UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIFECORE FITNESS, INC.
d/b/a ASSAULT FITNESS
Petitioner,

v.

WOODWAY USA, INC.
Patent Owner.

U.S. Patent No. 9,039,580 to Bayerlein et al.

Case No.: IPR2023-00836

DECLARATION OF ROBERT GIACHETTI, Ph.D.

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1016	Power Transmission Handbook, (Power Transmission Distributors Association 1993) ("PT Handbook")
1017	Neil Sclater and Nicholas P. Chironis, Mechanisms & Mechanical Devices Sourcebook, Third Ed., (McGraw-Hill 2001) ("Sclater") (available at https://catalog.loc.gov/vwebv/holdingsInfo?searchId=26&recCount=25&recPointer=0&bibId=12308523)
1018	Mechanical Clutches and Torque Overload Devices, (Emerson Industrial Automation, 2001) ("Emerson")
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1029	U.S. Patent No. 4,635,771 to Shoji ("Shoji")

I, Robert Giachetti, Ph.D., P.E., hereby declare as follows:

1. I am making this declaration at the request of LifeCORE Fitness, Inc. ("LifeCORE") in the matter of *Inter Partes* Review of U.S. Patent No. 9,039,580 ("the '580 Patent") to Bayerlein et al.

2. In preparation of this declaration, I have studied the exhibits as listed in the Exhibit List shown above in my report.

3. In forming the opinions expressed below, I have considered:

   a. The documents listed above as well as additional patents and documents referenced herein;

   b. The relevant legal standards, including the standard for obviousness provided in *KSR International Co. v. Teleflex, Inc*., 550 U.S. 398 (2007), and any additional documents cited in the body of this declaration; and

   c. My knowledge and experience based upon my work and study in this area as described below.

I. Qualifications and Professional Experience

4. I am a Licensed Professional Engineer in Illinois and Oklahoma, with over 20 years of experience in Mechanical Engineering. My experience in machinery and mechanisms spans numerous industries; I have worked directly designing mechanical systems and machinery, and I have consulted on the

operation of machinery in various fields including consumer products, rail, linear motion systems, conveyor systems, gear systems, wire rope, and exercise equipment.

5. I am employed by Fusion Engineering, LLC, where I have worked since November of 2020. Fusion is an engineering firm that provides multidisciplinary engineering consulting services.

6. I am currently the Director of Mechanical Engineering at Fusion and I am a Licensed Professional Engineer in Illinois and Oklahoma. In this role, I am responsible for providing engineering consulting services in Mechanical and Biomechanical engineering, coordinating client outreach, coordinating marketing materials, and recruiting.

7. Prior to joining Fusion as the Director of Mechanical Engineering I was a Senior Managing Engineer at Exponent, Inc., where I had been employed since 2008. In my positions there I worked on Biomechanical and Mechanical Engineering projects that frequently related to consumer product design, machinery design, product and machinery performance, and human interaction with consumer products or industrial equipment. In these roles I performed experimental studies where I built custom test fixtures that were comprised of typical mechanical power transmission components (e.g., linear actuators, belts, gears, conveyors, springs, bearings, etc.), measured forces and movements

generated by humans, and I was involved in several consulting matters that specifically involved exercise equipment.

8. I am currently a Member of ASTM and ASME where I sit on a number of committees, including ASTM's F15 Consumer Product Committee and ASTM's F08 Sports Equipment, Playing Surfaces, and Facilities Committee, that oversees treadmills. I have been an active participant in both of these committees.

9. I hold a Bachelor's, Master's and Ph.D. degree in Mechanical engineering. I have Minors in Physics as an undergraduate and Mechanics and Aeronautics as a graduate student. I have taught courses in Physics, Mechanical Engineering, and Biomechanics across three universities. My research in graduate school focused on two areas: 1) forces within the knee joint during daily activities, and 2) human balance and the coordination of limb musculature during walking, standing, running, etc.

10. As part of my work in human balance I was employed in the University of Wisconsin-Madison's Biomechanics laboratory in the Department of Kinesiology where I was also a teaching assistant in Biomechanics. While there, my research responsibilities included designing, developing and constructing equipment used to harness participants in efforts to analyze and characterize their lower limb force capabilities during every-day balancing and locomotive tasks. These research responsibilities also involved the use and disassembly of treadmills

to characterize force and balance capabilities of participants. As part of these research responsibilities, I reviewed studies focused on using treadmills and similar devices as rehabilitation devices (e.g. the "Locomat"). During this time, I also assisted in the preliminary development of a force measuring treadmill intended to dissociate the foot forces used in walking from the requirements imposed by upright posture.

11. Prior to attending graduate school, I worked as a project engineer, designing industrial machinery at Braner USA. In this position, I selected mechanical power transmission components, such as bearings and bearing plates in the design of machinery that uncoils sheet metal, conveys it, tensions it, processes it, recoils it and then deposits the coil into a coil car which transports the processed coil away. Prior to Braner USA I worked as an estimator and designer at Alloy Sling Chain, IND. LTD where I designed non-standard items as well as quoted new orders and repairs for lifting equipment.

12. I have been recognized as an expert in mechanical power transmission equipment and serve on the American Society of Mechanical Engineers (ASME) Power Transmission and Gearing Committee. I have also participated, by invitation, in the National Council of Examiners for Engineering and Surveying (NCEES) Mechanical Professional Activities and Knowledge Studies (PAKS) committee. This committee reviews and evaluates the problems and problem types

that appear on the Mechanical Engineering Professional Engineering exam for licensure as a Professional Engineer.

13. For nearly 25 years, I have been involved in the area of machine design and applications of machine design. These machines and products have ranged from children's mattresses to garden hoses, to pressure cookers, electronic tire/raft inflators, and industrial equipment including conveyors.

14. As briefly mentioned above, I have had experience using treadmills in a research environment while studying human balance and gait, and I have assisted with the preliminary design of a unique treadmill. In using treadmills for research purposes, I have disassembled them and am familiar with the common, well known and understood, mechanical power transmission components inside them.

15. In a consulting capacity I have also reviewed exercise equipment in pre-market analysis revolving around mechanical performance. These investigations included exercise equipment such as exercise bikes. In post-accident investigations, I have also reviewed exercise equipment in general on several occasions and these investigations involved many different types of exercise equipment. As part of my work in ASTM's F08 committee I also participate in the development of ASTM's standard both regarding exercise equipment in general, and in treadmills specifically.

16. I have provided my full background in the curriculum vitae that is

attached as Exhibit 1004.

II. Compensation and Prior Testimony

17. Fusion engineering is being compensated for my work in this matter at a rate of $390/hour for my time. I am a salaried employee of Fusion and my compensation in no way depends on my participation in this proceeding or the outcome of this proceeding.

18. I have previously provided expert testimony in at least three intellectual property related matters. My Curriculum Vitae identifies some of the areas in which I have previously provided expert testimony. (Giachetti CV, Ex. 1004.)

III. Materials and Information Considered

19. My findings, as explained below, are based on my years of education, research, experience, and background in the fields discussed above, as well as my investigation and study of relevant materials. In forming my opinions, I have studied and considered the materials identified in the Exhibit List shown at the beginning of my report. Each of the exhibits listed are true and accurate copies. The Exhibit List includes citations for each exhibit I have reviewed including a weblink where appropriate or applicable.

20. Additionally, I am aware of information generally available to, and relied upon by, persons of ordinary skill in the art at the relevant times, including

technical dictionaries and technical reference materials (including textbooks, manuals, technical papers and articles); some of my statements below are expressly based on such awareness.

21. Due to procedural limitations for *inter partes* reviews, the grounds of unpatentability discussed herein are based solely on prior patents and other printed publications. I understand that Petitioner reserves all rights to assert other grounds for unpatentability or invalidity, not addressed herein, at a later time. Thus, the absence of discussion of such matters here should not be taken as indicating that there are no such additional grounds for unpatentability and invalidity of the '580 Patent.

IV. Relevant Legal Standards

A. General

22. I have been asked to provide opinions on the claims of the '580 Patent in light of the prior art.

23. It is my understanding that a claimed invention is unpatentable under 35 USC § 102 if a prior art reference teaches every element of the claim. Further, it is my understanding that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the alleged invention was made to a person having ordinary skill in the art to which the subject

matter pertains. I also understand that an obviousness analysis takes into factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

24. It is my understanding that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of the claimed subject matter. Some of these rationales include the following: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to obtain predictable results; a predictable use of prior art elements according to their established functions; applying a known technique to a known device to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

B. Priority Dates for Claimed Subject Matter

25. I understand that in order to be considered "prior art," patents or printed publications must predate the pertinent priority dates for the subject matter claimed in the '580 Patent.

26. I have been informed that a patent is only entitled to a priority date

based on an earlier filed application if the earlier filed application meets the requirements of 35 U.S.C. §112. Specifically, I have been informed that 35 U.S.C. § 112, ¶1 requires that the specification of a patent or patent application must "contain a written description of the invention, and the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the [invention] . . . ." I understand that the requirements of this provision are commonly called the written description requirement and the enablement requirement.

27. I have been informed that compliance with both the written description requirement and enablement requirement must be determined as of the effective filing date of the application for which priority is sought.

28. I have been informed that to satisfy the written description requirement a patent's specification should reasonably convey to a person of skill in the art that the inventor had possession of the claimed invention as of the effective filing date of the application.

C. Claim Construction Standard

29. In order to properly evaluate these claims, I understand that the terms of the claims must first be construed.

30. I understand that in this proceeding, the claims are construed

consistent with the specification and using the same construction as that used in litigation. I have been informed that the claims, after being construed in this manner, are then to be compared to the information in the prior art, which for this proceeding is limited to patents and printed publications. I also understand that, at the same time, absent some reason to the contrary, claim terms are typically given their ordinary and accustomed meaning as would be understood by one of ordinary skill in the art.

31. I understand that a claim that includes functional language without sufficient structural limitations may be construed as a "means for" or "means plus" claim. Such a claim may be interpreted as requiring structural limitations disclosed in the specification.

32. I also understand that a means for / means plus claim may or may not include the term "means."

D. Anticipation

33. I understand that the following standards govern the determination of whether a patent claim is "anticipated" by the prior art.

34. I understand that, for a patent to be "anticipated" by the prior art, each and every limitation of the claim must be found, expressly, implicitly or inherently, in a single prior art reference. I further understand that the requirement of strict identity between the claim and the reference is not met if a single element or

limitation required by the claim is missing from the applied reference.

35. I understand that claim limitations that are not expressly described in a prior art reference may still be there if they are implicit or inherent to the thing or process being described in the prior art. I have been informed that to establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference and that it would be so recognized by persons of ordinary skill in the art. I have been informed that inherency cannot be established just because a certain thing may result from a given set of circumstances.

36. I understand that it is acceptable to consider evidence other than the information in a particular prior art document to determine if a feature is necessarily present in or inherently described by that reference.

E. Obviousness

37. I understand that for a single reference or a combination of references to render obvious a claimed invention, a POSA must have been able to arrive at the claimed invention by altering or combining the applied references.

38. I have been informed that a patent claim can be found unpatentable as obvious where the differences between the subject matter taught to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the relevant field.

Specifically, I understand that the obviousness question involves a consideration of:

a) the scope and content of the prior art;

b) the differences between the prior art and the claims at issue;

c) the knowledge of a person of ordinary skill in the pertinent art; and

d) whatever objective factors indicating obviousness or non-obviousness may be present in any particular case – referred to as "secondary considerations."

39. I have been informed that such secondary considerations include: (a) commercial success of a product due to the merits of the claimed invention; (b) a long-felt, but unmet need for the invention; (c) failure of others to find the solution provided by the claimed invention; (d) deliberate copying of the invention by others; (e) unexpected results achieved by the invention; (f) praise of the invention by others skilled in the art; (g) the taking of licenses under the patent by others and (h) the patentee proceeded contrary to the accepted wisdom of the prior art. I understand that secondary considerations are relevant where there is a connection, or nexus, between the evidence and the claimed invention.

40. In addition, I understand that the obviousness inquiry should not be done in hindsight, but must be done using the perspective of a person of ordinary skill in the relevant art as of the effective filing date of the patent claim.

41. I understand that in order for a claimed invention to be considered obvious, there must be some rationale for combining cited references as proposed.

42. I understand that obviousness may also be shown by demonstrating that it would have been obvious to modify what is taught in a single piece of prior art to create the patented invention. I understand that obviousness may be shown by establishing that it would have been obvious to combine the teachings of more than one item of prior art. In determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of one of ordinary skill in the art, I have been informed the following are examples of approaches and rationales that may be considered:

a) Combining prior art elements according to known methods to yield predictable results;

b) Simple substitution of one known element for another to obtain predictable results;

c) Use of a known technique to improve similar devices (methods, or products) in the same way;

d) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

e) Applying a technique or approach that would have been "obvious to try" (i.e., choosing from a finite number of identified,

predictable solutions, with a reasonable expectation of success);

f) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art; or

g) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. I also understand that this suggestion or motivation may come from such sources as explicit statements in the prior art, or from the knowledge or common sense of one of ordinary skill in the art.

43. I understand that an invention that might be considered an obvious variation or modification of the prior art may be considered non-obvious if one or more prior art references discourages or lead away from the line of inquiry disclosed in the reference(s). I understand a reference does not "teach away" from an invention simply because the reference suggests that another embodiment of the invention is better or preferred. My understanding of the doctrine of teaching away requires a clear indication that the combination should not be attempted (e.g., because it would not work or explicit statement saying the combination should not

be made).

V. Qualifications of one of ordinary skill in the art

44. Based on my review of these materials, I believe that the relevant field for purposes of the ’580 Patent includes exercise apparatuses and methods for developing or strengthening the muscles or joints of the body by working against gravity, a counterforce or countermovement, such as the field of treadmills, including manual treadmills. (*See* Ex. 1001, 1:19-20.)

45. As described in Section I above, I have extensive experience in the relevant field, including experience relating to treadmill design. Based on my experience, I have an established understanding of the relevant field.

46. I understand that a “person of ordinary skill in the art” (POSA) or a “skilled artisan” is one who is presumed to be aware of all pertinent art as of the relevant timeframe, thinks along conventional wisdom in the art, and is a person of ordinary creativity. I understand that the level of skill in the art is evidenced by the prior art references. It is my understanding that the ’580 Patent is to be interpreted based on how it would be read by a POSA. It is my understanding that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made may help establish the level of skill in the art. I understand that a POSA is not a specific real

individual, but rather is a hypothetical individual having the qualities reflected by the factors above.

47. I understand the relevant timeframe for evaluating a claim is at the time of the invention, which is based on the effective filing date of each claim, or the date at which the subject matter of the claim was first disclosed in an application in such full, clear, concise, and exact terms as to enable the person skilled in the art to make and use the claimed invention. For reasons not addressed in this Declaration or the Petition it accompanies, the effective filing date of certain claims of the ’580 Patent is March 16, 2010. However, I have assumed a March 17, 2009 priority date for purposes of my analysis below, as the priority date is not relevant to the specific grounds of unpatentability forming the basis of this challenge.

48. In my opinion, given the relevant field and relevant timeframe of the ’580 Patent, a POSA would have a bachelor’s degree in mechanical engineering and at least one year of machine design experience related to power transmission equipment and a demonstrated understanding of exercise biomechanics, including anthropometry (*i.e.*, the study of human proportion).

49. Based on my experience, I have an understanding of the capabilities of a person of ordinary skill in the relevant field as of March 2009.

VI. State of the art

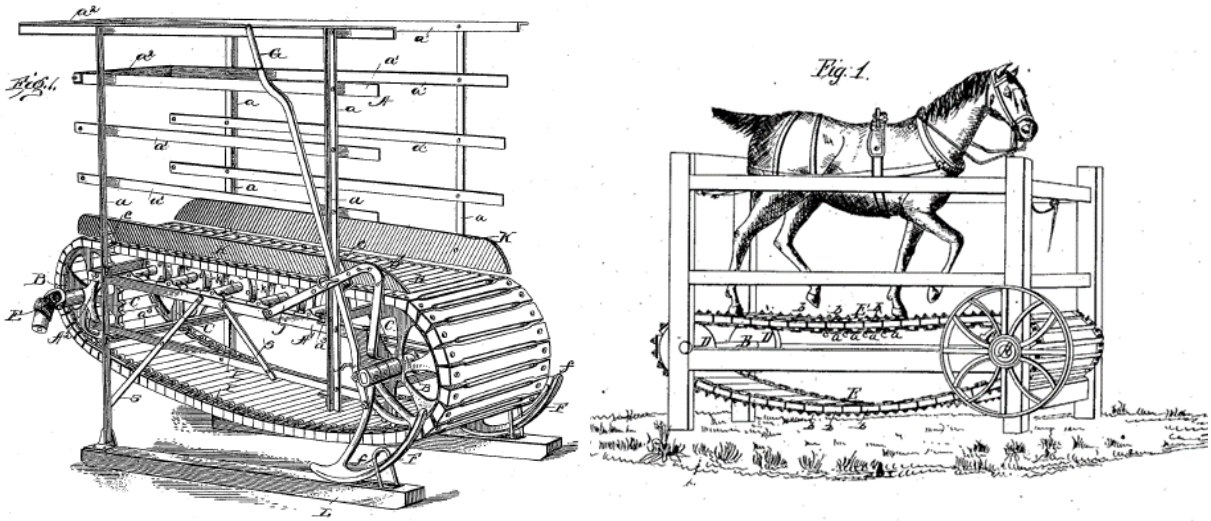
50. A treadmill is "an exercise device that consists of an endless conveyor belt that is rotated either manually or by a motor and on which a person can walk or jog in one place." ("Treadmills: Supplier Guide" Ex. 1007 at 2.) The user moves their foot against a running surface that would propel them forward, however, in most treadmills, the running surface moves rearward at the same speed such that the user walks or runs in place. Treadmills, when viewed through the lens of a POSA, fall under two categories of broad technical skills: machine design and biomechanics. The biomechanical portion covers the anthropometry of humans, such as their size and shape, *i.e.* anthropometry. The aspect of machine design includes the knowledge of elementary machine components and how they are assembled to accomplish intended tasks, *i.e.*, power transmission.

51. A manual treadmill is generally regarded as a treadmill in which the user provides the power that moves the running surface, whereas a motorized treadmill includes a motor that propels the running surface. A treadmill may include a flat running surface or a curved running surface, which is the two-dimensional shape of the running surface when viewed from the side, irrespective of the orientation relative to level ground. Treadmills typically include one or more bearings to support the running surface. Treadmills have a number of safety concerns that are addressed by several standards bodies including The Australian

Competition and Consumer Commission, ASTM International (*e.g.*, ASTM F2115), and International Organization for Standardization (*e.g.*, ISO 20957).

A. Manual vs Motorized Treadmills

52. Manual treadmills have been used for harnessing human or animal power for hundreds of years using hamster-style wheels. Treadmills resembling modern treadmills began to appear in the mid-1800s and early 1900s. For example, U.S. Patent No. 641,424 to Ziebell (Ex. 1008) issued in 1900, and US Patent 8308X to Briggs[1] issued in 1834; both patents describe treadmills for harnessing animal power.

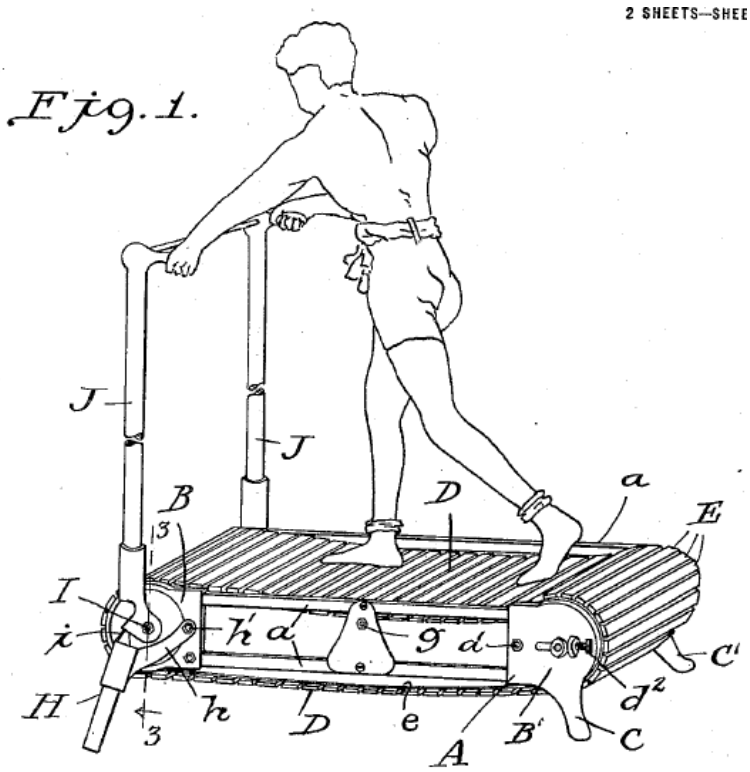


Ziebell, Ex. 1008, Fig. 1 (Left); Briggs, Fig. 1 (Right)

53. Manual treadmills for exercise purposes emerged in the early 1900's, before electrical power and electrical motors were widely available to consumers.

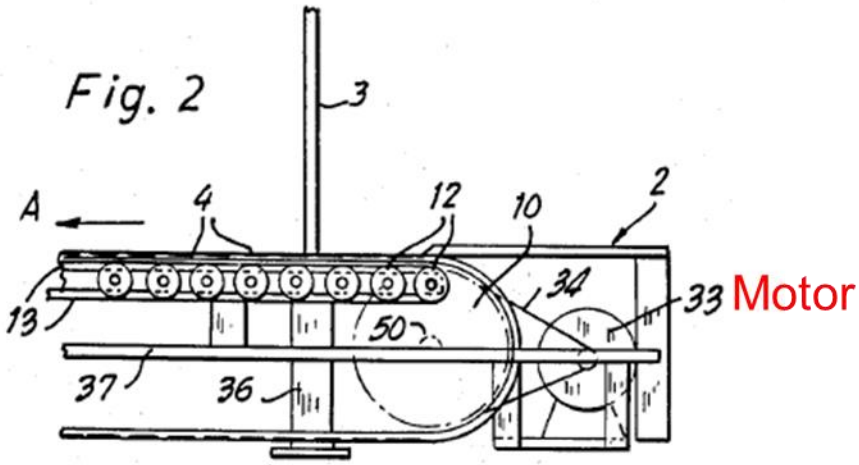
[1] Available at https://catalog.archives.gov/id/178329130.

For example, U.S. Patent No. 1,211,765 to A.P. Schmidt issued January 9, 1917, and describes a "Health Exerciser." (Ex. 1009.)



Schmidt, Ex. 1009, Fig. 1

54. By the late 1900's inexpensive and lightweight polymeric belts were widely available, electricity and electric motors were also widely available, and accordingly, treadmills began to be offered with motors to propel the running surface. For example, U.S. Patent No. 4,614,337 to Schonenberger (Ex. 1010) issued on September 30, 1986 and describes a motorized treadmill:



Schonenberger, Ex. 1010, Fig. 2 (Annotated)

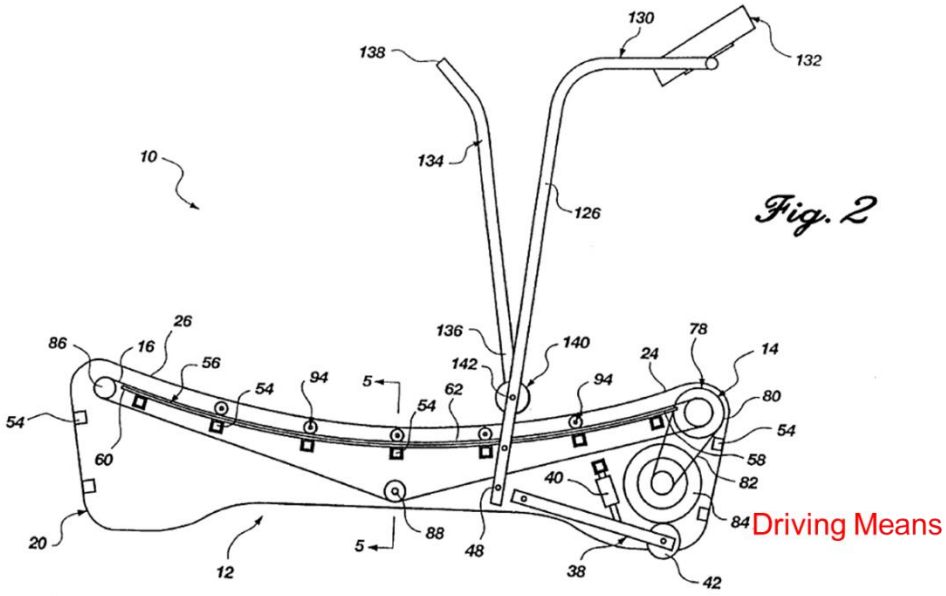
> The physical exercise apparatus illustrated in FIG. 1 is driven by a motor 33 (FIGS. 2, 3) which drives the movable surface 1. A person standing on the surface, when driven, in order to remain thereon, must walk, jog, or run. The apparatus is enclosed in a housing 2 to which also support bars 3 are secured.

(Schonenberger, Ex. 1010, 4:1-6.)

55. Similarly, U.S. Patent No. 5,897,461 to Socwell (Ex. 1011) issued on April 27, 1999 and describes an Exercise Treadmill with driving means 84, such as a conventional electric motor, for rotating the running surface:

> In one presently preferred embodiment of the present invention, a driving means 84 is operably connected to at least one roller to enable the rotation of the belt 16. The driving means 84 preferably comprises a conventional electric motor for rotating the belt 16.

(Socwell, Ex. 1011, 11:34-36; Fig. 2.)



Socwell, Ex. 1011, Fig. 2 (Annotated)

56. Motorized treadmills add cost and complexity:

> A meaningful disadvantage of prior art motorized exercise treadmills includes the general disposition or placement of the motor in relation to the roller assembly and belt. Accordingly, the motor may be generally disposed either in front of, behind, or at one side of the endless belt. The usual placement or disposition of the motor in relation to prior art exercise treadmills, however, typically minimizes valuable space which could be alternatively allocated to the disposition of other internally working components of the treadmill or for the purpose of increasing the walking surface provided by the dimensional size of the belt.

(Socwell, Ex. 1011, 2:1-11.)

57. Manual treadmills do not require electricity to drive the belt, which is an attractive option for a climate conscious runner. Accordingly, to reduce cost,

complexity, and electrical energy consumption, both Schonenberger and Socwell also describe offering their treadmills without motors for use as manual treadmills:

> This invention allows a runner to use the apparatus in a 5% elevation position without any external motor power.

(Schonenberger, Ex. 1010, 6:16-18[2].)

> One of the drums 10 is driven by motor 33, or by gravity of earth or by any other suitable motive drive apparatus by means of a drive belt 34 (FIGS. 2, 3), preferably with interposition of a step-down gearing.

(Schonenberger, Ex. 1010, 4:34-37.)

> In an alternate embodiment, the curved deck treadmill 10 or the present invention may be implemented without a driving means engagably disposed to a roller in order to facilitate the forced rotation of the belt 16. If so implemented, the rollers 78, 86 and 88 and the deck 56 should be generally calibrated in relation to the belt 16 to provide an optimal frictional resistance to enable a user to safely walk, jog, and/or run thereon, while still providing sufficient resistance to enable a user to exercise.

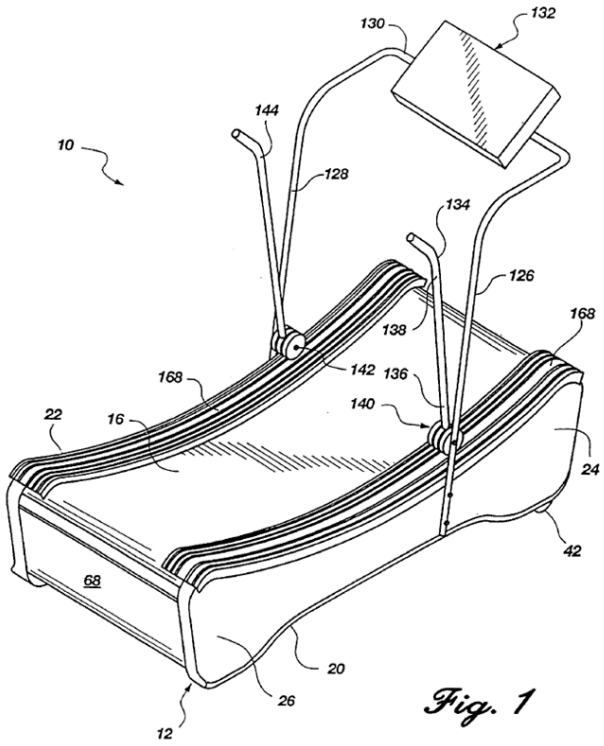
(Socwell, Ex. 1011, 11:53-61.)

B. Running Surface

58. The running surface is the portion of the treadmill where the user is expected to place their feet while exercising. Treadmills typically include one of

[2] All emphasis added unless otherwise noted.

two different types of running surfaces: a belt style, or a track style. A belt style running surface is a flexible unitary endless belt that is usually formed from a thin sheet of a polymer material, although a number of other materials and methods of construction also are known, such as using a woven fabric or metal. This type of belt as shown in Figure 1 of Socwell below:



Socwell, Ex. 1011, Fig. 1

59. A track style running surface includes a plurality of lateral segments, or slats, that are connected together by flexible bands, belt(s) or chain to form an endless loop. In the Power Transmission field these can also referred to as a hinged belt (PT Handbook, Ex. 1016, 6-4, 6-5) and they have a resemblance to a tank

track as shown in Figure 1 of Schonenberger:

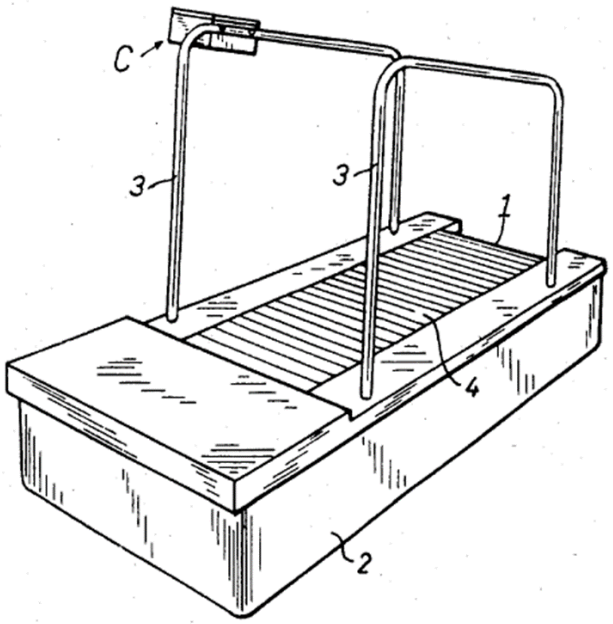


Fig. 1

Schonenberger, Ex. 1010, Fig. 1

60. Motorized treadmills also include drawbacks related to energy consumption and noise generation. Schmidt discloses a "noiseless" device. (Schmidt, Ex. 1009, 3:22-27.) And there are also reports that as of 2007 sustainable gyms had already started to emerge where it was seen as a benefit to generate

energy via exercise instead of consuming it. (Ex. 1024.[3])

C. Curved vs Flat Treadmills

61. Flat treadmills are understood to result in greater impact loading on the users' joints, unsmooth operation, as well as a likelihood of users falling off of the back:

> In accordance with prior art exercise treadmills comprising a flat, horizontal or slightly inclined moveable surface, the endless belt supportably disposed in relation to the rollers will typically absorb the full impact force of the foot of a user repetitively depressed thereagainst. The impact force sustained by the endless belt of prior art exercise treadmills generally produces a breaking [SIC] effect which causes temporary stalling of the rotational movement of the belt. This undesirable stalling motion of the belt typically alters the continuity of the user's exercise routine and may further institute jerking movements with each step of the user. As the force or pressure associated with the impact of the user's feet on the flat, horizontal surface increases, the more likely prior art exercise treadmills will realize this breaking effect. In this regard, a heavy person running on a horizontal belt supported by rollers engaging a frame will more likely

[3] Inhabitat, "HUMAN-POWERED GYMS in Hong Kong" is a true and accurate copy of a webpage that is understand was posted by Inhabit on March 8, 2007. (Available at https://inhabitat.com/human-powered-gyms-in-hong-kong/)

> introduce a consistent breaking effect on the rotational movement of the belt, than a lighter person walking on the same treadmill."

(Socwell, Ex. 1011, 2:12-29.)

> Another meaningful disadvantage of exercise treadmills of the prior art is the inherent danger associated with users tending to fall off the back end of the treadmill and become injured. Several attempts have been made to keep a user exercising on prior exercise treadmills from falling off the back end of the endless belt and from the treadmill frame. For example, prior art exercise treadmills were developed by those skilled in the art which include a belt for harnessing the user to the treadmill. Unfortunately, harnessing a user to the treadmill is often found to be as dangerous as falling off the back of the treadmill.

(Socwell, Ex. 1011, 2:45-55.)

> Another meaningful disadvantage of prior art exercise treadmills is their general inability to reduce the physical impact to the joints and muscles of a user conducting general exercise routines in relation thereto. In this regard, an exercise treadmill which is capable of reducing the physical impact on the knees and back of a user will resolve several barriers left unsolved by known prior art devices, especially in light of providing an operative role in rehabilitative exercises.

(Socwell, Ex. 1011, 3:1-9.)

62. Treadmills having a curved running surface provide benefits, such as providing an inclined rear surface to push forward from, alleviating some of the

risk of falling off of the back end, as well as a shape that conforms to the natural path of the foot in relation to the body.

> Another feature of the present invention not found in prior art structures is that, associated with the frictional resilient tread, is means whereby the tread surface may assume, under the action of the operator, a slightly curved surface, thereby greatly facilitating the operation of running or walking upon the exerciser and, at the same time, allowing the operator to maintain perfect equilibrium and balance.

(Schmidt, Ex. 1009, 1:50-59.)

> In view of the foregoing, it is a primary object of the present invention to provide a novel curved deck treadmill which provides a structurally supported arcuate shaped, moveable surface on which a user may exercise.

(Socwell, Ex. 1011, 3:25-29.)

63. A user can adjust their running pace by adjusting the angle of the running surface:

> When a faster pace is desired, the inclination of the tread surface 16a is increased by moving pins 30 into one of the upper holes 17, or by elevating the forward end of the base 10 with jackscrews 11, or both. A slower pace is attained by reversing these operations.

(Chickering, Ex. 1013, 2:44-49.)

64. A runner may adjust their running speed by running on a different

portion of a curved running surface:

> A continuous belt has an upper course lying above and resting on these rollers, and a lower course below them, so that a person walking, jogging, or running on them automatically locates himself fore-and-aft of the exerciser by the balance between his weight, his speed, and the variation in inclination along the curved path of the continuous belt.

(Cutter, Ex. 1014, Abstract.)

D. Treadmill Bearing Systems

65. A bearing is a general term for a mechanical element that provides a means for low friction movement between two surfaces (PT Handbook, Ex 1016, 2-1). The motion between the elements may be rotary motion or "linear" motion (PT Handbook, Ex 1016, 2-1). The three most common and predominant bearing systems for supporting a treadmill running surface are: rotary plain/journal bearings, rotary rolling element bearings, and linear bearings/bearing surfaces.

66. The type of running surface that is used corresponds with the type of bearing system selected for the treadmill. The belt style treadmill generally implements rollers, a rotary style of bearing typically identified by its elongated form factor that may also incorporate journal bearings or rolling element bearings to manage its frictional qualities, or a bearing surface (i.e., a "deck" or slider bed) because the belt cannot resist the loads imparted to it from the operator so the belt relies on rollers or deck underneath the belt to provide rigidity to the running

surface. On the other hand, small rolling element bearings are predominantly selected for the track style running surface because the transverse slats are strong enough to resist the operator's loads without anything directly underneath the slats where the operator's foot is. Historically, treadmills that implement small rolling element bearings still include front and rear connections, such as a roller, drum, sheave, pulley or shaft assembly, between the two frontmost side bearings and also the two rearmost side bearings to ensure alignment of the endless belt(s). These common and well understood methods are also found in known Power Transmission technology, i.e., conveyor technology, see, for example PT Handbook, Ex 1016, 6-2, 6-4.

1. Plain / Journal Bearings

67. Plain rotary bearings are widely used in machinery and equipment. They function as a tight-fitting cylinder that encloses and supports a moving member, generally called the shaft or journal (PT Handbook, Ex 1016 at 2-1, 2-2). Plain / Journal Bearings are generally recognized by the characteristic that they are a single piece that provides low-friction rotary motion through sliding action. The low-friction interface can be achieved by the material of the plain bearing itself or it can be achieved by imparting a lubricant into or applying a coating to the surface of the bearing; some plain bearings are also intended to be lubricated. A bearing system that includes such a series of plain / journal bearings is described in

Chickering (Ex. 1013):

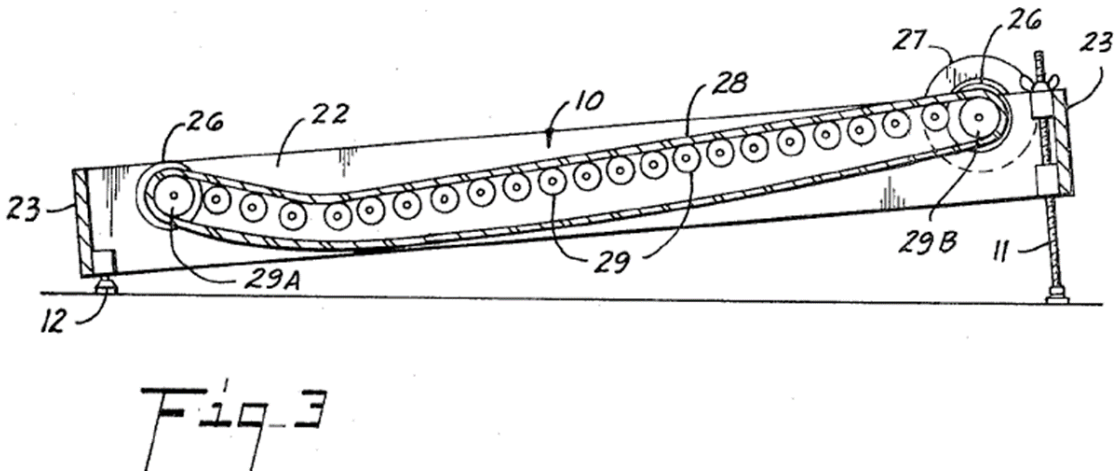


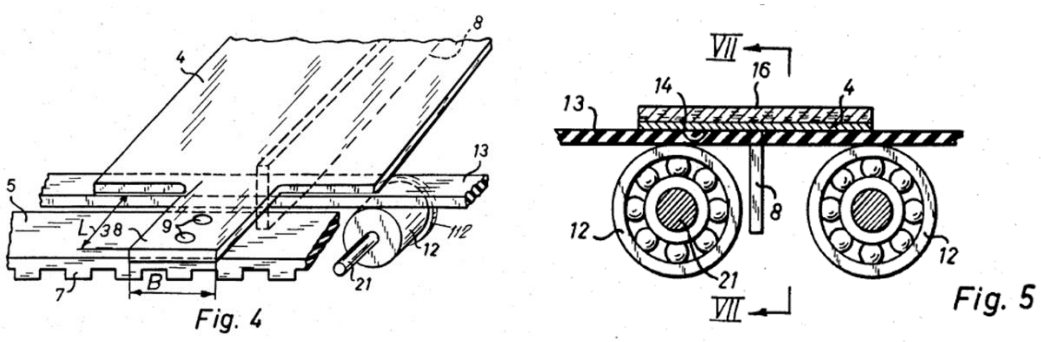
Fig. 3

Chickering, Ex. 1013, Fig. 3

2. Rolling Element Bearings

68. Rolling element rotary bearings include multiple elements and the low friction rotary motion they enable is provided by rolling action, not sliding action, in contrast to plain bearings. Rolling element rotary bearings include a series of rolling elements, like rollers or balls, that are located between two concentric rings. The portion of the rings that the rolling elements contact is known as the race. Rolling element bearings usually fall into two categories: ball bearings and roller bearings. Ball bearings have tiny balls that are spherically shaped whereas roller bearings include some sort of cylindrical element that is longer than it is in diameter (the diameter does not need to be constant, as is the case with spherical roller bearings). (PT Handbook, Ex 1016 at 2-3.) In the treadmill art, rolling element bearings are typically found along the sides of the frame and/or down the middle of the running surface where they either are attached to the treadmill or the

track. There are some treadmills found in the art that employ an array of rotary bearings distributed two-dimensionally in a deck instead of using sliding contact on a deck surface. Rolling element bearings are usually found inside of other objects, as how they are found in skateboard wheels, however some rolling element bearings called cam followers, track followers, or stud bearings, are also common and these implement a thick outer ring so that they can be used as the contact surface themselves without an outer wheel or roller (PT Handbook, Ex 1016, 2-7.) A side bearing system typically includes rotary bearings that are disposed along the sides of the running surface to provide low friction motion between the running surface. The side bearing system is often used with track style running surfaces because track style running surfaces are typically much more rigid than a belt style and accordingly, are able to resist the loads from the user without a supplemental support structure beneath. Schonenberger (Ex. 1010) and U.S. Patent No. 6,042,514 to Abelbeck (Ex. 1015) disclose such side roller bearing systems.



Schonenberger, Ex. 1010, Figs. 4, 5

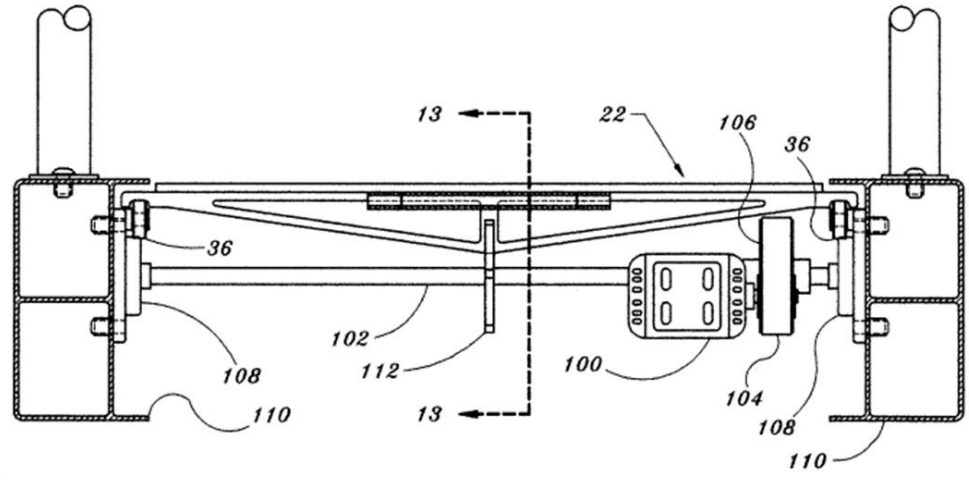


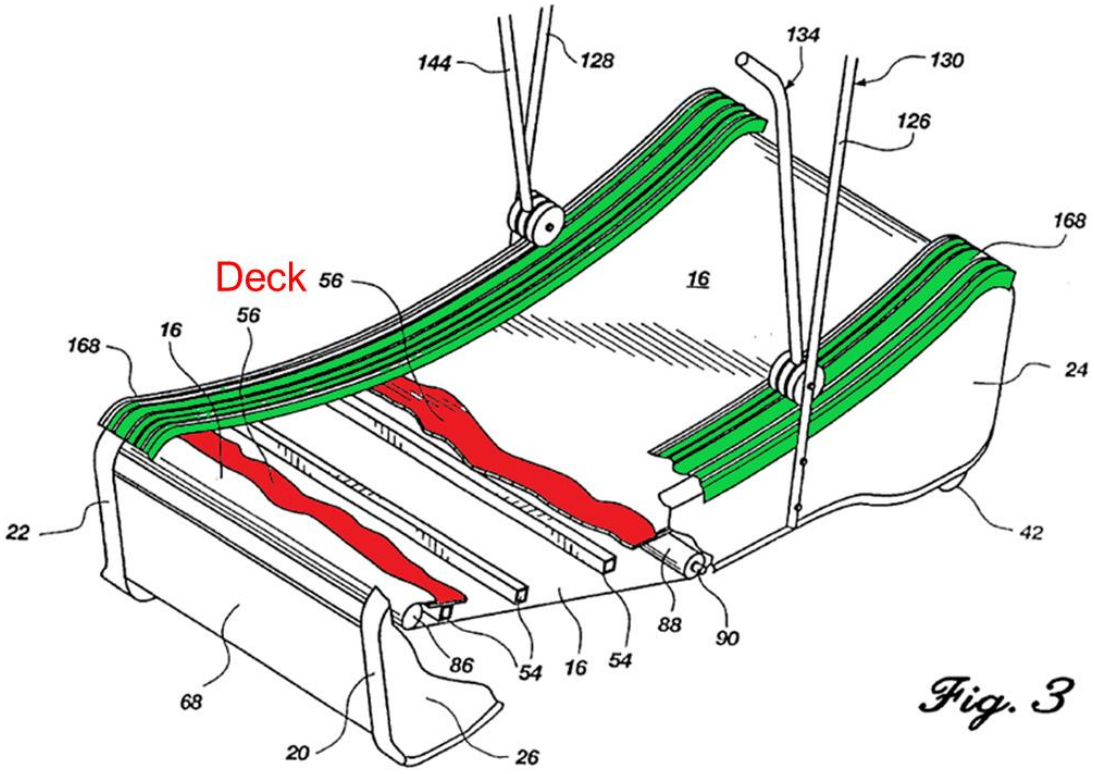
Fig. 12

Abelbeck, Ex. 1015, Fig. 12

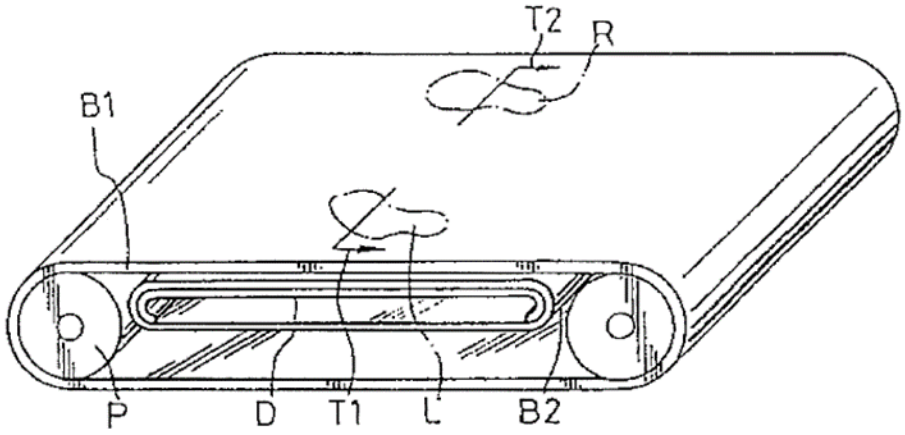
3. Bearing Surface

69. A bearing surface is a low friction surface that does not move relative to another surface that slides across it, and the bearing surface is typically more rigid than the moveable surface in treadmill art. "As with any other power transmission system, a linear motion system must be supported and guided. Forces generated by moving parts in a linear system must be resisted by bearings for the system to remain stable." (PT Handbook, Ex. 1016, 10-11.) Bearing surfaces are also known as plain linear bearings or slider beds in general, and in the treadmill art they are known as a deck. The PT Handbook describes these plain linear bearings as being "the oldest device that lets one machine element, such as the bed of a planer, move easily on another." (PT Handbook, Ex. 1016, 10-11.) Bearing

surfaces are generally coupled to a treadmill frame underneath the running surface to resist the loading applied by the user while still enabling a low friction sliding action between the deck and belt. The bearing surface may be formed of a low-friction material, a material impregnated with lubricant, or a lubricant may be applied to the bearing surface, just as with plain rotary bearings. Socwell and Magid disclose such bearing surfaces, *i.e.*, decks:



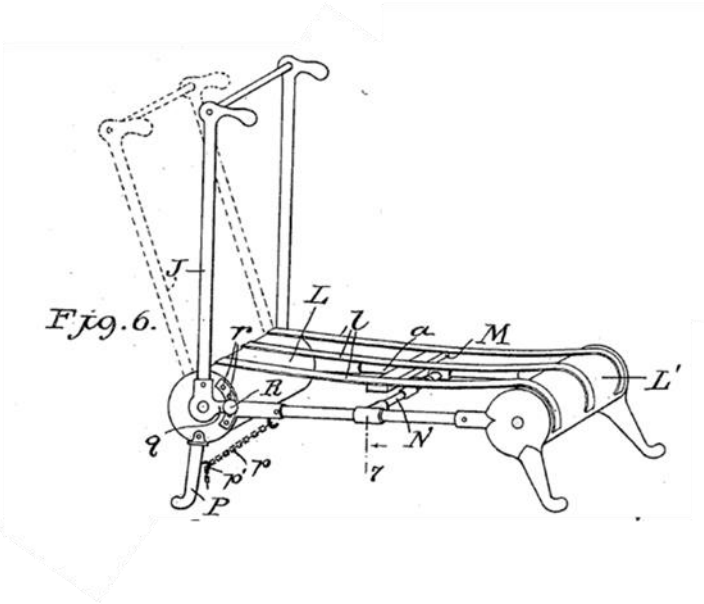
Socwell, Ex. 1011, Fig. 3 (Annotated)



PRIOR ART
FIG. 1

Magid, Ex. 1012, Fig. 1

70. Schmidt discloses a bearing surface that includes a series of longitudinally extending suspension rods: "Thus, as the person operates the apparatus, he walks upon a resilient, springy suspension, and the flexible tread band glides, in frictional contact, over suspension rods *d* in a smooth and noiseless manner." (Schmidt, Ex. 1009, 3:22-27.)



Schmidt, Ex. 1009, Fig. 6

E. Safety

1. Safety Concerns

71. It has long been recognized that users may be injured by falling off of a treadmill either while mounting or dismounting it or while using it. This may be due to the treadmill belt moving in an unexpected direction or in such a way that the user cannot regain their equilibrium. It could also be due to the incline of the surface causing the position of user to drift rearwards, and off, over time.

72. Chickering describes such a problem due to insufficient friction between a belt and rollers in a roller bearing system:

> In Wood and Morairty, which exemplify the more common type of treadmills in general use today, the problem is just the opposite. There the support harness and railings are necessitated by the fact that the tread surface on each device is frictionless-comprising merely an

> endless belt which is disposed about a series of frictionless rollers on an inclined base. A person exercising on this type of treadmill is likely to lose his balance because the frictionless surface offers no resistance to the movement of his feet, and he is therefore unable to obtain the leverage necessary for proper balance. Also, the user is likely to run off the lower end of the treadmill because the faster he runs the faster the belt accelerates and moves beneath his feet, carrying him to the rear. Thus, some external support is necessary to enable the user of such treadmills to maintain his balance, as well as his position on the moving belt.

(Chickering, Ex. 1013, 1:24-39.)

a. Safety Solutions

73. Socwell acknowledges this problem and proposes using rollers with sufficient friction:

> In addition, if sufficient frictional resistance is not found in relation to the rotation of the free-moving rollers rotatably engaging the belt, a user attempting to exercise on the treadmill may suffer from injuries sustained as a result of an uncontrolled rotation of the anti-friction rollers engaging the belt. In particular, if the rollers supportably disposed in relation to the endless belt are so easily moveable, the user may potentially lose his equilibrium or balance and fall from the exercise treadmill resulting in possible injuries.

(Socwell, Ex. 1011, 1:28-36.)

74. Magid describes using a one-way clutch (an external ratchet and pawl

clutch) to limit the belt to motion in one direction:

> A unidirectional control means 6,6' is installed to permit only unidirectional movement of the left and right foot belts 4, 4'. In this embodiment, the control means 6,6' includes a pair of ratchet gears 61 attached to outer ends of the front rollers 41 and mounted rotatably on the first shaft 411, and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61 to permit unidirectional rotation of the front rollers 451, thereby preventing bidirectional movement of the foot belts 4, 4'. A releasable means (not shown) may be provided to release selectively the pawls 62 from the ratchet gears 61 in a known manner to permit reciprocating movement of the foot belts 4, 4' when desired. Of course, the ratchet gears may be attached to the rear rollers 42 to achieve the same result.

(Magid, Ex. 1012, 4:46-60.)

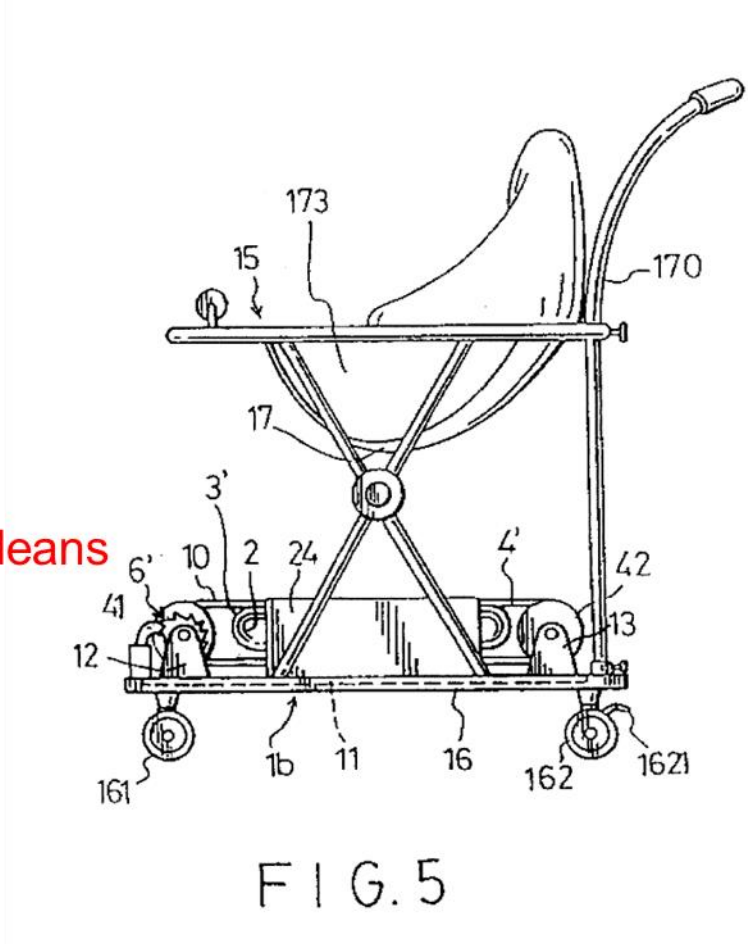


FIG. 5

Magid, Ex. 1012, Fig. 5 (Annotated)

75. A recognized issue with treadmill use is a user falling off the back of the treadmill due to an inability to move forward on the running surface:

> Another meaningful disadvantage of exercise treadmills of the prior art is the inherent danger associated with users tending to fall off the back end of the treadmill and become injured. Several attempts have been made to keep a user exercising on prior exercise treadmills from falling off the back end of the endless belt and from the treadmill frame. For example, prior art exercise treadmills were developed by those skilled in the art which include a belt for harnessing the user to

> the treadmill. Unfortunately, harnessing a user to the treadmill is often found to be as dangerous as falling off the back of the treadmill.

(Socwell, Ex. 1011, 2:45-55.)

76. Treadmills include handrails or a curved track to prevent a user from falling off the back:

> Additionally, exercise treadmills of the prior art may furnish a user with an upright handle to grasp while exercising. While somewhat useful in retaining the user's balance on the rotating endless belt, having to grasp a fixed handle may impede the natural body motion of a user attempting to exercise. Such an encumbrance may be feasible when a user is attempting to walk, but when a user begins to jog or run on prior art exercise treadmills, having to grasp a handle to keep centered on the treadmill may severely interfere with one's natural body motion and further abdicate the inherent physical advantages of the exercise routine.

(Socwell, Ex. 1011, 2:56-67.)

77. Several prior art exercisers have provided a solution to the user's inability to control their position relative to the running belt by shaping the running surface so that the rear of the running surface is inclined upward providing a surface to push forward from that is not reliant on frictional resistance:

> Also, the surface 25a, due to its upward inclination, will support a forward component of force which enables the person using the exercise device to "push off" against surface 25a at the end of each step. These combined decelerating and forward force-supporting

> characteristics of surface 25a enable a user of the device to both overcome the rearward motion and momentum imparted to his body during the first part of each step, and also to gain enough forward push to maintain his balance and position.

(Chickering, Ex. 1013, 2:64-72.)

b. Safety Standards

78. Several standards bodies have produced industry standards that provide guidance to manufacturers regarding both exercise equipment safety in general and specifically for treadmill safety. ASTM International published F2115 in 2005 (Standard Specification for Motorized Treadmills) ("ASTM Standard,"[4] Ex. 1019). This standard defines terminology such as deck, and foot rail, and usable moving surface. (ASTM Standard, Ex. 1019 at 1-2.) This standard also provides guidance regarding safety, including: the stability of a treadmill, safety against pinch points, "[a]ll treadmills shall be equipped with foot rails to facilitate mounting and dismounting," and "[a]ll treadmills shall be equipped with a handrail for user support during use to assist in dismount." (ASTM Standard, Ex. 1019 at 3-4.) The ASTM Standard also invokes UL 1647 as part of its instruction that

[4] ASTM F2115-05, Standard Specification for Motorized Treadmills, (ASTM, 2005) ("ASTM Standard") is a true and accurate copy of a standard that I understand was published by ASTM in 2005.

"Electrical elements shall be guarded so as to meet or exceed UL1647." *Id.* at 3. This standard also provides guidance regarding warnings, labeling, and the control panel, as well as how fast a support structure system may raise or lower the treadmill. (ASTM Standard, Ex. 1019 at 5.)

79. The international community also published a standard, ISO 20957-6, also in 2005 under the title Stationary training equipment – Part 6: Treadmills, additional specific safety requirements and test methods. ("ISO Standard[5]," Ex. 1020.) This standard also requires "side handrails or front handlebar for user support and emergency dismount" and foot platforms with a "non slip surface" for safety. (ISO Standard, Ex. 1020 at 8.) Stationary Training Equipment is a true and accurate copy of a standard that I understand was published by ISO in 2005. Also like ASTM, ISO includes a clause regarding electrical safety where it invokes EN 60335 and EN 60601. (ISO Standard, Ex. 1020 at 8.)

80. Finally, the Australian Competition and Consumer Commission published a Product safety bulletin first published in 2010 and describes in

[5] ISO 20957-6 Stationary Training Equipment – Part 6: Treadmills, additional specific safety requirements and test methods. (ISO, 2005) ("ISO Standard") is a true and accurate copy of a standard that I understand was published by ISO in 2005.

common language the Australian Regulation that was enacted to apply to all treadmills in Australia enacted on June 4, 2009. (ACCC Product Safety Supplier Guide, Ex. 1007.)

F. Mechanical Clutches

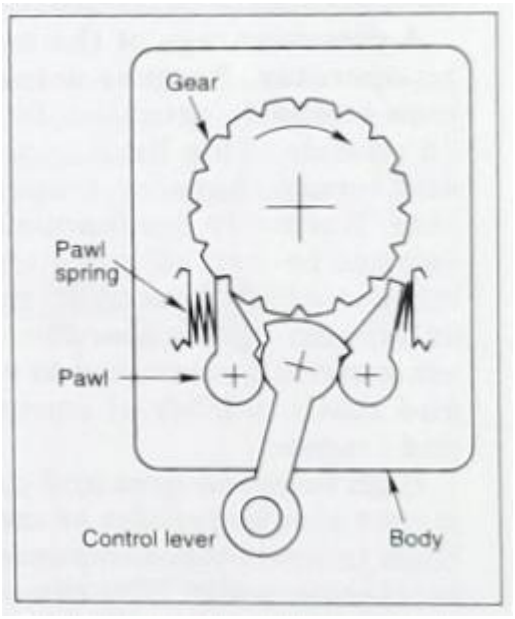
81. A mechanical clutch is used to control and transmit torque, speed, and power in a rotating drive system. (PT Handbook,[6] Ex. 1016, 5-1.) An overrunning clutch transmits torque in one direction and freewheels, locks up, or reduces speed in the reverse direction. Some common mechanical clutches include ratchet clutches and cam type one-way clutches, such as sprag clutches.

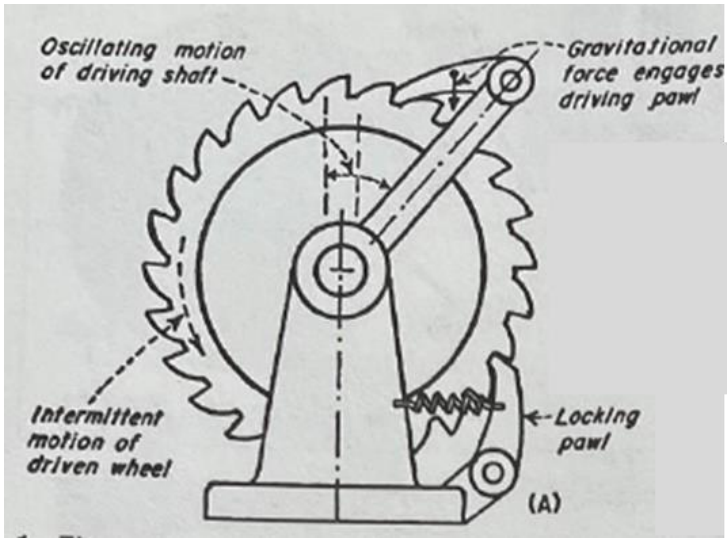
1. Ratchet Clutch

82. A ratchet clutch is typically a clutch where a spring-loaded pawl engages a notched wheel or gear, permitting rotation in only one direction. (PT Handbook, Ex. 1016, 5-5.) A ratchet clutch may be used in low-speed overrunning, indexing, and backstopping modes of operation. (*Id.*) As shown in the figures below, the position of a control lever (left figure) or the gear tooth profile and pawl orientation (right figure) determines whether the clutch operates in forward,

[6] Power Transmission Handbook, (Power Transmission Distributors Association 1993.) The PT Handbook is a true and accurate copy of a book that I understand was published by the Power Transmission Distributors Association in 1993.

reverse, freewheeling (neutral), or locked modes.





PT Handbook, Ex. 1016, 5-5; Sclater,[7] Ex. 1017, 316.

83. A ratchet clutch having a pawl that contacts the gear during overrunning is loud, as compared to other mechanical clutches:

> (A) A ratchet and pawl mechanism converts reciprocating or oscillating movement to intermittent rotary motion. This motion is positive but limited to a multiple of the tooth pitch. (B) A friction-type clutch is quieter, but it requires a spring device to keep the eccentric pawl in constant engagement. (C) Balls or rollers replace the pawls in

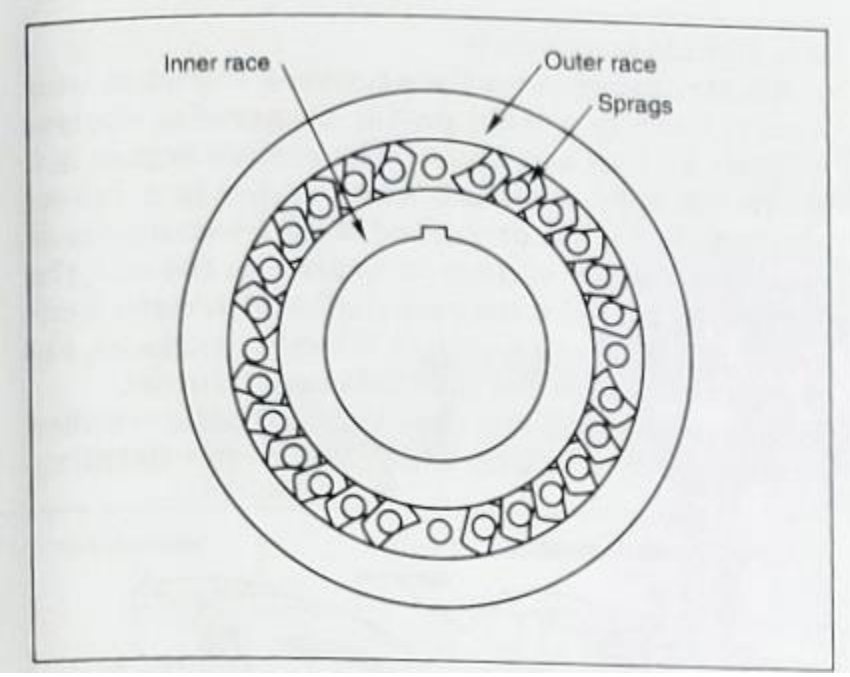
[7] Neil Sclater and Nicholas P. Chironis, Mechanisms & Mechanical Devices Sourcebook, Third Ed., (McGraw-Hill 2001). Sclater is a true and accurate copy of a book that I understand was published by McGraw-Hill in 2001.

this device. Motion of the outer race wedges the rollers against the inclined surfaces of the ratchet wheel.

(Sclater, Ex. 1017, 316.)

2. Sprag Type One-Way Bearing Clutch

84. A sprag type overrunning (one-direction) clutch includes cylindrical inner and outer races,[8] or rings, with sprags filling the space between. The inner race may be secured to a shaft by a key-keyway interface. Such a keyway is illustrated in the figure below.



PT Handbook, Ex. 1016, 5-5

85. The sprags are "sized, shaped, and mounted in a manner that causes

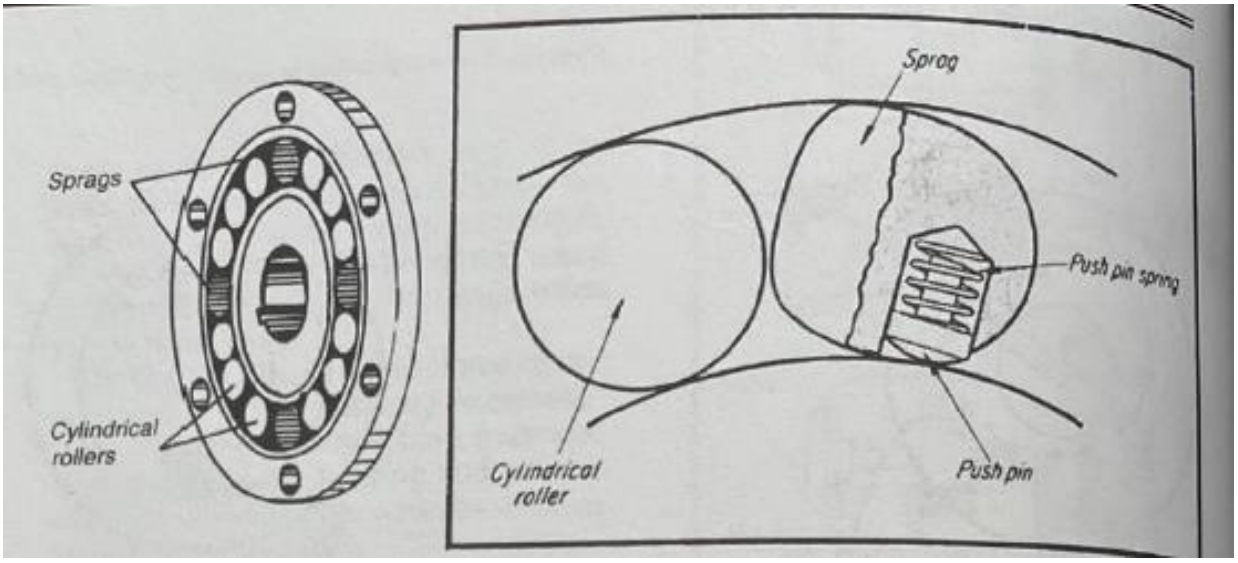
[8] A POSA would have understood that the terms "race" and "ring" are used interchangeably when describing bearing components.

them to wedge between, and thereby link, the two races when rotation occurs in the proper direction." (PT Handbook, Ex. 1016, 5-4.) However, "[w]hen rotation is reversed, or when output overruns input in the driven direction, the sprags fall out of engagement." (PT Handbook, Ex. 1016, 5-5.) This wedging, or jamming, action is accomplished through frictional means.

86. Sclater discloses a one-way bearing that includes sprags combined with rolling elements, such as cylindrical rollers or balls:

> Sprags combined with cylindrical rollers in a bearing assembly can provide a simple, low-cost method for meeting the torque and bearing requirements of most machine applications. Designed and built by Est. Nicot of Paris, this unit gives one-direction only torque transmission in an overrunning clutch. In addition, it also serves as a roller bearing.

(Sclater, Ex. 1017, 312.)



Sclater, Ex. 1017, 312

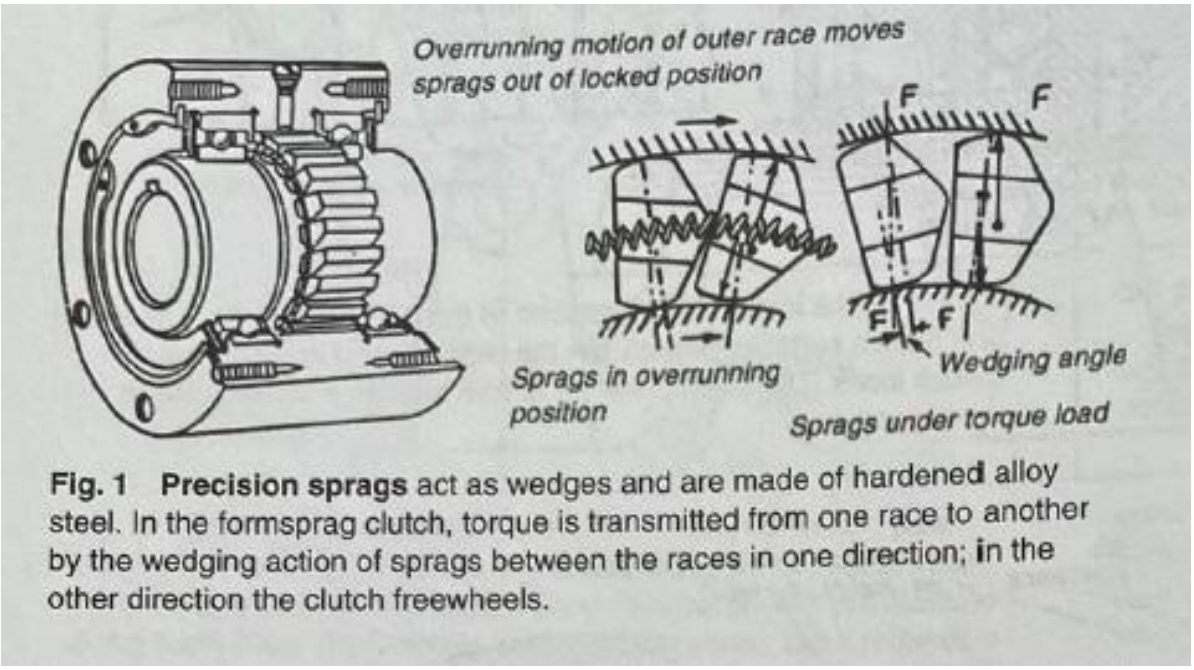


Fig. 1 Precision sprags act as wedges and are made of hardened alloy steel. In the formsprag clutch, torque is transmitted from one race to another by the wedging action of sprags between the races in one direction; in the other direction the clutch freewheels.

Sclater, Ex. 1017, 318

87. Sclater discloses that the inner and outer races are concentric but the sprags are nonconcentric, or asymmetric, to provide a locking ramp:

> Races are concentric; a locking ramp is provided by the sprag profile, which is composed of two nonconcentric curves of different radius. A spring-loaded pin holds the sprag in the locked position until the torque is applied in the running direction.

(Sclater, Ex. 1017, 312.)

88. As illustrated in the figure below on the left, when the inner race rotates in a first direction relative to the outer race, the sprags move out of the locked position such that an overrun condition occurs. However, as illustrated below right, when the inner race rotates in the opposite direction relative to the outer race, the sprags move, jamming within the races, locking the outer and inner

race into rotating together, or not rotating at all if the outer race is fixed (*i.e.*, a backstop mode of operation).

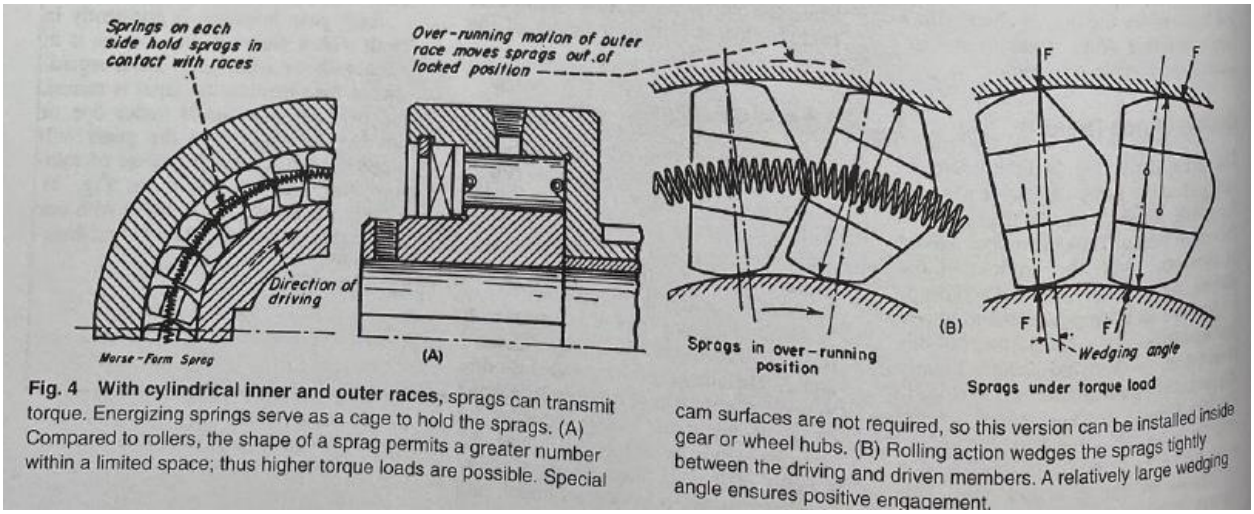
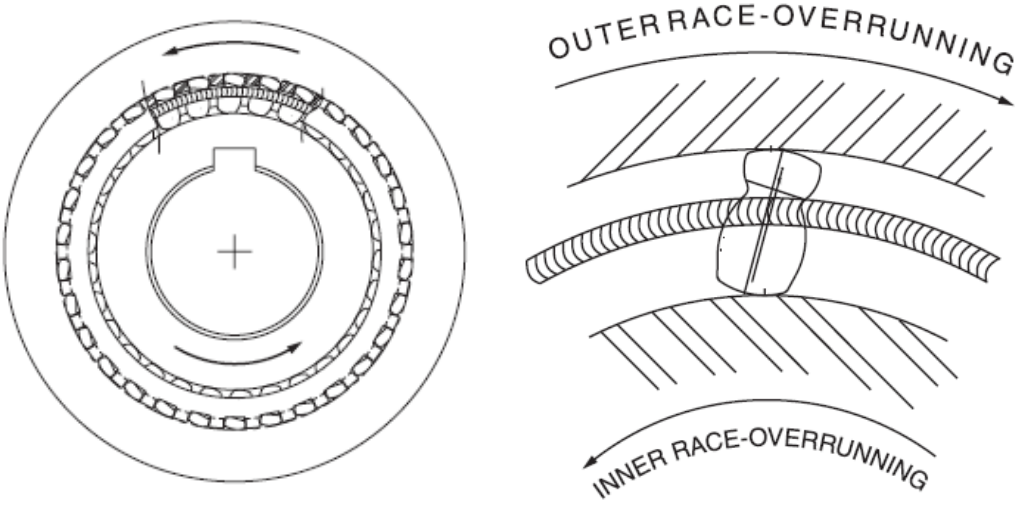


Fig. 4 With cylindrical inner and outer races, sprags can transmit torque. Energizing springs serve as a cage to hold the sprags. (A) Compared to rollers, the shape of a sprag permits a greater number within a limited space; thus higher torque loads are possible. Special cam surfaces are not required, so this version can be installed inside gear or wheel hubs. (B) Rolling action wedges the sprags tightly between the driving and driven members. A relatively large wedging angle ensures positive engagement.

Sclater, Ex. 1017, 316

3. Modes of Operation

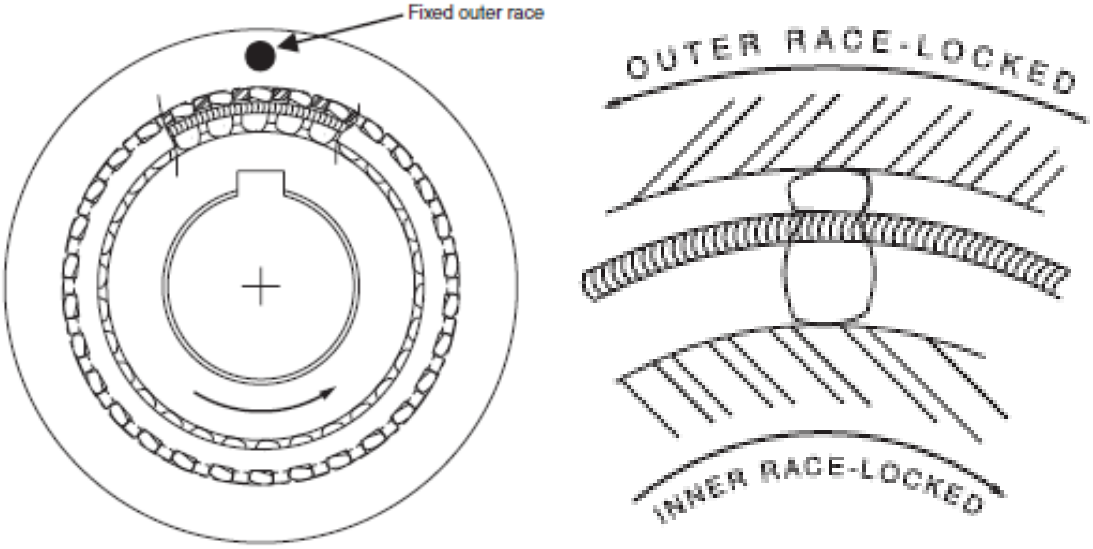
89. Mechanical lockup devices, *i.e.*, clutches, are some of the oldest and most basic clutching methods, and offer a simple design for no-slip registry and indexing. (PT Handbook, Ex. 1016, 5-3.) They operate in three basic modes of operation: overrunning, indexing, and backstopping. During an overrunning operation, the clutch allows one or both members to rotate freely (freewheel) without transferring torque to the other.



Emerson[9], Ex. 1018, 8, 9

90. During a backstopping or lock up operation, the clutch is used to prevent reverse rotation. For example, U.S. Patent No. 4,635,771 to Shoji issued in 1987 and describes a sprag-type "one-way clutch bearing" for a backstop mode of operation. (Ex. 1029.) For such an application, the outer race is typically fixed to a frame and the inner race is coupled to a rotating shaft:

[9] Emerson, Mechanical Clutches and Torque Overload Devices, (Emerson Industrial Automation, 2001.) Emerson is a true and accurate copy of a catalog that I understand was published by Emerson Industrial Automation in 2001.

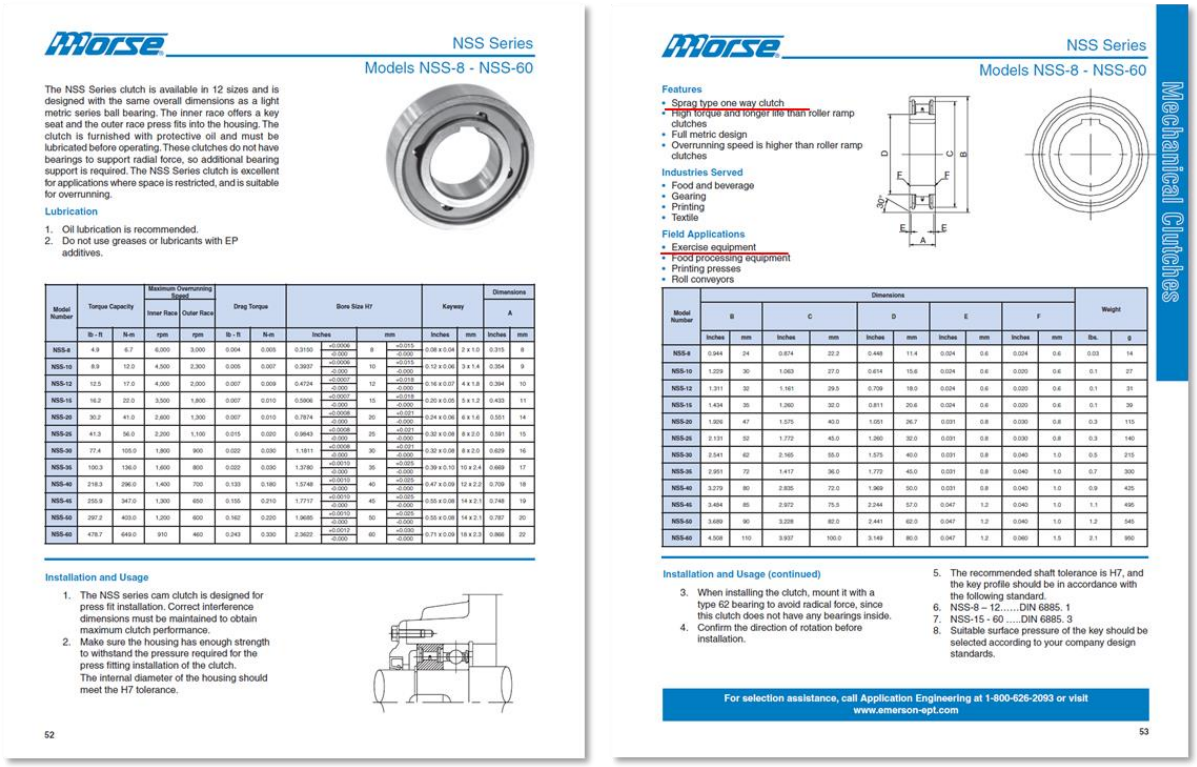


Emerson, Ex. 1018, 8, 9

4. Applications

91. Sprag-type one-way clutch bearings are used in multiple applications, as illustrated in Emerson Industrial Automation's Mechanical Clutches and Torque Overload Devices from 2001. (Emerson, Ex. 1018.) For example, Emerson describes its NSS Series sprag type one-way clutch as an option for multiple "Field Applications," including "Exercise equipment," "Food processing equipment," "Printing presses," and "Roll conveyors." (Ex. 1018, 52-53.) Emerson offers their commercially available one-way clutches with keyways on the inner race and also on the outer race, as illustrated below. Emerson describes the sprag clutches as "often referred to as freewheel, sprag, overrunning, backstop or one-way clutches, depending upon their application." (Emerson, Ex. 1018, 3.) Emerson advertises

their bearings as designed with the same dimensions as standard metric light series ball bearings, available with keyed inner races, and furnished with grease to increase life. (*Id.* at 5). Emerson also describes torque arms for mounting the bearings to an underlying surface. (*Id.* at 38-43.)



NSS Series
Models NSS-8 - NSS-60

The NSS Series clutch is available in 12 sizes and is designed with the same overall dimensions as a light metric series ball bearing. The inner race offers a key seat and the outer race press fits into the housing. The clutch is furnished with protective oil and must be lubricated before operating. These clutches do not have bearings to support radial force, so additional bearing support is required. The NSS Series clutch is excellent for applications where space is restricted, and is suitable for overrunning.

Lubrication

1. Oil lubrication is recommended.
2. Do not use greases or lubricants with EP additives.

Model Number	Torque Capacity		Maximum Overrunning Speed		Drag Torque		Bore Size H7		Keyway		Dimensions A	
			Inner Race	Outer Race			Inches	mm	Inches	mm	Inches	mm
	lb - ft	N-m	rpm	rpm	lb - ft	N-m						
NSS-8	4.9	6.7	6,000	3,000	0.004	0.005	0.3150 +0.0008 -0.000	8 +0.015 -0.000	0.08 x 0.04	2 x 1.0	0.315	8
NSS-10	8.9	12.0	4,500	2,300	0.005	0.007	0.3937 +0.0006 -0.000	10 +0.015 -0.000	0.12 x 0.06	3 x 1.4	0.354	9
NSS-12	12.5	17.0	4,000	2,000	0.007	0.009	0.4724 +0.0007 -0.000	12 +0.018 -0.000	0.16 x 0.07	4 x 1.8	0.394	10
NSS-15	16.2	22.0	3,500	1,800	0.007	0.010	0.5906 +0.0007 -0.000	15 +0.018 -0.000	0.20 x 0.05	5 x 1.2	0.433	11
NSS-20	30.2	41.0	2,600	1,300	0.007	0.010	0.7874 +0.0008 -0.000	20 +0.021 -0.000	0.24 x 0.06	6 x 1.6	0.551	14
NSS-25	41.3	56.0	2,200	1,100	0.015	0.020	0.9843 +0.0009 -0.000	25 +0.021 -0.000	0.32 x 0.08	8 x 2.0	0.591	15
NSS-30	77.4	105.0	1,800	900	0.022	0.030	1.1811 +0.0008 -0.000	30 +0.021 -0.000	0.32 x 0.08	8 x 2.0	0.629	16
NSS-35	100.3	136.0	1,600	800	0.022	0.030	1.3780 +0.0019 -0.000	35 +0.025 -0.000	0.39 x 0.10	10 x 2.4	0.669	17
NSS-40	218.3	296.0	1,400	700	0.133	0.180	1.5748 +0.0010 -0.000	40 +0.025 -0.000	0.47 x 0.09	12 x 2.2	0.709	18
NSS-45	255.9	347.0	1,300	650	0.155	0.210	1.7717 +0.0010 -0.000	45 +0.025 -0.000	0.55 x 0.08	14 x 2.1	0.748	19
NSS-50	297.2	403.0	1,200	600	0.162	0.220	1.9685 +0.0012 -0.000	50 +0.025 -0.000	0.55 x 0.08	14 x 2.1	0.787	20
NSS-60	478.7	649.0	910	460	0.243	0.330	2.3622 +0.0012 -0.000	60 +0.030 -0.000	0.71 x 0.09	18 x 2.3	0.866	22

Installation and Usage

1. The NSS series cam clutch is designed for press fit installation. Correct interference dimensions must be maintained to obtain maximum clutch performance.
2. Make sure the housing has enough strength to withstand the pressure required for the press fitting installation of the clutch. The internal diameter of the housing should meet the H7 tolerance.

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NSS Series
Models NSS-8 - NSS-60

Mechanical Clutches

Features

- Sprag type one way clutch
- High torque and longer life than roller ramp clutches
- Full metric design
- Overrunning speed is higher than roller ramp clutches

Industries Served

- Food and beverage
- Gearing
- Printing
- Textile

Field Applications

- Exercise equipment
- Food processing equipment
- Printing presses
- Roll conveyors

Model Number	Dimensions B		C		D		E		F		Weight	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	lbs.	g
NSS-8	0.944	24	0.874	22.2	0.448	11.4	0.024	0.6	0.024	0.6	0.03	14
NSS-10	1.229	30	1.063	27.0	0.614	15.6	0.024	0.6	0.020	0.6	0.1	27
NSS-12	1.311	32	1.161	29.5	0.709	18.0	0.024	0.6	0.020	0.6	0.1	31
NSS-15	1.434	35	1.260	32.0	0.811	20.6	0.024	0.6	0.020	0.6	0.1	39
NSS-20	1.926	47	1.575	40.0	1.051	26.7	0.031	0.8	0.030	0.8	0.3	115
NSS-25	2.131	52	1.772	45.0	1.260	32.0	0.031	0.8	0.030	0.8	0.3	140
NSS-30	2.541	62	2.165	55.0	1.575	40.0	0.031	0.8	0.040	1.0	0.5	215
NSS-35	2.951	72	1.417	36.0	1.772	45.0	0.031	0.8	0.040	1.0	0.7	300
NSS-40	3.279	80	2.835	72.0	1.969	50.0	0.031	0.8	0.040	1.0	0.9	425
NSS-45	3.484	85	2.972	75.5	2.244	57.0	0.047	1.2	0.040	1.0	1.1	495
NSS-50	3.689	90	3.228	82.0	2.441	62.0	0.047	1.2	0.040	1.0	1.2	545
NSS-60	4.508	110	3.937	100.0	3.149	80.0	0.047	1.2	0.060	1.5	2.1	950

Installation and Usage (continued)

3. When installing the clutch, mount it with a type 62 bearing to avoid radial force, since this clutch does not have any bearings inside.
4. Confirm the direction of rotation before installation.
5. The recommended shaft tolerance is H7, and the key profile should be in accordance with the following standard.
6. NSS-8 – 12.....DIN 6885. 1
7. NSS-15 - 60 .....DIN 6885. 3
8. Suitable surface pressure of the key should be selected according to your company design standards.

For selection assistance, call Application Engineering at 1-800-626-2093 or visit www.emerson-ept.com

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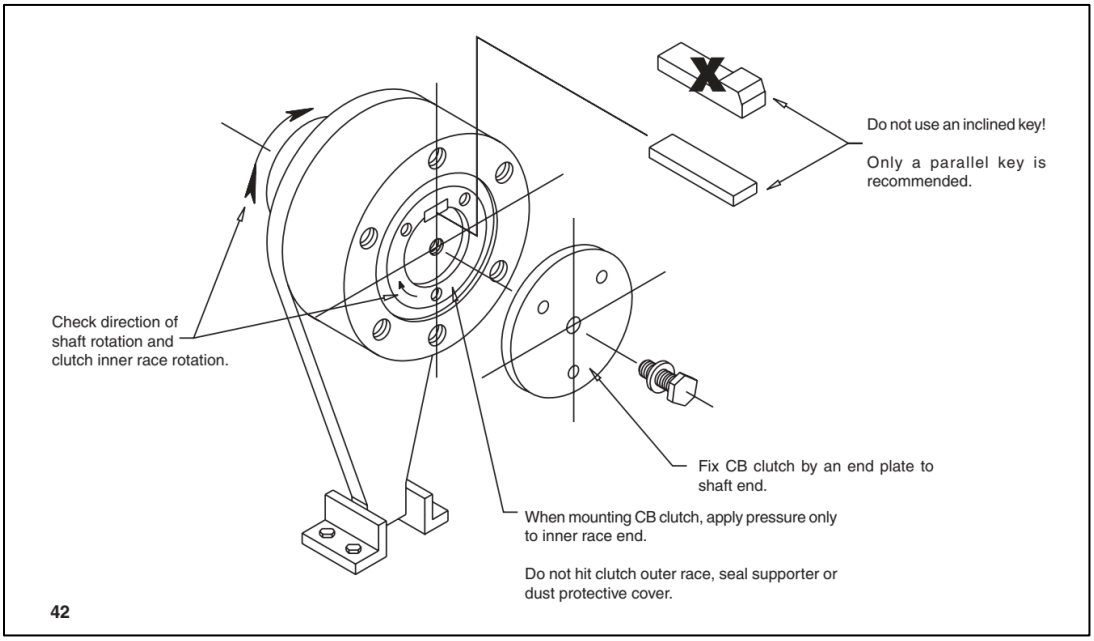
Emerson, Ex. 1018 at 52-53

Emerson, Ex. 1018 at 6



Emerson, Ex. 1018 at 42

VII. U.S. 9,039,580 to Bayerlein et al.

A. Overview of the '580 Patent

92. The '580 Patent relates generally to manually operated treadmills and mechanisms for controlling the motion of a running belt of the treadmill. ('580 Patent, Ex. 1001, Abstract.) With reference to Figure 1, the '580 Patent discloses a manual treadmill 10 with "a running belt 16 that extends substantially longitudinally along a longitudinal axis 18" of a base 12. ('580 Patent, Ex. 1001, 5:22-24.)

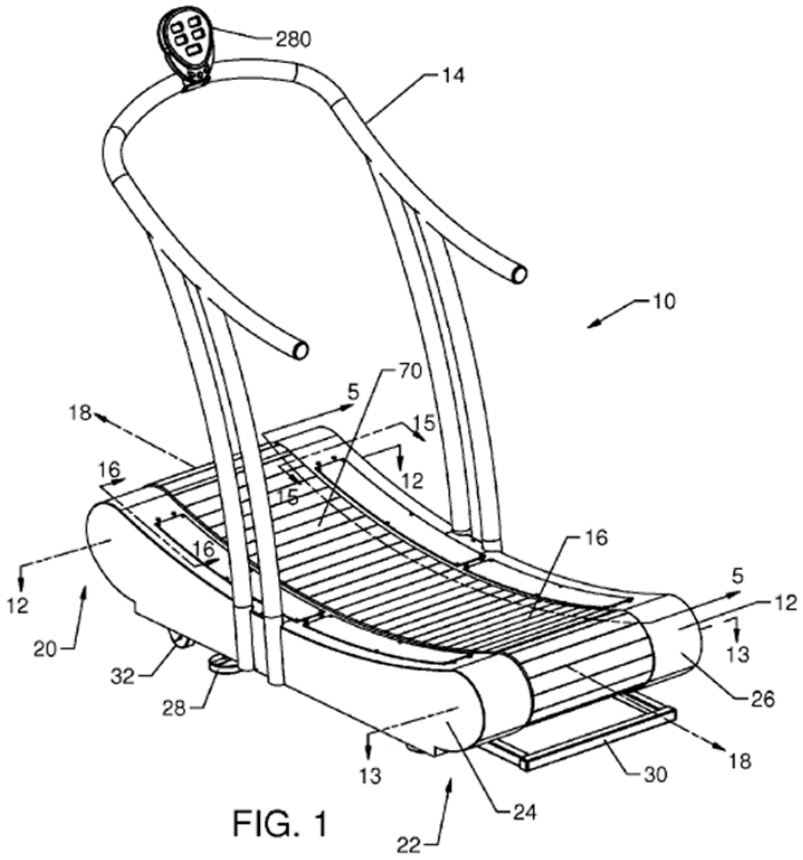
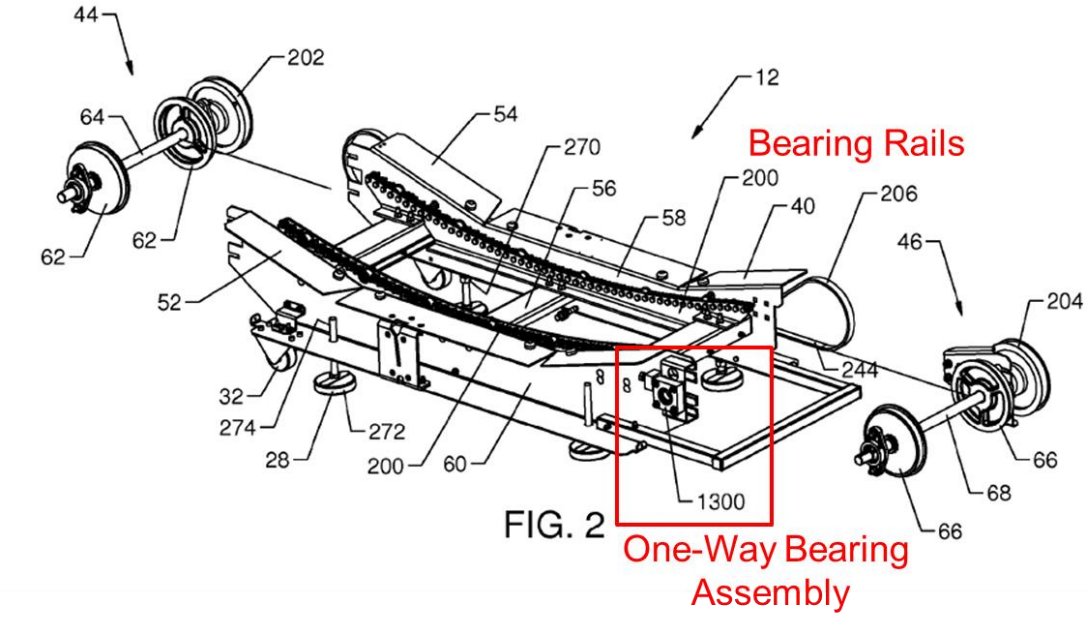


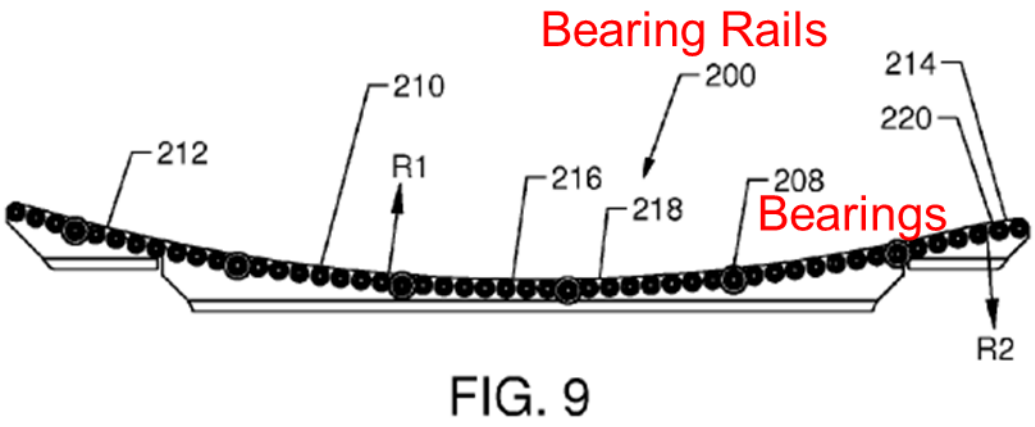
FIG. 1

'580 Patent, Ex. 1001, Fig. 1

93. The treadmill includes bearing rails 200 that include a plurality of bearings 208. ('580 Patent, Ex. 1001, 11:41-44.) "[T]he running belt 16 moves substantially along the top profile 210 of the bearing rails 200." ('580 Patent, Ex. 1001, 11:56-58.) "Accordingly, the running surface 70 has a shape that substantially corresponds to the shape of the top profile 210 of the bearing rails 200." ('580 Patent, Ex. 1001, 12:3-5.)



'580 Patent, Ex. 1001, Fig. 2 (Annotated)



'580 Patent, Ex. 1001, Fig. 9 (Annotated)

94. As illustrated in Figure 2 above, and Figure 36 below, the treadmill 12 includes a "safety device shown as a one-way bearing assembly 1300 . . . that is configured to permit rotation of at least one of the front and rear shaft assemblies 44, 46 (and hence the running belt 16) in only one direction." ('580 Patent, Ex.

1001, 27:11-15.) The '580 Patent further discloses that "[t]he one-way bearing assembly 1300 comprises a housing 1302 which supports an inner ring 1304 that cooperates with the rear shaft 68 and supports an outer ring 1306 fixed relative to the housing 1302." (*Id.*, 27:18-21.) The one-way bearing assembly includes a "plurality of sprags (not shown) [that] are disposed between the inner ring 1304 and the outer ring 1306." (*Id.*, 27:21-23.) Although the '580 Patent does not show the sprags, it states that each sprag has an "asymmetric" shape to "provide for motion in one direction and prevent rotation in the opposite direction." (*Id.*, 27:23-25.) The '580 Patent does not illustrate the sprags, nor explain their interaction with the inner and outer rings 1304, 1306. Instead, the '580 Patent simply states that each sprag has an "asymmetric" shape to "provide for motion in one direction and prevent rotation in the opposite direction." (Ex.1001, 27:23-25.) And that the "sprags become wedged between the inner ring 1304 and the outer ring 1306, preventing the counterclockwise rotation of the inner ring and key 1312 disposed therein." (*Id.*, 27:56-58.)

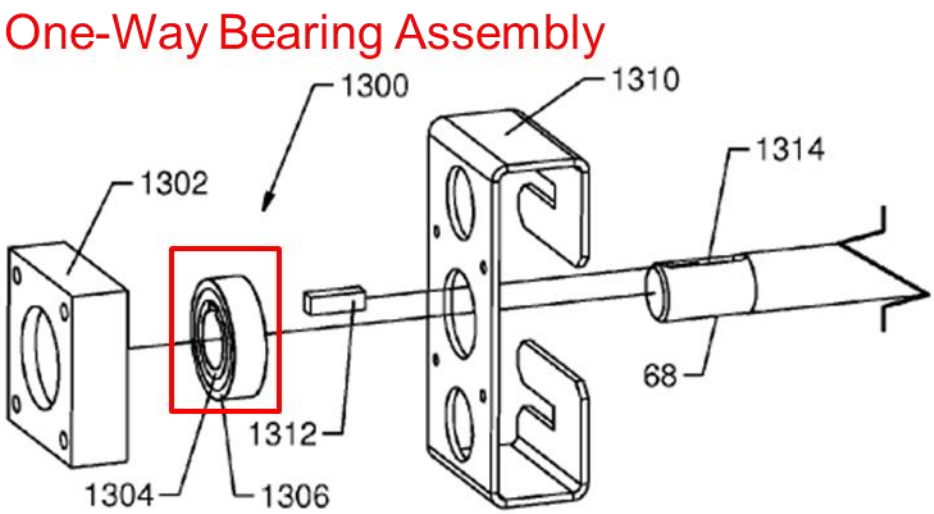


FIG. 36

'580 Patent, Ex. 1001, Fig. 36 (Annotated)

95. Independent claims 1, 11, and 25 of the '580 Patent are directed to a common manual treadmill topology that includes a belt that is supported by bearing rails to provide a curved running surface. The running belt is disposed about rotatable front and rear shafts and constrained by a safety device so that it moves in only one direction. Independent claim 1 is representative and reproduced below:

1. A **manually powered treadmill** comprising:

a frame having a front end and a rear end positioned opposite the front end;

a front shaft rotatably coupled to the frame at the front end;

a rear shaft rotatably coupled to the frame at the rear end;

a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;

a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;

a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt **follows a curved running surface**; and

a safety device coupled to at least one of the front shaft and the rear shaft, wherein the safety device is structured **to substantially prevent rotation** of at least one of the front shaft and the rear shaft **in a first rotational direction while permitting rotation** of the at least one of the front shaft and the rear shaft **in a second rotational direction** opposite the first rotational direction.

96. In my opinion, the technology of the challenged independent claims of the '580 Patent was old and well-known in the art by March 2009. The treadmill topology of claims 1, 11, and 25 is a straightforward manual treadmill with a curved running surface. This topology has existed for human exercise since at least 1917. (*See* e.g., Schmidt, Ex. 1009, Fig. 1.) The use of a bearing rail to support the bearings of a treadmill is also old and well known. (*See* e.g., Chickering, Ex. 1013, Fig. 1; Schonenberger, Ex. 1010, Fig. 7.)

97. The need to limit the motion of the treadmill belt motion for user stability and safety was also well known. (*See,* e.g., Chickering, Ex. 1013, 1:24-39; Socwell, Ex. 1011, 1:28-41; ASTM Standard, Ex. 1019,3-4.). Further, using one-

way clutches to limit treadmill belt motion to one direction dates back to at least 1996. (*See* e.g., Magid, Ex. 1012, 4:46-60, Fig. 5.) And sprag-type one-way bearings were commercially available for exercise equipment since at least 2001. (Emerson, Ex. 1018, 52-53.)

98. The dependent claims add common features, e.g., cross-members (claims 2, 3), one-way bearings (claims 6, 7), key-keyway interfaces (claims 8, 9), handrails (claim 10), and elevation adjustment structures (claim 14).

B. Priority Claim

99. It is my understanding that the ‘580 Patent is part of an extensive family of patents and pending patent applications. The ‘580 Patent claims priority to several patent applications within this large patent family. A graphic of the ‘580 Patent Family is provided below, with the ‘580 Patent highlighted in yellow and the related asserted patents shaded in gray:

PRV	61/161,027 - 17MAR2009		
PCT	PCT/US2010/027543 -16MAR2010 WO2010/107840 - 23SEPT2010		
CIP	CIP - Abandoned 13/235,065 - 16SEPT2011 US2012/0010053 - 12JAN2012		
	14/243,716 - 2APRIL2014 US8,986,169	14/076,912 - 11NOV2013 US9,114,276	
	14/656,942 - 13MAR2015 US9,039,580 - 26MAY2015	14/832,708-21AUG2015 US10,265,566	
		15/958,339 - 20APRIL2018 US10,561,884 - 18FEB2020	15/957,721-19APRIL2018 US10,561,883
		16/792,426 - 17FEB2020 US10,799,745 - 13OCT2020	16/792,444-17FEB2020 US10,850,150
			17/247,101-30NOV2020 US11,465,005-11OCT202

The ‘580 Patent Family

100. The earliest application filing date in the priority claim is March 17, 2009 and is associated with provisional Application No. 61/161,027 (“the ’027 Provisional Application”). The ’580 Patent also claims priority to PCT Application No. PCT/US2010/027543 (“the PCT Application”) filed March 16, 2010 and a continuation-in-part (“CIP”), U.S. Patent Application No. 13/235,065 (“the ‘065 CIP Application”) filed September 16, 2011.

101. For purposes of my analysis below, I have assumed a priority date of March 17, 2009 because the effective filing date of the challenged claims is not relevant to the specific grounds of unpatentability forming the basis of this challenge.

C. File History

102. The file history of the '580 is better understood in view of the prosecution history of its parent application, which issued as U.S. 8,986,169.

1. The '169 Patent File History

103. U.S. Patent Application No. 14/243,716 was filed on April 2, 2014 with a request for accelerated examination under Track 1. ('169 File History, Ex. 1021, 1-114.) The application as filed included independent claims 1, 10, and 14, with many similar limitations as those in the '580 Patent. (*Id.* at 54-59.) For example, independent claims 1, 10, and 14 included "*one way bearing*" limitations that permit a shaft to rotate in one direction but prevent rotation in an opposite direction. (*Id.*) Dependent claim 16 required a "*bearing rail having a plurality of bearings . . . having a concave curve . . . wherein the running surface of the running belt is supported by the top profile of the at least one bearing rail*." (*Id.* at 58.)

104. On June 11, 2014 the USPTO issued an office action rejecting claims 1-11 as obvious over US 2006/0287165 to Pasqualin in view of US 3,642,279 to Cutter in view of US 5,538,489 to Magid (Ex. 1012.). (Ex.1021 at 125-130.) The Examiner also rejected claims 14-18 as obvious over US 1,211,765 to Schmidt (Ex. 1009) in view of Magid (Ex. 1012). The Examiner relied on Magid's disclosure of control means for satisfying the "*one-way bearing*" claim limitations,

and Schmidt's disclosure with reference to Figure 6 for satisfying the "*bearing rail*" limitation of claim 16. (Ex. 1021 at 126, 132.)

105. On September 11, 2014, Patent Owner filed a response with minor amendments to the independent claims, including changing the term "*one-way bearing*" to "*safety device*." (*Id*. at 150, 152, 153.) Patent Owner also amended claim 16 to require that the bearings are "*rotatably coupled to the at least one bearing rail*," and argued that Schmidt did not teach this limitation. (*Id.* at 154, 169-170.) Patent Owner argued that: 1) Magid's disclosure of two-belts teaches away from one belt references ("Magid specifically teaches away from the use of a single, wide belt because a twisting moment is applied to either the left foot or the right foot when treading the left-side or right side parts of the belt"); 2) the combination of Magid with a curved running surface would render Magid inoperable "a curved running surface would add difficultly walking for uncoordinated, thereby rendering Magid unsatisfactory for its intended purpose." (*Id.* at 160-163.) The Patent Owner also submitted a declaration from one of the inventors to support these arguments. (*Id.* at 173-180.) For example, the declarant stated that moving the safety device to the rear shaft provides improvements, i.e., "Placing the safety device on the rear shaft greatly reduces the amount of slack that needs to be taken up before the safety device engages. This reduces the amount of time and distance of unexpected motion." (Ex.1021 at 176.)

106. On October 17, 2014 the Examiner issued a final office action, allowing a few dependent claims, including claim 16 with the "*bearing rail*" limitations; and rejecting all of Patent Owner's arguments over Magid. (*Id.* at 202-203.) The Examiner rejected Patent Owner's teaching away and inoperability arguments stating:

> Magid does not explicitly reject using the safety device on a single-belt treadmill. As discussed above, there is a need for a safety device to prevent the user from accidently or unexpectedly propelling the belt the wrong direction. By Applicant's own admission, Applicant acknowledges this risk.

(*Id.* at 202-203.)

107. On January 16, 2015, the Patent Owner filed an amendment amending the independent claims to include the allowable subject matter of a few dependent claims, including amending claim 14 to include the allowable "*bearing rail*" limitations of claim 16. (*Id*. at 211.) The Examiner issued a notice of allowance on February 2, 2015, and the '169 Patent issued on March 24, 2015. (*Id.* at 223-225, 245.)

2. The '580 Patent File History

108. U.S. Patent Application No. 14/656,942 was filed on March 13, 2015 with a request for accelerated examination under Track 1. ('580 File History, Ex. 1002, 1-111.) On April 7, 2015, Patent Owner conducted an interview with the

Examiner, during which they discussed pending claims 11 and 26, along with "SCHMIDT AND MAGID." (Ex. '580 File History, Ex. 1002, 191.) I understand that this refers to Schmidt (Ex. 1009) and Magid (Ex. 1012). I note that the same Examiner examined the '580 Patent and the '169 Patent. (*See* Ex. 1002, 183, Ex. 1021, 190.)

109. The Examiner issued a notice of allowance on April 16, 2015, with an Examiner's Amendment. (Ex. '580 File History, Ex. 1002, 185-190.) The Examiner amended the independent claims so that all independent claims required first and second "*bearing rails*" where each bearing rail having "*a plurality of bearings*" and each bearing rail is "*attached to a side of the frame*" or longitudinally extends on the frame. (*Id*. at 188-189.)

110. The Examiner provided the following reasons for allowance:

> The prior art discloses a human-powered treadmill with a frame, a pair of shafts, and a curved running belt disposed on the shafts. See, e.g., U.S. Patent 1,211,765 (Schmidt). However, the prior art lacks the same in combination with a pair of bearing rails supporting the running belt, and a safety device associated with one of the shafts to prevent that shaft and the running belt from rotating one direction while allowing free rotation in the opposite direction.

('580 File History, Ex. 1002 at 188-189.)

111. The Examiner considered Schmidt (Ex. 1009) as the closest prior art, but noted that Schmidt does not disclose "a pair of bearing rails supporting the

running belt" and a "safety device." Patent Owner paid the issue fee, and the '580 Patent issued on May 26, 2015. (Ex. '580 File History, Ex. 1002, 188-189.)

D. Construction of Terms in the Challenged Claims

112. I have been asked to review claims 1-12, 14, 15, 18, and 25 of the '580 Patent.

113. In order to properly evaluate these claims, I understand that the terms of the claims must first be construed. For purposes of this declaration, I am applying the following claim constructions for my analysis regarding unpatentability for Grounds 3 and 6:

114. I understand that the proposed construction of the term "*shaft*," as recited in claims 1, 11, and 25 is "a rotating element used to transmit power from one part to another."

115. I understand that the proposed construction of the term "safety device," as recited in claims 1, 11, 25 is as a means plus function. The specification identifies in detail the structure needed to fulfill this function as being one-way bearing assemblies having inner and outer rings and sprags. ('580 Patent, Ex. 1001, 27:16-29; Figs. 2, 36.) The specification also mentions the following structures:

> Other safety devices to help prevent undesirable forward rotation of the running belt 16 may include cam locking systems, which may be particularly well-suited for use in conjunction with track systems 700,

800, and 900. Also, taper locks, a user operated pin system, or a band brake system with a lever may be utilized.

('580 Patent, Ex. 1001, 29:23-28.)

116. I understand that the proposed construction of the term "substantially prevent[]," as recited in claims 1, 11, 25, be construed as "Prevent Any Movement After Allowing No Or Minimal Movement."

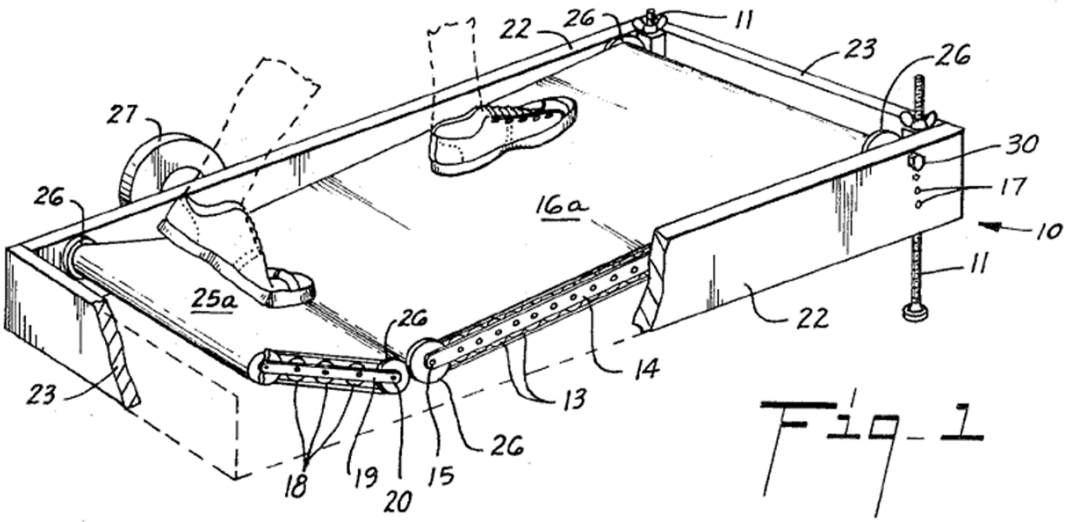
VIII. Patentability Analysis of the Challenged Claims

A. Overview of the prior art

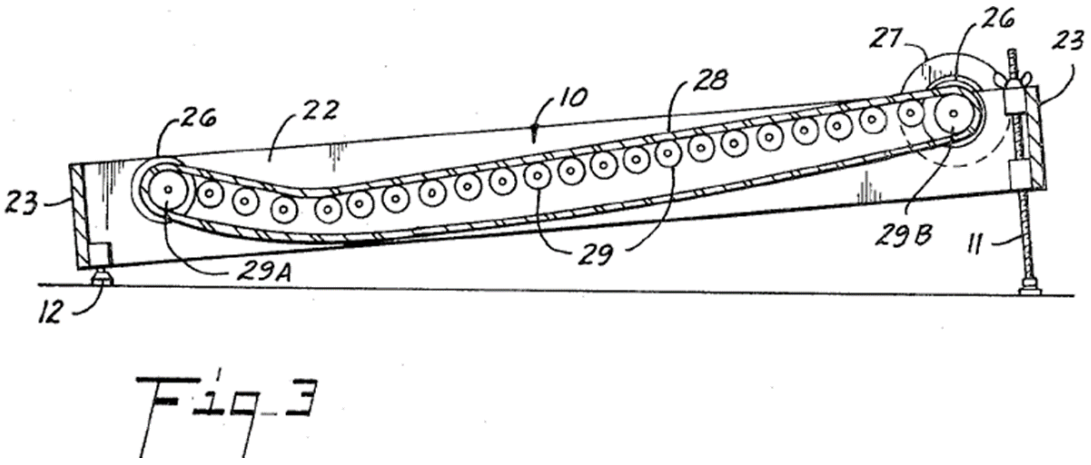
1. U.S. Patent No. 3,637,206 ("Chickering," Ex. 1013)

117. Chickering is a U.S. patent that issued on January 25, 1972. I understand that Chickering is prior art to all claims of the '580 Patent under 35 USC § 102(b).

118. Chickering discloses a manual treadmill with a belt that is supported by a plurality of rollers to form a curved running surface. (Chickering, Ex. 1013, Fig. 3; 2:73-3:10.) Chickering further discloses that each end of the rollers is rotatably mounted to a support arm which is mounted to the frame. (Chickering, Ex. 1013, 1:72-2:12, Fig. 1.)



Chickering, Ex. 1013, Fig. 1



Chickering, Ex. 1013, Fig. 3

2. U.S. Patent No. 5,538,489 ("Magid," Ex. 1012)

119. Magid is a U.S. patent that issued on July 23, 1996. I understand that Magid is prior art to all claims of the '580 Patent under 35 USC § 102(b).

120. Magid discloses a manual treadmill with a belt that is supported by a plurality of rollers or a flat bearing surface. (Magid, Ex. 1012, Figs., 8, 1.) Magid

also discloses a one-way clutch that is coupled to a front shaft or a rear shaft to permit only unidirectional movement of the belt. (Magid, Ex. 1012, Fig. 5, 4:46-60.)

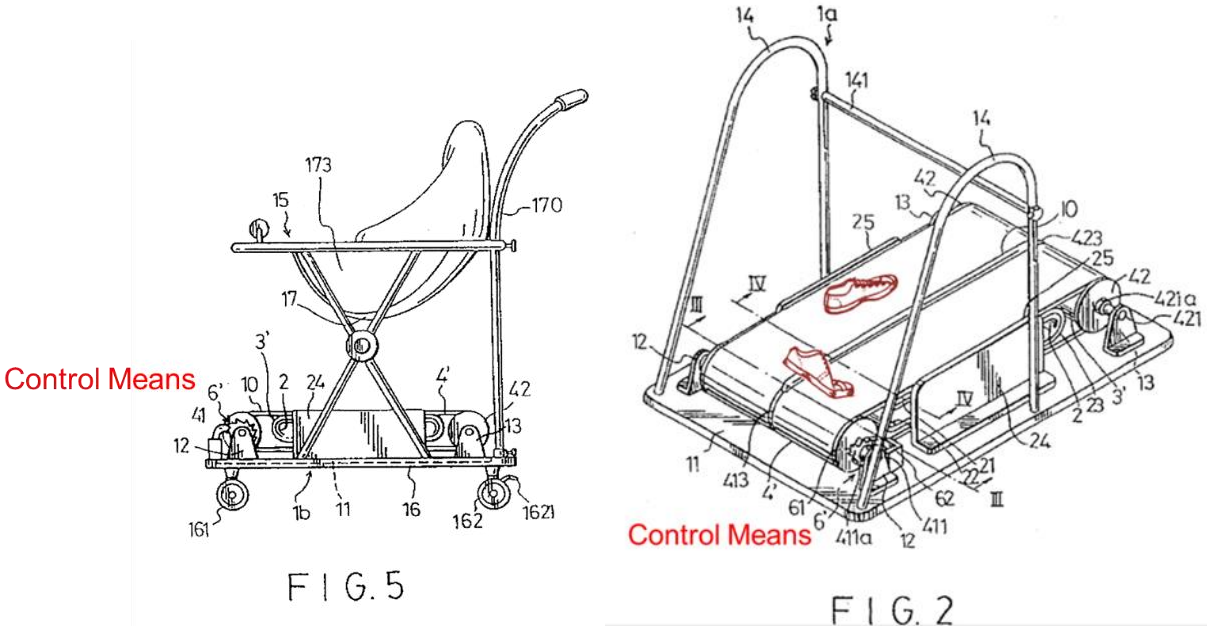


FIG. 5 FIG. 2

Magid, Ex. 1012, Figs. 5 and 2 (Annotated)

3. Neil Sclater and Nicholas P. Chironis, Mechanisms & Mechanical Devices Sourcebook, Third Ed., (McGraw-Hill 2001) ("Sclater," Ex. 1017)

121. Sclater is a reference sourcebook that published in 2001. I understand that Sclater is prior art to all claims of the '580 Patent under 35 USC § 102(b).

122. Sclater is a reference sourcebook that "contains drawings and descriptions of more than 2000 different mechanisms and mechanical devices that have proven themselves in modern products, machines, and systems." (Sclater, Ex. 1017, Back Cover.) Sclater describes different types of coupling, clutching, and braking devices in Chapter 9, including ratchet clutches and one-way bearing

assemblies that include sprags. (Sclater, Ex. 1017, 311-312.)

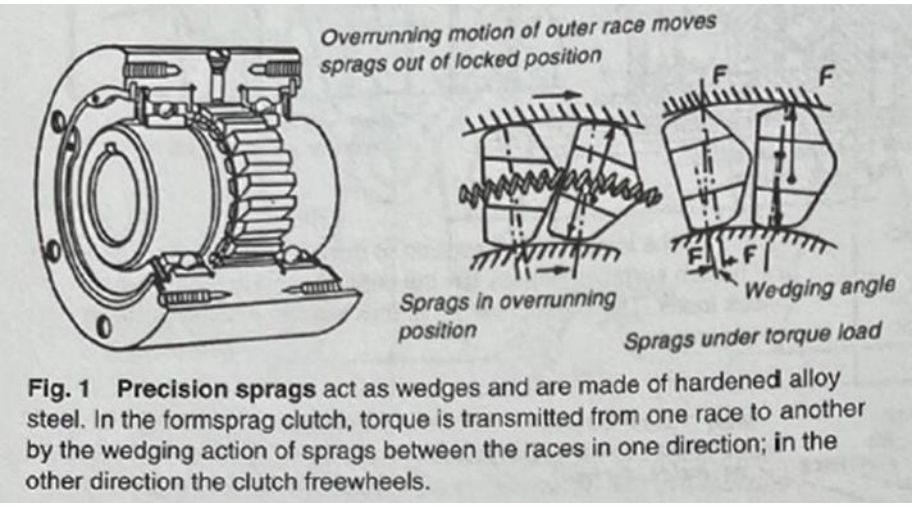


Fig. 1 Precision sprags act as wedges and are made of hardened alloy steel. In the formsprag clutch, torque is transmitted from one race to another by the wedging action of sprags between the races in one direction; in the other direction the clutch freewheels.

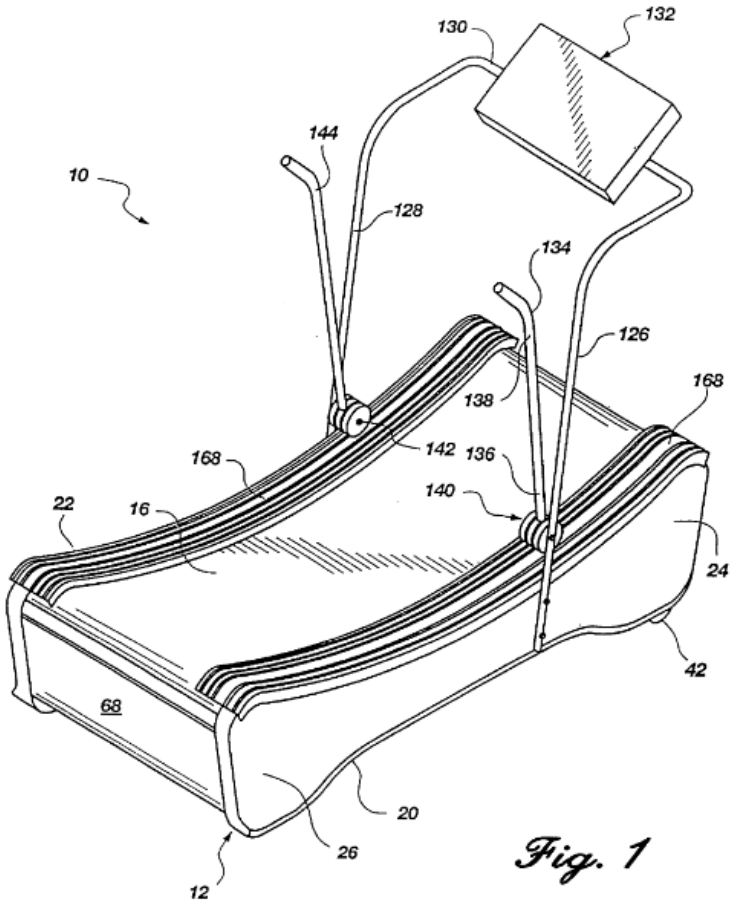
Sclater, Ex. 1017, 318

123. Sclater also discloses some of the deficiencies of pawl and ratchet clutches as compared to roller and friction type clutches, including noise and speed limitations. (Sclater, Ex. 1017, 302-303, 316.)

4. U.S. Patent No. 5,897,461 ("Socwell," Ex. 1011)

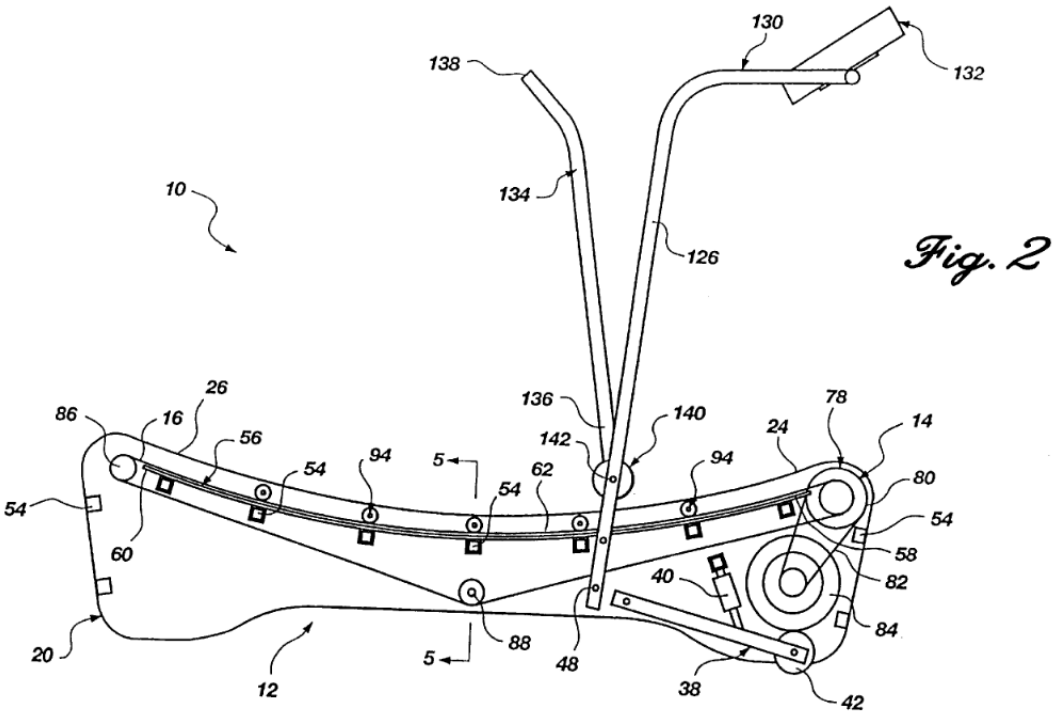
124. Socwell is a U.S. patent that issued on April 27, 1999. I understand that Socwell is prior art to all claims of the '580 Patent under 35 USC § 102(b).

125. Socwell discloses a manual, curved treadmill having a belt that forms the running surface. (Socwell, Ex. 1011, 11:52-61.)



Socwell, Ex. 1011, Fig. 1

126. The belt is looped around front and rear rollers, is supported from beneath by a curved deck, and is maintained in the curved shape by upper rollers positioned longitudinally along the left and right sides of the belt. (Socwell, Ex. 1011, 3:30-36, 5:20-45, 7:31-43, 10:17-31.) The rollers are arranged curvilinearly to match the curvature of the deck.



Socwell, Ex. 1011, Fig. 2

127. The bearings are mounted to their respective side of the frame by secondary supports that are elongate and extend longitudinally. The secondary supports are bolted to the frame. (Socwell, Ex. 1011, 10:49-60, 11:15-33)

128. Socwell discloses support feet used for changing an inclination of the running surface. The support feet are pivotal relative to the frame to adjust the height and include wheels. (Socwell, Ex. 1011, 9:29-56.)

IX. Grounds for Challenge

A. Ground 1 – The Combination of Chickering and Magid Teaches all of the Limitations of Claims 1, 2-5, 10-11, 14, 18, and 25

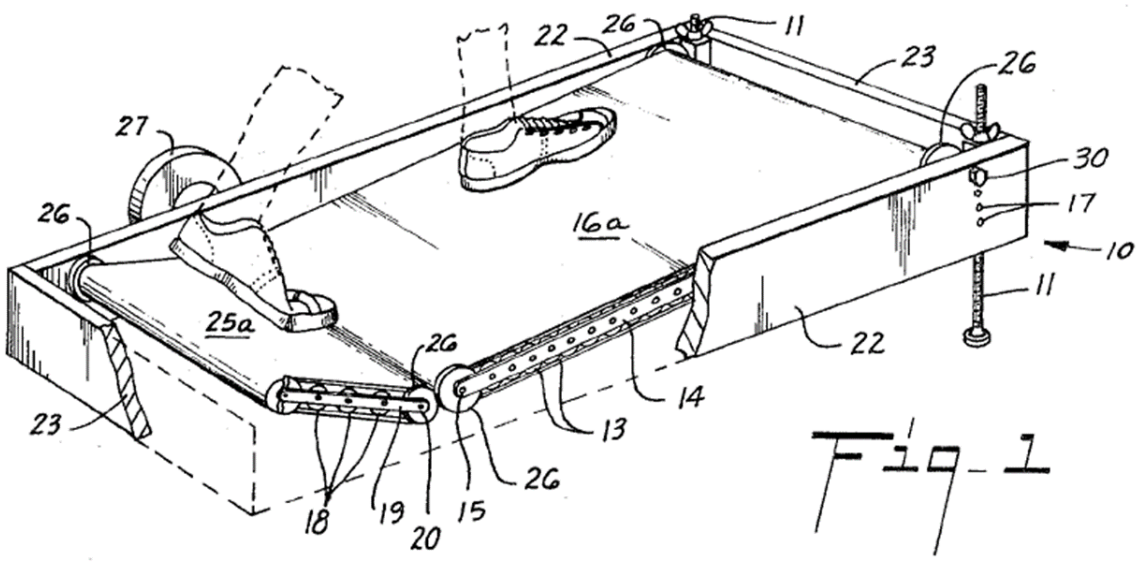
1. Independent Claim 1

129. I have given each of the limitations of claim 1 a unique numerical identifier, as shown in the chart below:

U.S. Patent No. 9,039,580
[1.0] A manually powered treadmill comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to the frame at the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and
[1.7] a safety device coupled to at least one of the front shaft and the rear shaft, wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

… ***[1.0] A manually powered treadmill comprising:***

130. Chickering discloses "a new type of treadmill exercising device . . . on which the user can simulate the acts of walking, jogging and running without relying on handles, belts or other external supports for maintaining his balance." (Chickering, Ex. 1013, 1:1-7.)



Chickering, Ex. 1013, Fig. 1

131. Chickering does not refer to its treadmill as a manual treadmill, nor does it disclose a motor for propelling the belt. However, Chickering discloses that a user can adjust their running pace by adjusting the angle of the tread surface:

> When a faster pace is desired, the inclination of the tread surface 16a is increased by moving pins 30 into one of the upper holes 17, or by elevating the forward end of the base 10 with jackscrews 11, or both. A slower pace is attained by reversing these operations.

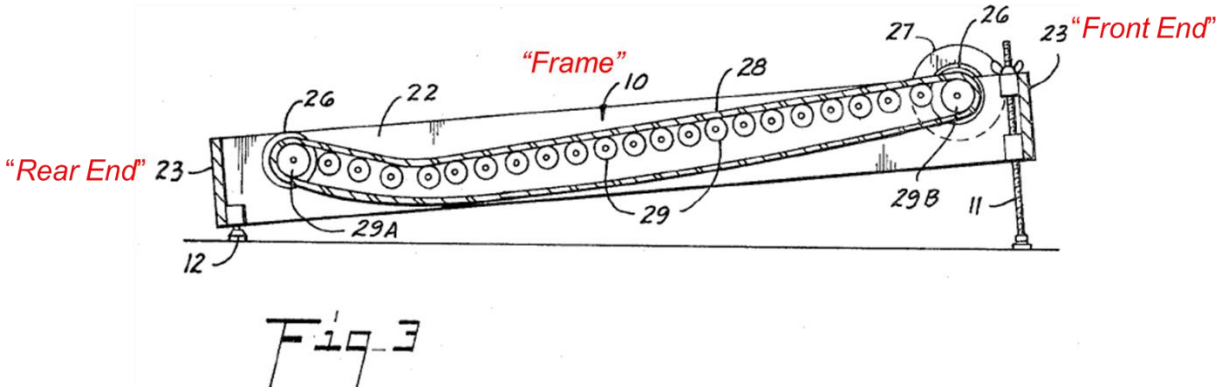
(Chickering, Ex. 1013, 2:43-48.)

132. A POSA would have known that with a manual treadmill, the incline of the running surface relative to the force of gravity affects the user's pace. Therefore, Chickering's disclosure of adjusting pace by adjusting the elevation of tread surface discloses that the treadmill is a manual treadmill.

133. Thus, Chickering discloses "*A manually powered treadmill*."

… ***[1.1] a frame having a front end and a rear end positioned opposite the front end;***

134. Chickering discloses that the treadmill has a base 10 ("*frame*"). "[T]he exercising device . . . has a base 10 which comprises an inclined rectangular frame having two sidewalls 22 and two end walls 23." (Chickering, Ex. 1013, 1:65-68.) As shown in Figure 3 below, the end walls 23 are positioned opposite each other, one at the front end of the frame 10 and one at the rear end of the frame 10.



Chickering, Ex. 1013, Fig. 3 (Annotated)

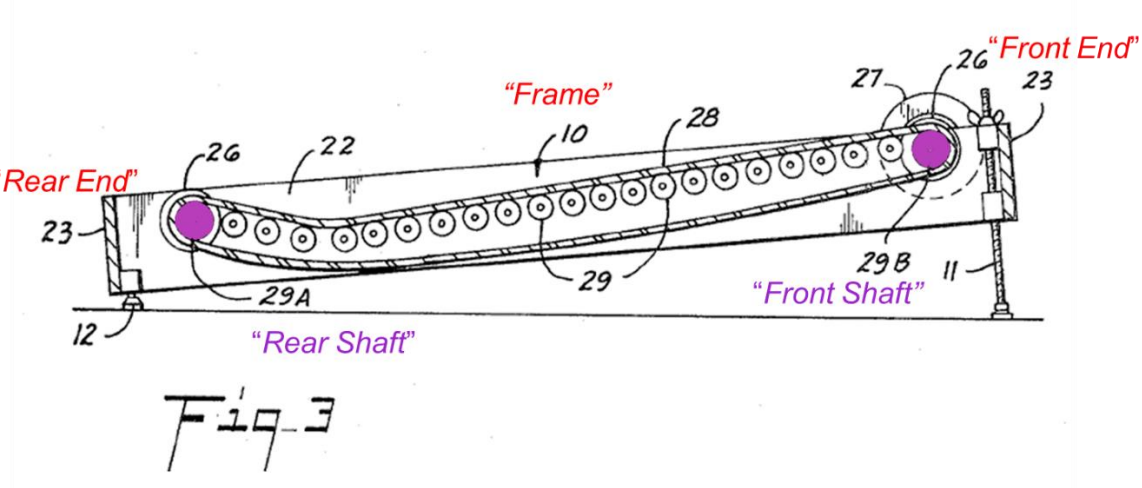
135. Thus, Chickering discloses "*a frame* [base 10] *having a front end and a rear end* [end walls 23] *positioned opposite the front end*."

… ***[1.2] a front shaft rotatably coupled to the frame at the front end;***

136. Chickering discloses an end roller 29b coupled to a front end of the frame:

> When a single belt is used, it may be necessary to use heavier belting material so that the belt will lie flat upon the rollers without being under tension. When such heavier belting material is used, it may also be desirable to provide larger **<u>end rollers</u>** as at 29a and **<u>29b</u>** to give a larger turning radius for the belt.

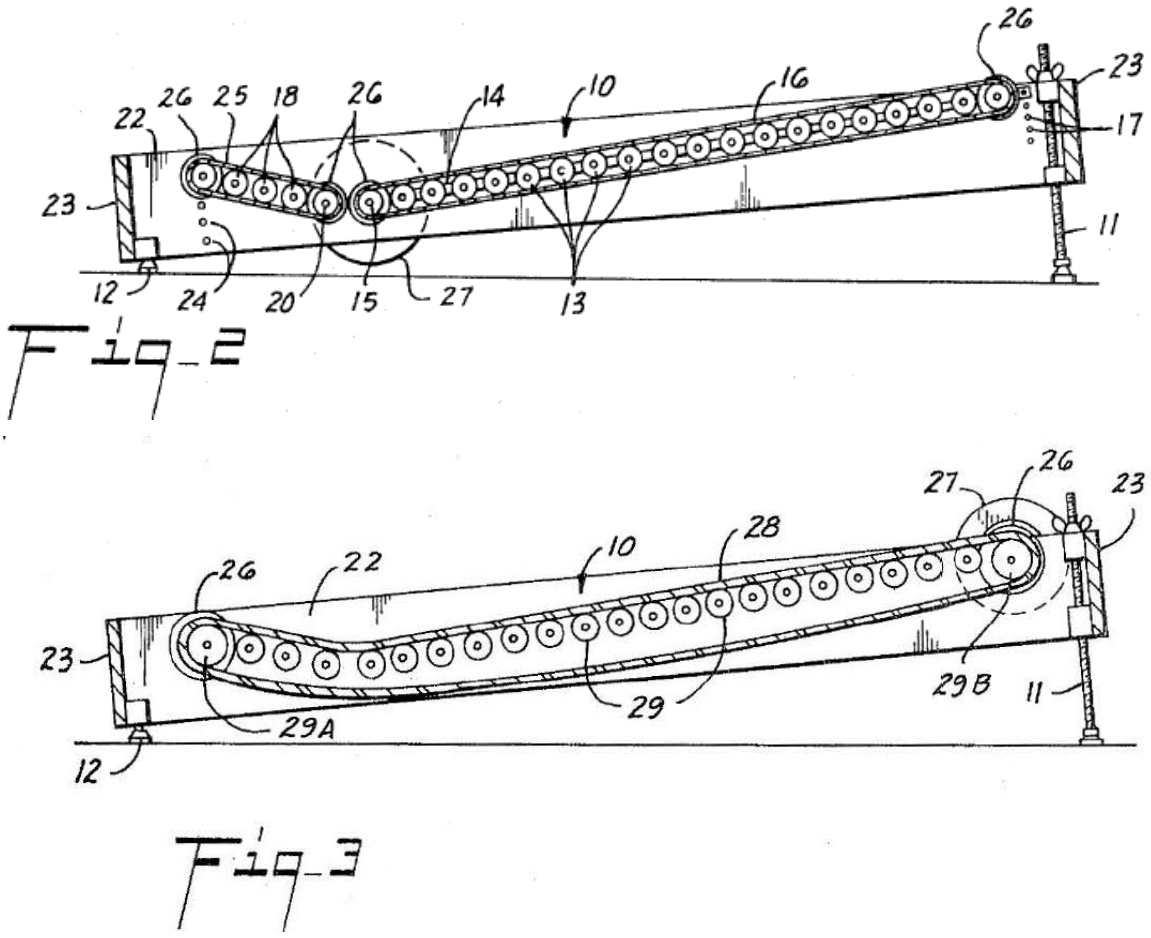
(Chickering, Ex. 1013, 3:11-16.)



Chickering, Ex. 1013, Fig. 3 (Annotated)

137. With reference to Figure 3, Chickering discloses that the "rollers 29 are provided journaled in the sidewalls 22 of base 10." (Chickering, Ex. 1013, 2:75-3:2.) With reference to Figures 1 and 2, Chickering discloses rollers 13, 18 that are "journaled" or rotatably coupled to the support arms 14, 19 that are

pivotally connected to the base 10. (Ex. 1013, 1:74-2:4, 2:13-21.) A journal or sleeve bearing is a plain bearing in which a journal shaft rotates. (PT Handbook, Ex. 1016, at 2-1, 2-2.)



Chickering, Ex. 1013, Figs. 2 and 3

138. As described below with reference to claim limitations [1.4]-[1.5], a POSA would have modified Chickering's Treadmill of the Figure 3 embodiment to include the support arms 14, 19 of the Figures 1 and 2 embodiment, such that the front end roller 29b is journaled to the support arm and pivotally connected to the base 10 by a pin.

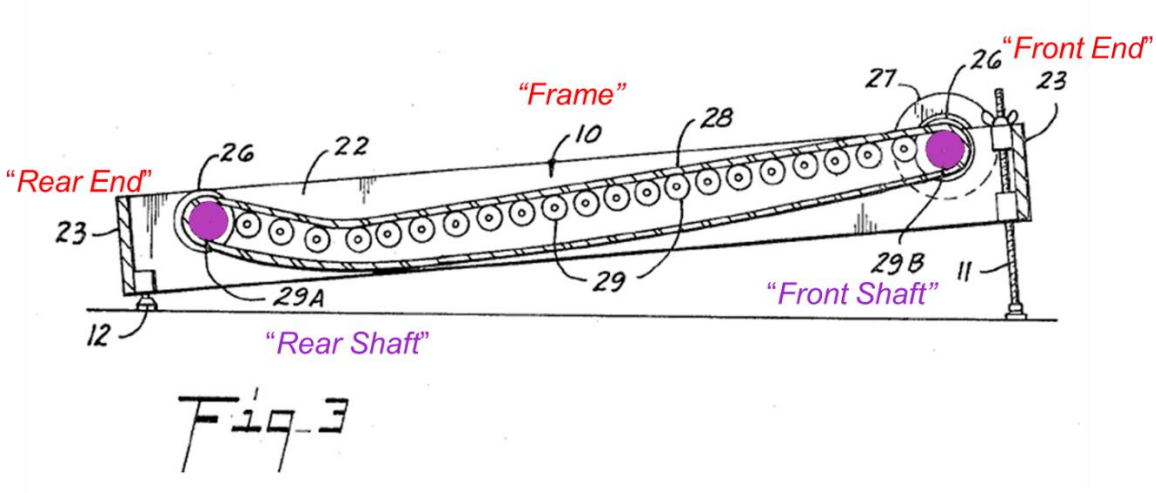
139. Thus, Chickering discloses "*a front shaft* [end roller 29b] *rotatably coupled to the frame* [base 10] *at the front end* [through the support arm]."

> … ***[1.3] a rear shaft rotatably coupled to the frame at the rear end;***

140. Chickering discloses an end roller 29a coupled to a rear end of the frame:

> When a single belt is used, it may be necessary to use heavier belting material so that the belt will lie flat upon the rollers without being under tension. When such heavier belting material is used, it may also be desirable to provide larger **end rollers** as at **29a** and 29b to give a larger turning radius for the belt.

(Chickering, Ex. 1013, 3:11-16.)



Chickering, Ex. 1013, Fig. 3 (Annotated)

141. With reference to Figure 3, Chickering discloses that the "rollers 29 are provided journaled in the sidewalls 22 of base 10." (Chickering, Ex. 1013, 2:75-3:2.) With reference to Figures 1 and 2, Chickering discloses rollers 13, 18

that are "journaled" or rotatably coupled to the support arms 14, 19 that are pivotally connected to the base 10. (Ex. 1013, 1:74-2:4, 2:13-21.) A journal or sleeve bearing is a plain bearing in which a journal shaft rotates. (PT Handbook, Ex. 1016, at 2-1, 2-2.)

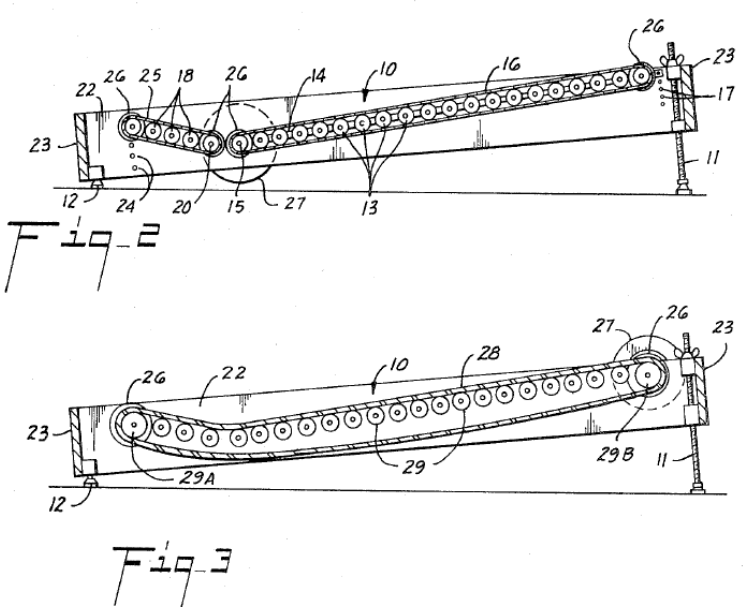
142. As described below with reference to claim limitations [1.4]-[1.5] a POSA would have modified Chickering's Treadmill of the Figure 3 embodiment to include the support arms 14, 19 of the Figures 1 and 2 embodiment, such that the rear end roller 29a is journaled to the support arm and pivotally connected to the base 10 by a pin.

143. Thus, Chickering discloses "*a rear shaft* [end roller 29a] *rotatably coupled to the frame* [base 10] *at the rear end* [through the support arm]."

… ***[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***

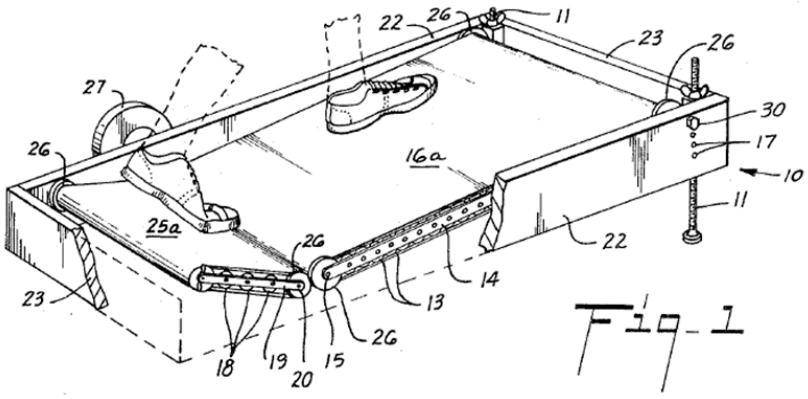
144. Chickering discloses that the treadmill may be implemented in multiple embodiments, including a single belt embodiment (Figure 3) and a two-belt embodiment (Figures 1 and 2). Chickering discloses that the "one-belt model requires a fairly heavy belt since the belt must remain in contact with the rollers due to its weight alone." (Chickering, Ex. 1013, 3:20-22.) Accordingly, Chickering teaches that a non-tensioned, heavy, belt will conform to the profile of the support rollers. A POSA would have understood the heavy belt to be an

advantage because it would remain in contact with the rollers by its weight rather than lift off, its increased inertia will mitigate small transient changes in speed of the running surface during heel strike and toe-off, and it would eliminate the pinch-point between the two belts.



Chickering, Ex. 1013, Figs. 2 and 3

145. Chickering discloses, with reference to the two-belt embodiment of Figures 1 and 2, a first series of transverse parallel rollers 13 that are supported at opposing ends by a pair of front support arms 14 and a second series of transverse parallel rollers 18 that are supported at opposing ends by a pair of rear support arms 19. (Chickering, Ex. 1013, 1:74-2:12.)



Chickering, Ex. 1013, Fig. 1

146. Chickering further discloses that the rollers 13, 18 are "journaled" or rotatably coupled to the support arms 14, 19:

> A first series of transverse parallel rollers 13 have their ends 15 journaled in arms 14. An endless belt 16 of some suitable material such as rubber or heavy cloth, is disposed about the series of rollers 13 to provide a first tread surface 16a.
>
> A second series of transverse parallel rollers 18 have their ends journaled in arms 19. An endless belt 25 is disposed about the series of rollers 18 to provide a second tread surface 25a adjacent the first tread surface.

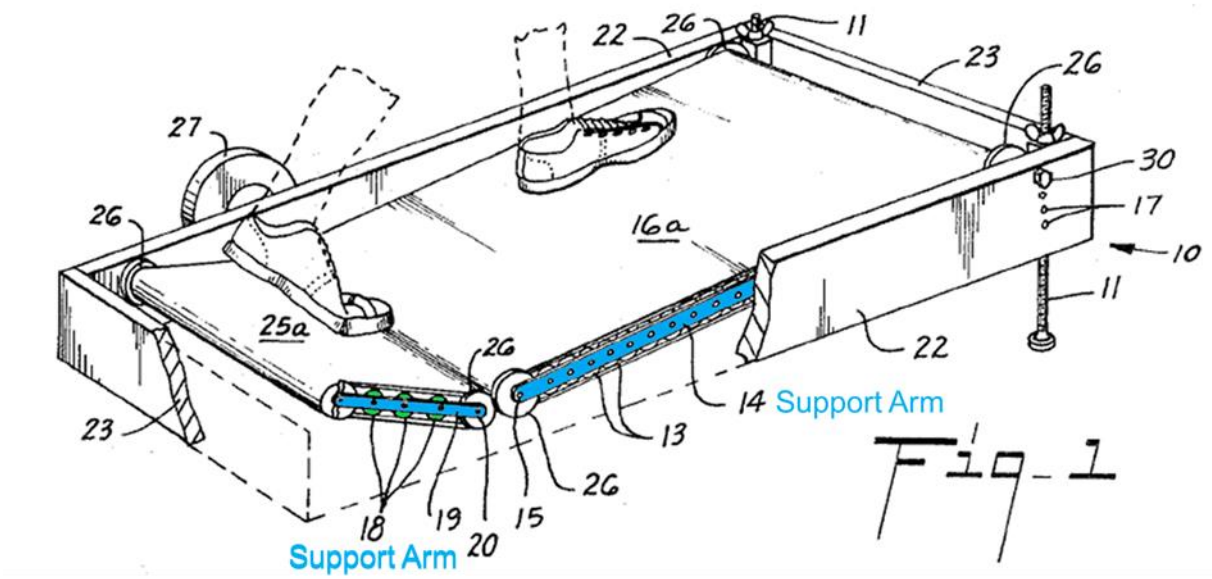
(Chickering, Ex. 1013, 2:13-21.)

147. Chickering discloses that the support arms 14, 19 are pivotally connected to a central portion of the base 10 at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt:

> In the embodiment as illustrated in FIGS 1 and 2 a first and second series of such transverse parallel rollers are carried by the base

preferably as follows: Two elongate support arms 14 are provided, one such arm being pivotally mounted at 15 to the inside of each sidewall 22 of base 10.

(Chickering, Ex. 1013, 1:74-2:4.)



Chickering, Ex. 1013, Fig. 1 (Annotated)

148. Chickering further discloses that the forward ends of the front support arms 14 and the rearward ends of the rear support arms 19 are connected to the frame 10 by pins 30.

The forward and free end of each arm 14 is supported by a pin inserted through one of several holes 17 provided in each sidewall 22 near its forward end. Two other similar but preferably shorter support arms 19 are carried by base 10, one arm 19 being pivotally connected at 20 to each sidewall 22 and having its rearward and free end

> supported by a pin (not shown) inserted through one of several holes 24 provided in each sidewall 22 near its rearward end.

(Chickering, Ex. 1013, 2:4-2:12.)

149. As illustrated in Figure 2 below, the front of the frame includes holes 17 for receiving the front pins and the rear of the frame includes holes 24 for receiving the rear pins.

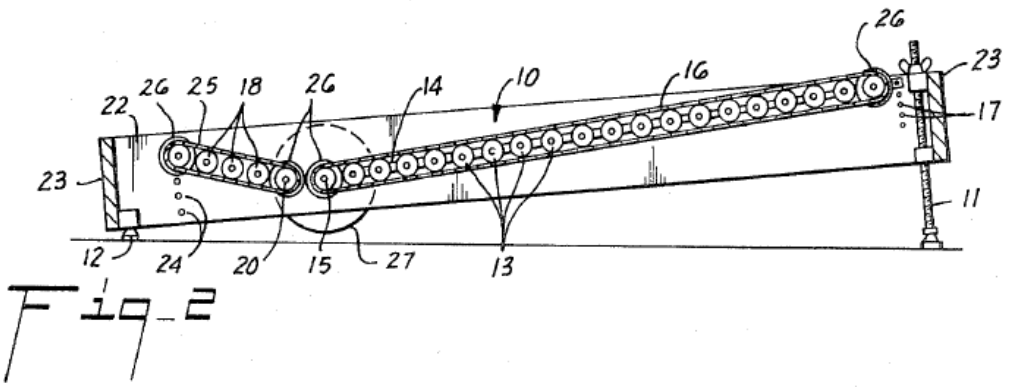


Fig. 2

Chickering, Ex. 1013, Fig. 2

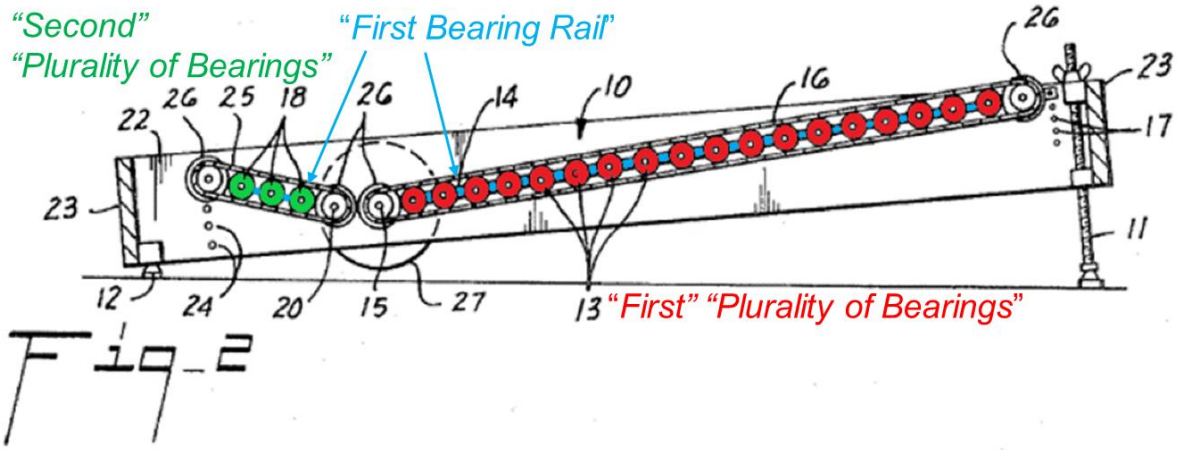
150. Chickering discloses that the inclination of the rollers 13 and 18, and the belt, may be adjusted by inserting the pins 30 through different holes 17 and 24:

> The relative inclinations of the first and second series of rollers 13 and 18, and consequently of the tread surfaces l6a and 25a, to each other and to the horizontal can be adjusted by means of the support pins in holes 17 and 24 and by means of the elevating jackscrews 11.

(Chickering, Ex. 1013, 2:26-30.)

151. Chickering's left front support arm 14 and left rear support arm 19, as

illustrated in Figure 2, collectively satisfy the "*first bearing rail*" claim limitation. And Chickering's first series of rollers 13 satisfy the "*plurality of bearings*" claim limitation.



Chickering, Ex. 1013, Fig. 2 (Annotated)

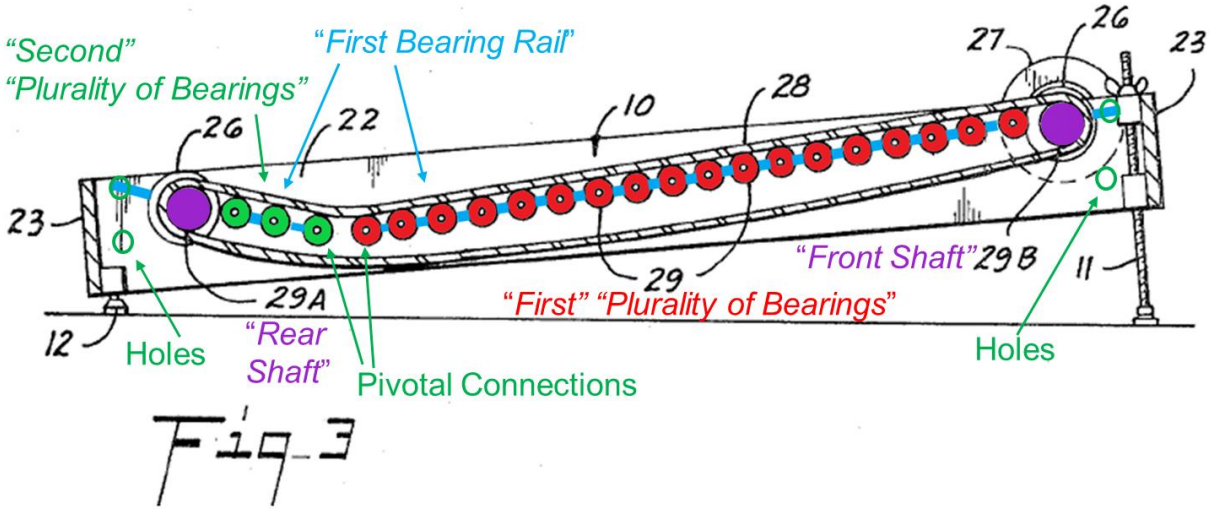
152. Chickering's disclosure with reference to the two-belt embodiment (Figures 1 and 2) is applicable to the single belt embodiment (Figure 3). For example, Chickering states that:

> The foregoing disclosure and description of the invention is illustrative and explanatory thereof, and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made within the scope of the appended claims without departing from the spirit of the invention.

(Chickering, Ex. 1013, 3:42-47.)

153. A POSA would have been motivated to modify Chickering's single belt treadmill embodiment of Figure 3 to include Chickering's support arms, or

"*bearing rails*" (shown below in blue) to allow a user to adjust the elevation angle of the tread surface, as taught by Chickering with reference to Figure 1. As explained by Chickering, adjusting the elevation angle is one way to adjust running speed on a manual treadmill. "When a faster pace is desired, the inclination of the tread surface 16a is increased by moving pins 30 into one of the upper holes 17 . . . [and a] slower pace is attained by reversing these operations." (Chickering, Ex. 1013, 2:44-49.) The modification would include having the ends of the rollers journaled in the support arms/bearing rails rather than the frame, and include a pin to extend through different holes (shown in green) of the frame to couple the front roller 29b to the frame.



Chickering, Ex. 1013, Fig. 3 (Annotated)

154. The modification would include pivotally connecting the central rollers to the base 10 as shown in annotated Figure 3 above. A front pin (not shown) would extend through different holes (shown as open green circles) of the

frame to couple the front roller 29b to the frame, and a rear pin (not shown) would extend through one of multiple different holes (also shown in green) of the frame to couple the rear roller 29a to the frame.

155. Therefore Chickering discloses a "*a first bearing rail* [left front support arm 14 and left rear support arm 19] *having a plurality of bearings* [rollers 13], *the first bearing rail attached to a left side of the frame*."

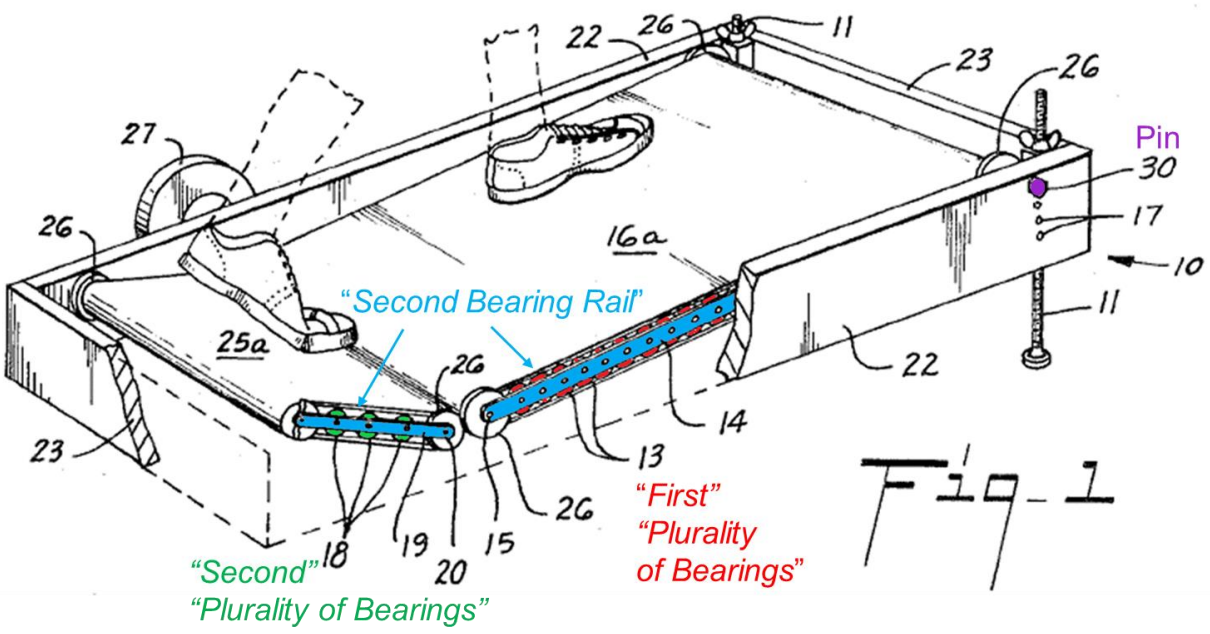
> … ***[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

156. As explained above for claim limitation [1.4], Chickering discloses, with reference to the two-belt embodiment of Figures 1 and 2, a first series of transverse parallel rollers 13 that are supported at opposing ends by a pair of front support arms 14 and a second series of transverse parallel rollers 18 that are supported at opposing ends by a pair of rear support arms 19. (Ex. 1013, 1:74-2:12.) Chickering further discloses that the rollers 13, 18 are "journaled" or rotatably coupled to the support arms 14, 19. (Chickering, Ex. 1013, 2:13-20.)

157. Chickering discloses that the support arms 14, 19 are pivotally connected to a central portion of the base 10 at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt. (Chickering, Ex. 1013, 1:74-2:12, Fig. 1.)

158. Chickering's right front support arm 14 and right rear support arm 19

collectively satisfy the "*second bearing rail*" claim limitation. And Chickering's second series of rollers 18 satisfy the "*plurality of bearings*" claim limitation.



Chickering, Ex. 1013, Fig. 1 (Annotated)

159. As explained above for claim limitation [1.4], a POSA would have been motivated to modify Chickering's single belt treadmill embodiment of Figure 3 to include support arms, or "*bearing rails*" to allow a user to adjust the angle of inclination of each end of the tread surface, as taught by Chickering with reference to Figures 1 and 2. Such adjustment allows a user to adjust their speed on a manual treadmill. (Chickering, Ex. 1013, 2:44-49.)

160. Therefore Chickering discloses "*a second bearing rail* [right front support arm 14 and right rear support arm 19] *having a plurality of bearings*

[rollers 18], *the second bearing rail attached to a right side of the frame*."

> … ***[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and***

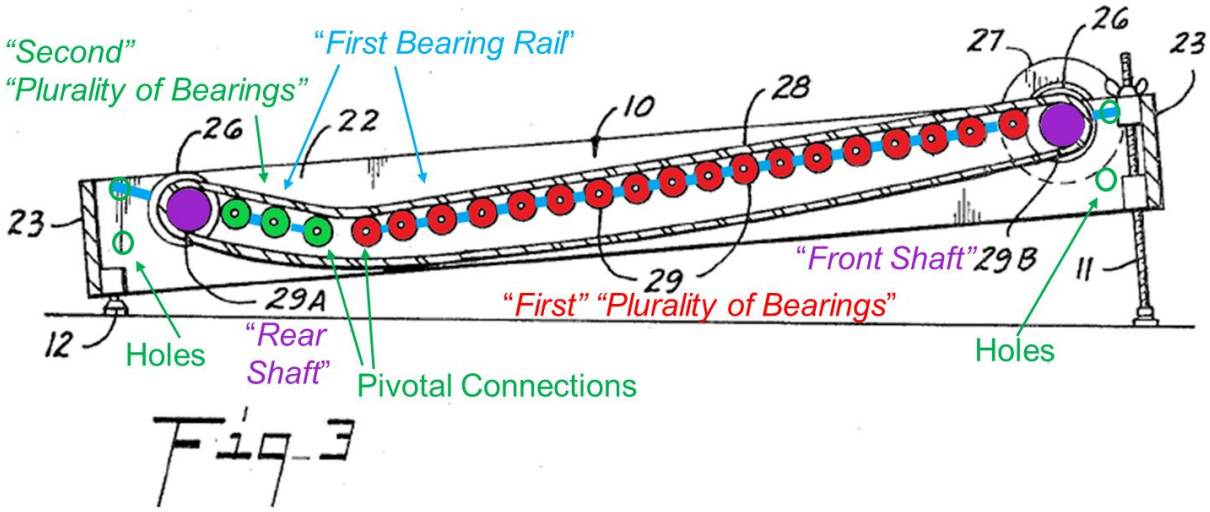
161. Chickering discloses "a single endless belt 28" that is disposed about the rollers 29, including the front roller 29b and the rear roller 29a, which collectively form a curved running surface:

> An alternate form of the exercising device of the present invention is shown in FIG. 3, wherein **a single endless belt 28** forms both the accelerating and decelerating areas. Ln the device shown in FIG. 3, a single series of rollers 29 are provided journaled in the sidewalls 22 of base 10. However, the rollers are so disposed that **the forward rollers lie approximately in a plane slanting downwardly from the front of the base, while the rear rollers lie approximately in a plane slanting upward toward the rear of the base 10**. Thus, when the endless belt 28 is placed about the rollers, it follows their contour and provides a forward accelerating area and a rear decelerating area which are inclined from the horizontal with each being lowest at their point of nearest proximity.

(Chickering, Ex. 1013, 2:73-3:10.)

162. As described above for claim limitations [1.4] and [1.5], Chickering is modified to include support arms ("*bearing rails*") which support the rollers and the running belt 28 and collectively form a curved running surface, as shown

below in Figure 3:



Chickering, Ex. 1013, Fig. 3 (Annotated)

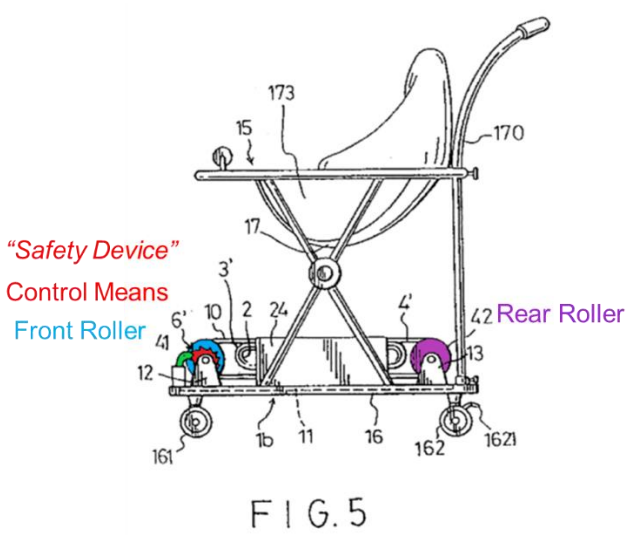
163. As shown in Figure 3 above, the belt 28 is supported by the "*first bearing rail*" which provides a curved running surface.

164. Thus, Chickering discloses "*a running belt* [endless belt 28] *supported by the first bearing rail and the second bearing rail* [support arms 14, 19] *and disposed about the front shaft* [front end roller 29b] *and the rear shaft* [rear end roller 29a]*, wherein the running belt follows a curved running surface*."

… ***[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft,***

165. Magid discloses a walker apparatus with adjacent left and right foot belts (4, 4'). (Magid, Ex. 1012, Figs. 5,6.) Magid further discloses "A unidirectional control means 6, 6' is installed to permit only unidirectional

movement of the left and right foot belts 4, 4'." (Magid, Ex. 1012, 4:46-48.)



Magid, Ex. 1012, Figure 5 (Annotated)

166. As shown in Figure 5 above, Magid discloses that the control means 6, 6' are a pair of control means that are attached to opposing ends of the front rollers 41. Magid also discloses that the control means 6, 6' may be attached to the rear rollers 42 and that each control means 6, 6' includes a ratchet gear 61 and a pawl 62:

> A unidirectional control means 6, 6' is installed to permit only unidirectional movement of the left and right foot belts 4, 4'. In this embodiment, the control means 6, 6' includes a pair of ratchet gears 61 attached to outer ends of the front rollers 41 and mounted rotatably on the first shaft 411, and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61 to permit only unidirectional rotation of the front rollers 41, thereby preventing bidirectional movement of the foot belts 4, 4'. A releasable means (not shown) may

> be provided to release selectively the pawls 62 from the ratchet gears 61 in a known manner to permit reciprocating movement of the foot belts 4, 4' when desired. Of course, the ratchet gears may be attached to the rear rollers 42 to achieve the same result.

(Magid, Ex. 1012, 4:46-59.)

167. Magid illustrates the control means 6, 6’ coupled to the rear rollers in Figures 2 and 9 below. Although Magid mislabels the front roller and the rear roller with the wrong reference numeral in these figures, a POSA would have understood, from the orientation of the handrail 14, and the ratchet gear 61, that the control means 6, 6’ are mounted to the rear roller. Figure 2 of Magid is annotated to include a user’s feet to further illustrate front and rear rollers of the treadmill.

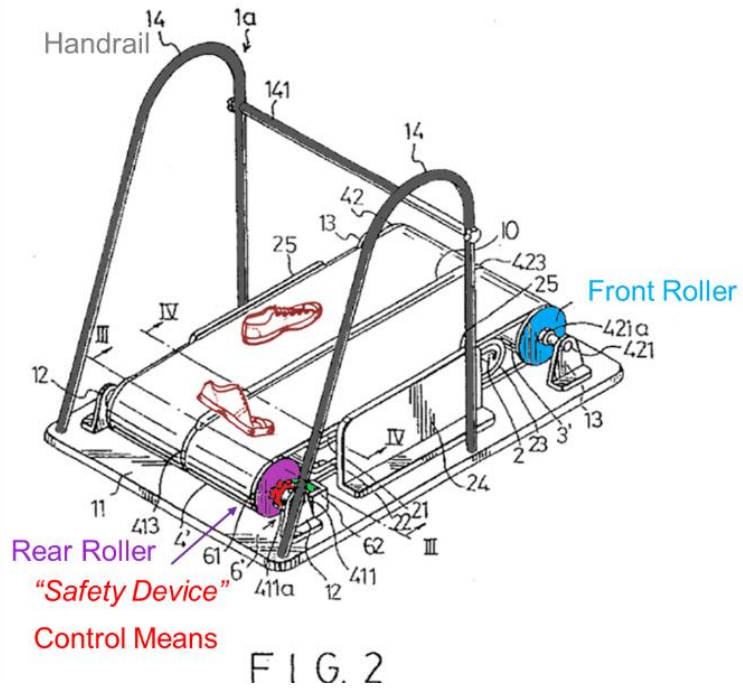


FIG. 2

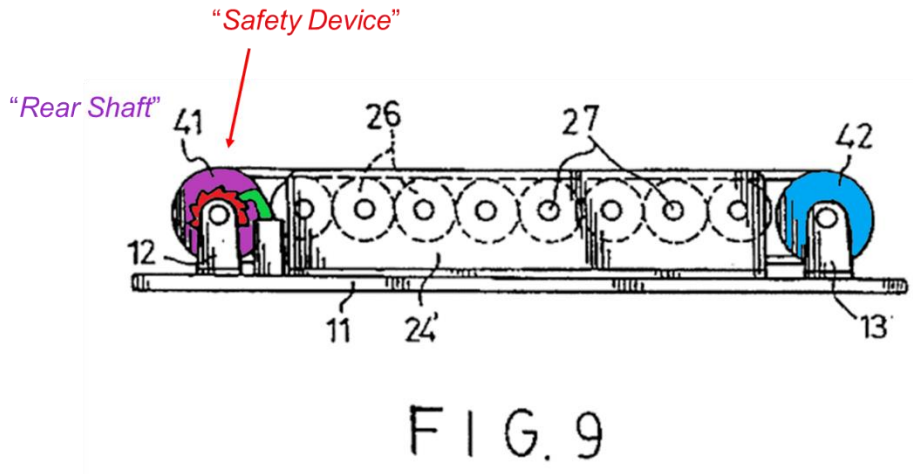
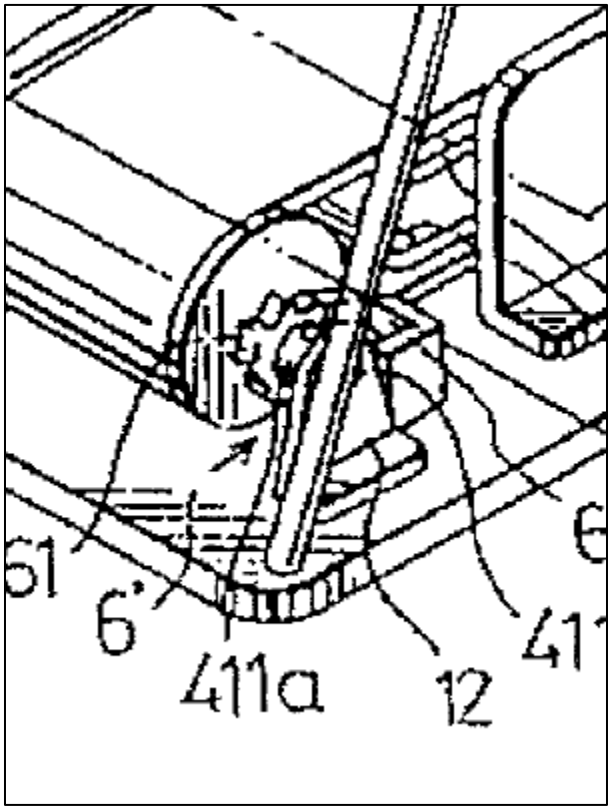


FIG. 9

Magid, Ex. 1012, Figures 2 and 9 (Annotated)

168. Additionally, the gear profile of the ratchet and orientation of the pawl in Figure 2 would prevent the rear roller from rotating in a first direction, which corresponds with the belt being blocked from moving to the right on the page, or forward.



Magid, Ex. 1012, Fig. 2 (Enlarged)

169. As explained in ¶¶ 230-243, It would have been obvious to a POSA to combine Chickering's treadmill with Magid's control means to permit only unidirectional movement of the running belt to reduce the risk of a user stepping onto the running belt of the treadmill and losing their balance when the belt moves in the forward direction. Magid's control means 6, 6' provide a "*safety device*" by preventing the left and right foot belts 4, 4' from moving forward. Thus, the combination of Chickering and Magid teach "*a safety device* [the control means 6, 6'] *coupled to at least one of the front shaft and the rear shaft*."

> … ***[1.7] [b] wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

170. Magid discloses that "the control means 6,6' includes a pair of ratchet gears 61 attached to outer ends of the front rollers 41 and mounted rotatably on the first shaft 411, and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61 to permit unidirectional rotation of the front rollers 451, thereby preventing bidirectional movement of the foot belts 4, 4'." (Magid, Ex. 1012, 4:48-54.)

171. The figure below is an enlarged image of the front roller 41 of Figure 5 of Magid. The image illustrates how the profile of the ratchet gear permits the front roller to freewheel or rotate clockwise (as indicated by the red arrow) which allows the running surface to move rearward (as indicated by the green arrow). The image also illustrates how the profile of the ratchet gear engages the pawl to prevent counterclockwise rotation of the front roller 41 and thereby prevent the belt from moving forward (to the left in the image).

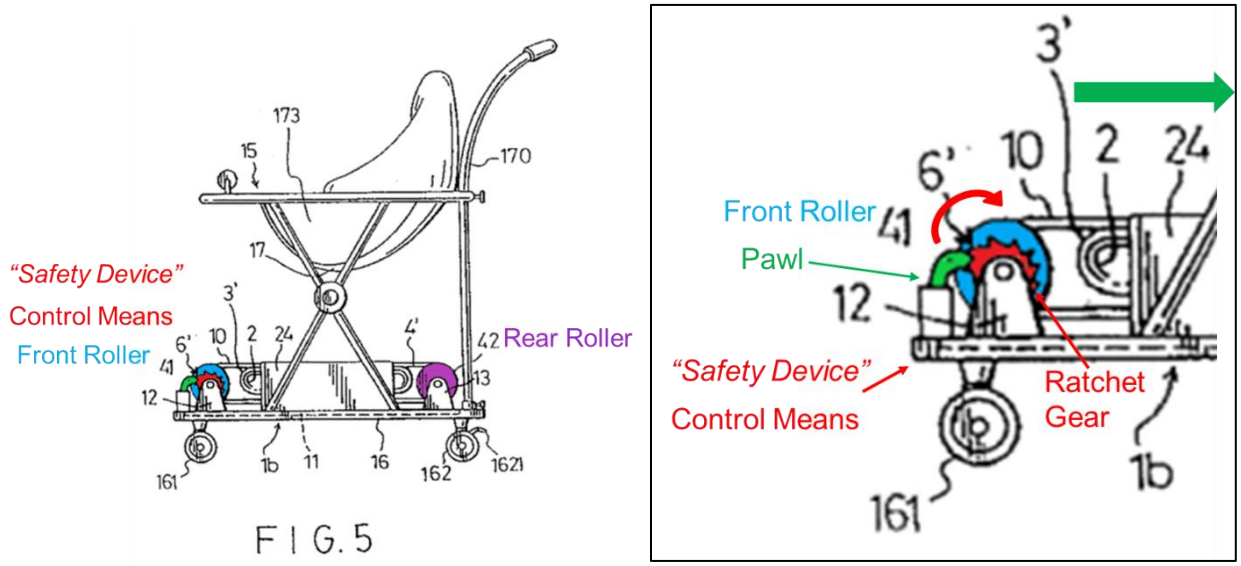


FIG. 5

Magid, Ex. 1012, Figure 5 (Annotated)

172. Magid also discloses, with reference to Figures 2 and 9 below, that the control means 6, 6' includes a pair of ratchet gears 61 that are attached to outer ends of the rear rollers and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61. (Magid, Ex. 1012, 4:48-54.)

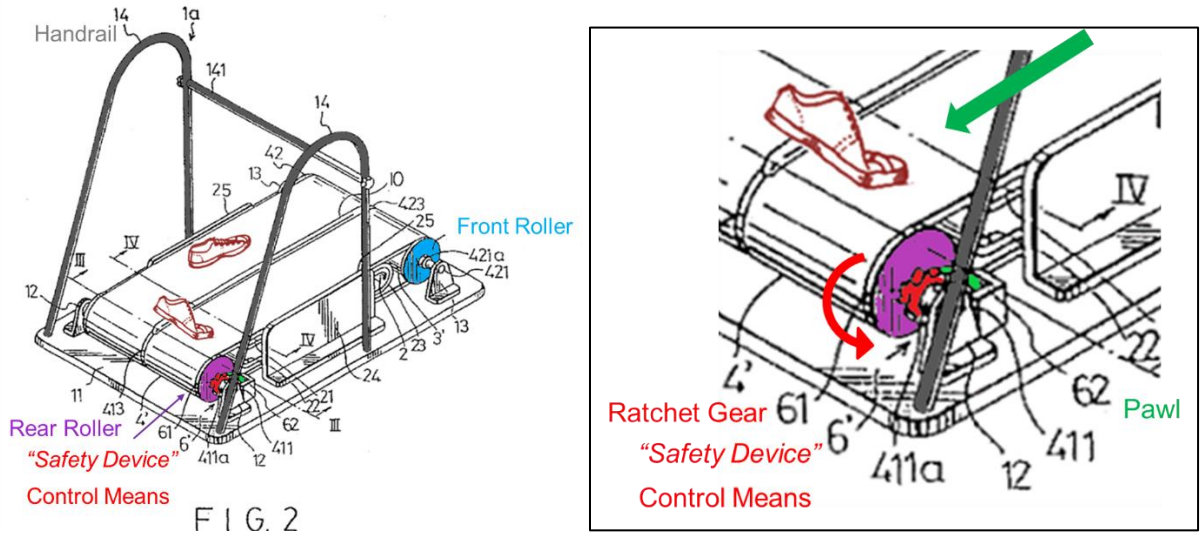


FIG. 2

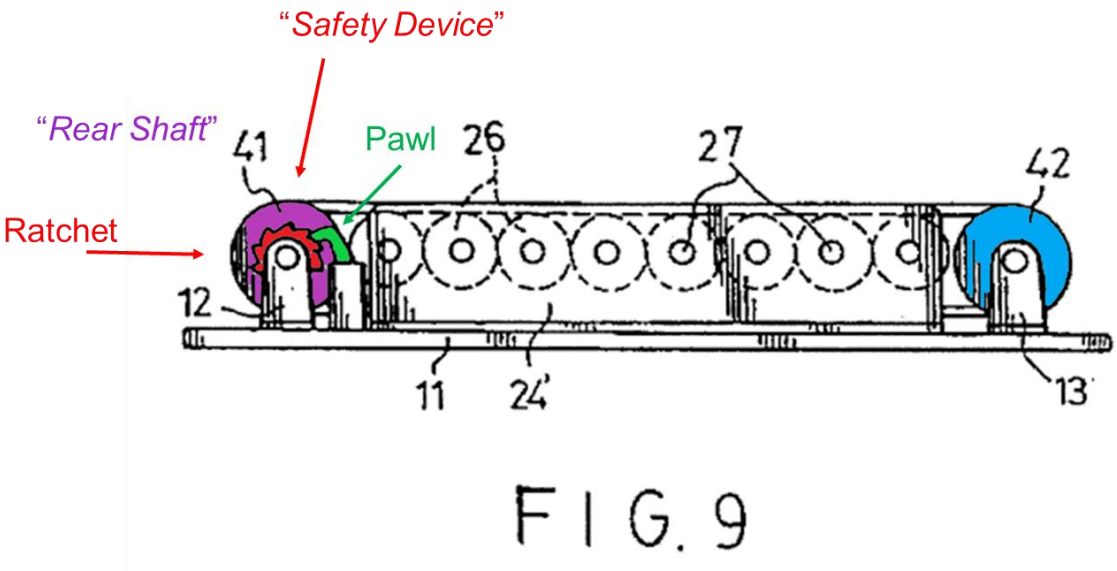


FIG. 9

Magid, Ex. 1012, Figures 2 and 9 (Enlarged, Annotated)

173. The above figure illustrates how the profile of the ratchet gear permits the rear roller to freewheel or rotate counter-clockwise (as indicated by the red arrow) which allows the running surface to move rearward (as indicated by the green arrow). The image also illustrates how the profile of the ratchet gear engages the pawl to prevent clockwise rotation of the front roller 41 and thereby prevent the belt from moving forward (to the right in the image).

174. Thus, the combination of Chickering and Magid teaches "*wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft* [Magid, Fig. 5 Embodiment] *and the rear shaft* [Magid, Fig. 2 Embodiment] *in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite*

the first rotational direction."

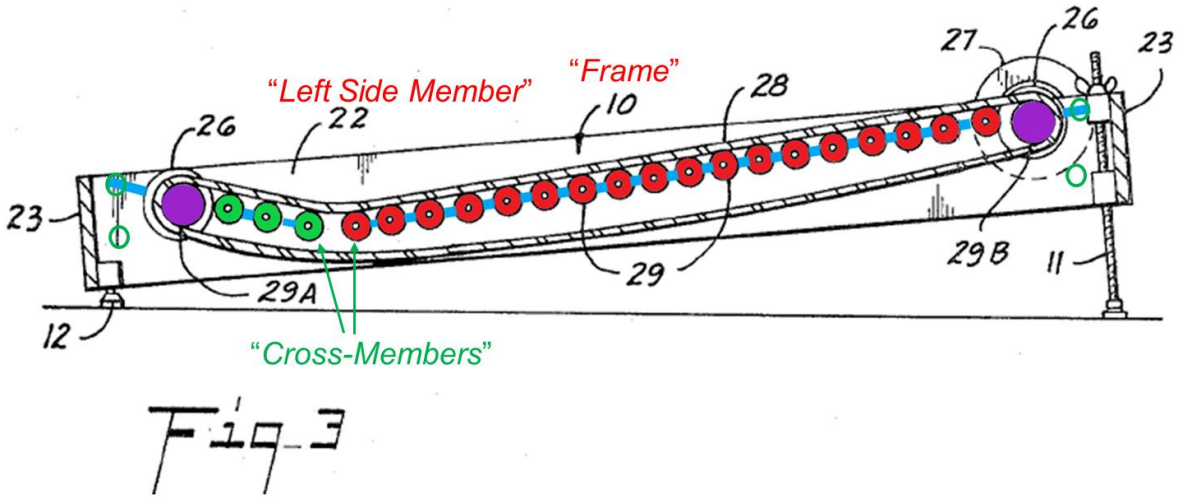
2. Dependent Claims 2, 3, 5, and 10

175. Claims 2, 3, 5, and 10 depend directly or indirectly from claim 1, which I understand means that claims 2, 3, 5, and 10 require all of the limitations of claim 1 and the limitations of any intervening claims in addition to their additional limitations.

176. The combination of Chickering and Magid disclose all of the limitations of claim 1 as described above. (*See* ¶¶ 130-174.)

> … ***[2] The manually powered treadmill of claim 1, wherein the frame includes at least one cross-member, a left side member, and a right side member; and wherein the at least one cross-member extends between the left side member and the right side member.***

177. Chickering discloses that the exercising device "has a base 10 which comprises an inclined rectangular frame having two sidewalls 22 and two end walls 23." (Chickering, Ex. 1013, 1:65-68.)



Chickering, Ex. 1013, Fig. 3 (Annotated)

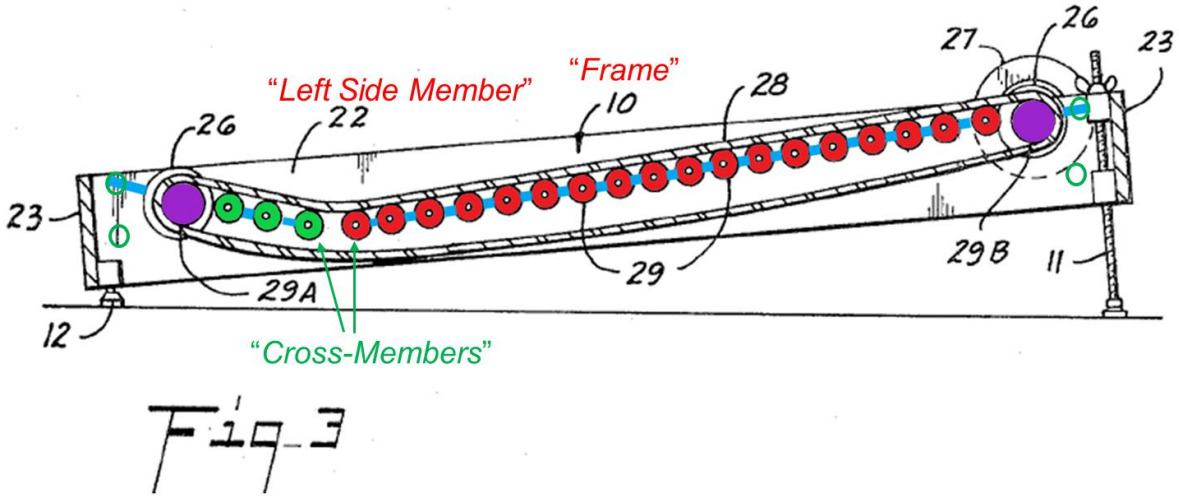
178. Chickering discloses that the exercise device has a first series of transverse parallel rollers 13 and a second series of transverse parallel rollers 18. (Chickering, Ex. 1013, 1:74-2:12.) Chickering also discloses that each series of rollers 13, 18 includes a central roller (annotated in green) that is pivotally connected to a central portion of the sidewalls 22 at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt:

> In the embodiment as illustrated in FIGS 1 and 2 a first and second series of such transverse parallel rollers are carried by the base preferably as follows: Two elongate support arms 14 are provided, one such arm being pivotally mounted at 15 to the inside of each sidewall 22 of base 10. The forward and free end of each arm 14 is supported by a pin inserted through one of several holes 17 provided in each sidewall 22 near its forward end. Two other similar but preferably shorter support arms 19 are carried by base 10, one arm 19

> being pivotally connected at 20 to each sidewall 22 and having its rearward and free end supported by a pin (not shown) inserted through one of several holes 24 provided in each sidewall 22 near its rearward end.

(Chickering, Ex. 1013, 1:74-2:12.)

179. These central rollers satisfy the "*cross-member*" limitation. As explained with reference to claim limitations [1.4] and [1.5], Chickering's "*bearing rail*" disclosure, including the central rollers ("*cross members*") that are pivotally connected to the sidewalls 22, is applicable to the single belt embodiment of Figure 3.



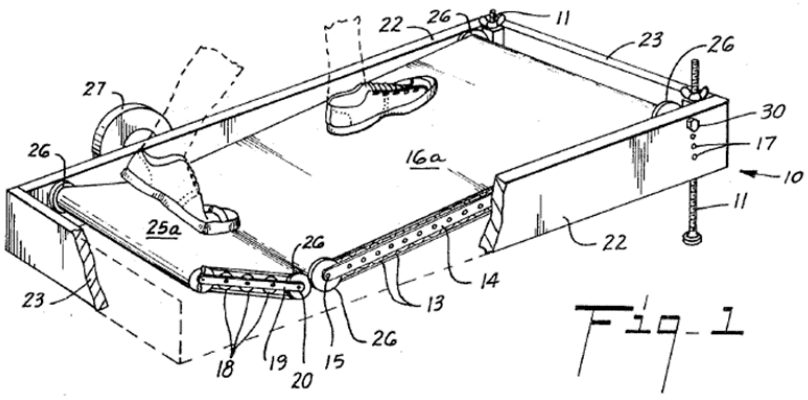
Chickering, Fig. 3 (Annotated)

180. Thus, Chickering discloses "*wherein the frame* [base 10] *includes at least one cross-member* [central rollers], *a left side member* [left sidewall 22], *and a right side member* [right sidewall 22]*; and wherein the at least one cross-*

member [central rollers] *extends between the left side member and the right side member* [left and right sidewalls 22]."

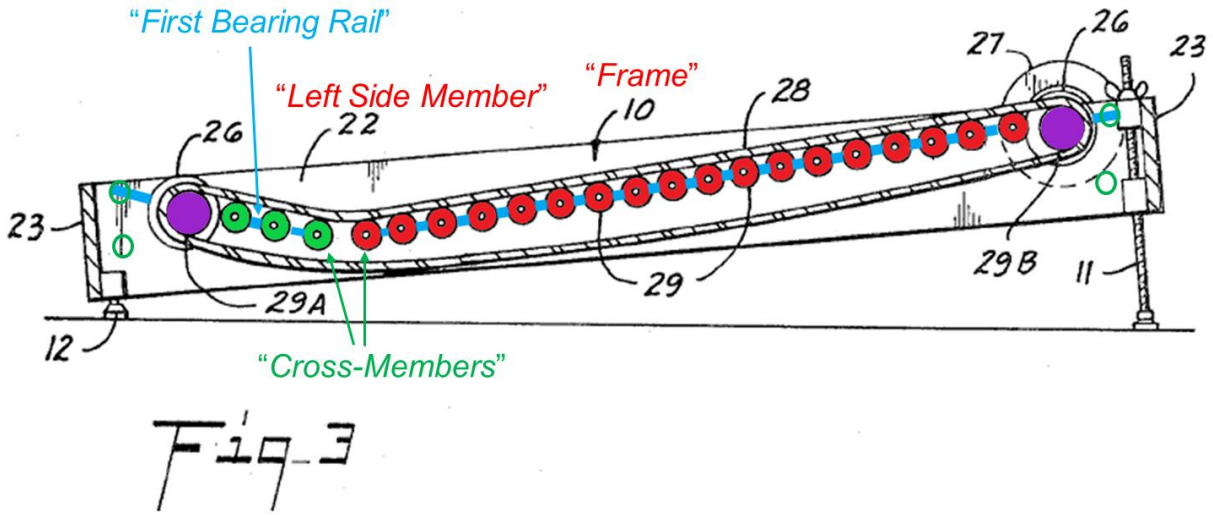
… ***[3] The manually powered treadmill of claim 2, wherein each one of the first and second bearing rails are coupled to at least one of the at least one cross-member.***

181. Chickering discloses that the support arms 14, 19 are pivotally connected to a central portion of the base 10 at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt. (Chickering, Ex. 1013, 1:74-2:12.)



Chickering, Ex. 1013, Fig. 1

182. As explained with reference to claim limitations [1.4] and [1.5], Chickering's belt elevation adjustment disclosure, including the central rollers ("*cross members*") that are coupled to the support arms 14, 19 ("*bearing rails"*) and pivotally connected to the sidewalls 22, is applicable to the single belt embodiment of Figure 3.

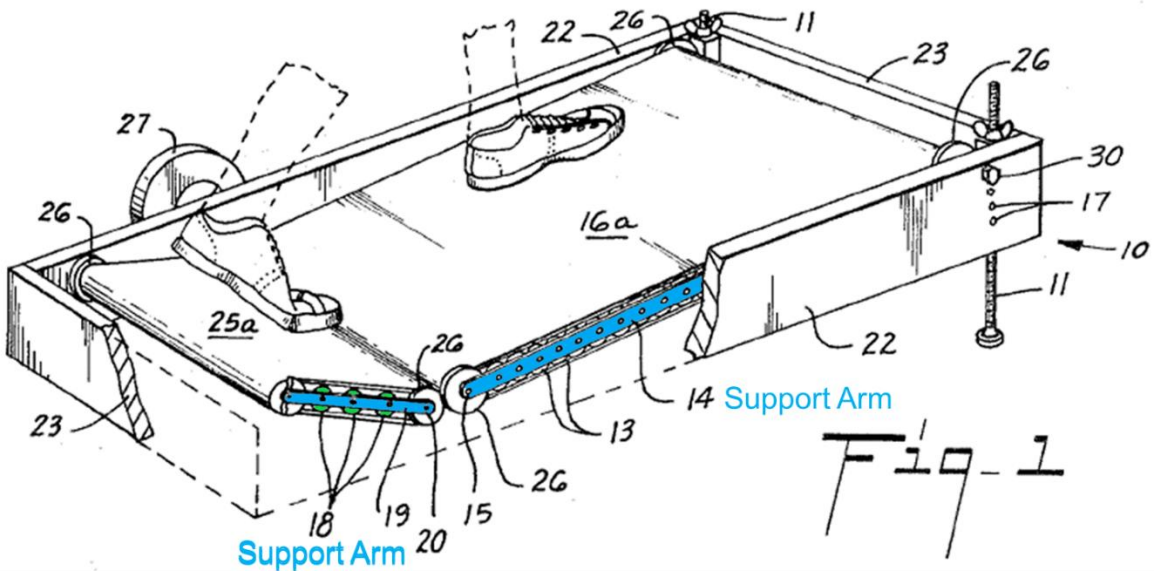


Chickering, Ex. 1013, Fig. 3 (Annotated)

183. Thus, Chickering discloses "*wherein each one of the first and second bearing rails* [support arms 14, 19] *are coupled to at least one of the at least one cross-member* [central rollers]."

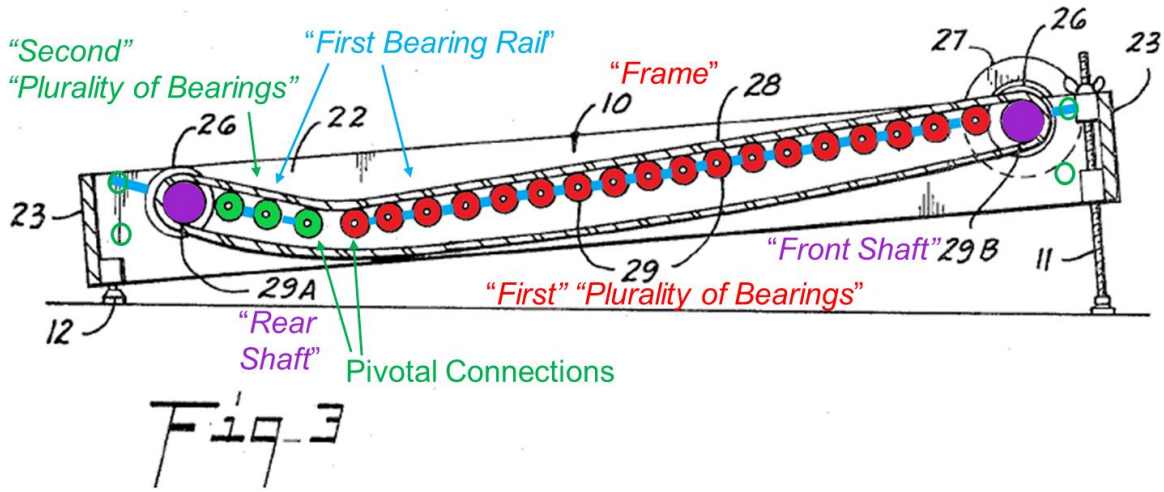
> … ***[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

184. As explained with reference to claim limitations [1.4] and [1.5], Chickering discloses that the support arms 14, 19 ("*first and second bearing rails*") are pivotally connected to a central portion of the base 10 ("*frame*") at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt. (Chickering, Ex. 1013, 1:74-2:4.)



Chickering, Ex. 1013, Fig. 1 (Annotated)

185. As illustrated in Figure 3 below, the pivotal connections are located between the front end roller 29b ("*front shaft*") and the rear end roller 29a ("*rear shaft*").



Chickering, Ex. 1013, Fig. 3 (Annotated)

186. Thus Chickering discloses "*wherein each one of the first and second*

bearing rails [support arms 14, 19] *are attached longitudinally to the frame between the front shaft* [end roller 29B] *and the rear shaft* [end roller 29A]."

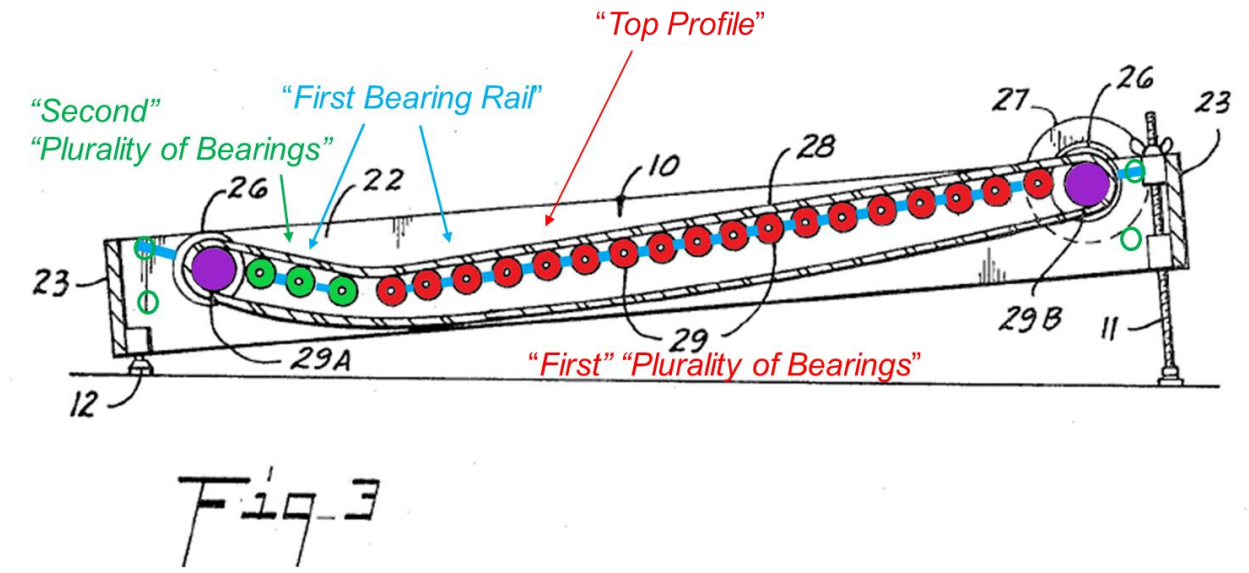
> … ***[5.] The manually powered treadmill of claim 1, wherein each one of the first bearing rail and the second bearing rail define in part a top profile corresponding to the curved running surface.***

187. Chickering discloses that the endless belt 28 ("*running belt*") is placed about the rollers ("*bearings*") and follows their curved contour:

> Thus, when the endless belt 28 is **placed about the rollers, it follows their contour** and provides a forward accelerating area and a rear decelerating area which are inclined from the horizontal with each being lowest at their point of nearest proximity.

(Chickering, Ex. 1013, 2:73-3:10.)

188. As illustrated below, the upper surfaces of the rollers 29 define a "*top profile*" that engages the belt 28 to form the "*curved running surface*."



Chickering, Ex. 1013, Fig. 3 (Annotated)

189. Chickering discloses that the rollers 29 ("*bearings*") are supported by the support arms ("*bearing rails*"). (Ex. 1013, 2:2-12.) Therefore, Chickering discloses "*wherein each one of the first bearing rail and the second bearing rail* [support arms 14, 19] *define in part a top profile corresponding to the curved running surface*."

> … ***[10.] The manually powered treadmill of claim 1, further comprising a handrail attached to the frame and structured to provide a support structure for the user of the manually powered treadmill.***

190. Chickering discloses that its treadmill may be provided with "handles, railings and the like":

> While the exercising device is usable without external supports such as handles, railings and the like, such supports may be provided, if desired, without departing from the spirit of the invention.

(Chickering, 3:38-41.)

191. Magid discloses, with reference to Figure 2, "a pair of handrails 14 mounted on opposite longitudinal sides of the base 11 to permit use of the walker apparatus as an exercise walker." (Magid, Ex. 1012, 5:45-48.)

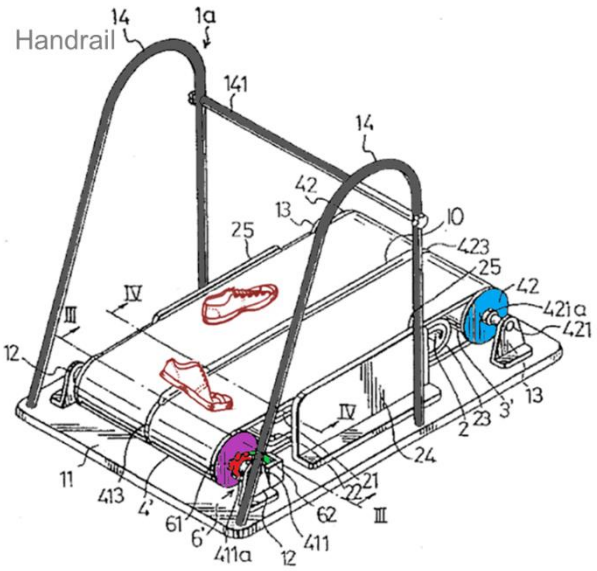


FIG. 2

Magid, Ex. 1012, Fig. 2 (Annotated)

192. A POSA would have been motivated to add a handrail, such as that disclosed in Magid, to Chickering as explained by Chickering. (Chickering, Ex. 1013, 3:38-41.) Further such handrails are required for safety by the ASTM Standard and the ISO Standard. (ASTM Standard, Ex. 1019 at 4; ISO Standard,

Ex. 1020 at 8.)

193. Thus, the combination of Chickering and Magid teach "*a handrail attached to the frame and structured to provide a support structure for the user of the manually powered treadmill*."

3. Independent Claim 11

194. Independent claim 11 is largely duplicative of independent claim 1. To illustrate, the table below shows a side-by-side comparison of claims 1 and 11. Claim 11 is "marked up" to show the minor differences.

'580 Patent Claim 1	'580 Patent Claim 11
[1.0] A manually powered treadmill comprising:	**[11.0]** A manually powered treadmill, comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;	**[11.1]** a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to the frame at the front end;	**[11.2]** a front shaft attached to the frame adjacent the front end;
[1.3] a rear shaft rotatably coupled to the	**[11.3]** a rear shaft attached to the frame

‘580 Patent Claim 1	‘580 Patent Claim 11
frame at the rear end;	adjacent the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;	**[11.4]** a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;	**[11.5]** a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and	**[11.6] [a]** a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail, **[b]** wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the

‘580 Patent Claim 1	‘580 Patent Claim 11
	front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and
[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft, **[b]** wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.	**[11.7]** a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

195. As illustrated above, limitations [11.0]-[11.5] and [11.7] are nearly identical to corresponding limitations of claim 1. The only substantial modification to claim 11 to differentiate it from claim 1 was to claim various positions and locations of the running belt in limitation [11.6].

… ***[11.0] A manually powered treadmill, comprising:***

196. Limitation [11.0] is identical to limitation [1.0]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Chickering and Magid. (*See* ¶¶ 130-133.)

… ***[11.1] a frame having a front end and a rear end positioned opposite the front end;***

197. Limitation [11.1] is identical to limitation [1.1]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Chickering and Magid. (*See* ¶¶ 134-135.)

… ***[11.2] a front shaft attached to the frame adjacent the front end;***

198. Claim limitation [11.2] is substantially similar to limitation [1.2] of claim 1. Claim [11.2] requires "*a front shaft attached to the frame adjacent the front end*," whereas limitation [1.2] requires "*a front shaft rotatably coupled to the frame at the front end.*" As explained for limitation [1.2], Chickering discloses that the front end roller 29b ("*front shaft*") is journaled to the support arm and pivotally connected to the base 10 ("*frame*") by a pin. (*See* ¶¶ 136-139.) Therefore

Chickering's discloses a front end roller 29b ("*front shaft*") that is both "*attached to*" and "*rotatably coupled*" to the front end of the "*frame*."

199. Thus, Chickering discloses "*a front shaft attached to the frame adjacent the front end*."

… ***[11.3] a rear shaft attached to the frame adjacent the rear end;***

200. Claim limitation [11.3] is substantially similar to limitation [1.3] of claim 1. Claim [11.3] requires "*a rear shaft attached to the frame adjacent the rear end*," whereas limitation [1.3] requires "*a rear shaft rotatably coupled to the frame at the rear end.*" As explained for limitation [1.3], Chickering discloses that the rear end roller 29a ("*rear shaft*") is journaled to the support arm and pivotally connected to the base 10 ("*frame*") by a pin.

201. Therefore Chickering's discloses a rear end roller 29a ("*rear shaft*") that is both "*attached to*" and "*rotatably coupled*" to the rear end of the "*frame*." (*See* ¶¶ 140-143.)

202. Thus, Chickering discloses "*a rear shaft attached to the frame adjacent the rear end*."

… ***[11.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***

203. Limitation [11.4] is identical to limitation [1.4]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the

combination of Chickering and Magid. (*See* ¶¶ 144-155.)

> … ***[11.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

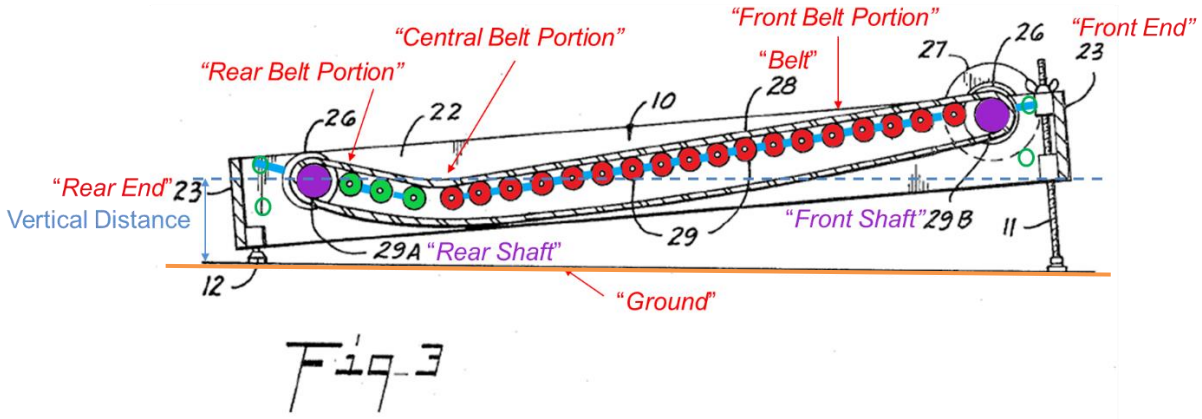
204. Limitation [11.5] is identical to limitation [1.5]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Chickering and Magid. (*See* ¶¶ 156-160.)

> … ***[11.6][a] a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail,***

205. As illustrated in the above table, limitation [11.6][a] includes the same limitations as limitation [1.6] of claim 1, however the limitations are rearranged and use slightly different language. These differences are not substantial; therefore I refer back to my analysis of limitation [1.6] of claim 1 to establish that limitation [11.6] [a] is met by the combination of Chickering and Magid. (*See* ¶¶ 161-164.)

> … ***[11.6][b] wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and***

206. As illustrated in the image below, Chickering discloses in Figure 3 that the endless belt 28 includes a "*front belt portion*" that is proximate to the front end wall 22 ("*front end*"), a "*rear belt portion*" that is proximate to the rear end wall 22 ("*rear end*"), and a "*central belt portion*" that is between the front end wall 22 and the rear end wall 22. The "*central belt portion*" is positioned vertically closer to a ground surface supporting the base 10 ("*frame*") than the "*front and rear belt portions*," as depicted by the vertical distance annotation in blue, such that the endless belt 28 follows a "*curved running surface*."



Chickering, Ex. 1013, Fig. 3 (Annotated)

207. Thus, Chickering discloses "*wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface*."

> … ***[11.7] a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

208. As illustrated in the above table, limitation [11.7] includes the same limitations as limitation [1.7] of claim 1, however the limitations are rearranged and use slightly different language. These differences are not substantial; therefore

I refer back to my analysis of limitation [1.7] of claim 1 to establish that limitation [11.7] is met by the combination of Chickering and Magid. (*See* ¶¶ 165-174.)

209. Thus, the combination of Chickering and Magid teach "*a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction*."

4. Dependent Claims 14 and 18

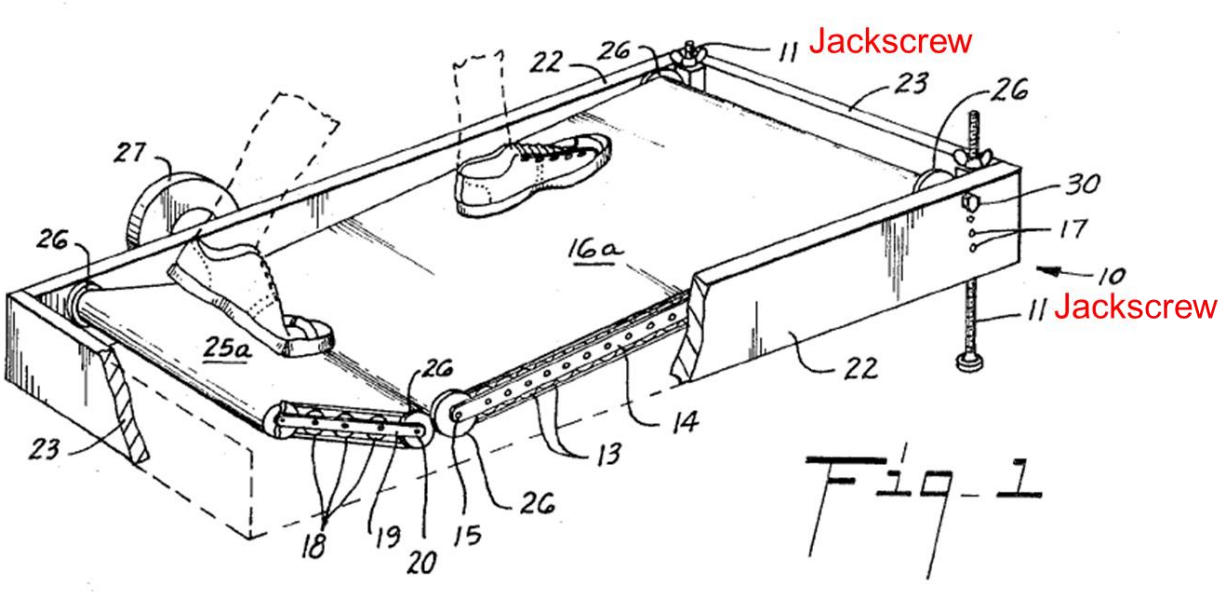
210. Claims 14, and 18 depend from claim 11 which I understand means that claims 14 and 18 require all of the limitations of claim 11 in addition to their additional limitations.

211. The combination of Chickering and Magid disclose all of the limitations of claim 11 as described above. (*See* ¶¶ 196-209.)

> … ***[14.] The manually powered treadmill of claim 11, further comprising support feet coupled to the frame, wherein the support feet are vertically adjustable to adjust an incline of the manually powered treadmill relative to the ground surface.***

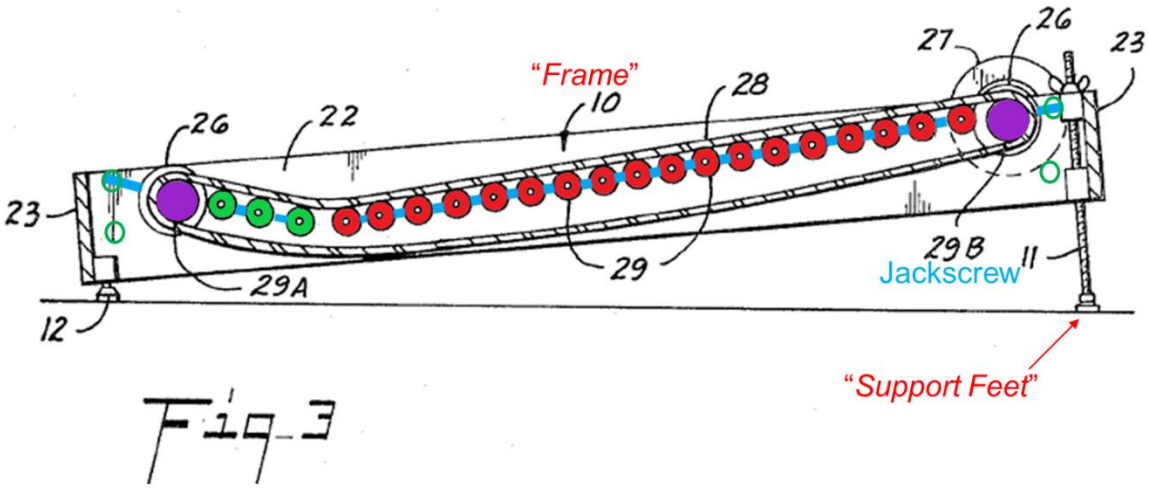
212. Chickering discloses that the treadmill includes "jackscrews 11 [that] are provided at the forward corners of base 10 for adjusting its angle of inclination. Leveling buttons 12 may be used on the rear corners to keep the base steady."

(Chickering, Ex. 1013, 1:69-70.)



Chickering, Ex. 1013, Fig. 1 (Annotated)

213. As illustrated in Figure 3, leveling buttons ("support feet") are also attached at the ends of the jackscrews 11.



Chickering, Ex. 1013, Fig. 3 (Annotated)

214. Thus, Chickering discloses "*support feet* [jackscrews 11] *coupled to*

the frame [base 10], *wherein the support feet are vertically adjustable to adjust an incline of the manually powered treadmill relative to the ground surface*."

> … ***[18] The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

215. Claim 18 is largely duplicative of claim 4. To illustrate, the table below shows a side-by-side comparison of claims 4 and 18. Claim 18 is "marked up" to show the minor differences.

'580 Patent Claim 4	**'580 Patent Claim 18**
[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.	[18.] The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.

216. Because the additional limitations of claim 18 are identical to the additional limitations of claim 4, I refer back to my analysis of these limitations of claim 4 to establish that they are met by the combination of Chickering and Magid. (*See* ¶¶ 184-186.)

5. Independent Claim 25

217. Although a method claim, independent claim 25 is largely duplicative of independent claim 1. To illustrate, the table below shows a side-by-side comparison of claim 1 and claim 25. Claim 25 is "marked up" to show the minor differences.

'580 Patent Claim 1	'580 Patent Claim 25
[1.0] A manually powered treadmill comprising:	**[25.0]** A method, comprising: providing a manually powered treadmill,
[1.1] a frame having a front end and a rear end positioned opposite the front end;	**[25.1]** the manually powered treadmill having a frame with a front end and rear end;
[1.2] a front shaft rotatably coupled to the frame at the front end;	
[1.3] a rear shaft rotatably coupled to the frame at the rear end;	

‘580 Patent Claim 1	‘580 Patent Claim 25
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;	**[25.2] [a]** providing a first bearing rail and a second bearing rail, the first and second bearing rails each comprising a plurality of bearings and **[b]** extending longitudinally on the frame, **[c]** wherein the first and second bearing rails define a curved top profile;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;	
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and	**[25.3]** disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface corresponding to the curved top profile of the first and second bearing rails;
[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft,	

‘580 Patent Claim 1	‘580 Patent Claim 25
[b] wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.	**[25.5]** substantially preventing movement of the running belt in a second direction opposite the first direction. **[25.4]** permitting movement of the running belt in a first direction; and

218. Despite being a method claim, limitations [25.0]-[25.2][a] and [25.3] are structural elements identical to the structural elements recited in apparatus claim 1. The only modification to claim 25 to differentiate it from claim 1 was to add “*running belt*” limitations [25.2][b] “*extending longitudinally on the frame, [c] wherein the first and second bearing rails define a curved top profile*.”

> … ***[25.0] A method, comprising:***
>
> … ***[25.1] providing a manually powered treadmill, the manually powered treadmill having a frame with a front end and rear end;***

219. Claim limitations [25.0]-[25.1] are substantially similar to limitation

[1.0]. Therefore, I refer back to my analysis of these limitations of claim 1 to establish that they are met by the combination of Chickering and Magid. (*See* ¶¶ 130-133.)

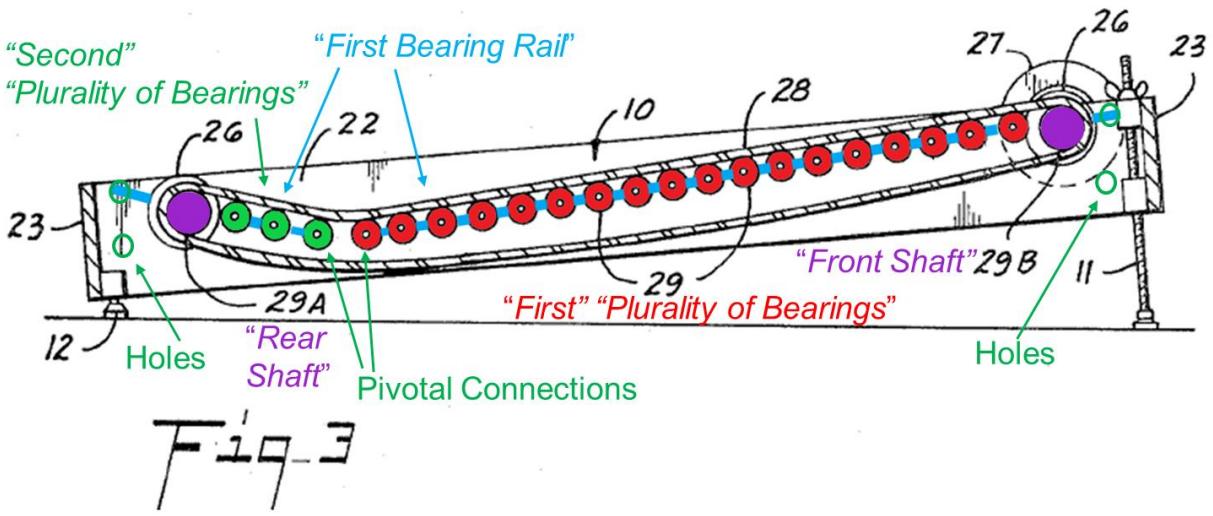
> … ***[25.2][a]providing a first bearing rail and a second bearing rail, the first and second bearing rails each comprising a plurality of bearings and***

220. Claim limitation [25.2][a] is substantially similar to limitations [1.4]-[1.5]. Therefore, I refer back to my analysis of these limitations of claim 1 to establish that they are met by the combination of Chickering and Magid. (*See* ¶¶ 144-160.)

> … ***[25.2] [b] extending longitudinally on the frame,***

221. Chickering discloses that the support arms 14, 19 ("*first and second bearing rails*") are pivotally connected to a central portion of the base 10 ("*frame*") at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt. (Chickering, Ex. 1013, 1:74-2:4.)

222. As illustrated in Figure 3 below, the support arms ("*bearing rails*") extend longitudinally from the pivotal connections between the front end roller 29b ("*front shaft*") and the rear end roller 29a ("*rear shaft*").



Chickering, Ex. 1013, Fig. 3 (Annotated)

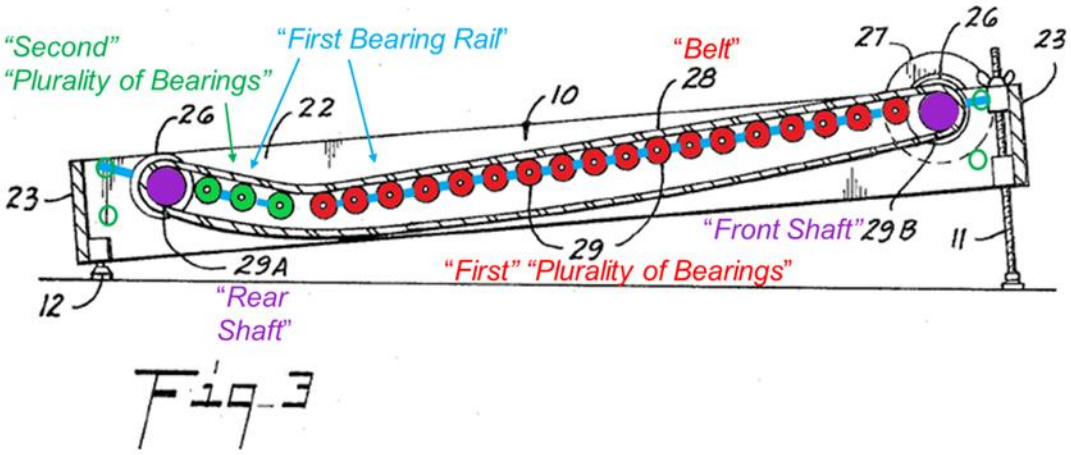
… ***[25.2] [c] wherein the first and second bearing rails define a curved top profile;***

223. Chickering discloses that the endless belt 28 ("*running belt*") is placed about the rollers ("*bearings*") and follows their curved contour:

> Thus, when the endless belt 28 is **placed about the rollers, it follows their contour** and provides a forward accelerating area and a rear decelerating area which are inclined from the horizontal with each being lowest at their point of nearest proximity.

(Chickering, Ex. 1013, 2:73-3:10.)

224. Chickering discloses that the rollers ("*bearings*") are supported by the support arms ("*bearing rails*"). (Ex. 1013, 2:2-12.)



Chickering, Ex. 1013, Fig. 3 (Annotated)

225. Thus, Chickering discloses "*[a] providing a first bearing rail and a second bearing rail, the first and second bearing rails each comprising a plurality of bearings and [b] extending longitudinally on the frame, [c] wherein the first and second bearing rails define a curved top profile*."

> … ***[25.3] disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface corresponding to the curved top profile of the first and second bearing rails;***

226. Claim limitation [25.3] is substantially similar to limitation [1.6] of claim 1. Regarding the limitations "*disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface*," I refer back to my analysis of these limitations of claim [1.6] to establish that they are met by the combination of

Chickering and Magid. (*See* ¶¶ 161-164.)

227. Claim [25.3] further requires that the "*top curved running surface correspond[s] to the curved top profile of the first and second bearing rails*." As explained for claim [25.2][c], Chickering discloses that the endless belt 28 ("*running belt*") is placed about the rollers ("*bearings*") and follows their curved contour; and the rollers ("*bearings*") are supported by the support arms ("*bearing rails*") (Chickering, Ex. 1013, 2:2-12, 2:73-3:10.)

228. Thus, Chickering discloses "*disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface corresponding to the curved top profile of the first and second bearing rails*."

> … ***[25.4] permitting movement of the running belt in a first direction; and***
>
> … ***[25.5] substantially preventing movement of the running belt in a second direction opposite the first direction.***

229. Because limitations [25.4]-[25.5] are nearly identical to limitations [1.7][b], I refer back to my analysis of these limitations of claim 1 to establish that they are met by the combination of Chickering and Magid. (*See* ¶¶ 170-174.)

6. Rationale for combining Chickering and Magid

230. It would have been obvious to a POSA to combine the manual

treadmill topology with a curved running surface disclosed in Chickering with the known technique of a one-way clutch to prevent treadmill belt motion in a forward direction as disclosed in Magid.

231. Chickering and Magid are from the same field – Exercise Equipment, more specifically treadmills for home exercise use. (Chickering, Ex. 1013, 1:1-7; Magid, Ex. 1012, 1:53-58; 3:23-27.) Both Chickering and Magid disclose treadmills with a running belt that is supported by rollers. (Chickering, Ex. 1013, 2:73-3:6, Fig. 3; Magid, Ex. 1012, 6:46-53, Fig. 8.) Chickering discloses rollers 13, 18 that are "journaled" or rotatably coupled to support arms 14, 19. (Chickering, Ex. 1013, 2:13-21, Fig. 1.) The support arms 14, 19 support the rollers and the running belt 28 and collectively form a curved running surface. (Chickering, Ex. 1013, 2:13-21, Fig. 3.)

232. It has long been recognized that users may be injured by falling off of a treadmill while mounting or dismounting it, or while using it. This may be due to the treadmill belt moving in an unexpected direction or in such a way that the user cannot regain their equilibrium. It could also be due to the incline of the surface causing the position of user to drift rearwards, and off, over time. (¶¶ 71-72.)

> A person exercising on this type of treadmill is likely to lose his balance because the frictionless surface offers no resistance to the movement of his feet, and he is therefore unable to obtain the leverage necessary for proper balance. Also, the user is likely to run off the

> lower end of the treadmill because the faster he runs the faster the belt accelerates and moves beneath his feet, carrying him to the rear.

(Chickering, Ex. 1013, 1:30-37.)

> In particular, if the rollers supportably disposed in relation to the endless belt are so easily moveable, the user may potentially lose his equilibrium or balance and fall from the exercise treadmill resulting in possible injuries.

(Socwell, Ex. 1011, 1:32-36.)

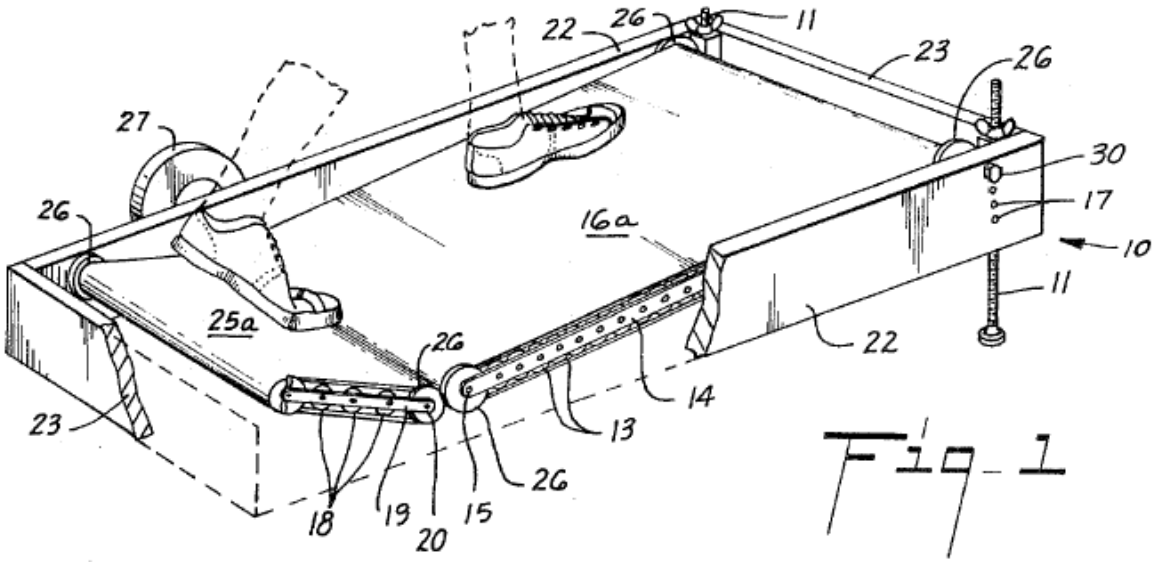
> Another meaningful disadvantage of exercise treadmills of the prior art is the inherent danger associated with users tending to fall off the back end of the treadmill and become injured.

(Socwell, Ex. 1011, 2:45-48.)

233. Several professional organizations have produced standards to provide guidance to manufacturers regarding both exercise equipment safety in general and other standards specifically for treadmill safety. *See* ASTM Standard, Ex. 1019; ISO Standard, Ex. 1020; and ACCC Product Safety Supplier Guide, Ex. 1007. These standards establish requirements for foot rails and handrails on treadmills to address stability. (ASTM Standard, Ex. 1019 at 3-4; ISO Standard, Ex. 1020 at 8.)

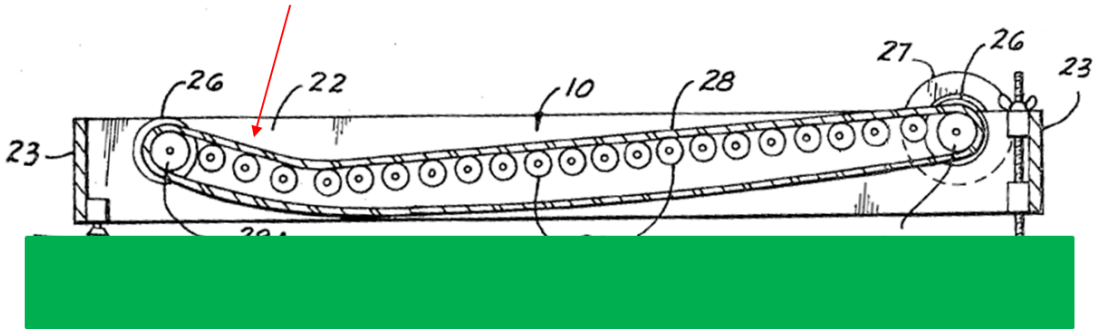
234. Chickering proposes a treadmill with a curved running surface to address this problem: "The upwardly sloping decelerating area [at the rearward end of the treadmill] offers enough resistance to the users foot to enable him to maintain his balance and position on the exercising device." (Chickering, Ex. 1013,

2:37-39.)



Chickering, Ex. 1013, Fig. 1

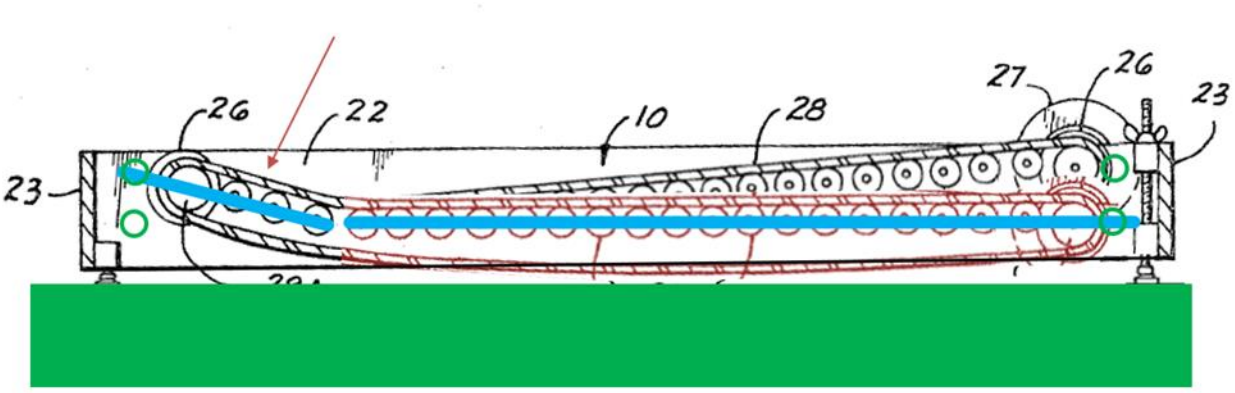
235. However, Chickering's curved running surface does not expressly address the safety issue of the running belt moving in a forward direction when a user steps onto the treadmill. For example, with a curved running surface, such as that disclosed in Chickering, such forward motion is likely to occur if a user were to step onto the rearward end of the running surface (indicated by the red arrow), causing the foot to unexpectedly move towards the lowest portion of the treadmill. In the condition where the user adjusts the frame to a generally horizontal position using the front jackscrew, as depicted in the image below, this unexpected motion would be exacerbated.



Chickering, Ex. 1013, Fig. 3 (Annotated)

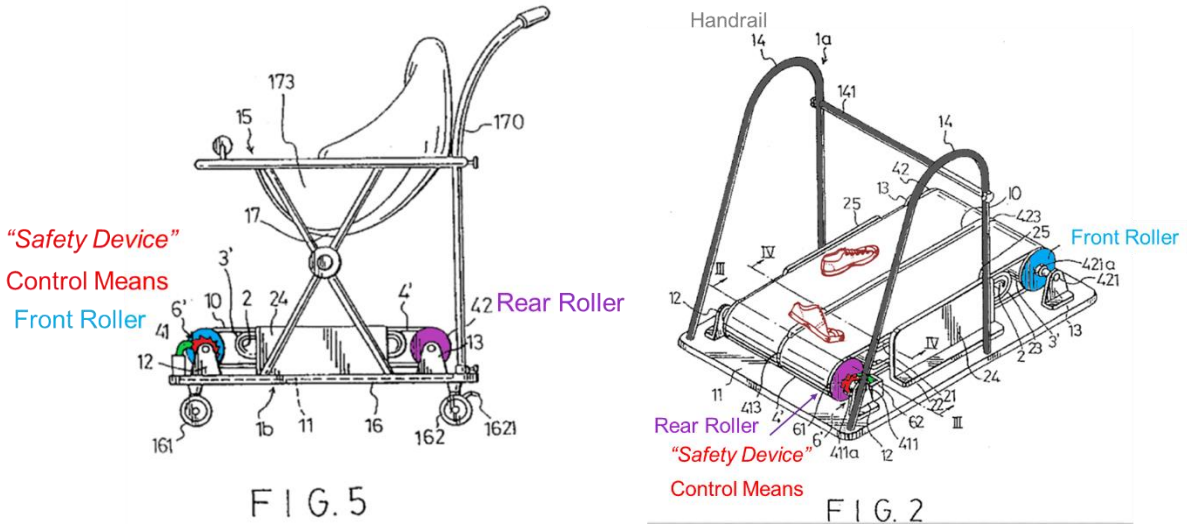
236. Chickering discloses that the support arms 14, 19 are pivotally connected to a central portion of the base 10 at pivotal connections 15 and 20 to allow adjustment of different angles of inclination of the belt. (Chickering, Ex. 1013, 1:74-2:4.)

237. The running belt is even more likely to move in a forward direction if a user were to step onto the rearward end of the running surface (indicated by the red arrow), when the front running surface is adjusted to a slightly downward position and the forward end of the bearing rail is pinned to the lower hole, as described with reference to claim limitations [1.4] [1.5] and depicted in the image below.



Chickering, Ex. 1013, Fig. 3 (Annotated)

238. Magid discloses a one-way clutch (unidirectional control means 6, 6') that is coupled to a front shaft (Fig. 5) or a rear shaft (Fig. 2) to permit only unidirectional movement of the belt. (Magid, Ex. 1012, Fig. 5, 4:46-59.)



Magid, Ex. 1012, Figs. 5 and 2 (Annotated)

239. It would have been obvious to a POSA to combine Chickering's treadmill with Magid's control means to permit only unidirectional movement of the running belt to reduce the risk of a user stepping onto the running belt of the

treadmill and losing their balance when the belt moves in the forward direction.

240. Accordingly, a POSA would have been motivated to modify Chickering to include Magid's control means mounted to the front roller as shown in the image below, or the rear roller as shown in the image farther below.

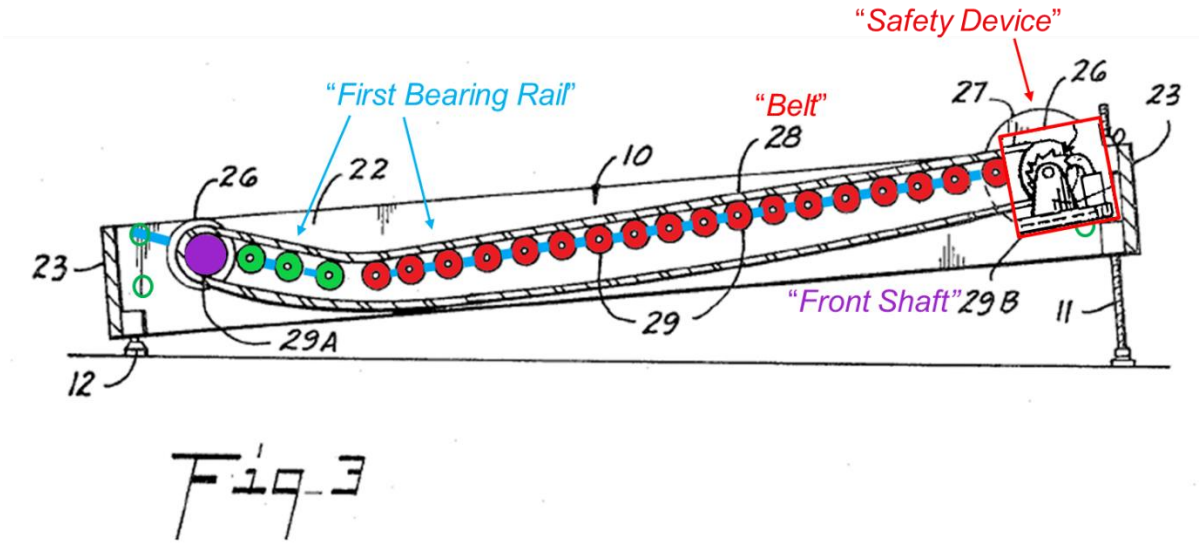


Fig. 3

Chickering, Ex. 1013, Fig. 3; Magid, Ex. 1012, Fig. 2 (Annotated)

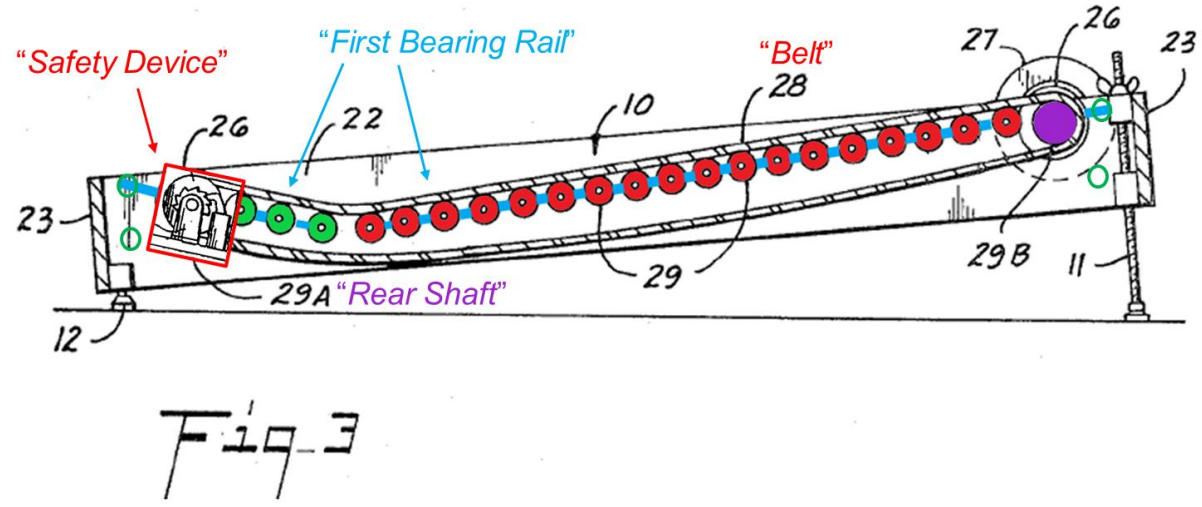


Fig. 3

Chickering, Ex. 1013, Fig. 3; Magid, Ex. 1012, Fig. 2 (Annotated)

241. The modification would include mounting at least one one-way

ratchet clutch to the front roller or the rear roller. The rachet gear is mounted coaxially with the roller and the pawl is mounted adjacent to the ratchet gear, as taught by Magid. (Magid, Ex. 1012, Fig. 2.) For example, the pawl may be coupled to the support arm.

242. This modification would have been a straightforward and well understood combination of known elements in the prior art: Chickering's manual treadmill with a curved running surface and Magid's one-way ratchet clutch.) The pawl is arranged forward of the ratchet gear and biased to engage the teeth. The profile of the ratchet gear teeth is swept forward to yield well understood and predictable results: 1) permitting the ratchet gear to overrun counterclockwise to allow rearward belt motion, and 2) provide a backstop by preventing the ratchet gear from rotating clockwise to prevent, or allow only minimal, forward belt motion. (¶¶ 71, 82-83, 89-91.)

243. The modification would also be the use of known technique, using a one-way clutch in a backstopping mode of operation, to improve similar devices, i.e., treadmills, in the same way, *i.e.*, to provide unidirectional belt motion. (¶¶ 89-91; Magid, Ex. 1012 at 4:48-54.)

B. Ground 2 – The Combination of Chickering, Magid, and Sclater Teaches all of the Limitations of Claims 6, 7, 8, 9, and 12

1. Dependent Claims 6-9

244. Claims 6-9 depend from claim 1 which I understand means that claims 6-9 require all of the limitations of claim 1 in addition to their additional limitations.

245. The combination of Chickering and Magid disclose all of the limitations of claim 1 as described above. (*See* ¶¶ 130-174.)

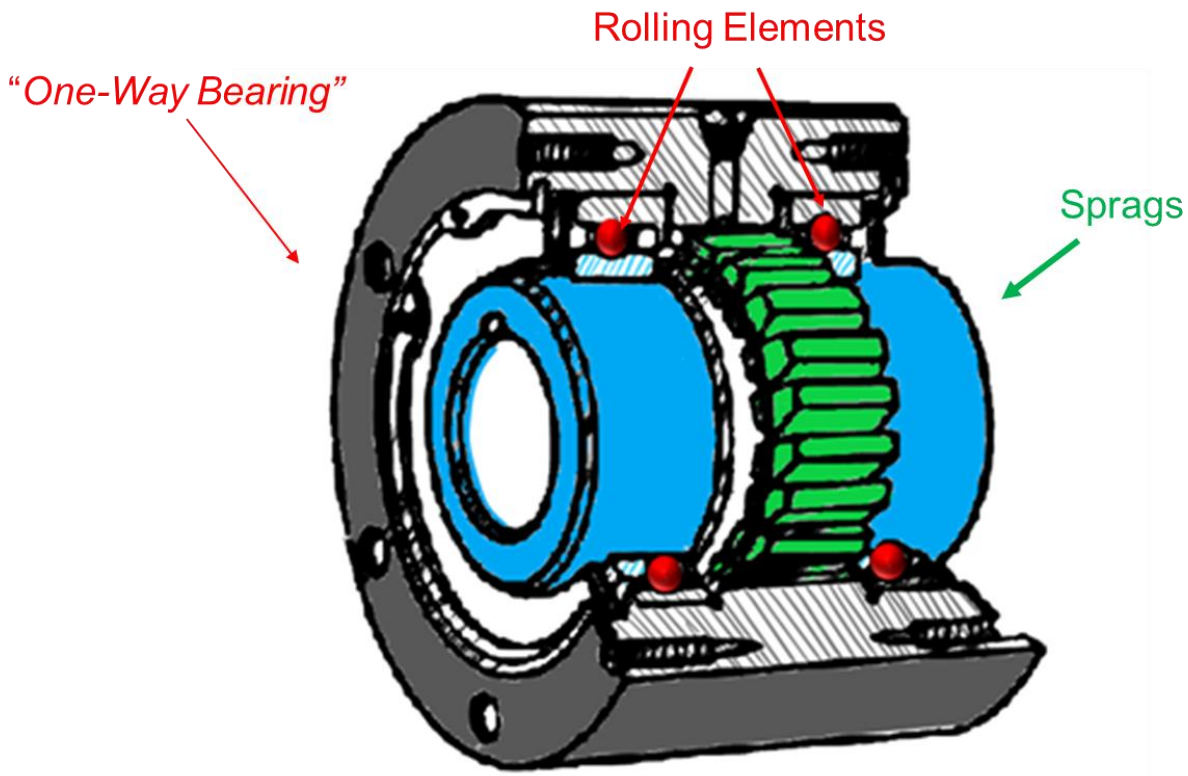
> … ***[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.***

246. As explained for claim limitation [1.7][a], Magid discloses that each control means 6, 6' includes a ratchet gear 61 and a pawl 62. (Magid, Ex. 1012, 4:46-59, Figs. 2, 5.)

247. As explained in the state of the art section, a ratchet clutch is a one-way clutch that typically includes a ratchet and pawl. (*See* ¶¶ 82-83.) However, this type of clutch is not typically referred to as a one-way bearing.

248. Sclater discloses a bearing assembly that includes sprags, combined with rolling elements, such as cylindrical rollers or balls, to provide one-way functionality. "Sprags combined with cylindrical rollers in a bearing assembly can provide a simple, low-cost method for meeting the torque and bearing requirements of most machine applications." (Ex. 1017 at 312.) Sclater further

discloses that this sprag type bearing assembly functions as a one-way bearing by providing "one-direction only torque transmission in an overrunning clutch." *Id*.



Sclater, Ex. 1017 at 318 (Annotated)

249. Sclater further discloses that:

> Precision sprags act as wedges and are made of hardened alloy steel. In the formsprag clutch, torque is transmitted from one race to another by the wedging action of sprags between the races in one direction; in the other direction the clutch freewheels.

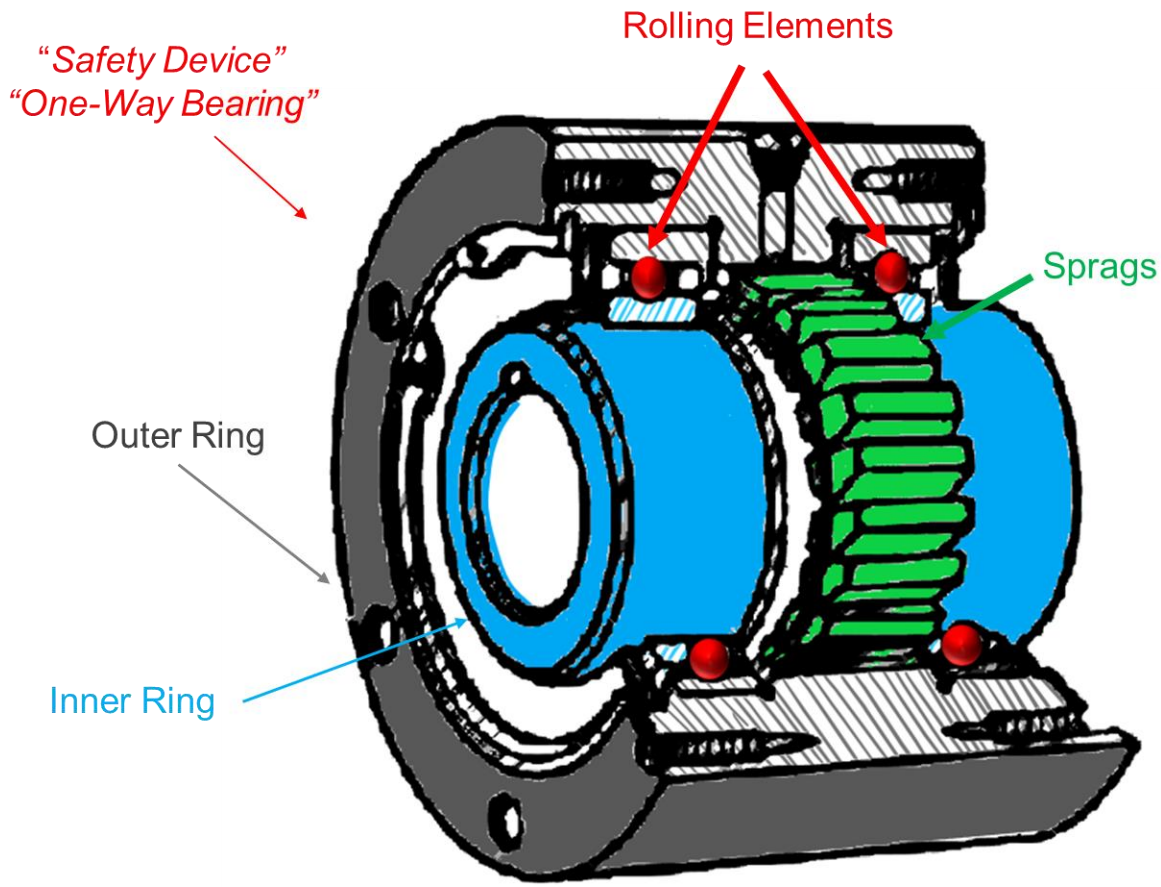
(Sclater, Ex. 1017 at 318.)

250. Thus the combination of Chickering, Magid, and Sclater teach

"*wherein the safety device includes a one-way bearing*."

> … ***[7.] [a] The manually powered treadmill of claim 6, wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring,***

251. As explained for claim 6, Sclater discloses a sprag type one-way bearing assembly. As illustrated in the image below, Sclater further discloses that the sprag type one-way bearing assembly includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and the outer ring.



Sclater, Ex. 1017, 318 (Annotated)

252. Thus the combination of Chickering, Magid, and Sclater teach "*wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring*."

> … ***[7.] [b] wherein the plurality of sprags are asymmetric shaped to substantially prevent rotation of the inner ring in the first rotational direction while permitting rotation of the inner ring in the second rotational direction.***

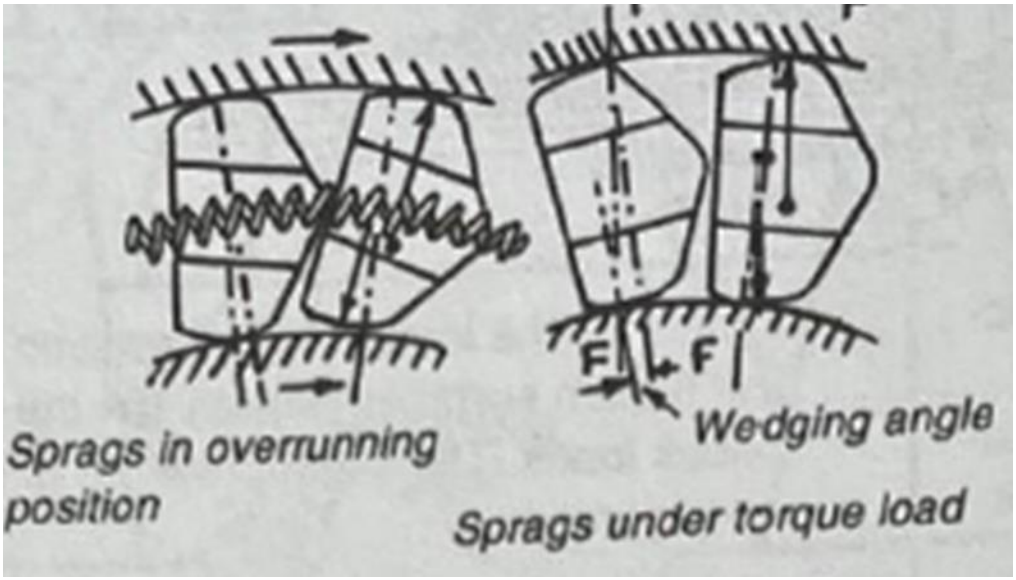
253. Sclater discloses a *"one-way bearing"* having concentric inner and outer races (or rings) and an array of sprags radially disposed therebetween. Each sprag has a "sprag profile, which is composed of two nonconcentric curves of different radius." (Sclater, Ex. 1017 at 312.) This asymmetric sprag profile provides a locking ramp:

> Races are concentric; which is composed of two nonconcentric curves of different radius. A spring-loaded pin holds the sprag in the locked position until the torque is applied in the running direction. A stock roller bearing cannot be converted because the hard-steel races of the bearing are too brittle to handle the locking impact of the sprag. The sprags and rollers can be mixed to give any desired torque value.

(Sclater, Ex. 1017 at 312.)

254. As illustrated in the figure below on the left, Sclater discloses that when the inner ring rotates in a first direction relative to the outer ring, the sprags

move out of the locked position such that an overrun condition occurs. However, as illustrated below right, when the inner ring rotates in the opposite direction relative to the outer ring, the sprag profile causes the sprags to wedge into a locked position preventing relative rotation between the inner and outer rings.



Sclater, Ex. 1017 at 318

255. Thus the combination of Chickering, Magid, and Sclater teach "*wherein the plurality of sprags are asymmetric shaped to substantially prevent rotation of the inner ring in the first rotational direction while permitting rotation of the inner ring in the second rotational direction*."

> … ***[8.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the rear shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the rear shaft in the first rotational direction while permitting rotation of the rear shaft in the second rotational direction.***

256. As explained for claim [1.7], Magid discloses, with reference to Figure 2, that the control means 6, 6' are attached to the rear roller ("rear shaft"). (Magid, Ex. 1012, 4:46-59.)

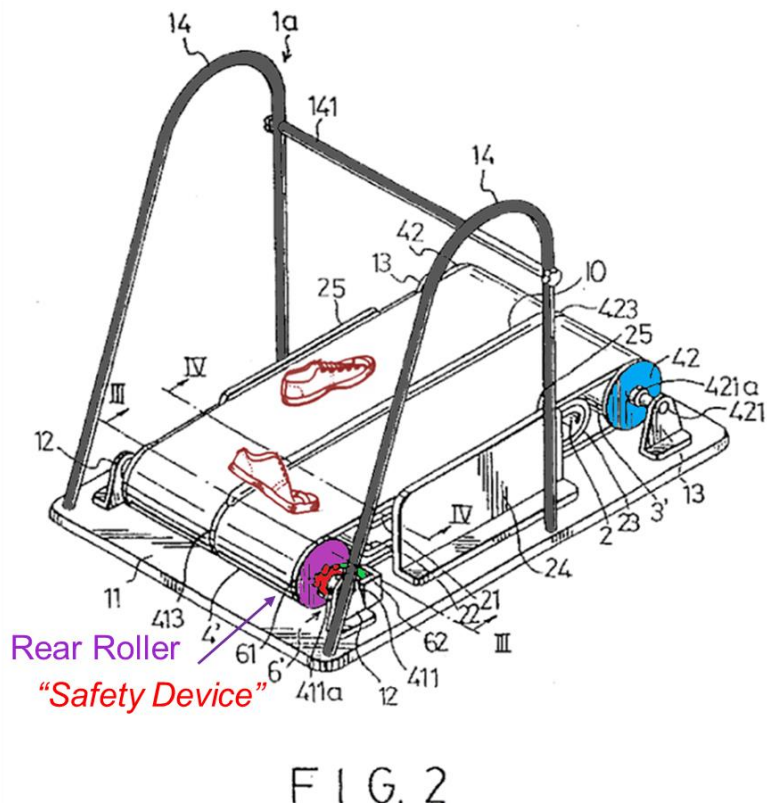


FIG. 2

Magid, Ex. 1012, Fig. 2 (Annotated)

257. Chickering combined with Magid's control means 6, 6' is illustrated

below.

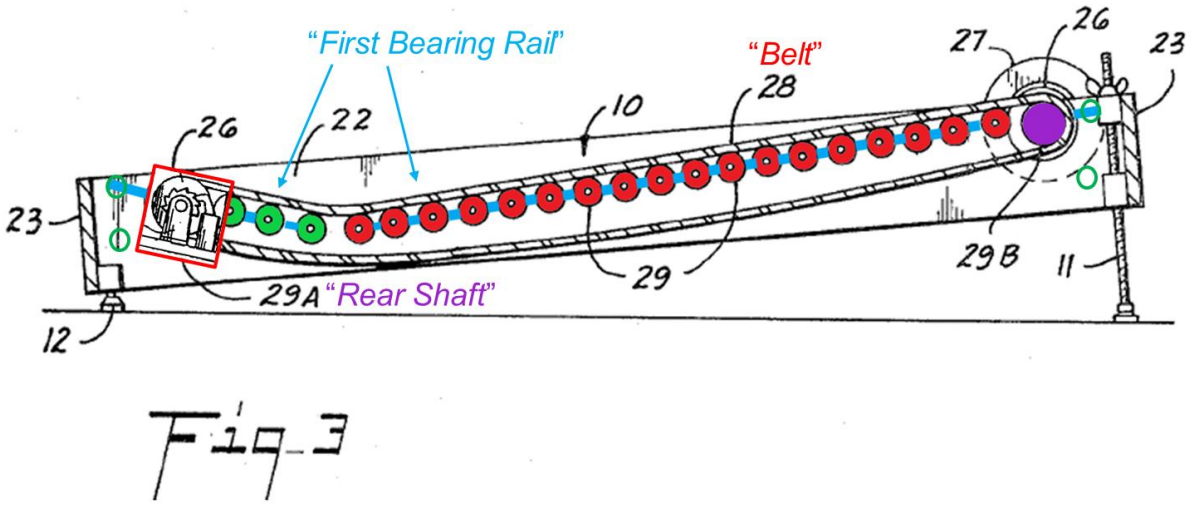
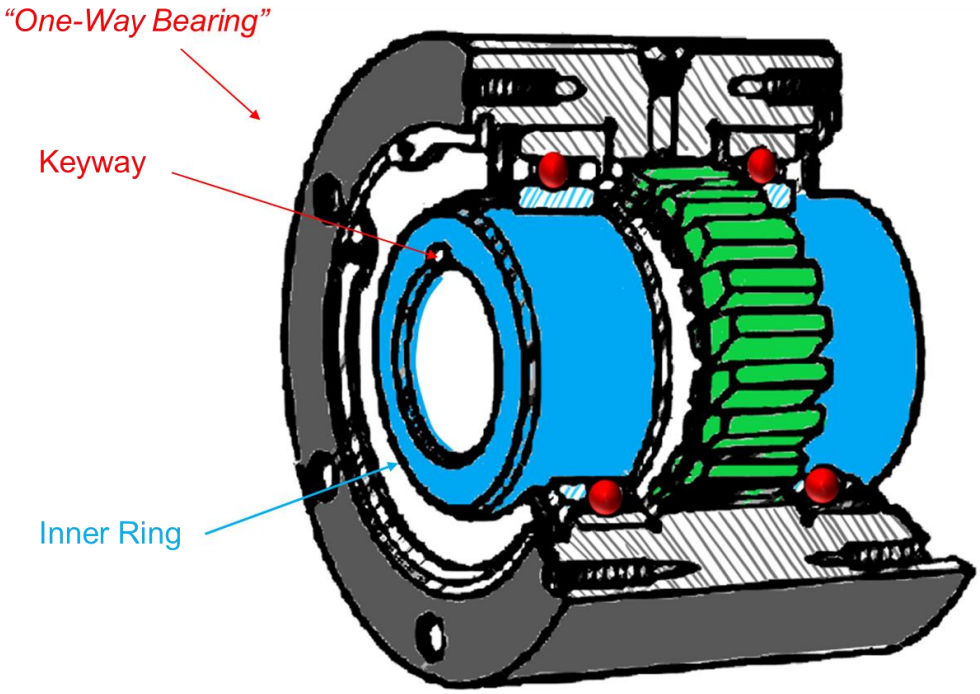


Fig. 3

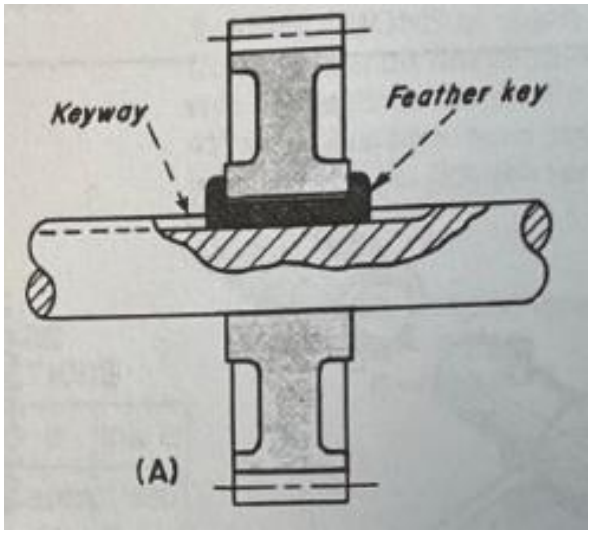
Ex.1013, Fig.3; Ex.1012, Fig.9

258. Sclater discloses a keyway formed into the inner ring of the one-way bearing. The keyway is recessed into the inner circumferential surface of the inner ring adjacent to the shaft.



Sclater, Ex. 1017, 318 (Annotated)

259. Key-keyway interfaces are a traditional method of transmitting torque from one rotary element to another. Key-keyway interfaces are old, commonly used, and well understood in the power transmission world. Nevertheless, Sclater discloses fourteen different ways to fasten hubs to shafts, including using a key-keyway interface. (Sclater, Ex. 1017 at 420-421.) For example, Sclater discloses a key that is located in a keyway in the inner diameter of a gear that also engages a keyway that is formed into the corresponding shaft:



Sclater, Ex. 1017 at 420

260. A POSA would have understood that the keyway formed in the inner ring of the bearing assembly is sized to receive a key, i.e., such that the key "*is fixed relative to the inner ring and a keyway formed in the front shaft*."

261. Thus, the combination of Magid and Sclater discloses "*a key that is fixed relative to the inner ring and a keyway formed in the rear shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the rear shaft in the first rotational direction while permitting rotation of the rear shaft in the second rotational direction.*"

> … ***[9.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the front shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the front shaft in the first rotational direction while permitting rotation of the front shaft in the second rotational direction.***

262. As explained for claim [1.7], Magid discloses, with reference to Figure 5, that the control means 6, 6' are attached to the front roller ("*front shaft*"). (Magid, Ex. 1012, 4:46-59.)

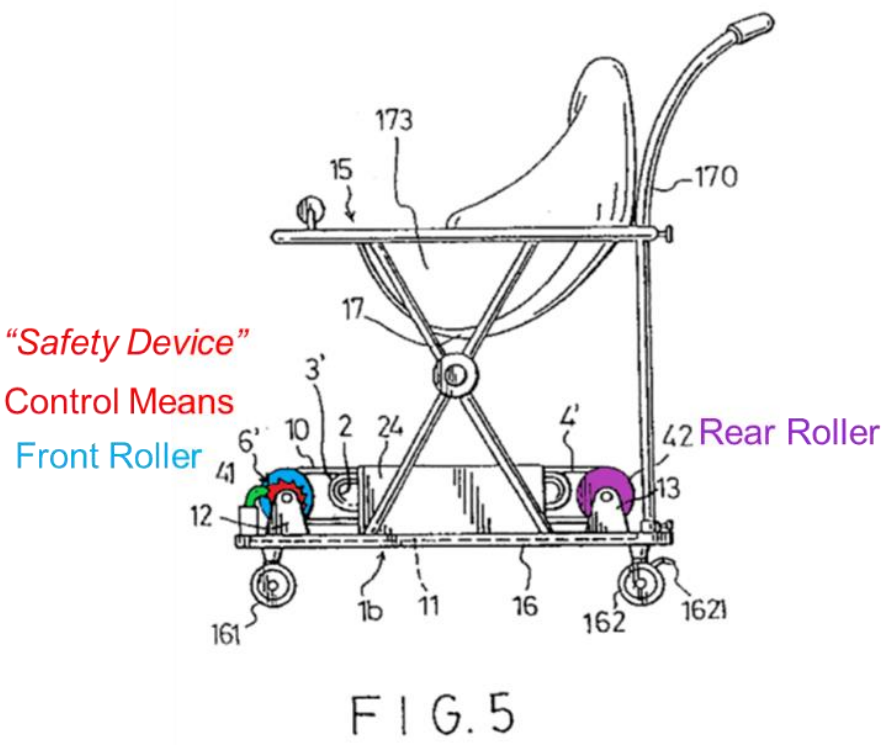
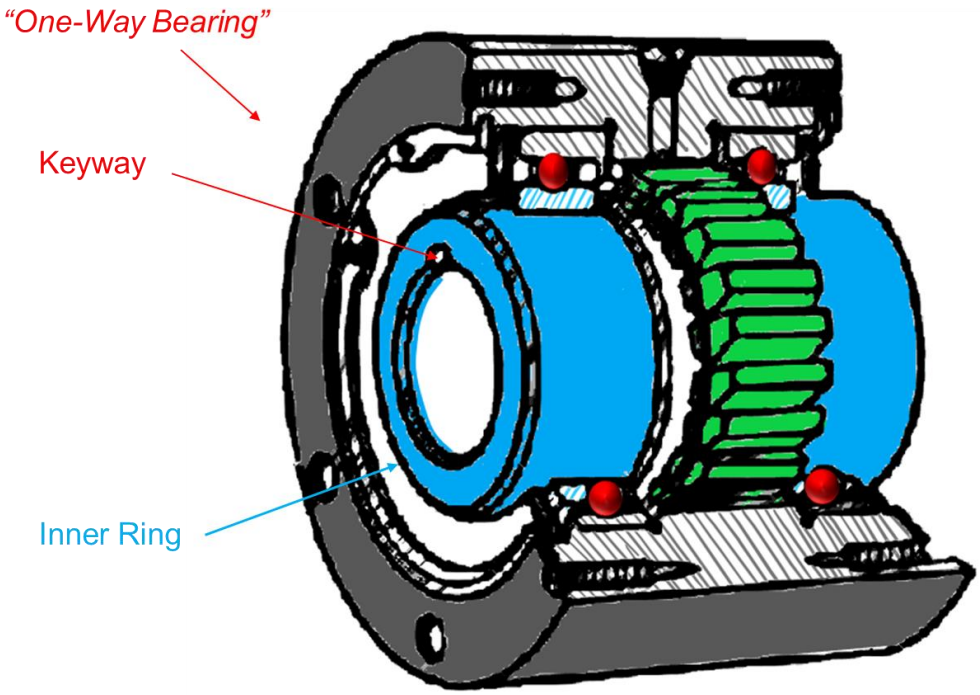


FIG. 5

Magid, Ex. 1012, Fig. 5 (Annotated)

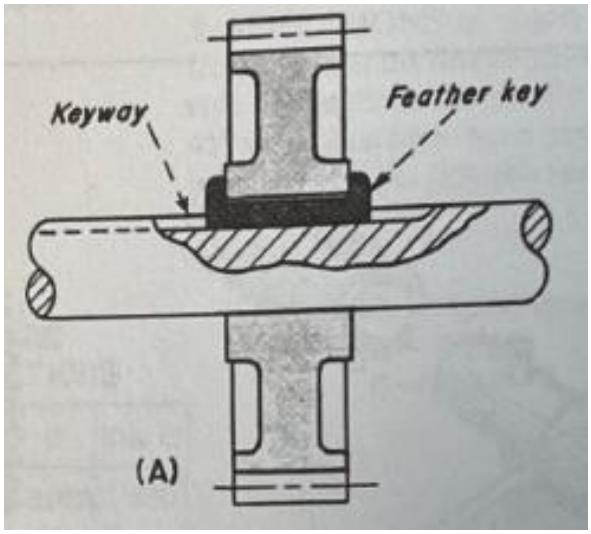
263. Sclater discloses a keyway formed into the inner ring of the one-way

bearing.



Sclater, Ex. 1017, 318 (Annotated)

264. Sclater discloses fourteen different ways to fasten hubs to shafts, including using a key-keyway interface. (Sclater, Ex. 1017, 420-421.) For example, Sclater discloses a key that interfaces with a keyway in the inner diameter of a gear that also engages a keyway formed into the corresponding shaft:



Sclater, Ex. 1017 at 420

265. A POSA would have understood that the keyway formed in the inner ring of the bearing assembly is sized to receive a key, i.e., such that the key "*is fixed relative to the inner ring and a keyway formed in the front shaft*."

266. Thus, the combination of Magid and Sclater teaches "*a key that is fixed relative to the inner ring and a keyway formed in the front shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the front shaft in the first rotational direction while permitting rotation of the front shaft in the second rotational direction*."

2. Dependent Claim 12

267. Claim 12 depends from claim 11 which I understand means that claim 12 requires all of the limitations of claim 11 in addition to its additional limitations.

268. The combination of Chickering and Magid disclose all of the limitations of claim 11 as described above. (*See* ¶¶ 196-209.)

> … ***[12.] The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.***

269. Claim 12 is duplicative of claim 6. To illustrate, the table below shows a side-by-side comparison of claims 6 and 12. Claim 12 is "marked up" to show the minor differences.

'580 Patent Claim 6	**'580 Patent Claim 12**
[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.	**[12.]** The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.

270. Because the additional limitations of claim 12 are identical to the additional limitations of claim 6, I refer back to my analysis of these limitations of claim 6 to establish that they are met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 246-250.)

3. Rationale for combining Chickering, Magid, and Sclater

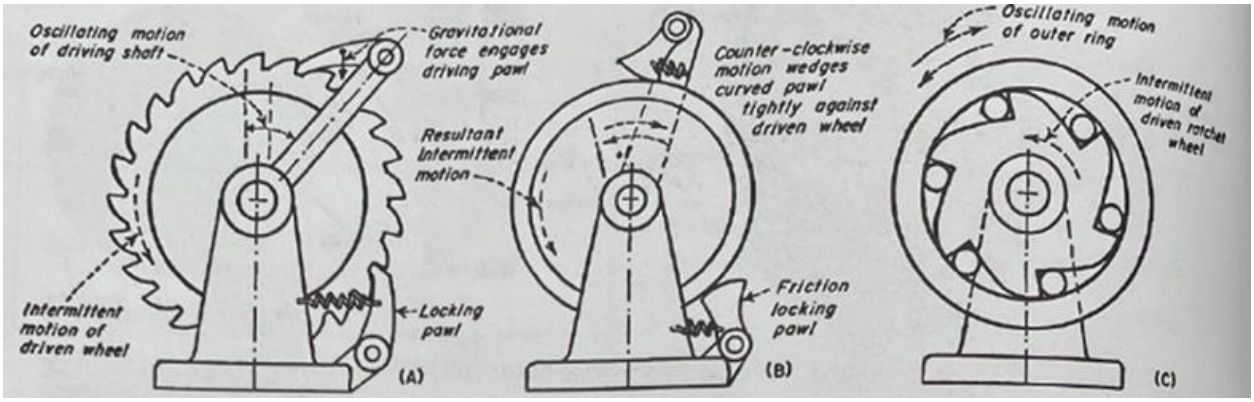
271. A POSA would have been motivated to substitute Sclater's one-way sprag type bearing assembly for Magid's ratchet-and-pawl one-way clutch mechanism to obtain predictable results, e.g., reduced noise and improved durability.

272. Ratchet and pawl clutch mechanisms make noise during operation.

The pawl is spring-loaded to engage each gear tooth of the ratchet and it makes an audible "click" when colliding with the gear tooth root after overrunning or passing over each tooth. For example, a POSA would have been aware of this noise from other common ratchet clutches, such as those included in a ratchet wrench and an automotive parking brake. Sclater acknowledges that a "friction-type clutch" is quieter than a ratchet type clutch:

> Fig. 1 Elementary overriding clutches: (A) A ratchet and pawl mechanism converts reciprocating or oscillating movement to intermittent rotary motion. This motion is positive but limited to a multiple of the tooth pitch. (B) **A friction-type clutch is quieter**, but it requires a spring device to keep the eccentric pawl in constant engagement. (C) Balls or rollers replace the pawls in this device. Motion of the outer race wedges the rollers against the inclined surfaces of the ratchet wheel.

(Sclater, Ex. 1017, 316.)



Sclater, Ex. 1017 at 316

273. Sclater further discloses that roller clutches are better suited for high

speed freewheeling than pawl-and-ratchet clutches. This is because the pawl may skip past a few teeth before backstopping the ratchet gear, whereas the sprags are always in contact with the rings and do not need to find a discrete gear tooth to stop. Additionally, because there are multiple sprags, they distribute the load over a larger surface area.

> Fig. 9 Cam and Roller Clutch: This over-running clutch is better suited for higher-speed free-wheeling than a pawl-and-ratchet clutch. The inner driving member has cam surfaces on its outer rim that hold light springs that force the rollers to wedge between the cam surfaces and the inner cylindrical face of the driven member. While driving, friction rather than springs force the rollers to wedge tightly between the members to provide positive clockwise drive. The springs ensure fast clutching action. If the driven member should begin to run ahead of the driver, friction will force the rollers out of their tightly wedged positions and the clutch will slip.

(Sclater, Ex. 1017 at 303.)

> Overrunning sprag clutches transmit torque in one direction and reduce speed, rest, hold, or free-wheel in the reverse direction. Applications include overrunning, back stopping and indexing. Their selection – similar to other mechanical devices – requires a review of the torque to be transmitted, overrunning speed, type of lubrication, mounting characteristics, environmental conditions, and shock conditions that might be encountered.

(Sclater, Ex. 1017 at 320.)

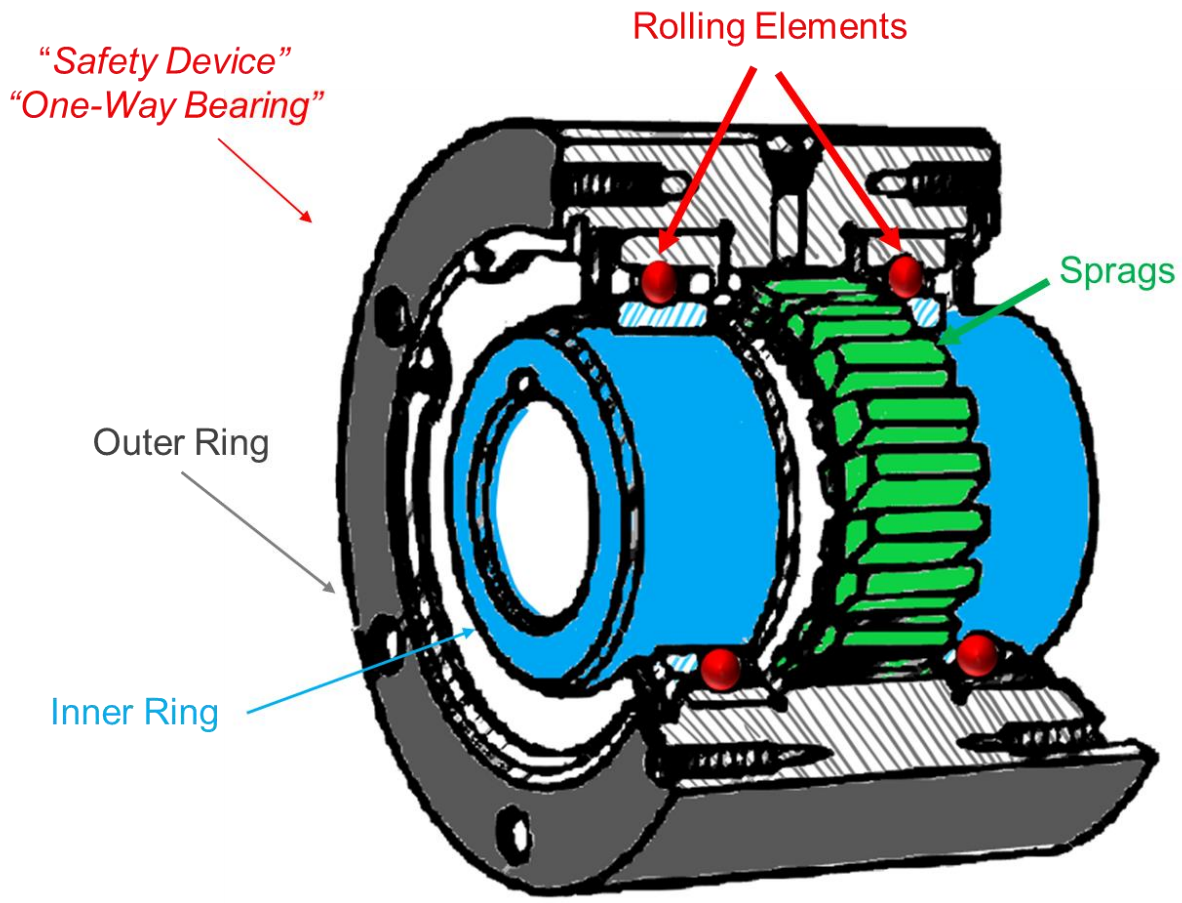
274. Sclater further describes a backstopping mode of operation for a conveyor:

> An example is a clutch mounted on the headshaft of a conveyor. The outer race is restrained by torque-arming the stationary frame of the conveyor.

(Sclater, Ex. 1017 at 320.)

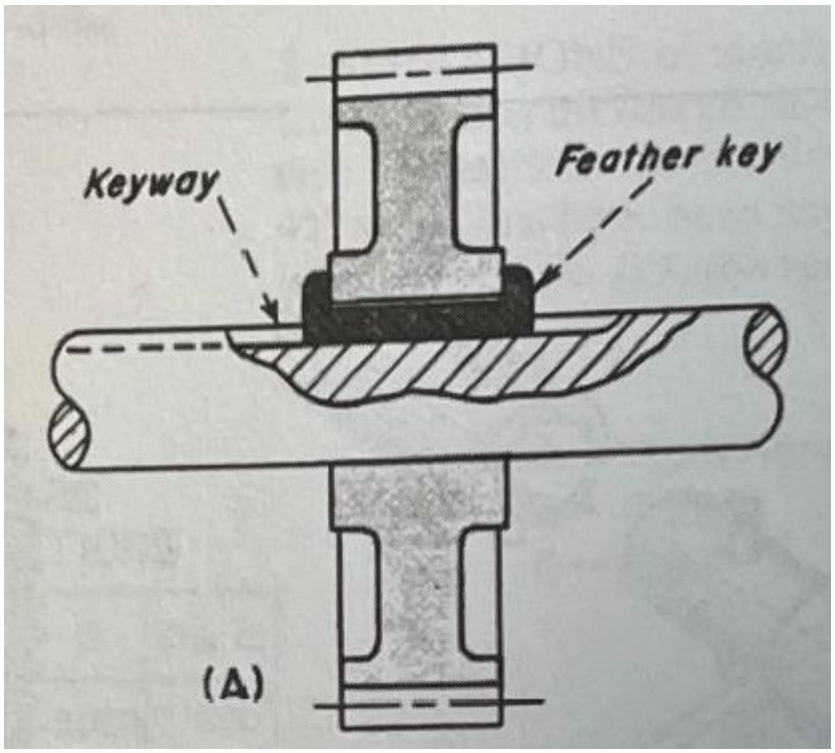
275. A POSA would have considered a sprag-type one-way clutch bearing for an exercise equipment application, such as a treadmill. Emerson is a bearing catalog from 2001 that describes its NSS Series sprag type one-way clutch as an option for multiple "Field Applications," including "Exercise equipment," "Food processing equipment," "Printing presses," and "Roll conveyors." (Ex. 1018, 52-53; Ex. 1003, ¶¶ 91.)

276. A POSA would have known how to replace Magid's control means with Sclater's one-way bearing assembly. For example, the outer ring would be fixed to the frame either directly or through one or more intermediaries, e.g., a bracket, or support structure. For example, Sclater illustrates below that the outer ring includes tapped holes for receiving fasteners for mounting the one-way bearing to a bracket, and Emerson describes examples of commercially available brackets or torque arms. (*See* Ex. 1018, 38-43.)



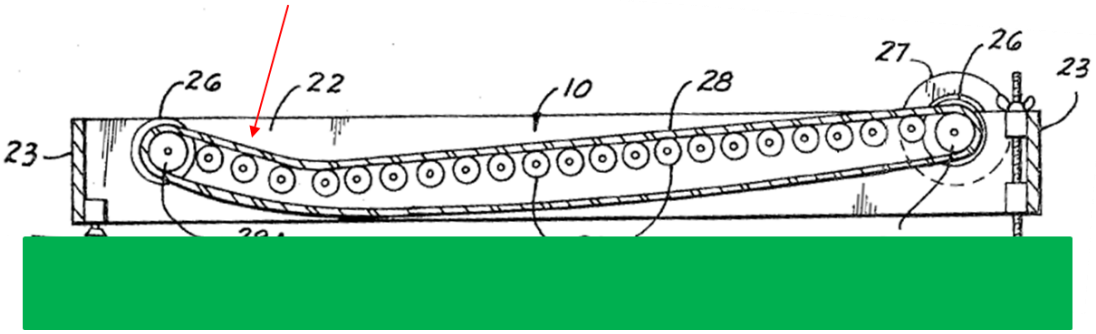
Sclater, Ex. 1017 at 318 (Annotated)

277. The inner ring of the one-way bearing would be secured to the axle of the front roller or rear roller, e.g., with a key/keyway interface, such as that disclosed by Sclater, above and below:

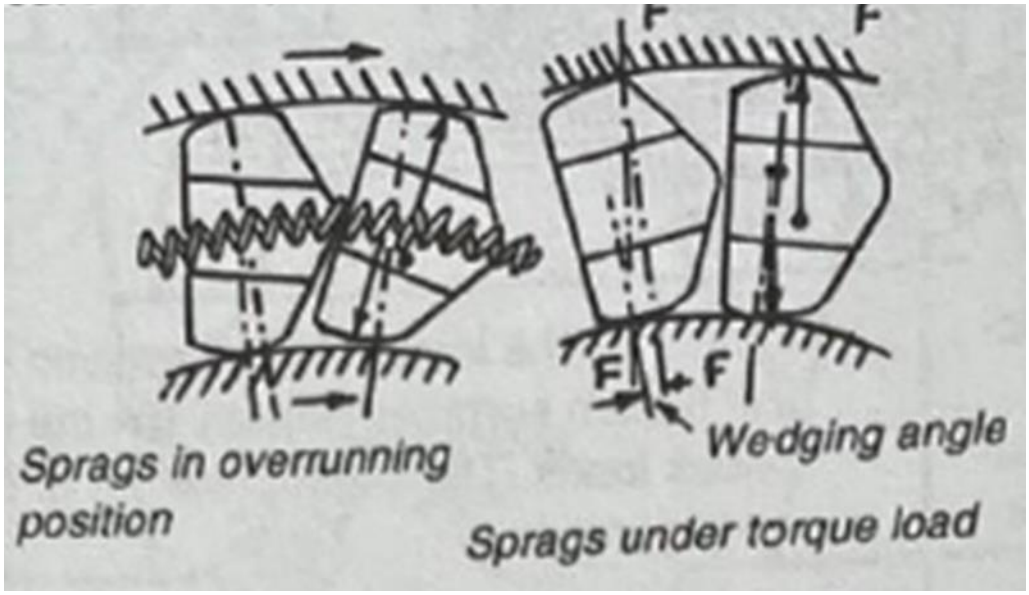


Sclater, Ex. 1017 at 420

278. With this arrangement, rearward motion of the endless belt 28 would rotate the front/rear roller and inner ring so that the inner ring would overrun and move the sprags out of the locked position. However, forward motion of the endless belt 28 would rotate the inner ring the opposite direction and wedge the sprags into the locked position to backstop and prevent forward motion of the belt.



Chickering, Ex. 1013, Fig. 3 (Annotated)



Sclater, Ex. 1017 at 318

C. Ground 3 – The Combination of Chickering, Magid, and Sclater Teaches all of the Limitations of Claims 1-12, 14, and 18

279. In Ground 3, I consider certain claim constructions that I did not consider in Grounds 1 and 2.

1. Independent Claim 1

280. I have given each of the limitations of claim 1 a unique numerical identifier, as shown in the chart below:

U.S. Patent No. 9,039,580
[1.0] A manually powered treadmill comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to the frame at the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;

[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and
[1.7] a safety device coupled to at least one of the front shaft and the rear shaft, wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

… ***[1.0] A manually powered treadmill comprising:***

… ***[1.1] a frame having a front end and a rear end positioned opposite the front end;***

281. Because limitations [1.0]-[1.1] do not include any claim constructions, I refer back to my analysis of these limitations in Ground 1 to establish that they are met by the combination of Chickering and Magid. (*See* ¶¶ 130-135.)

… ***[1.2] a front shaft rotatably coupled to the frame at the front end;***

282. I understand that the proposed construction of the term "*shaft*" is "a rotating element used to transmit power from one part to another."

283. It is therefore my understanding that claim limitation [1.2] should be interpreted as "*a front* [rotating element used to transmit power from one part to another] *rotatably coupled to the frame at the front end*."

284. Regarding the original claim limitations, I refer back to my analysis of claim limitation [1.2] in Ground 1. (*See* ¶¶ 136-139.)

285. Regarding the claim limitation as construed, Chickering discloses that the front roller 29b is coupled to the rear roller 29a through the belt 28. (Chickering, Ex. 1013, Fig. 3.) The front roller 29b receives power from the user through the belt. As a user walks/runs on a belt 28, the resultant force on the belt 28 is transferred to the front roller 29b. The front roller 29b then transfers this power to the rear roller 29a through the belt.

286. Thus, Chickering discloses "*a front* [rotating element (end roller 29b) used to transmit power from one part to another] *rotatably coupled to the frame at the front end*."

… ***[1.3] a rear shaft rotatably coupled to the frame at the rear end;***

287. I understand that the proposed construction of the term "*shaft*" is "a

rotating element used to transmit power from one part to another."

288. It is therefore my understanding that claim limitation [1.3] should be interpreted as "*a rear* [rotating element used to transmit power from one part to another] *rotatably coupled to the frame at the rear end*."

289. Regarding the original claim limitations, I refer back to my analysis of claim limitation [1.3] in Ground 1. (*See* ¶¶ 140-143.)

290. Regarding the claim limitation as construed, Chickering discloses that the rear roller 29a is coupled to the front roller 29b through the belt 28. The rear roller 29a receives power from the user through the belt. As a user walks/runs on a belt 28 the resultant force on the belt 28 is transferred to the rear roller 29a. The rear roller 29a then transfers this power to the front roller 29b through the belt.

291. Thus, Chickering discloses "*a rear* [rotating element (end roller 29a) used to transmit power from one part to another] *rotatably coupled to the frame at the rear end*."

> … ***[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***
>
> … ***[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

292. Because limitations [1.4]-[1.5] do not include any claim constructions, I refer back to my analysis of these limitations in Ground 1 to establish that they

are met by the combination of Chickering and Magid. (*See* ¶¶ 144-160.)

> … ***[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and***

293. Although limitation [1.6] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of [1.6], therefore I refer back to my analysis of limitation [1.6] in Ground 1 to establish that it is met by the combination of Chickering and Magid. (*See* ¶¶ 161-164.)

> … ***[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft,***

294. I understand that the proposed construction of the term "*safety device*" is as a means plus function requiring the structure disclosed in the '580 Patent for fulfilling this function. The '580 Patent discloses the following safety device structure: a) a one-way bearing assembly having inner and outer rings and sprags; b) a cam locking system; c) a taper lock; d) a user operated pin system; and e) a band brake system with a lever. ('580 Patent, Ex. 1001, 27:16-29; 29:23-28; Figs. 2, 36.)

295. It is therefore my understanding that claim limitation [1.7][a] should be interpreted as "*a* [one-way bearing assembly having inner and outer rings and sprags; b) a cam locking system; c) taper locks; d) a user operated pin system; or e)

a band brake system with a lever] *coupled to at least one of the front shaft and the rear shaft*."

296. Regarding the original claim limitations, I refer back to my analysis of claim limitation [1.7][a] in Ground 1. (*See* ¶¶ 165-169.)

297. However, Magid's rachet and pawl control means is not one of the safety devices expressly disclosed in the '580 Patent.

298. The proposed construction of the "*safety device*" in Claim [1.7][a] as a "one-way bearing assembly having inner and outer rings and sprags" is similar to the limitations of claim [7.][a], i.e., "*wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring*."

299. Accordingly, I refer back to my analysis of claim limitation [7.][a] in Ground 2 to establish that claim limitation [1.7][a] as construed is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 251-252.)

300. Thus, Sclater discloses "*a* [one-way bearing assembly having inner and outer rings and sprags] *coupled to at least one of the front shaft and the rear shaft*."

> … ***[1.7] [b] wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

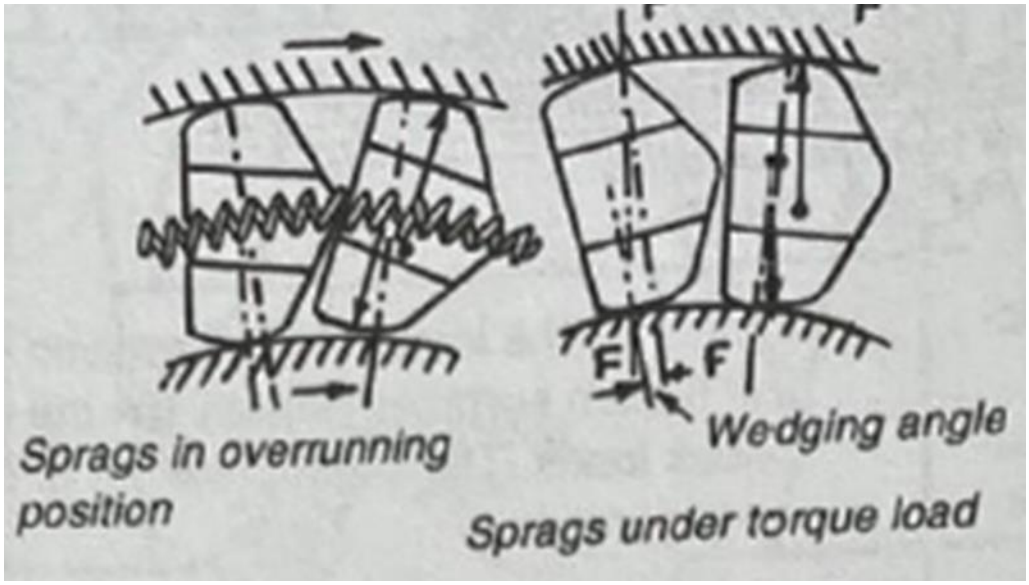
301. I understand that the proposed construction of the term "*substantially prevent rotation*" is "prevent any movement after allowing no or minimal movement."

302. It is therefore my understanding that claim limitation [1.7][b] should be interpreted as "*wherein the* [one-way bearing assembly having inner and outer rings and sprags] *is structured to* [prevent any movement after allowing no or minimal movement] *rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction*."

303. Regarding the original claim limitations and the "*safety device*" construction, I refer back to my analysis of claim limitation [7.][b] in Ground 2. (*See* ¶¶ 253-255.)

304. Regarding the proposed construction for "*substantially prevent rotation*," a sprag-type one-way bearing allows minimal movement before the

sprags rotate into a locked position. As illustrated in the figure below on the left, Sclater discloses that when the inner ring rotates in a first direction relative to the outer ring, the sprags move out of the locked position such that an overrun condition occurs. However, as illustrated below right, when the inner ring rotates in the opposite direction, the sprag profile wedges the sprags into a locked position preventing relative motion between the inner and outer rings.



Sclater, Ex. 1017 at 318

305. Thus, Magid combined with Sclater discloses "*wherein the* [one-way bearing assembly having inner and outer rings and sprags] *is structured to* [prevent any movement after allowing no or minimal movement] *rotation of . . . the front shaft . . . in a first rotational direction* [counterclockwise] *while permitting rotation of . . . the front shaft . . . in a second rotational direction* [clockwise] *opposite the first rotational direction*."

2. Dependent Claims 2-10

306. Claims 2-10 depend directly or indirectly from claim 1, which I understand means that claims 2-10 require all of the limitations of claim 1 and the limitations of any intervening claims in addition to their additional limitations.

307. The combination of Chickering, Magid, and Sclater disclose all of the limitations of claim 1 as described above. (*See* ¶¶ 281-305.)

> … ***[2.] The manually powered treadmill of claim 1, wherein the frame includes at least one cross-member, a left side member, and a right side member; and wherein the at least one cross-member extends between the left side member and the right side member.***
>
> … ***[3.] The manually powered treadmill of claim 2, wherein each one of the first and second bearing rails are coupled to at least one of the at least one cross-member.***

308. Because claims [2]-[3] do not include any claim constructions, I refer back to my analysis of these limitations in Ground 1 to establish that they are met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 177-183.)

> … ***[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

309. Although claim [4] includes the term "*shaft*," the proposed

construction of "*shaft*" does not impact the additional limitations of claim [4], therefore I refer back to my analysis of claim [4] in Ground 1 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 184-186.)

> … ***[5.] The manually powered treadmill of claim 1, wherein each one of the first bearing rail and the second bearing rail define in part a top profile corresponding to the curved running surface.***

310. Because claim [5] does not include any claim constructions, I refer back to my analysis of claim [5] in Ground 1 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 187-189.)

> … ***[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.***

311. I understand that the proposed construction of the term "*safety device*" is as a means plus function requiring the structure disclosed in the '580 Patent for fulfilling this function. The '580 Patent discloses the following safety device structure: a) a one-way bearing assembly having inner and outer rings and sprags; b) a cam locking system; c) a taper lock; d) a user operated pin system; and e) a band brake system with a lever. ('580 Patent, Ex. 1001, 27:15-29; 29:23-28; Figs. 2, 36.)

312. It is therefore my understanding that claim [6] should be interpreted as "*wherein the* [one-way bearing assembly having inner and outer rings and sprags;

b) a cam locking system; c) taper locks; d) a user operated pin system; or e) a band brake system with a lever] *includes a one-way bearing*."

313. Claim 6 as construed is similar in scope as original claim 6, therefore I refer back to my analysis of claim 6 in Ground 2 to establish that claim 6 is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 246-250.)

> … ***[7.] [a] The manually powered treadmill of claim 6, wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring, [b] wherein the plurality of sprags are asymmetric shaped to substantially prevent rotation of the inner ring in the first rotational direction while permitting rotation of the inner ring in the second rotational direction.***

314. Because claim [7] does not include any claim constructions, I refer back to my analysis of claim [7] in Ground 2 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 251-255.)

> … ***[8.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the rear shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the rear shaft in the first rotational direction while permitting rotation of the rear shaft in the second rotational direction.***

315. Although claim [8] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of claim [8], therefore I refer back to my analysis of claim [8] in Ground 2 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 256-261.)

> … ***[9.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the front shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the front shaft in the first rotational direction while permitting rotation of the front shaft in the second rotational direction.***

316. Although claim [9] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of claim [9], therefore I refer back to my analysis of claim [9] in Ground 2 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 262-266.)

> … ***[10.] The manually powered treadmill of claim 1, further comprising a handrail attached to the frame and structured to provide a support structure for the user of the manually powered treadmill.***

317. Because claim [10] does not include any claim constructions, I refer back to my analysis of this claim in Ground 1 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 190-193.)

3. Independent Claim 11

318. Independent claim 11 is largely duplicative of independent claim 1. To illustrate, the table below shows a side-by-side comparison of claims 1 and 11. Claim 11 is "marked up" to show the minor differences.

'580 Patent Claim 1	**'580 Patent Claim 11**
[1.0] A manually powered treadmill comprising:	**[11.0]** A manually powered treadmill, comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;	**[11.1]** a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to	**[11.2]** a front shaft attached to the frame

‘580 Patent Claim 1	‘580 Patent Claim 11
the frame at the front end;	adjacent the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;	**[11.3]** a rear shaft attached to the frame adjacent the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;	**[11.4]** a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;	**[11.5]** a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and	**[11.6] [a]** a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail, **[b]** wherein the running belt includes a front belt portion

‘580 Patent Claim 1	‘580 Patent Claim 11
	proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and
[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft, **[b]** wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational	**[11.7]** a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

‘580 Patent Claim 1	‘580 Patent Claim 11
direction opposite the first rotational direction.	

319. As illustrated above, limitations [11.0]-[11.5] and [11.7] are nearly identical to corresponding limitations of claim 1. The only substantial modification to claim 11 to differentiate it from claim 1 was to claim various positions and locations of the running belt in limitation [11.6].

> … ***[11.0] A manually powered treadmill, comprising:***
>
> … ***[11.1] a frame having a front end and a rear end positioned opposite the front end;***

320. Because limitations [11.0]-[11.1] are identical to limitations [1.0]-[1.1], I refer back to my analysis of these limitations of claim 1 in Ground 3 to establish that they are met by the combination of Chickering, Magid, and Sclater. (*See* ¶ 281.)

> … ***[11.2] a front shaft attached to the frame adjacent the front end;***

321. Because Claim limitation [11.2] is substantially similar to limitation [1.2] of claim 1, I refer back to my analysis of this limitation of claim 1 in Ground 3 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 282-286.)

… ***[11.3] a rear shaft attached to the frame adjacent the rear end;***

322. Because claim limitation [11.3] is substantially similar to limitation [1.3] of claim 1, I refer back to my analysis of this limitation of claim 1 in Ground 3 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 287-291.)

… ***[11.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***

… ***[11.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

323. Because limitations [11.4]-[11.5] are identical to limitations [1.4]-[1.5], I refer back to my analysis of these limitations of claim 1 in Ground 3 to establish that they are met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 292.)

> … ***[11.6][a] a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail,***
>
> … ***[11.6][b] wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and***

324. Although limitation [11.6] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of [11.6], therefore I refer back to my analysis of limitation [11.6] in Ground 1 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 205-207.)

> … ***[11.7] a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

325. As illustrated in the above table, limitation [11.7] includes the same

limitations as limitation [1.7] of claim 1, however the limitations are rearranged and use slightly different language. These differences are not substantial; therefore I refer back to my analysis of limitation [1.7] of claim 1 of Ground 3 to establish that limitation [11.7] is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 294-305.)

4. Dependent Claims 12, 14 and 18

326. Claims 12, 14, and 18 depend from claim 11 which I understand means that claims 12, 14 and 18 require all of the limitations of claim 11 in addition to their additional limitations.

327. The combination of Chickering and Magid disclose all of the limitations of claim 11 as described above. (*See* ¶¶ 320-325.)

… ***[12.] The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.***

328. Claim 12 is duplicative of claim 6. To illustrate, the table below shows a side-by-side comparison of claims 6 and 12. Claim 12 is "marked up" to show the minor differences.

'580 Patent Claim 6	**'580 Patent Claim 12**
[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.	**[12.]** The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.

329. Because the additional limitations of claim 12 are identical to the additional limitations of claim 6, I refer back to my analysis of these limitations of claim 6 in Ground 3 to establish that they are met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 311-313.)

> … ***[14.] The manually powered treadmill of claim 11, further comprising support feet coupled to the frame, wherein the support feet are vertically adjustable to adjust an incline of the manually powered treadmill relative to the ground surface.***

330. Because claim [14] does not include any claim constructions, I refer back to my analysis of claim [14] in Ground 1 to establish that it is met by the combination of Chickering, Magid, and Sclater. (*See* ¶¶ 212-214.)

> … ***[18.] The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

331. Claim 18 is duplicative of claim 4. To illustrate, the table below shows a side-by-side comparison of claims 4 and 18. Claim 18 is "marked up" to show the minor differences.

‘580 Patent Claim 4	‘580 Patent Claim 18
[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.	**[18.]** The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.

332. Because the additional limitations of claim 18 are identical to the additional limitations of claim 4, I refer back to my analysis of these limitations of claim 4 in Ground 3 to establish that they are met by the combination of Chickering, Magid, and Sclater. (*See* ¶ 309.)

5. Rationale for combining Chickering with Magid and Sclater

333. The rationale to combine Chickering with Magid and Sclater is the same as the rationale to combine Chickering with Magid in Ground 1; and the rationale to combine Chickering and Magid with Sclater in Ground 2. Accordingly, I refer back to my rationale to combine references in Grounds 1 and 2. (*See* ¶¶ 230-243; 271-278.)

D. Ground 4 – The Combination of Socwell and Magid Teaches all the Limitations of Claims 1-5, 10-11, 14-15, 18 and 25

1. Independent Claim 1

334. I have given each of the limitations of claim 1 a unique numerical identifier, as shown in the chart below:

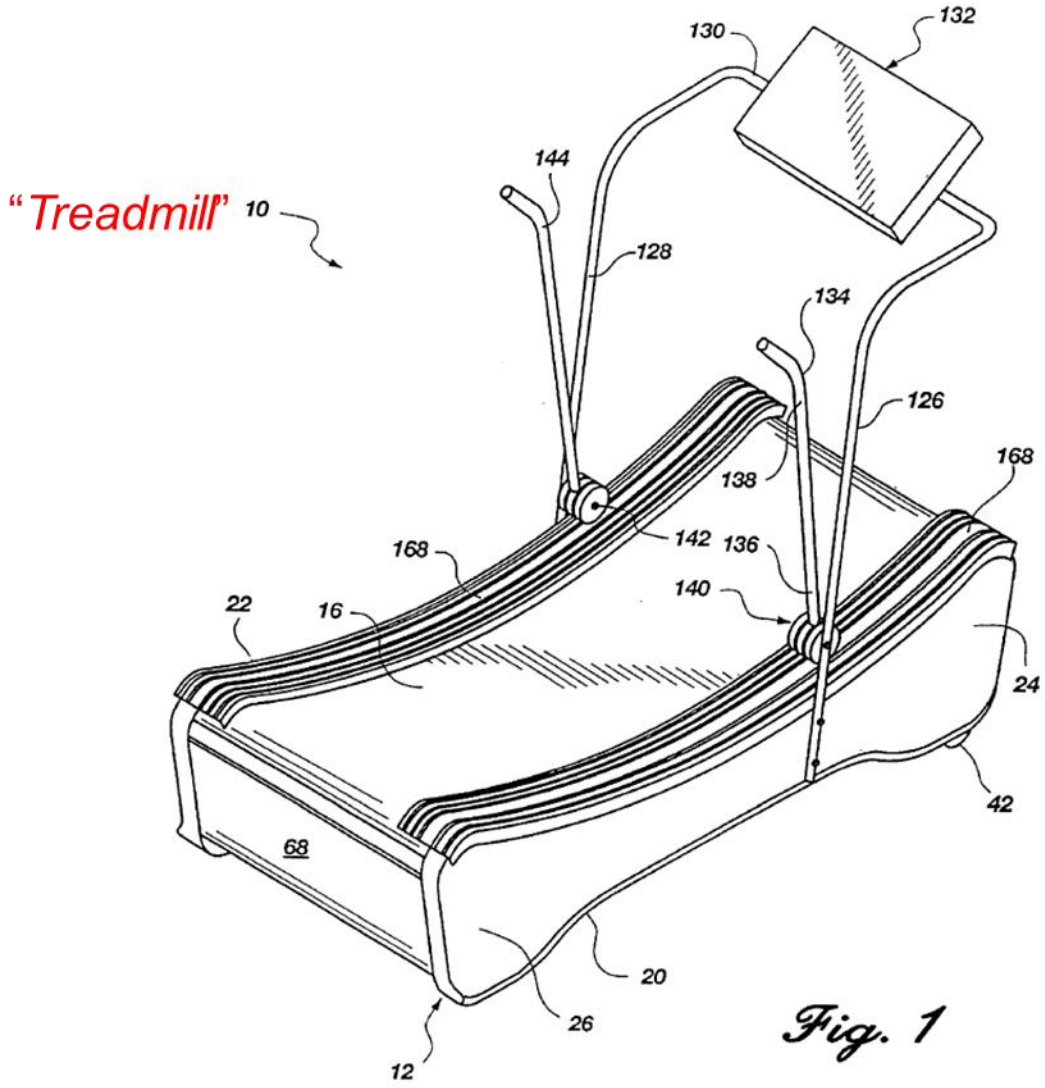
U.S. Patent No. 9,039,580
[1.0] A manually powered treadmill comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to the frame at the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and
[1.7] a safety device coupled to at least one of the front shaft and the rear shaft, wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

… ***[1.0] A manually powered treadmill comprising:***

335. Socwell discloses a manual treadmill 10. (Socwell, Ex. 1011, ABS.) Socwell explains it "is a primary object of the present invention to provide a novel curved deck treadmill which provides a structurally supported arcuate shaped, movable surface on which a user may exercise." (Socwell, Ex. 1011, 3:26-29.) Socwell discloses that the treadmill 10 may be powered by a drive means 84, e.g., an electric motor, or, alternatively:

> [T]he curved deck treadmill 10 . . . may be implemented without a driving means engagably disposed to a roller in order to facilitate the forced rotation of the belt 16. If so implemented, the rollers 78, 86 and 88 and the deck 56 should be generally calibrated in relation to the belt to provide an optional frictional resistance to enable the user to safely walk, jog, and/or run thereon, while still providing sufficient resistance to enable a user to exercise.

(Socwell, Ex. 1011, 11:34-38; 11:53-61.)



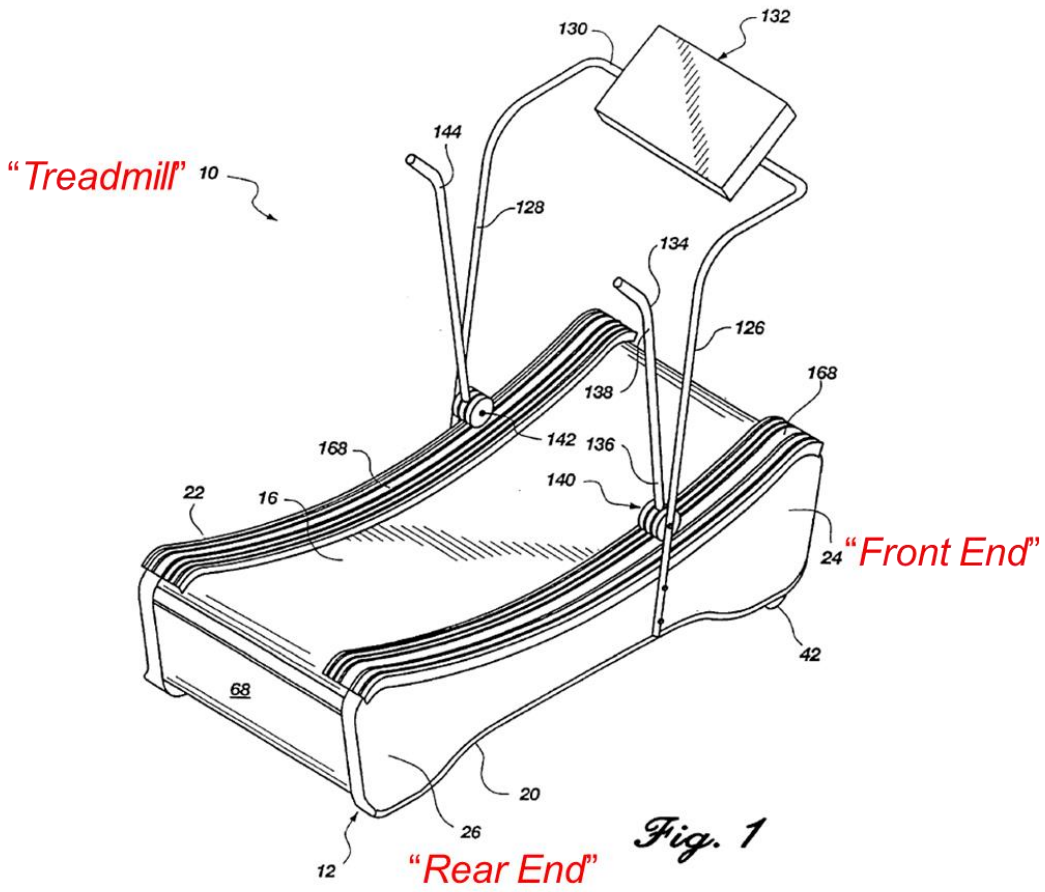
Socwell, Ex. 1011, Fig. 1 (Annotated)

336. Thus, Socwell discloses "*A manually powered treadmill*."

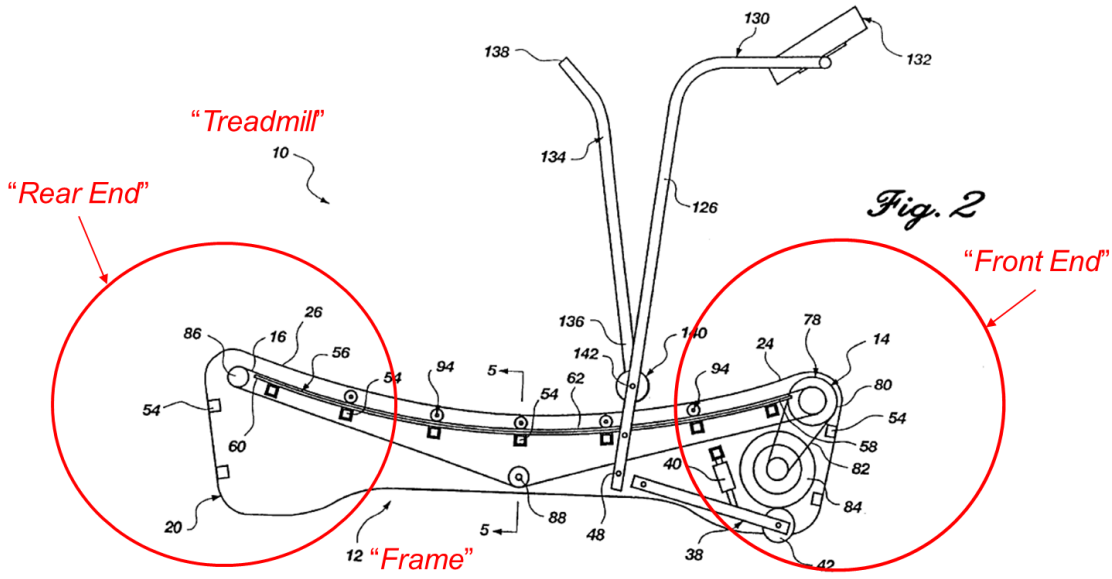
… ***[1.1] a frame having a front end and a rear end positioned opposite the front end;***

337. Socwell discloses that "the curved deck treadmill 10 comprises **a**

support frame 12 having a first side 20 and a second opposing side 22 and having a deck 56 supportably disposed therebetween." (Socwell, Ex. 1011, 5:23-26; Fig. 1.) "The first side 20 of the support frame 12 includes a first end 24 and a second opposing end 26." (Socwell, Ex. 1011, 6:23-25.) The second side 22 is the same as the first side. (Socwell, Ex. 1011, 9:57-65.)



Socwell, Ex.1011, Fig.1 (Annotated)



Socwell, Ex. 1011, Fig. 2 (Annotated)

338. A POSA would have understood that the first end 24 of first side 20 of the frame 12 and the first end of the second side 22 collectively provide "*a front end*," and the second end 26 of the first side 20 of the frame 12 and the second end of the second side 22 collectively provide "*a rear end*."

339. Thus, Socwell discloses "*a frame* [12] *having a front end and a rear end positioned opposite the front end*."

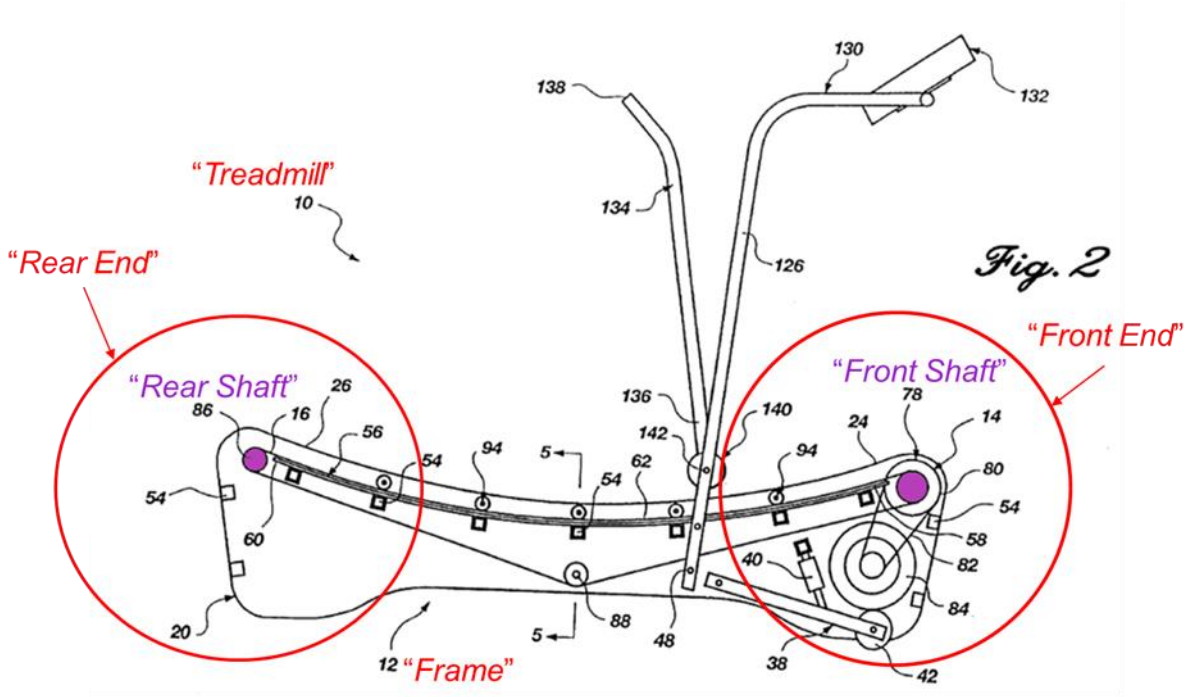
> … ***[1.2] a front shaft rotatably coupled to the frame at the front end;***
>
> … ***[1.3] a rear shaft rotatably coupled to the frame at the rear end;***

340. Socwell discloses a roller assembly 14 that is supported between the right side frame 20 and the left side frame 22 that includes a first roller 78 ("*front*

shaft") and a second roller 86 ("*rear shaft*"):

> Further, **a roller assembly 14** is provided preferably comprising a **first and second roller 78, 86**. The **first roller 78 may be rotatably disposed contiguous the first end 58 of the deck 56 between the first side 20 and the second opposing side 22 of the support frame 12.** Correspondingly similar in construction and design, **a second roller 86 is preferably disposed contiguous the second end 60 of the deck 56 between the first and second sides 20, 22** of the support frame 12.

(Socwell, Ex. 1011, 5:33-41.)



Socwell, Ex. 1011, Fig. 2 (Annotated)

341. The first roller 78 is located at the front end and a POSA would have understood the first roller 78 to be a "*front shaft*." Similarly, the second roller 86 is located at the rear end and a POSA would have understood the second roller 86 to

be a "*rear shaft*."

342. The rollers 78, 86 extend transversely between the right and left sides frames 20, 22. The right and left sides 20, 22 of the frame include journal housings 28 and 34, e.g., slots, configured to receive the journaled ends of the rollers 78, 86 to couple the rollers to the right and left sides of the frame 20, 22.

> As best illustrated in FIGS. 2 and 4, **a first journal housing 28** may be formed substantially adjacent the first end 24 of the first side 20 of the support frame 12. Preferably, **the first journal housing 28 is formed having an opening readily adapted to receive at least one journaling end (not shown) of the first roller 78**. Similarly, **a second journal housing 34** may be formed substantially adjacent the second end 26 of the first side 20 of the support frame 12 **and include an opening readily adapted to receive at least one journaling end (not shown) of the second roller 86**.
>
> In preferred design, **the journal housings 28, 34** formed at the first and second ends 24, 26 of the first side 20 of the support frame 12, respectively, **may be formed having an opening which provides a means for facilitating the introduction of the journaling ends of the respective first and second rollers 78, 86.** Preferably, the opening comprises an elongated slot wherein the journaling ends of the first and second rollers 78, 86 may be slidably adjusted.

(Socwell, Ex. 1011, 6:27-45.)

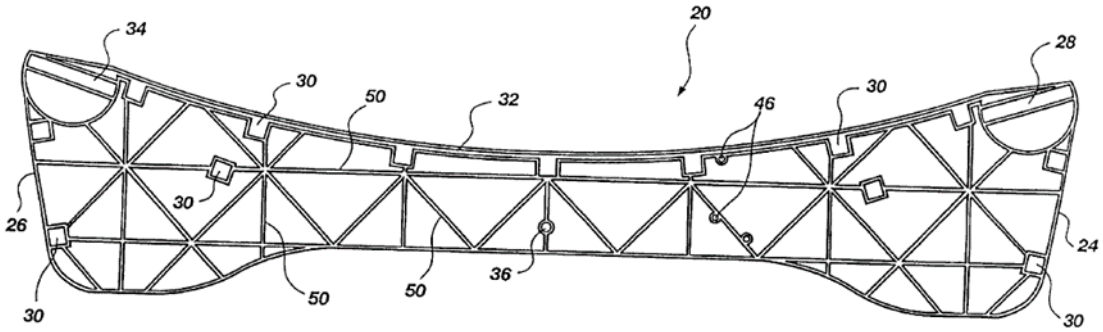


Fig. 4

Socwell, Ex. 1011, Fig. 4

343. Thus, Socwell discloses "*a front shaft* [first roller 78] *rotatably coupled to the frame* [12] *at the front end*" and "*a rear shaft* [second roller 86] *rotatably coupled to the frame at the rear end*."

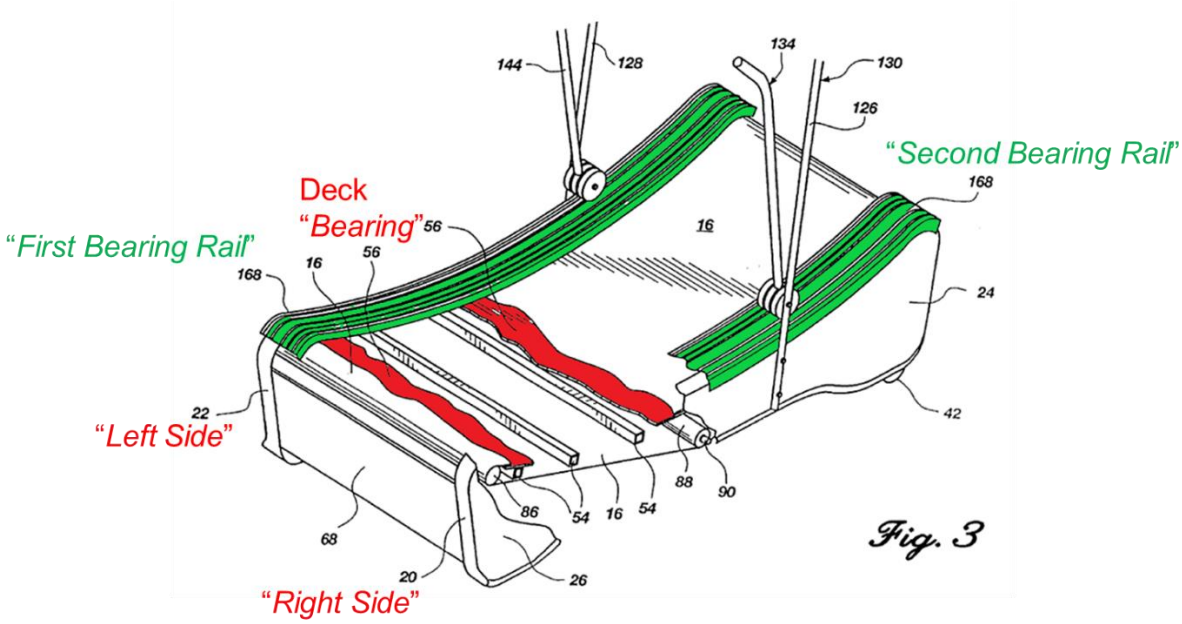
> … ***[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***
>
> … ***[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

344. Socwell discloses a deck 56 ("*bearing*") disposed between opposing sides of the support frame 12:

> One presently preferred embodiment of the present invention, designated generally at 10, is best illustrated in FIGS. 1 and 2. As shown, **the curved deck treadmill 10 comprises a support frame 12**

> **having a first side 20 and a second opposing side 22 and having a deck 56 supportably disposed therebetween**. In preferred construction, the deck 56 comprises a first end 58, a second end 60, and an intermediate portion 62 disposed therebetween. The intermediate portion 62 of the deck 56 is preferably formed having an arcuate configuration such that a significant portion of the intermediate portion 62 may be operably disposed dimensionally lower in longitudinal relationship to the first and second ends 58, 60 of the deck 56.

(Socwell, Ex. 1011, 5:21-33.)



Socwell, Ex. 1011, Fig. 3 (Annotated)

345. The deck 56 is a bearing surface, as I described above in the state of the art section, (VI.D.2, ¶69.) Socwell discloses that the deck 56 ("*bearing*") may be impregnated with wax to reduce the friction with the belt 16:

> In one presently preferred embodiment of the present invention, the **deck 56** is preferably formed consisting of **a wood laminate having an upper surface 66 that may be impregnated with a wax material to provide a means for reducing the coefficient of friction acting thereon**. In an alternate embodiment, the deck 56 may be formed of any of numerous organic, synthetic or processed materials which are mostly thermoplastic or thermosetting polymers of high molecular weight with or without additives, such as, plasticizers, auto oxidants, extenders, colorants, ultraviolet light stabilizers, or fillers, which can be shaped, molded, cast, extruded, drawn, foamed or laminated. It will be readily appreciated by those skilled in the art, however, that a wide variety of other suitable materials such as, metal or metal alloys, fiberglass, ceramic, graphite and/or other composite or polymeric materials are possible which are consistent with the spirit and scope of the present invention.

(Socwell, Ex. 1011, 8:11-27.)

346. Socwell discloses that the frame 12 includes deck slots 32 on each of the right and left sides 20, 22 to receive the longitudinal sides 64 of the deck 56:

> Referring back to the features of the support frame 12, **a deck slot 32** may be formed which extends substantially the longitudinal length of the first side 20, as shown in FIG. 4. **Preferably, the deck slot 32 is disposed such that the deck 56 may be insertably disposed therein**. In one presently preferred embodiment of the present invention, the deck slot 32 comprises a substantially curvilinear configuration which substantially corresponds in dimensional shape to the arcuate

> configuration of the intermediate portion 62 of the deck 56. **Similarly, the deck slot 32 is preferably formed having a sufficient size and depth sufficient to retain at least one longitudinal side of the deck 56 engagably inserted therein**, such that any possible flexing of the deck 56 from the weight of a user will not generally unseat the deck 56 from the deck slot 32. **Whereas, the opposing longitudinal side of the deck 56 is preferably disposed within the deck slot 32 formed in the second side 22 of the support frame 12**.

(Socwell, Ex. 1011, 7:58-8:07.)

347. Socwell discloses belt securing assemblies 94 that engage a topside of the belt 16 to retain the belt in its curvilinear configuration:

> Referring now to FIG. 5, the curved deck treadmill 10 may include one or more **belt securing assemblies 94** which provide a means for **retaining the endless belt 16 in a curvilinear configuration** being substantially flush with the upper surface 66 of the deck 56. Preferably, the belt securing assemblies 94 provide a means for substantially conforming the inherent flexible nature of the belt 16 to the arcuate configuration of the intermediate portion 62 of the deck 56.

(Socwell, Ex. 1011, 10:5-12.)

348. Each belt securing assembly 94 includes a roller 98 in rolling engagement with the belt 16. The roller 98 is mounted on an axle 100 supported by a bracket 96 to provide a low-friction connection with the belt 16:

> [T]he **belt securing assembly 94 comprises a roller 98 having an axle 100 which rotatably engages a mounting bracket 96**. The mounting bracket 96 is preferably disposed in relation to the roller 98 such that the **roller 98 may engage the belt 16, thereby substantially retaining a side portion of the belt 16 substantially flush with the deck 56**. In preferred operation, as the belt 16 rotates in relation to the roller assembly 14, the rollers 98 of the belt securing assembly 94 preferably rotate in relation thereto.

(Socwell, Ex. 1011, 10:17-26.)

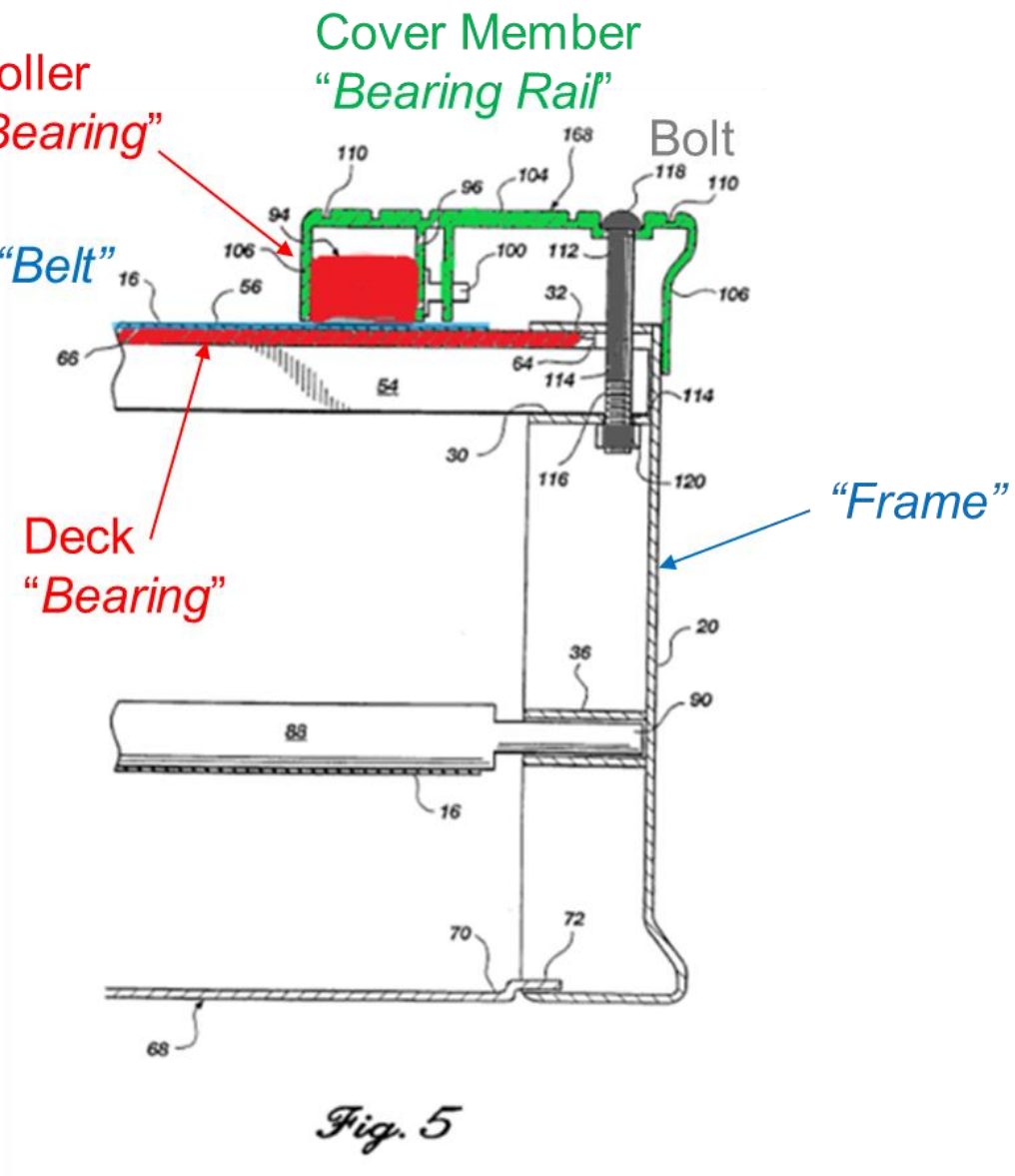
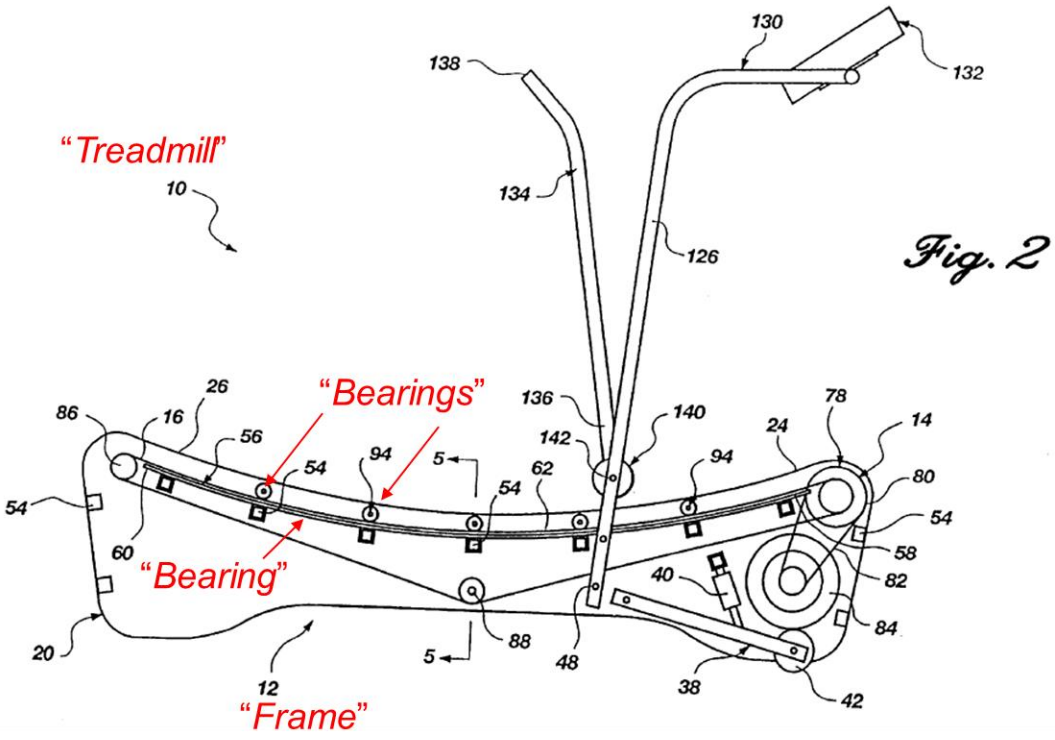


Fig. 5

Socwell, Ex. 1011, Fig. 5 (Annotated)

349. As illustrated in Figure 2 below, Socwell discloses a plurality of belt support assemblies 94 that are disposed along the right and left sides of the frame 12. Each belt support assembly 94 includes a roller 98. As I explained in the State-of-the-Art Section, rollers, such as the rollers 98, are bearings. (¶ 65.) Additionally, the deck 56 is a bearing surface. (¶¶ 66-67.) Therefore the rollers 98

and the deck collectively provide a "*plurality of bearings*."

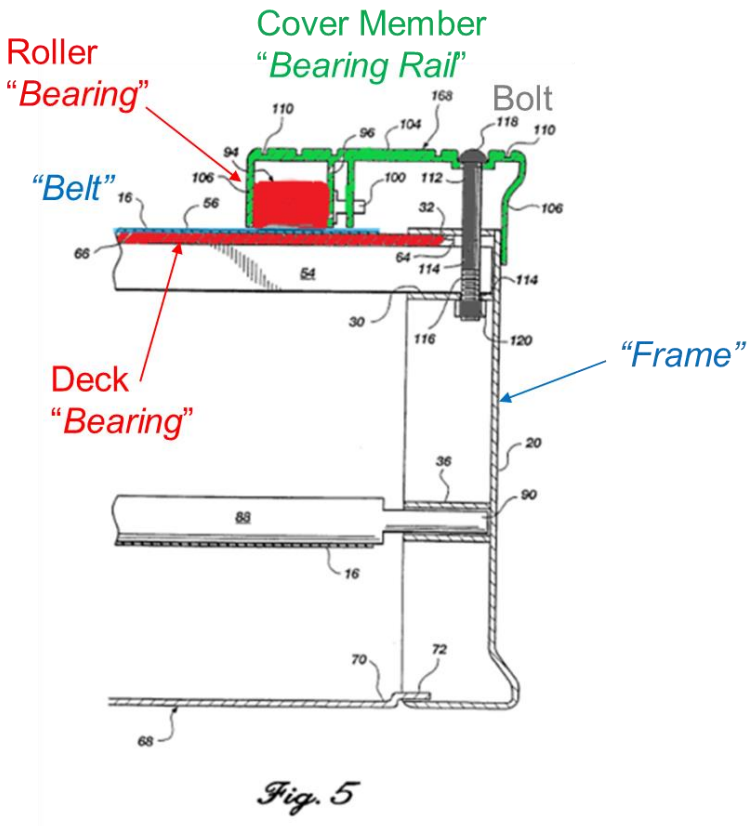


Socwell, Ex. 1011, Fig. 2 (Annotated)

350. Socwell discloses a cover member 168 ("*bearing rail*") that supports the belt securing assemblies 94, including the rollers 98 "*bearings*", and attaches to the frame 12 using bolts 118:

> Referring now to FIG. 5, **the belt securing assembly 94 and the corresponding <u>cover member 168 may be attached to the support frame 12</u> by a conventional fastening means**. For example, in one presently preferred embodiment of the present invention, **a bolt 118** may be disposed through an aperture 112 formed in the cover member 168 and at least one aperture 114 formed in a respective side 20, 22 of the support frame 12.

(Socwell, Ex. 1011, 11:15-22.)



Socwell, Ex. 1011, Fig. 5 (Annotated)

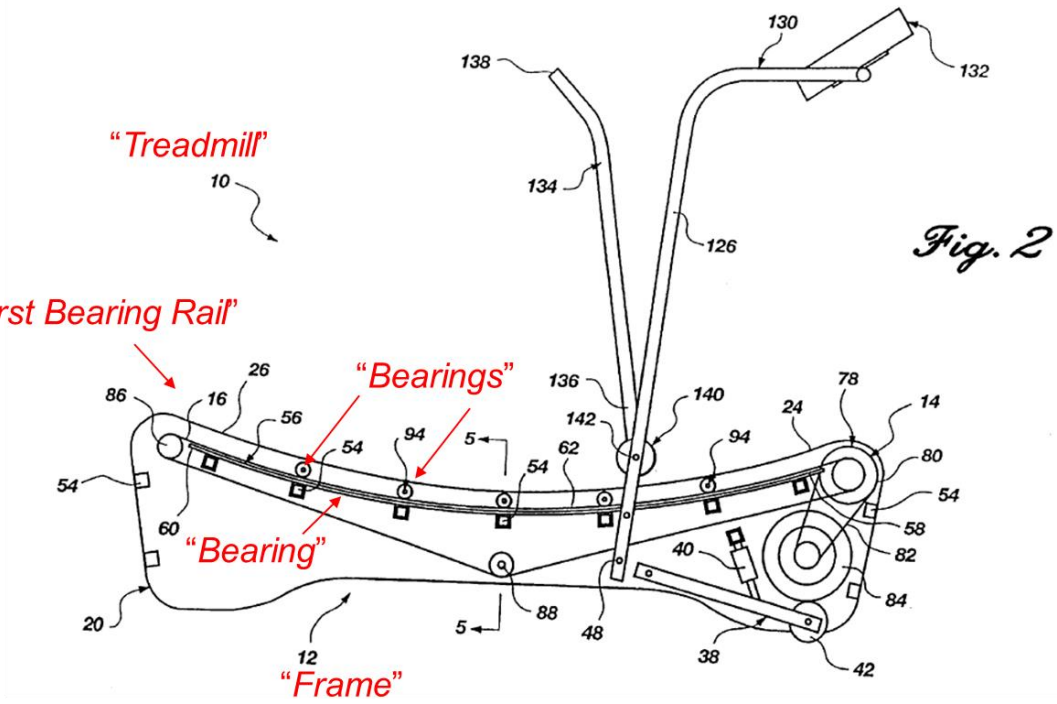
351. As illustrated in Figure 5 above, the right cover member 168 ("*second bearing rail*") includes a vertical side 106 disposed against the right frame side 20 and a horizontal portion 104 extending inwardly from the vertical side to be disposed over a side portion of the belt 16. (Socwell, Ex. 1011, 10:49-52) The horizontal portion 104 supports the belt securing assembly 94. (Socwell, Ex. 1011, 18:7-10, 10:56-60.) The cover member 168 that supports the belt securing assemblies 94, including the rollers 98, is attached to the frame 12 using bolts 118. The bolts 118 may also extend through apertures formed through the deck 66 to

attach the deck to the frame 12:

> Alternatively, the bolt 118 may be disposed through an aperture 116 formed in a support rib 54 which may further serve to secure the support rib 54 to the support frame 12. Moreover, if a longitudinal side 64 of the deck 56 were to extend past the apertures formed in the cover member 168 and the support frame 12, a corresponding through-bore (not shown) may be formed in **the deck 56** and disposed in alignment with the other apertures.

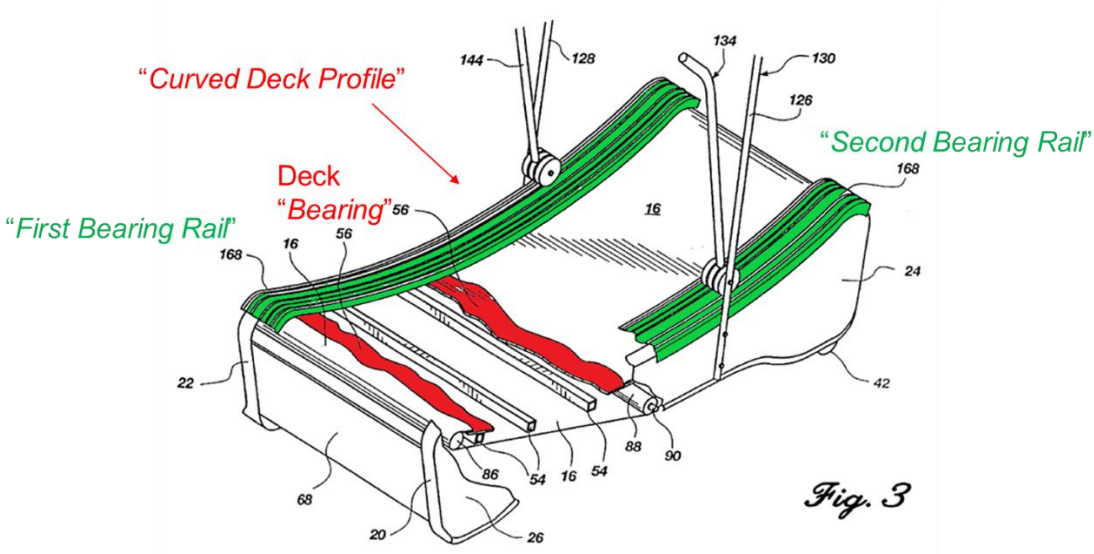
(Socwell, Ex. 1011, 11:22-29.)

352. Each cover member 168 is elongate in shape and supports a plurality of the belt securing assemblies 94, and each belt securing assembly includes a roller 98 ("*bearing*"). For example, Figure 2 illustrates the left cover member ("*first bearing rail"*) with five belt securing assemblies 94 that each include a roller 98 ("*plurality of bearings*") that are longitudinally spaced apart from each other along the "*left side of the frame*" 12. (Socwell, Ex. 1011, 10:13-17.)



Socwell, Ex. 1011, Fig. 2 (Annotated)

353. Socwell illustrates both cover members 168, *i.e.*, the "*first bearing rail*" and the "*second bearing rail*," in Figure 3.



Socwell, Ex. 1011, Fig. 3 (Annotated)

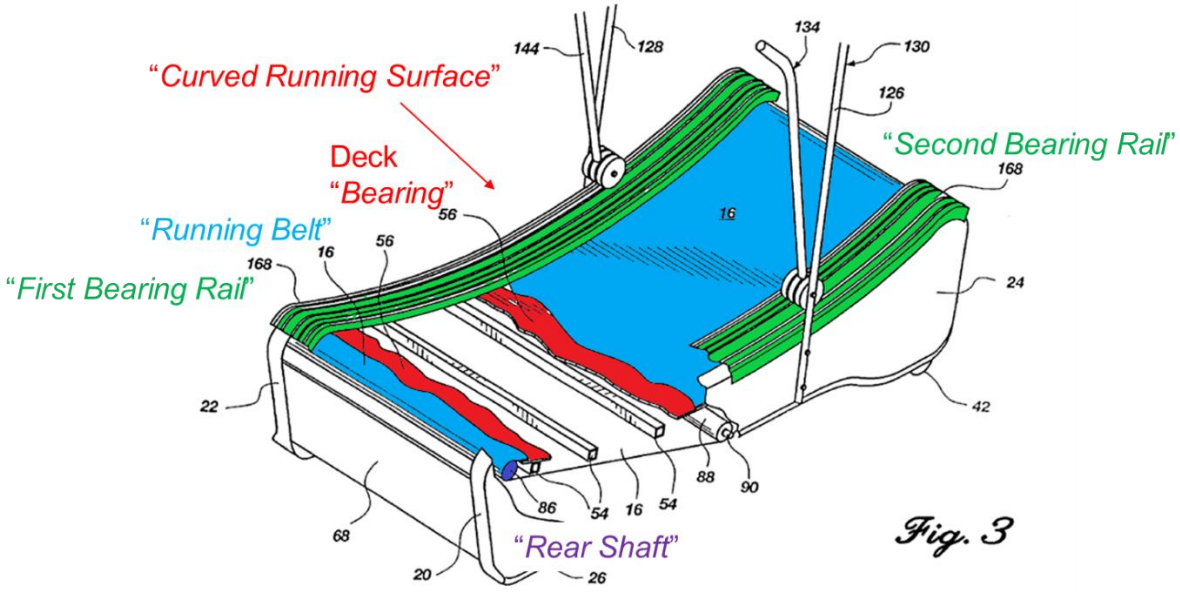
354. Thus, Socwell discloses "*a first bearing rail* [left cover member 168] *having a plurality of bearings* [deck 56 and left rollers 98], *the first bearing rail attached to a left side of the frame* [using bolts 118]" and "*a second bearing rail* [right cover member 168] *having a plurality of bearings* [deck 56 and right rollers 98], *the second bearing rail attached to a right side of the frame* [using bolts 118]."

> … ***[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and***

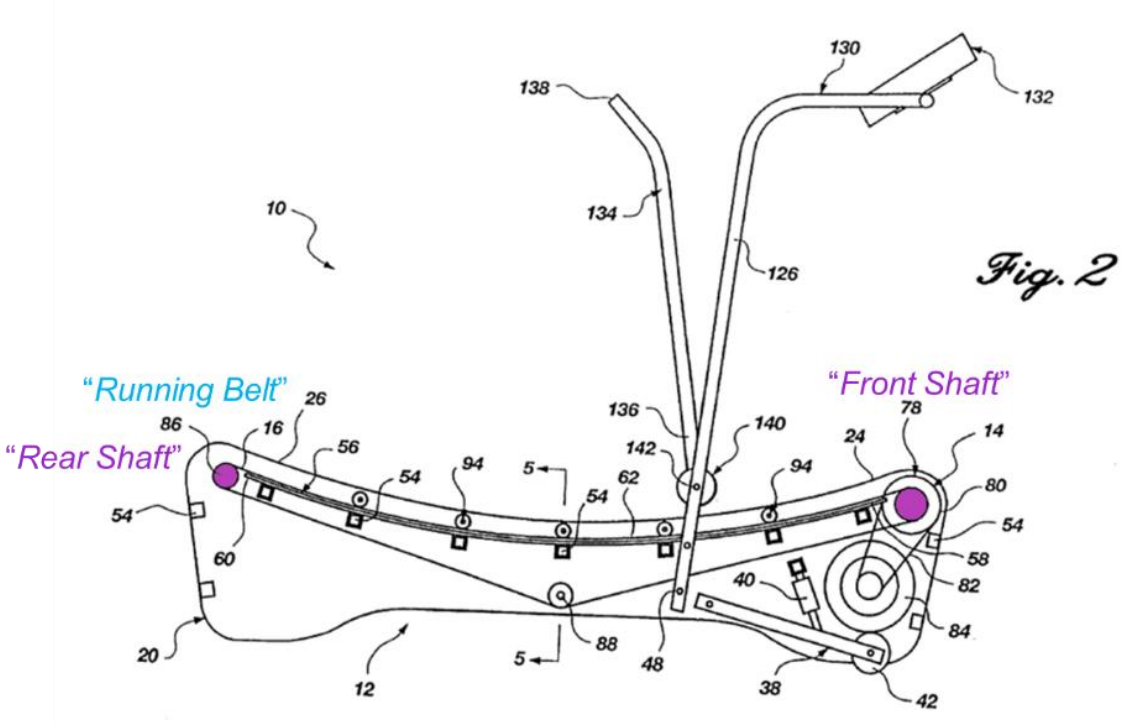
355. Socwell discloses a belt 16 that is supported by the curved deck 56 and retained by the rollers 98 ("*plurality of bearings*"). (Socwell, Ex. 1011, 10:17-26; Fig. 5.) The arrangement of the deck 56 and rollers 98 provides a structurally arcuate shape such that the deck 56 "*follows a curved running surface*":

> [A]n endless belt may be rotatably mounted in relation to the roller assembly and operatively disposed in relation to the deck, whereby providing a structurally supported arcuate shaped, movable surface on which a user may exercise."

(Socwell, Ex. 1011, 4:13-18.)



Socwell, Ex. 1011, Fig. 3 (Annotated)



Socwell, Ex. 1011, Fig. 2 (Annotated)

356. As explained for claims [1.4] and [1.5], the cover members 168 ("*bearing rails*") are mounted to the frame and support the deck 56 and rollers 98. (*See* ¶¶ 343-344.)

357. The belt 16 is disposed around the roller 78 ("*front shaft*") and the roller 86 ("*rear shaft*"):

> Referring back to FIGS. 1 and 2, **the belt 16 operably disposed in relation to the rollers 78, 86, 88 may be formed comprising an endless construction which preferably consists of a sufficiently sturdy material**. For example, the belt 16 may be formed of an endless sheet of a flexible canvas or a rubber-impregnated material. The belt 16 may alternatively be formed of a thin, flat band of steel or a sufficiently tenacious polymeric or composite material. As will be

> readily appreciated by those skilled in the art, the belt 16 can, of course, be formed of a wide variety of suitable materials which are consistent with the spirit and scope of the present invention.
>
> In accordance with one preferred arrangement, **the belt 16 is rotatably disposed in relation to the first roller 78, the second roller 86, and the third roller 88, whereby each roller 78, 86, 88 is preferably disposed in structural relation to the support frame 12 at their respectively preferred positions**, as disclosed above. The tension of the belt 16 may be readily tightened or loosened in relation to the disposition of the first and second rollers 78, 86 engagably disposed in the respective elongated slot of the journal housings 28, 34.

(Socwell, Ex. 1011, 7:31-52.)

358. Thus, Socwell discloses "*a running belt* [16] *supported by the first bearing rail and the second bearing rail* [cover members 168] *and disposed about the front shaft* [roller 78] *and the rear shaft* [roller 86], *wherein the running belt follows a curved running surface*."

> … ***[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft,***

359. Magid discloses a walker apparatus with adjacent left and right foot belts (4, 4'). (Magid, Ex. 1012, Figs. 5,6.) Magid further discloses "A unidirectional control means 6, 6' is installed to permit only unidirectional movement of the left and right foot belts 4, 4'." (Magid, Ex. 1012, 4:46-49.)

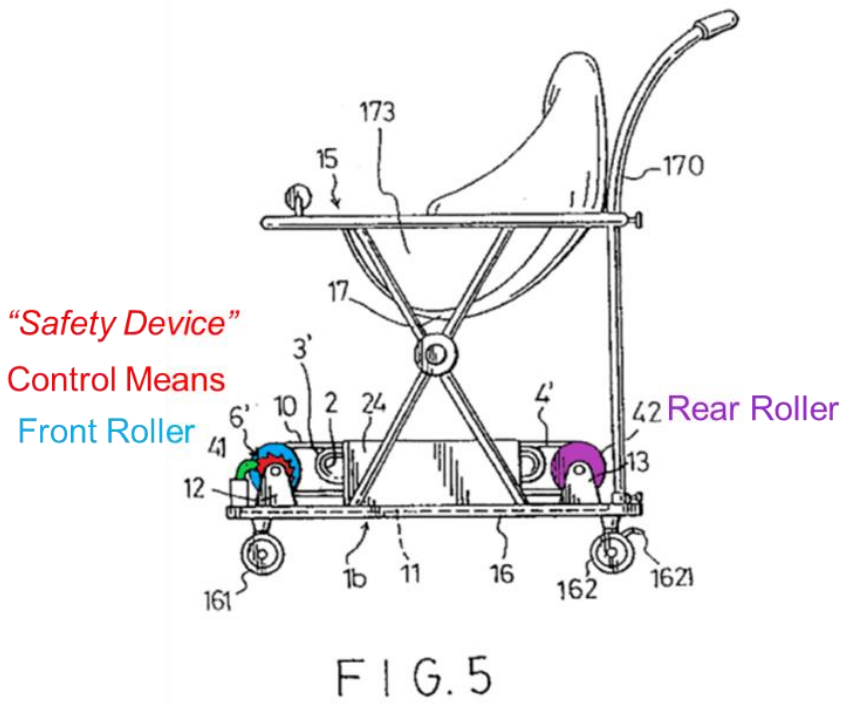


FIG. 5

Magid, Ex. 1012, Fig. 5 (Annotated)

360. As shown in Figure 5, Magid discloses that the control means 6, 6' are a pair of control means that are attached to opposing ends of the front rollers 41. Magid also discloses that the control means 6, 6' may be attached to the rear rollers 42 and that each control means 6, 6' includes a ratchet gear 61 and a pawl 62:

> A unidirectional control means 6, 6' is installed to permit only unidirectional movement of the left and right foot belts 4, 4'. In this embodiment, the control means 6, 6' includes a pair of ratchet gears 61 attached to outer ends of the front rollers 41 and mounted rotatably on the first shaft 411, and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61 to permit only unidirectional rotation of the front rollers 41, thereby preventing bidirectional movement of the foot belts 4, 4'. A releasable means (not shown) may

> be provided to release selectively the pawls 62 from the ratchet gears 61 in a known manner to permit reciprocating movement of the foot belts 4, 4' when desired. Of course, the ratchet gears may be attached to the rear rollers 42 to achieve the same result.

(Magid, Ex. 1012, 4:46-60.)

361. Magid illustrates the control means 6, 6’ coupled to the rear rollers in Figure 2 and 9 below. Although Magid mislabels the front roller and the rear roller with the wrong reference numeral in Figures 2 and 9, a POSA would have understood, from the orientation of the handrail 14, and ratchet gear 6’ depicted, that the control means 6, 6’ are mounted to the rear roller. (Figure 2 of Magid is annotated to include a user’s feet to further illustrate front and rear rollers of the treadmill.)

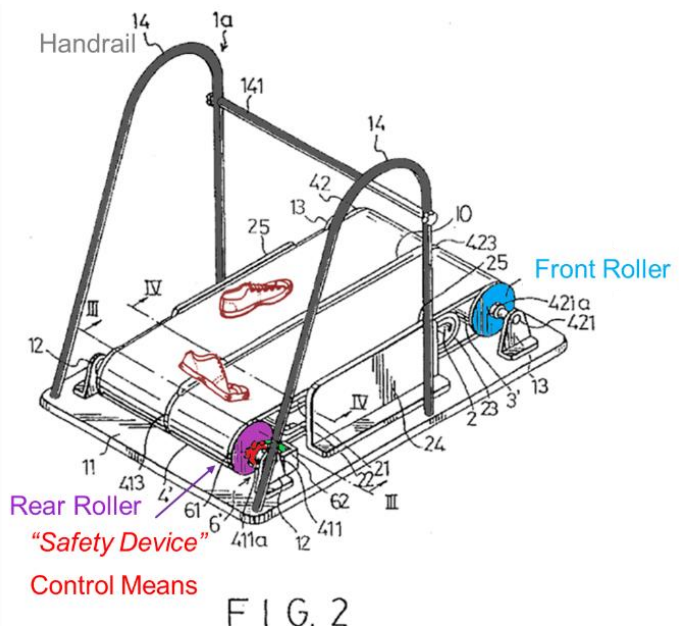


FIG. 2

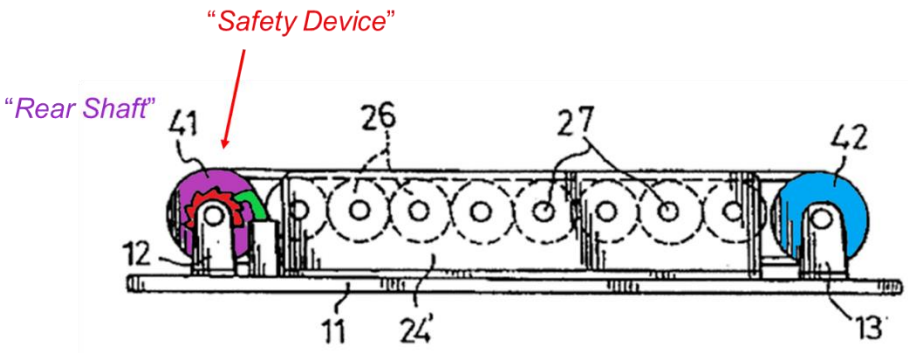
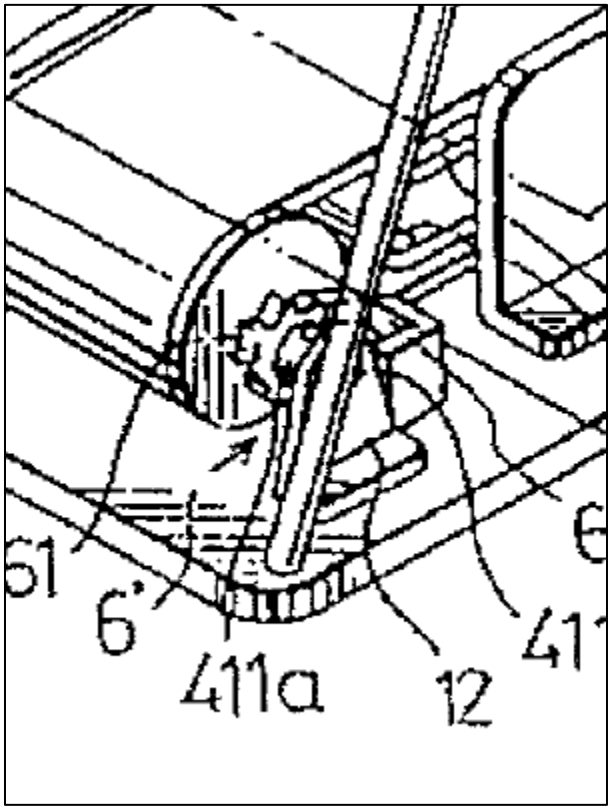


FIG. 9

Magid, Ex. 1012, Figs. 2, 9 (Annotated)

362. Additionally, the gear profile of the ratchet and orientation of the pawl in Figures 2 and 9 would prevent the rear roller from rotating clockwise, which corresponds with the belt being blocked from moving to the right on the page, or forward.



Magid, Ex. 1012, Fig. 2 (Enlarged)

363. As explained in ¶¶ 407-418, It would have been obvious to a POSA to combine Socwell's treadmill with Magid's control means to permit only unidirectional movement of the running belt to reduce the risk of a user stepping onto the running belt of the treadmill and losing their balance when the belt moves in the forward direction. Magid's control means 6, 6' provide a "*safety device*" by preventing the left and right foot belts 4, 4' from moving forward.

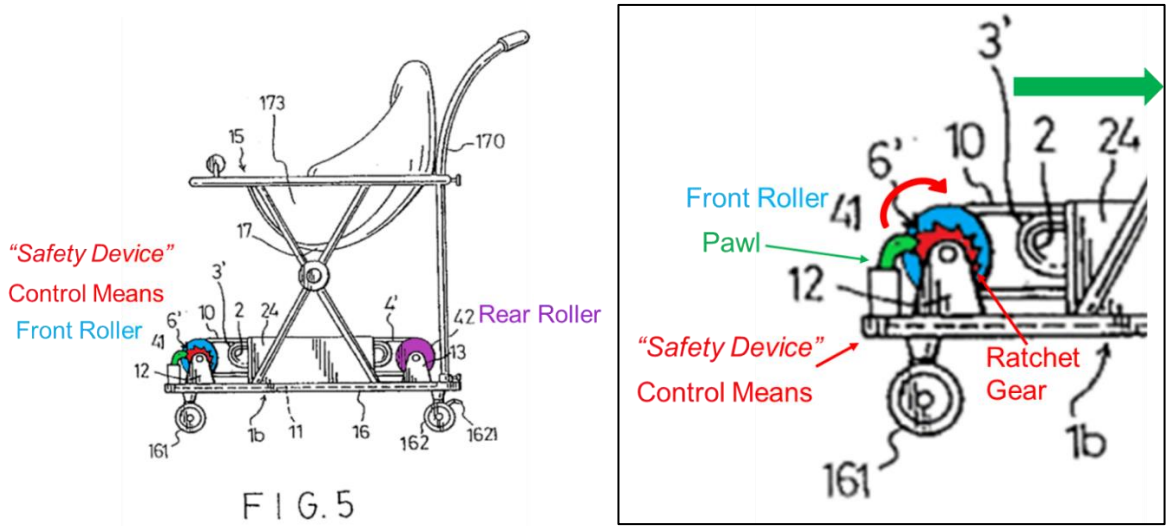
364. Thus, the combination of Socwell and Magid teach "*a safety device* [the control means 6, 6'] *coupled to at least one of the front shaft and the rear*

shaft."

> … ***[1.7] [b] wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

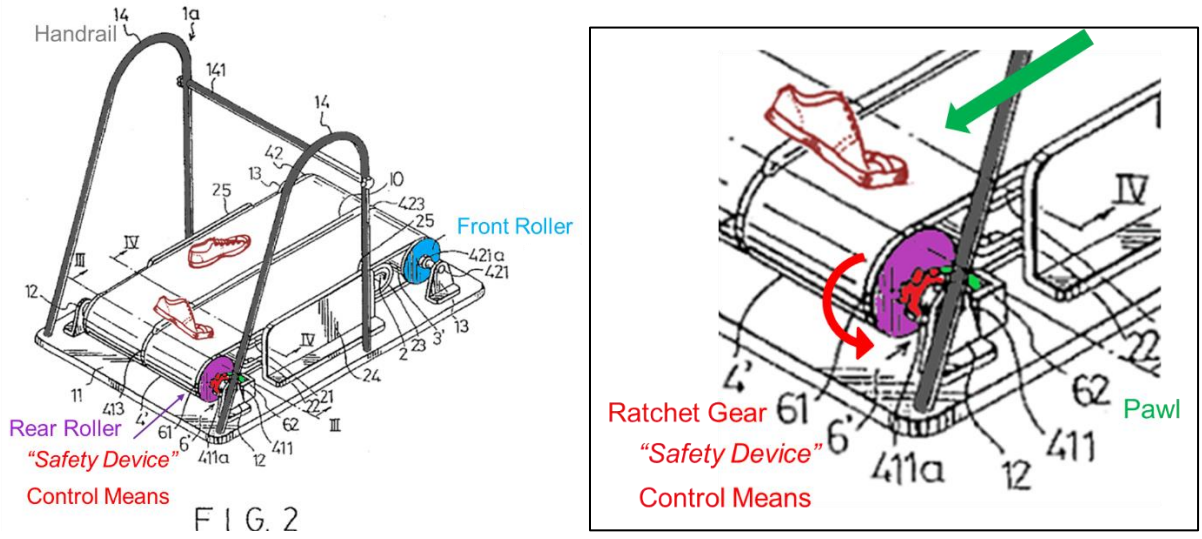
365. Magid discloses that "the control means 6,6' includes a pair of ratchet gears 61 attached to outer ends of the front rollers 41 and mounted rotatably on the first shaft 411, and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61 to permit unidirectional rotation of the front rollers 451, thereby preventing bidirectional movement of the foot belts 4, 4'." (Magid, Ex. 1012, 4:46-60.)

366. The figure below is an enlarged image of the front roller 41 of Figure 5 of Magid. The image illustrates how the profile of the ratchet gear permits the front roller to freewheel or rotate clockwise (as indicated by the red arrow) which allows the running surface, e.g., a belt, to move rearward (as indicated by the green arrow). The image also illustrates how the profile of the ratchet engages the pawl to prevent counterclockwise rotation of the front roller 41 and thereby prevents the belt from moving forward (to the left in the image).



Magid, Ex. 1012, Figure 5 (Enlarged, Annotated)

367. Magid also discloses, with reference to Figure 2 below, that the control means 6, 6' includes a pair of ratchet gears 61 that are attached to outer ends of the rear rollers and a pair of pawls 62 secured to the base 11 and engaging one of the ratchet gears 61. (Ex. 1012, 4:46-60.)



Magid, Ex. 1012, Figure 2 (Enlarged, Annotated)

368. The above figure illustrates how the profile of the ratchet gear permits the rear roller to freewheel or rotate counterclockwise (as indicated by the red arrow) which allows the running surface to move rearward (as indicated by the green arrow). The image also illustrates how the profile of the ratchet gear engages the pawl to prevent clockwise rotation of the front roller 41 and thereby prevent the belt from moving forward (to the right in the image).

369. Thus, the combination of Socwell and Magid teaches "*wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft* [Magid, Fig. 5] *and the rear shaft* [Magid, Fig. 2] *in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction*."

2. Dependent Claims 2, 3, 4, 5, and 10

370. Claims 2, 3, 5, and 10 depend from claim 1 which I understand means that claims 2, 3, 5, and 10 require all of the limitations of claim 1 in addition to their additional limitations.

371. The combination of Socwell and Magid disclose all of the limitations of claim 1 as described above. (*See* ¶¶ 335-369.)

> … ***[2.] The manually powered treadmill of claim 1, wherein the frame includes at least one cross-member, a left side member, and a right side member; and wherein the at least one cross-member extends between the left side member and the right side member.***

372. Socwell discloses "the curved deck treadmill 10 comprises a support frame 12 having a first side 20 and a second opposing side 22 and having a deck 56 supportably disposed therebetween." (Socwell, Ex. 1011, 5:23-26; Fig. 1.) Socwell also discloses supports ribs 54 (*i.e.*, "*cross members"*) that extend between the left side 22 and the right side 20 of the frame 12. The right and left sides 20, 22 have rib seats 30 that receive the ends of the support ribs 54 to connect the ribs to the frame sides 20, 22.

> As shown in Figure 4, the first side 20 of the support frame 12 may comprise one or more **rib seats 30** disposed adjacent the deck slot 32. The rib seats are preferably formed having an internal surface area sufficient **for seating at least one end of a support rib 54** disposed therein. **As best illustrated in Figure 3, one or more support ribs 54 extend substantially transverse dimensionally between first and second sides 20, 22 of the support frame**.

(Socwell, Ex. 1011, 8:27-34, ll. 27-34; *see also* Figs. 2 and 3.)

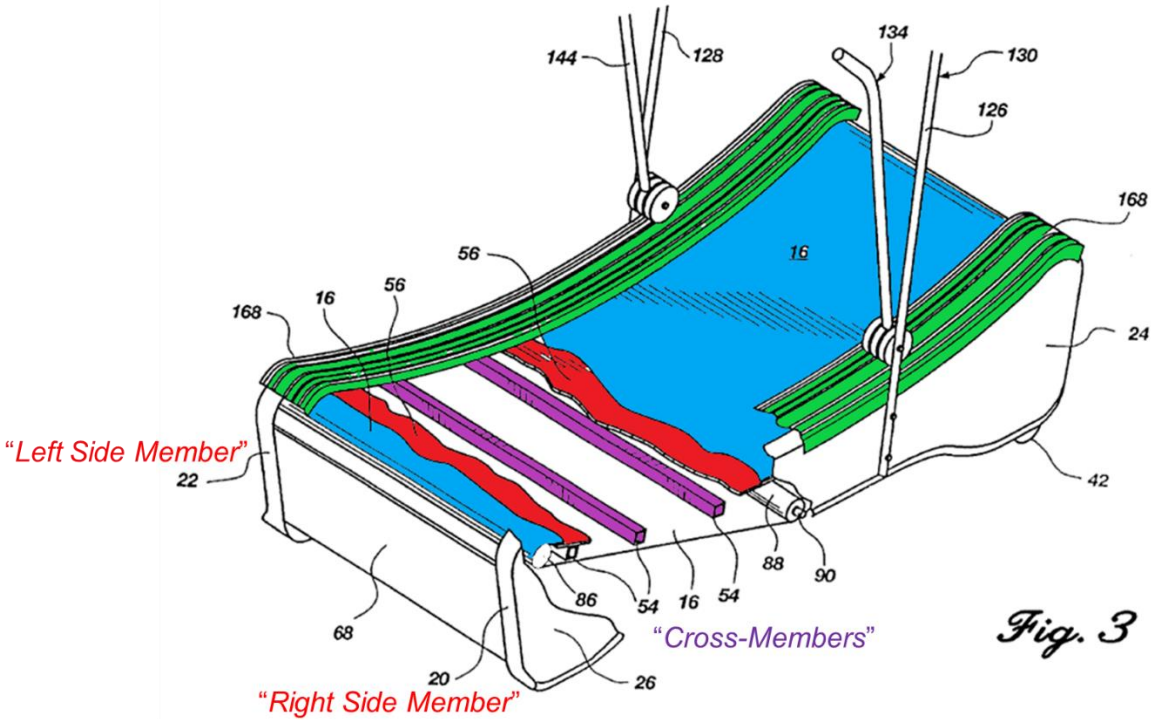


Fig. 3

Socwell, Ex. 1011, Fig. 3 (Annotated)

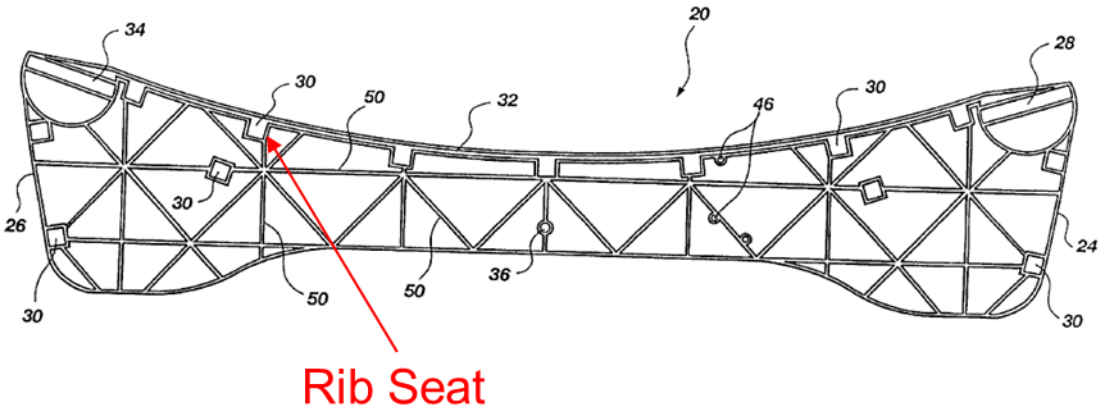


Fig. 4

Socwell, Ex. 1011, Fig. 4 (Annotated)

373. Thus, Socwell discloses, *wherein the frame* [12] *includes at least one*

cross-member [ribs 54]*, a left side member* [left side 22]*, and a right side member* [right side 20]*; and wherein the at least one cross-member extends between the left side member and the right side member*.

> … ***[3.] The manually powered treadmill of claim 2, wherein each one of the first and second bearing rails are coupled to at least one of the at least one cross-member.***

374. As discussed in claim 2, the support ribs 54 (i.e., *cross members*) are received in the rib seats 30 and extend between the left 22 and right 20 sides of the frame 12. (Socwell, Ex. 1012, 8:27-34, ll. 27-34; see also Figs. 2 and 3.) Socwell also discloses that the bolts 118 may extend through apertures formed through the support ribs 54 ("*cross-member*") to attach the cover members 168 ("*bearing rails*") to the frame 12, thereby coupling the "*bearing rails*" with the "*cross-members*":

> Alternatively, the bolt 118 may be disposed through an aperture 116 formed in a support rib 54 which may further serve to secure the support rib 54 to the support frame 12.

(Socwell, Ex. 1011, 11:22-25.)

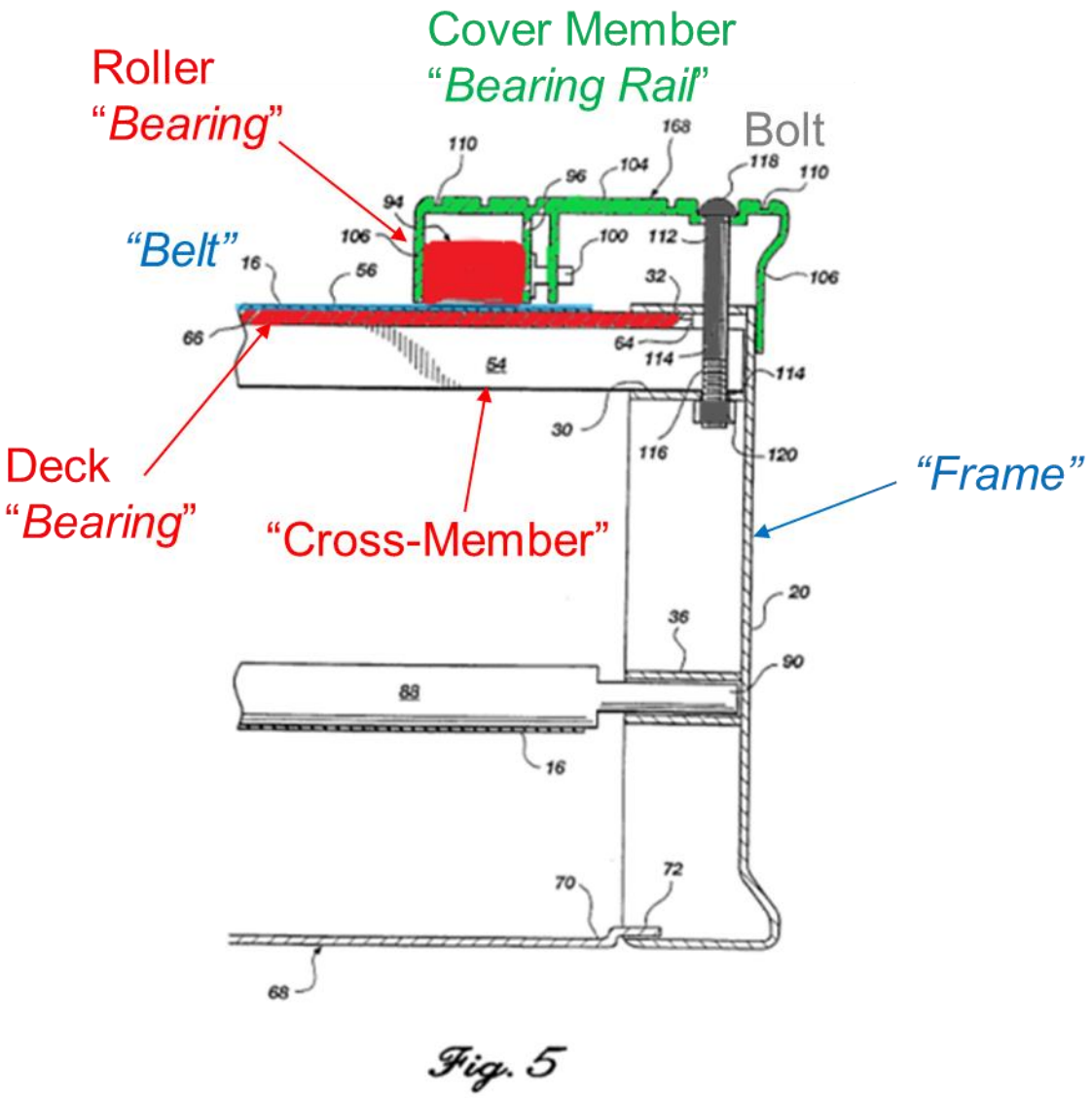


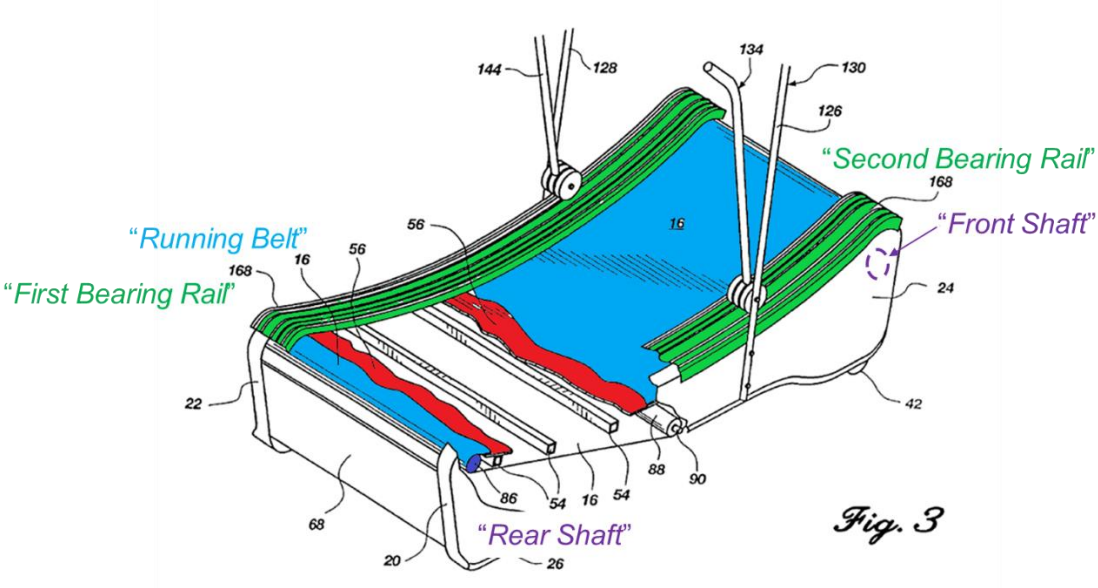
Fig. 5

Socwell, Ex. 1011, Fig. 5 (Annotated)

375. Thus, the combination of Socwell and Magid teaches, *each one of the first and second bearing rails* [cover members 168] *are coupled to at least one of the at least one cross-member* [support rib 54].

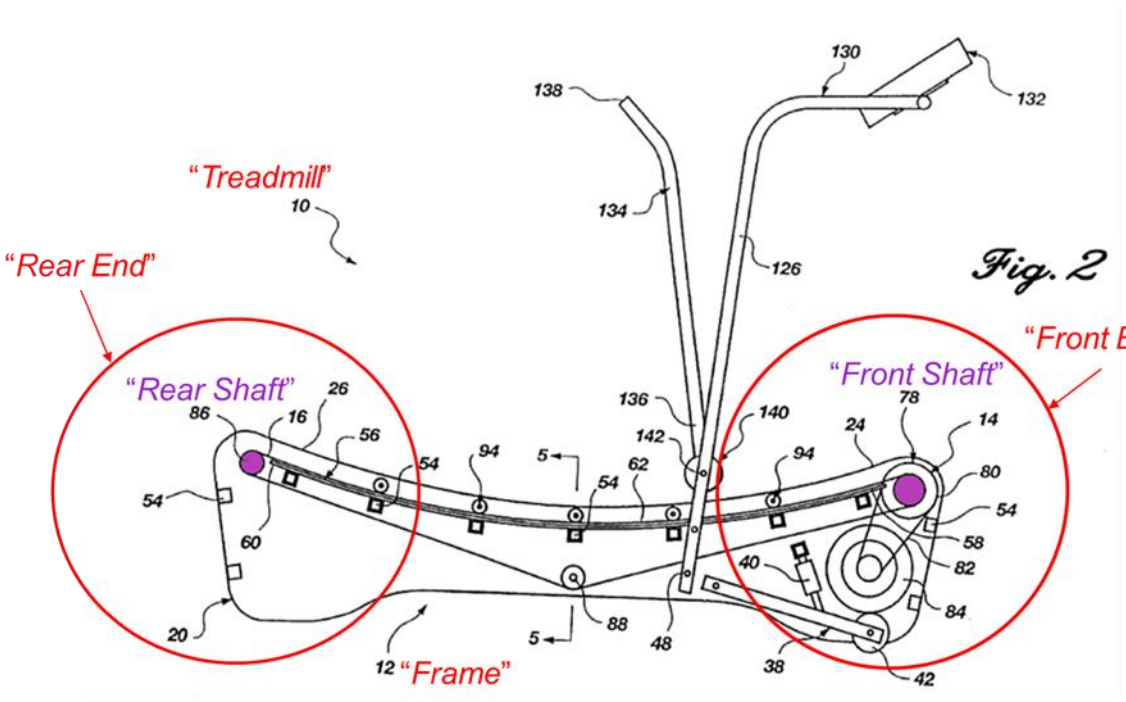
> … ***[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

376. Socwell illustrates both cover members 168, *i.e.*, the "*first bearing rail*" and the "*second bearing rail*," extending along a length of the frame 12 in Figure 3.



Socwell, Ex. 1011, Fig. 3 (Annotated)

377. The sides 20, 22 of the frame 12 extend longitudinally between the front and rear ends of the treadmill 10.



Socwell, Ex. 1011, Fig. 2 (Annotated)

378. Thus, the combination of Socwell and Magid teaches "*wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft*."

> … ***[5.] The manually powered treadmill of claim 1, wherein each one of the first bearing rail and the second bearing rail define in part a top profile corresponding to the curved running surface.***

379. Socwell discloses a belt 16 that is supported by the curved deck 56 and retained by the rollers 98 ("*plurality of bearings*"). (Socwell, Ex. 1011, 10:17-26; Fig. 5.) This arrangement provides a structurally arcuate shape for the belt 16 to follow a curved running surface: The "endless belt may be rotatably mounted in relation to the roller assembly and operatively disposed in relation to the deck,

whereby providing a structurally supported arcuate shaped, movable surface on which a user may exercise." (Socwell, Ex. 1011, 4:14-19.)

380. The cover members 168 ("*bearing rails*") support the deck 56 and rollers 98 ("*plurality of bearings*"). (Socwell, Ex. 1011, 11:15-23.)

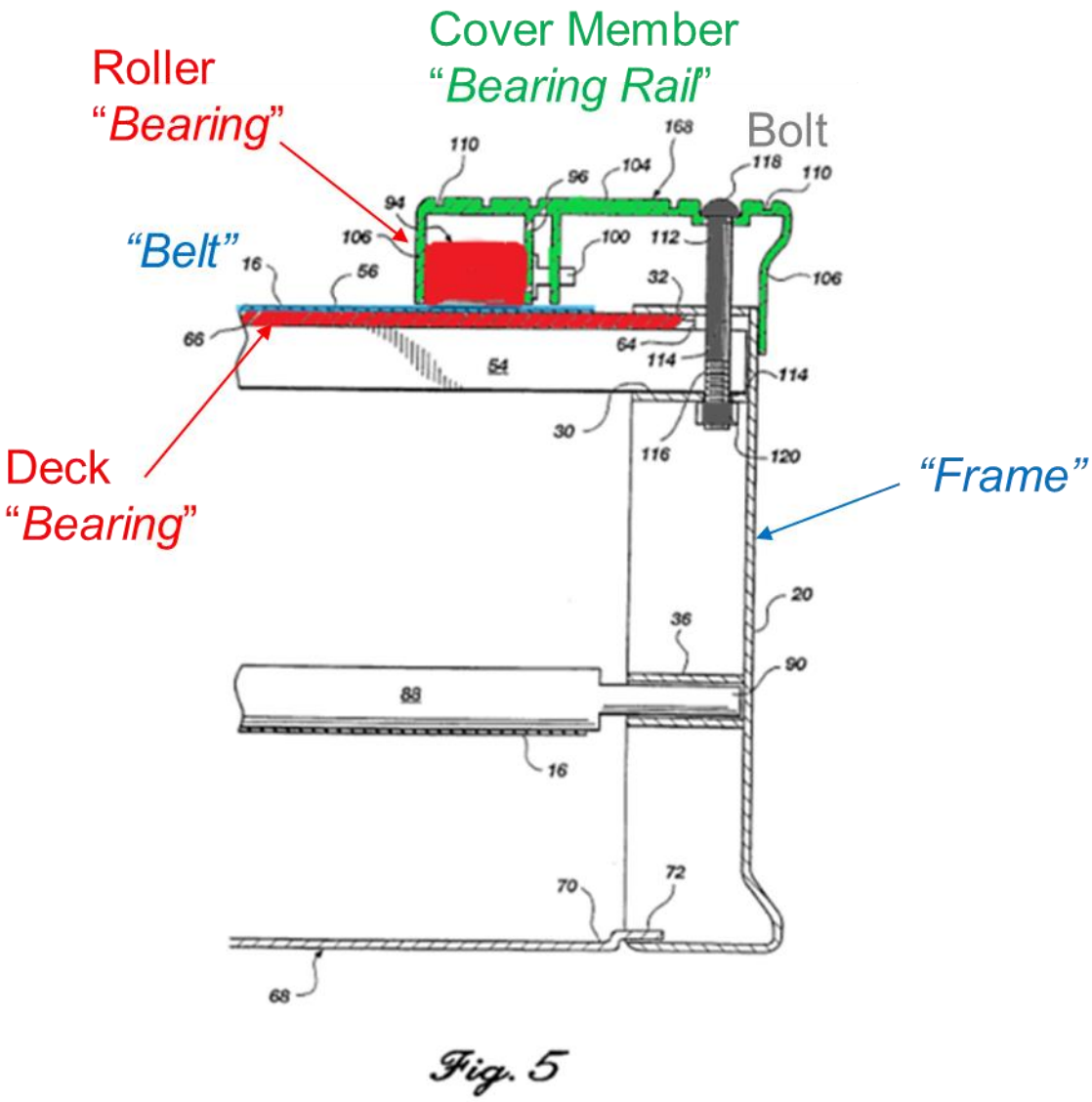
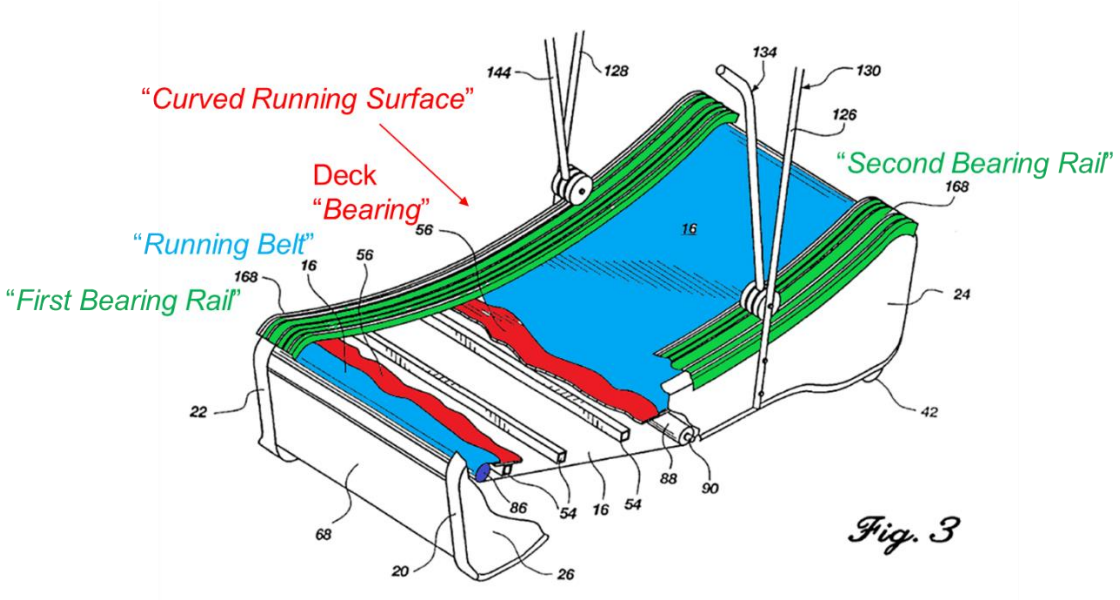


Fig. 5

Socwell, Ex. 1011, Fig. 5 (Annotated)

381. The arrangement of the deck 56 and rollers 98, which are supported

by the cover members 168 ("*bearing rails*") defines the curved running surface.



Socwell, Ex.1011, Fig. 3 (Annotated)

382. Thus, the combination of Socwell and Magid teaches "*wherein each one of the first bearing rail and the second bearing rail* [cover members 168] *define in part a top profile corresponding to the curved running surface*."

> … ***[10.] The manually powered treadmill of claim 1, further comprising a handrail attached to the frame and structured to provide a support structure for the user of the manually powered treadmill.***

383. Socwell discloses a crossbar 130 ("*handrail"*) that is attached to the frame 12:

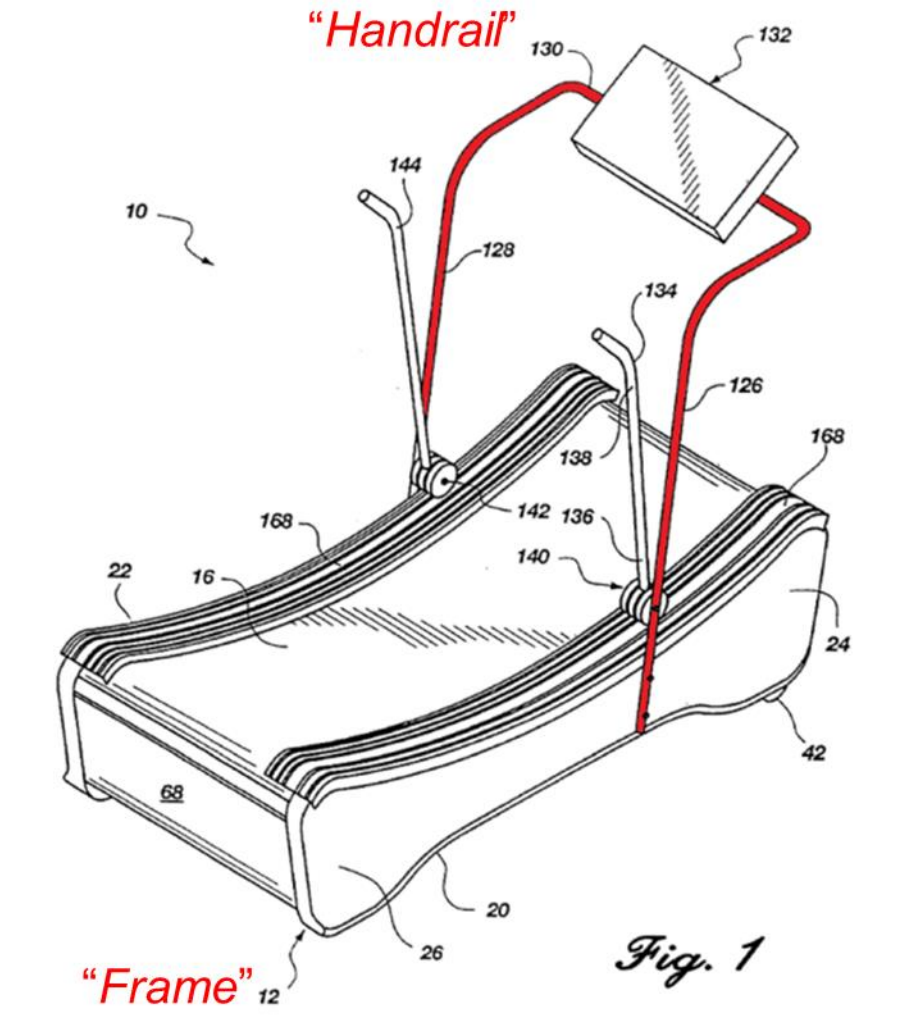
> As further illustrated in FIGS. 1 and 2, **at least one crossbar 130 may be structurally supported in relation to the support frame 12.** Preferably, the crossbar 130 functionally supports a console 132 substantially above the upper surface area of the support frame 12,

> deck 56, and belt 16. Disposed in relation to the support frame 12**, the crossbar 130 may be formed having a generally U-shaped configuration.** Further, the crossbar 130 may comprise a pivotal engagement 140 which provides a means for pivotally engaging one or more handles 134, 144 in relation to the crossbar 130 at the opposing sides thereof 126, 128.

(Socwell, Ex. 1011, 5:46-56.)

> **Referring now to FIGS. 1, 2 and 3, a crossbar 130 may be preferably formed having a generally U-shaped configuration and may be disposed in fixed relation to the first and second sides 20, 22 of the support frame 12 by means of conventional fasteners**. The fasteners may comprise one or more internally threaded seats 46 (as best shown in FIG. 4) wherein an appropriately sized fastener 48 may be introduced to provide a threaded or force-fit engagement **therebetween for securing the first side 126 of the cross-bar 130 to the first side 20 of the support frame 12. A second end 128 of the crossbar 130 may be similarly mounted in a preferably fixed engagement to the second side 22 of the support frame 12.** Although the crossbar 130 of the present invention is illustrated and described in connection with a generally U-shaped configuration, those skilled in the art will recognize that various other geometrical configurations are likewise suitable. The use of a generally U-shaped configuration is thus by way of illustration only and not by way of limitation.

(Socwell, Ex. 1011, 11:62-12:13.)



Socwell, Ex. 1011, Fig. 1 (Annotated)

384. Thus, Socwell discloses "*a handrail* [crossbar 130] *attached to the frame* [12] *and structured to provide a support structure for the user of the manually powered treadmill*."

3. Independent claim 11

385. Independent claim 11 is largely duplicative of independent claim 1. To illustrate, the table below shows a side-by-side comparison of claims 1 and 11. Claim 11 is "marked up" to show the minor differences.

‘580 Patent Claim 1	‘580 Patent Claim 11
[1.0] A manually powered treadmill comprising:	**[11.0]** A manually powered treadmill, comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;	**[11.1]** a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to the frame at the front end;	**[11.2]** a front shaft attached to the frame adjacent the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;	**[11.3]** a rear shaft attached to the frame adjacent the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;	**[11.4]** a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing	**[11.5]** a second bearing rail having a plurality of bearings, the second bearing

‘580 Patent Claim 1	‘580 Patent Claim 11
rail attached to a right side of the frame;	rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and	**[11.6] [a]** a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail, **[b]** wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and
[1.7] [a] a safety device coupled to at	**[11.7]** a safety device for substantially

‘580 Patent Claim 1	‘580 Patent Claim 11
least one of the front shaft and the rear shaft, **[b]** wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.	preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

386. As illustrated above, limitations [11.0]-[11.5] and [11.7] are nearly identical to corresponding limitations of claim 1. The only substantial modification to claim 11 to differentiate it from claim 1 was to claim various positions and locations of the running belt in limitation [11.6].

… ***[11.0] A manually powered treadmill, comprising:***

387. Limitation [11.0] is identical to limitation [1.0]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Chickering and Magid. (*See* ¶¶ 335-336.)

… ***[11.1] a frame having a front end and a rear end positioned opposite the front end;***

388. Limitation [11.1] is identical to limitation [1.1]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Chickering and Magid. (*See* ¶¶ 337-339.)

… ***[11.2] a front shaft attached to the frame adjacent the front end;***

… ***[11.3] a rear shaft attached to the frame adjacent the rear end;***

389. Claim limitation [11.2] is substantially similar to limitation [1.2] of claim 1. Claim [11.2] requires "*a front shaft attached to the frame adjacent the rear end*," whereas limitation [1.2] requires "*a front shaft rotatably coupled to the frame at the rear end.*" As explained for limitation [1.2], Socwell discloses a roller assembly 14 that is supported between the right side frame 20 and the left side frame 22 that includes a first roller 78 ("*front shaft*") and a second roller 86 ("*rear shaft*") that are "rotatably" coupled to the frame. (Socwell, Ex. 1011, 5:35-41.)

390. Thus, Socwell discloses "*a front shaft* [first roller 78] *attached to the frame adjacent the rear end*" and "*a rear shaft* [second roller 86] *attached to the frame adjacent the rear end*."

… ***[11.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***

391. Limitation [11.4] is identical to limitation [1.4]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Socwell and Magid. (*See* ¶¶ 344-354.)

… ***[11.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

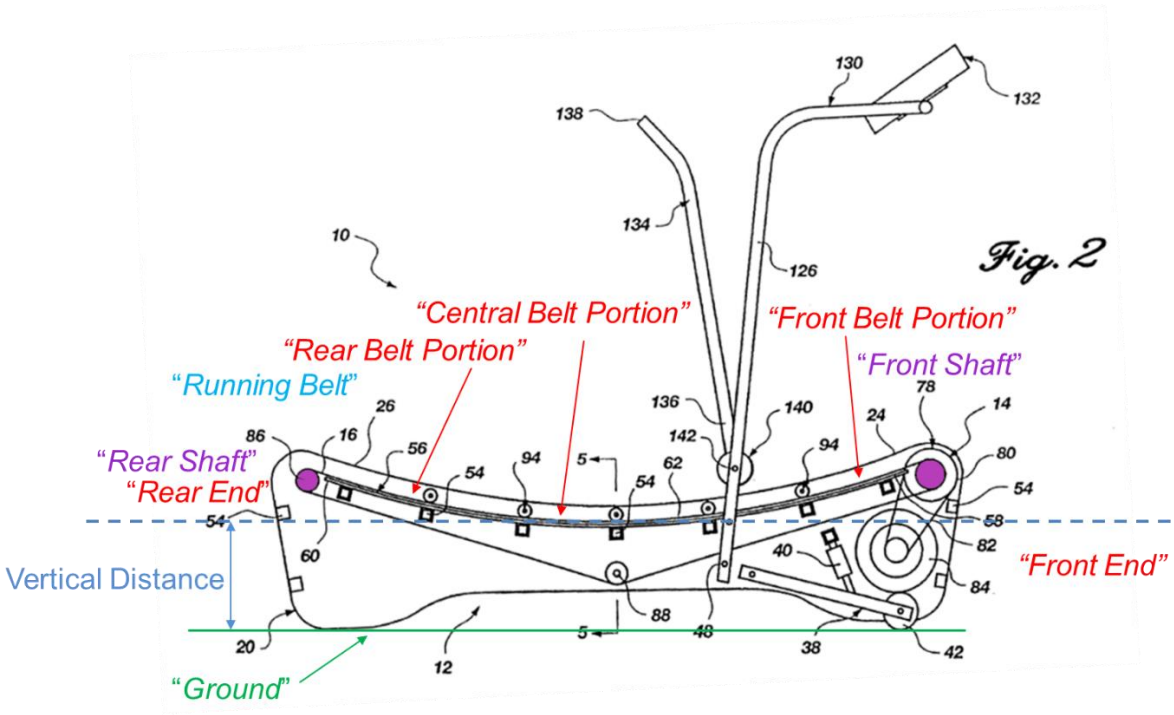
392. Limitation [11.5] is identical to limitation [1.5]. Therefore, I refer back to my analysis of this limitation of claim 1 to establish that it is met by the combination of Socwell and Magid. (*See* ¶¶ 344-354.)

… ***[11.6][a] a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail,***

393. As illustrated in the above table, limitation [11.6][a] includes the same limitations as limitation [1.6] of claim 1, however the limitations are rearranged and use slightly different language. These differences are not substantial; therefore I refer back to my analysis of limitation [1.6] of claim 1 to establish that limitation [11.6] [a] is met by the combination of Socwell and Magid. (*See* ¶¶ 355-358.)

> … ***[11.6][b] wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and***

394. As illustrated in the image below, Socwell discloses in Figure 2 the belt 16 includes a "*front belt portion"* that is proximate to the front end of the treadmill 10 ("*front end*"), a "*rear belt portion*" that is proximate to the rear end of the treadmill 10 ("*rear end*"), and a "*central belt portion*" that is between the front and rear ends. The "*central belt portion*" is positioned vertically closer to a ground surface supporting the frame 12 ("*frame*") than the "*front and rear belt portions*," as depicted by the vertical distance annotation in blue, such that the belt 16 follows a "*curved running surface*."



Socwell, Ex. 1011, Fig. 2 (Annotated)

395. Thus, Socwell discloses "*wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface*."

… ***[11.7] a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

396. As illustrated in the above table, limitation [11.7] includes the same limitations as limitation [1.7] of claim 1, however the limitations are rearranged and use slightly different language. These differences are not substantial; therefore I refer back to my analysis of limitation [1.7] of claim 1 to establish that limitation [11.7] is met by the combination of Socwell and Magid. (*See* ¶¶ 359-369.)

397. Thus, the combination of Socwell and Magid teach "*a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction*."

4. Dependent Claims 14, 15, and 18

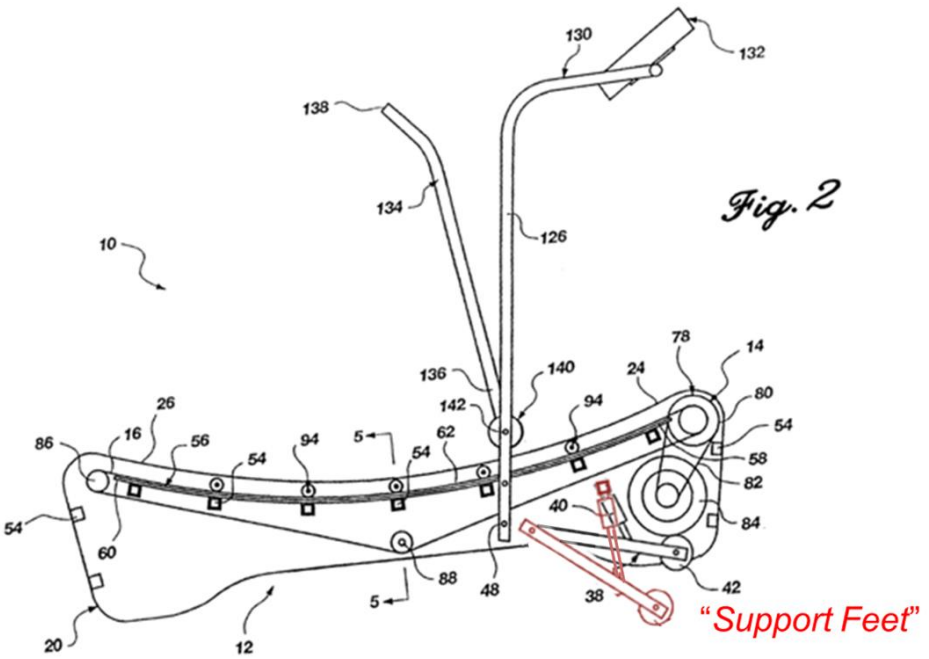
398. Claims 14, 15, and 18 depend from claim 1 which I understand means that claims 14, 15, and 18 require all of the limitations of claim 1 in addition to their additional limitations.

399. The combination of Socwell and Magid disclose all of the limitations

of claim 1 as described above. (*See* ¶¶ 335-369.)

> … ***[14.] The manually powered treadmill of claim 11, further comprising support feet coupled to the frame, wherein the support feet are vertically adjustable to adjust an incline of the manually powered treadmill relative to the ground surface.***

400. Socwell discloses foot roller assemblies 38 for adjusting the inclination of the belt 16. (Socwell, Ex. 1011, 9:29-40.) Each foot roller assembly 38 has an elongate support member (unlabeled) having an upper end pivotally attached to the frame 12 and a lower end supporting a wheel 42 ("*support feet*").



Socwell, Ex. 1011, Fig. 2 (Annotated)

> In one presently preferred embodiment of the present invention, the **first side 20 of the support frame 12 may comprise at least one conventional foot roller assembly 38 mountably** disposed in relation thereto, as best shown in FIG. 2. **The foot roller assembly 38 preferably includes one or more wheels 42** rotatably connected thereto in such a manner so as to provide a means for readily moving the curved deck treadmill 10. **The foot roller assembly 38 may further comprise a force absorbing member 40** disposed in relation thereto which provides a means for absorbing any forces or shocks sustained while moving the present invention from one location to another.

(Socwell, Ex. 1011, 9:29-40.)

401. A first one of the foot roller assemblies 38 is attached to the first side 20 of the frame 12. *Id*. Another foot roller assembly is attached to the second side 22 of the frame 12.

> As mentioned **above, the second opposing side 22 of the support frame 12 is correspondingly similar in dimensional structure and configuration to that of the first side 20**. Accordingly, the **components disposed on or in relation to the first side 20 of the support frame 12 are preferably disposed on or in relation to the second side 22.** The incorporation of substantially comparable sides 20, 22 of the support frame 12 comprises one presently preferred embodiment . . . Accordingly, the utilization of a support frame having correspondingly similar sides is thus by way of illustration only and not by way of limitation.

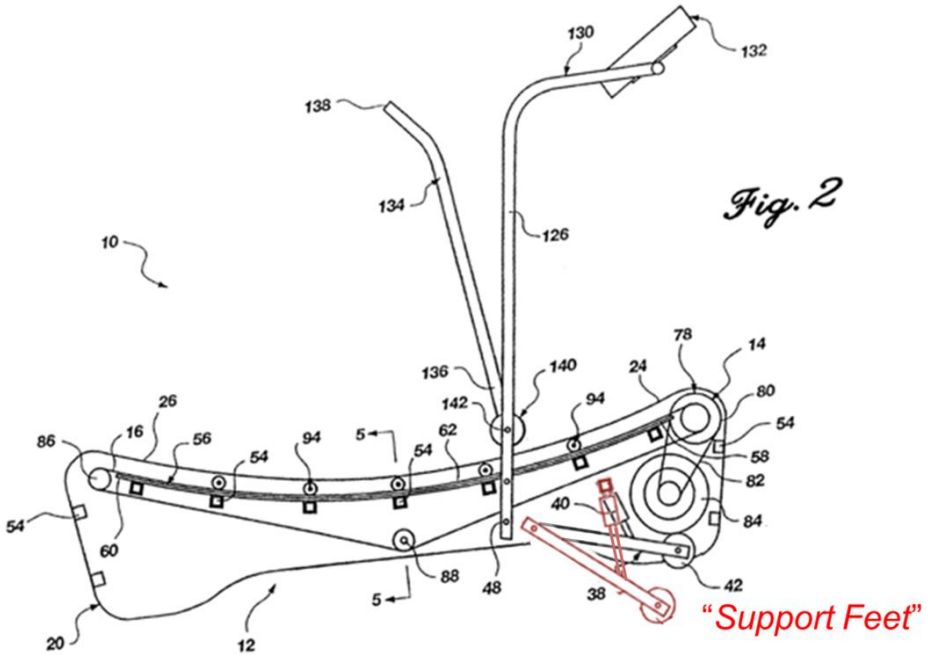
(Socwell, Ex. 1011, 9:57-10:4.)

402. Each foot roller assembly 38 has a wheel 42 resting on the ground surface and supporting the front end of the treadmill 10; thus, they are support feet. Each support foot is pivotally connected to their respective frame side 20, 22 to vertically adjust the support foot and adjust the incline of the treadmill relative 10 to the ground surface.

> **The force absorbing member 40 may also include a means for stabilizing the curved deck treadmill 10 at an elevated position so as to provide a means for inclining the front end 24 of the support frame 12 for increasing user workout**. In this regard, the force absorbing member 40 may comprise a gas or oil filled shock or, in the alternative, an electric gear motor having a locking shaft **which elevates the front end 24 of the support frame 12**.

(Socwell, Ex. 1011, 9:44-51.)

403. The incline of the belt 16 is increased by pivoting the wheel 42 away from the frame. The incline of the belt 16 is increased by pivoting the wheel 42 towards the frame.



Socwell, Ex. 1011, Fig. 2 (Annotated)

404. Thus, Socwell discloses, "*support feet* [foot roller assembly 38] *coupled to the frame, wherein the support feet are vertically adjustable to adjust an incline of the manually powered treadmill relative to the ground surface.*"

> … ***[15] The manually powered treadmill of claim 11, further comprising at least one front pulley coupled to the front shaft and at least one rear pulley coupled to the rear shaft, wherein a radius of the at least one front pulley is greater than a radius of the at least one rear pulley.***

405. Socwell discloses a roller assembly 14 that is supported between the

right side frame 20 and the left side frame 22 that includes a first roller 78 ("*front shaft*") and a second roller 86 ("*rear shaft*").

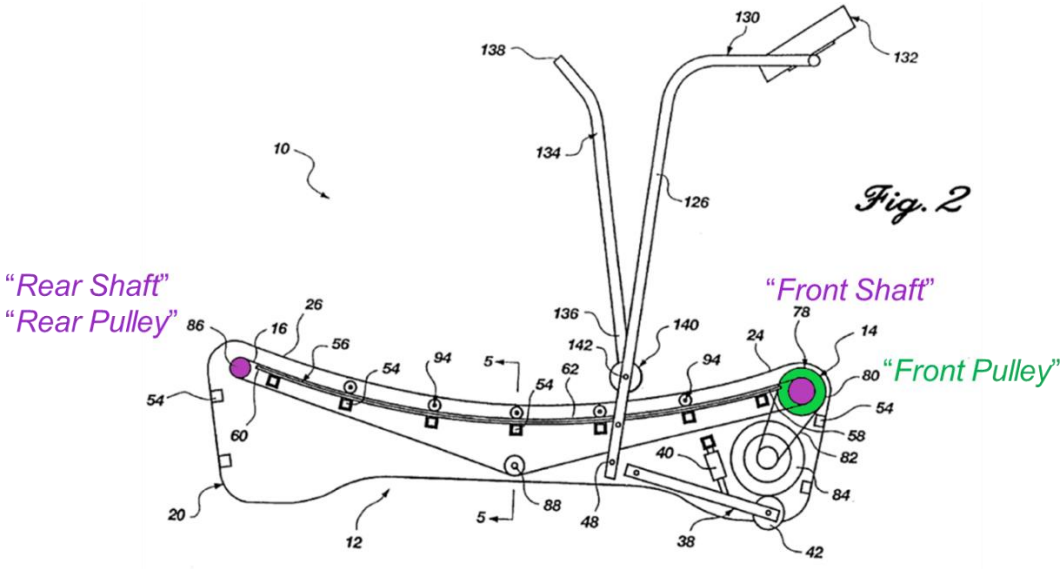
> The first roller 78 may be rotatably disposed contiguous the first end 58 of the deck 56 between the first side 20 and the second opposing side 22 of the support frame 12. Correspondingly similar in construction and design, a second roller 86 is preferably disposed contiguous the second end 60 of the deck 56 between the first and second sides 20, 22 of the support frame 12.

(Socwell, Ex.1011, 5:35-41.)

406. Socwell discloses a pulley 80 that is mounted to the first roller 78 ("*first shaft*")

> In preferred arrangement, a pulley 80 is disposably mounted to the first roller 78 at the first end 24 of the support frame 12.

(Socwell, Ex.1011, 11:38-41.)



Ex.1011, Fig.2 (Annotated)

407. As illustrated above, the radius of the pulley 80 ("*front pulley*") is greater than a radius of the second roller 86 ("*rear pulley*").

408. Thus, Socwell discloses *at least one front pulley coupled to the front shaft and at least one rear pulley coupled to the rear shaft, wherein a radius of the at least one front pulley is greater than a radius of the at least one rear pulley*.

> … ***[18] The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

409. Claim 18 is largely duplicative of claim 4. To illustrate, the table below shows a side-by-side comparison of claims 4 and 18. Claim 18 is "marked up" to show the minor differences.

'580 Patent Claim 4	**'580 Patent Claim 18**
[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.	[18.] The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.

410. Because the additional limitations of claim 18 are identical to the

additional limitations of claim 4, I refer back to my analysis of these limitations of claim 4 to establish that they are met by the combination of Socwell and Magid. (*See* ¶¶ 376-378.)

5. Independent Claim 25

411. Although a method claim, independent claim 25 is largely duplicative of independent claim 1. To illustrate, the table below shows a side-by-side comparison of claim 1 and claim 25. Claim 25 is "marked up" to show the minor differences.

'580 Patent Claim 1	'580 Patent Claim 25
[1.0] A manually powered treadmill comprising:	**[25.0]** A method, comprising: providing a manually powered treadmill,
[1.1] a frame having a front end and a rear end positioned opposite the front end;	**[25.1]** the manually powered treadmill having a frame with a front end and rear end;
[1.2] a front shaft rotatably coupled to the frame at the front end;	

‘580 Patent Claim 1	‘580 Patent Claim 25
[1.3] a rear shaft rotatably coupled to the frame at the rear end;	
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame; **[1.5]** a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;	**[25.2] [a]** providing a first bearing rail and a second bearing rail, the first and second bearing rails each comprising a plurality of bearings and **[b]** extending longitudinally on the frame, **[c]** wherein the first and second bearing rails define a curved top profile;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and	**[25.3]** disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface corresponding to the curved top profile of the first and second bearing rails;

‘580 Patent Claim 1	‘580 Patent Claim 25
[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft, **[b]** wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.	**[25.5]** substantially preventing movement of the running belt in a second direction opposite the first direction. **[25.4]** permitting movement of the running belt in a first direction; and

412. Despite being a method claim, limitations [25.0]-[25.2][a] and [25.3] are structural elements identical to the structural elements recited in apparatus claim 1. The only modification to claim 25 to differentiate it from claim 1 was to add “*running belt*” limitations [25.2][b] “*extending longitudinally on the frame, [c] wherein the first and second bearing rails define a curved top profile*.”

… ***[25.0] A method, comprising:***

… ***[25.1] providing a manually powered treadmill, the manually powered treadmill having a frame with a front end and rear end;***

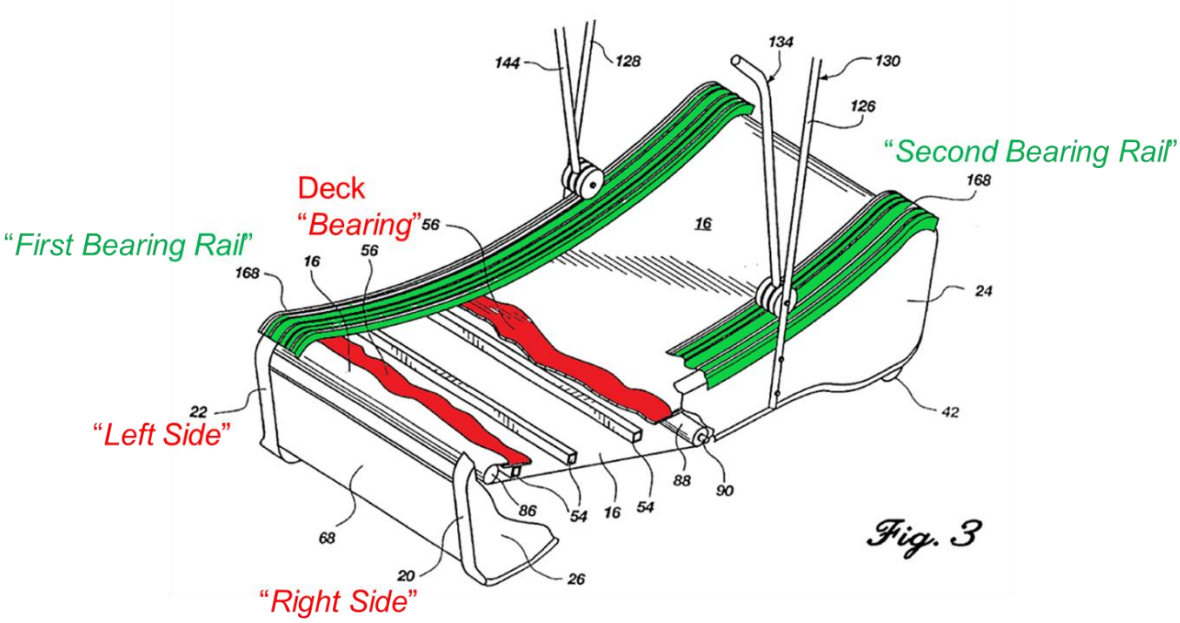
413. Claim limitations [25.0]-[25.1] are substantially similar to limitation [1.0]. Therefore, I refer back to my analysis of these limitations of claim 1 to establish that they are met by the combination of Socwell and Magid. (*See* ¶¶ 335-336.)

… ***[25.2][a]providing a first bearing rail and a second bearing rail, the first and second bearing rails each comprising a plurality of bearings and***

414. Claim limitation [25.2][a] is substantially similar to limitations [1.4]-[1.5]. Therefore, I refer back to my analysis of these limitations of claim 1 to establish that they are met by the combination of Socwell and Magid. (*See* ¶¶ 344-354.)

… ***[25.2] [b] extending longitudinally on the frame,***

415. Socwell illustrates both cover members 168, *i.e*., the "*first bearing rail*" and the "*second bearing rail,*" extending along a length of the frame 12 in Figure 3, i.e. extending longitudinally.

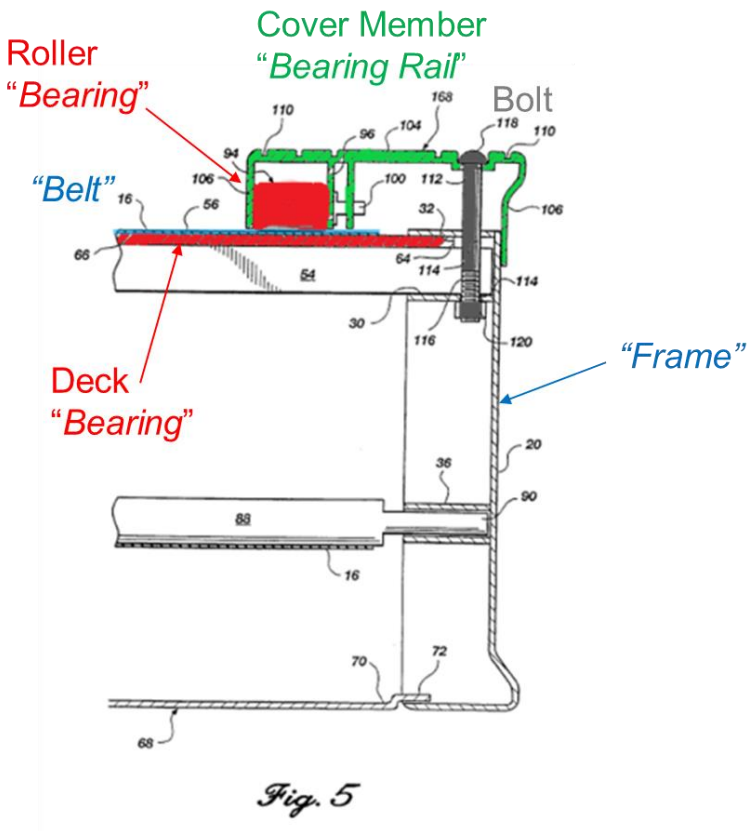


Socwell, Ex. 1011, Fig. 3 (Annotated)

… ***[25.2] [c] wherein the first and second bearing rails define a curved top profile;***

416. Socwell discloses a belt 16 that is supported by the curved deck 56 and retained by the rollers 98 ("*plurality of bearings*"). (Socwell, Ex. 1011, 10:17-26; Fig. 5.) This arrangement provides a structurally arcuate shape for the belt 16 to follow a curved running surface: The "endless belt may be rotatably mounted in relation to the roller assembly and operatively disposed in relation to the deck, whereby providing a structurally supported arcuate shaped, movable surface on which a user may exercise." (Socwell, Ex. 1011, 4:14-19.)

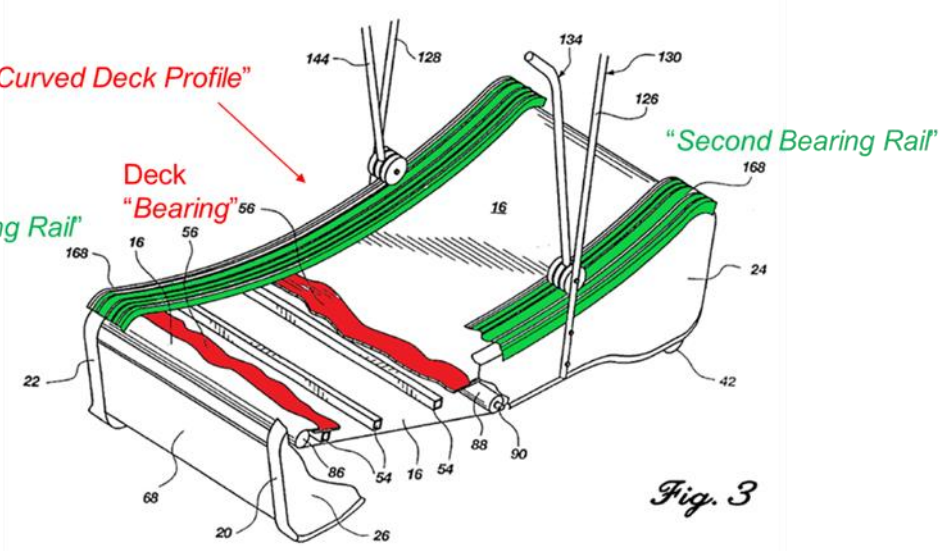
417. The cover members 168 ("*bearing rails*") support the deck 56 and rollers 98 ("*plurality of bearings*"). (Socwell, Ex. 1011, 11:15-23.)



Socwell, Ex. 1011, Fig. 5 (Annotated)

418. The arrangement of the deck 56 and rollers 98, which are supported by the cover members 168 ("*bearing rails*") defines the curved running surface.

419. Moreover, the cover members 168, as shown below, define a curved top profile in Figure 1.



Socwell, Ex. 1011, Fig. 1 (Annotated)

420. Thus, Socwell and Magid teach "*[a] providing a first bearing rail and a second bearing rail, the first and second bearing rails each comprising a plurality of bearings and [b] extending longitudinally on the frame, [c] wherein the first and second bearing rails define a curved top profile*."

> … ***[25.3] disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface corresponding to the curved top profile of the first and second bearing rails;***

421. Claim limitation [25.3] is substantially similar to limitation [1.6] of claim 1. Regarding the limitations "*disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface*," I refer back to my analysis of these limitations of claim [1.6] to establish that they are met by Socwell. (*See* ¶¶ 355-

358.)

422. Claim [25.3] further requires that the "*top curved running surface correspond[s] to the curved top profile of the first and second bearing rails*." As explained for claim [25.2][c], Socwell discloses that the belt 16 ("*running belt*") is placed about the curved deck 56 and retained by the rollers 98 ("*plurality of bearings*") and follows their curved contour; and the deck 56 and rollers 98 ("*bearings*") are supported by the cover members 168 ("*bearing rails*") shown to have the same curvature. (Socwell, Ex. 1011, 10:17-26, 4:14-19, 11:15-23, Figs. 3 and 5.)

423. Thus, the combination of Socwell and Magid teaches "*disposing a running belt on the plurality of bearings of the first bearing rail and the second bearing rail such that the running belt follows a top curved running surface corresponding to the curved top profile of the first and second bearing rails*."

> … ***[25.4] permitting movement of the running belt in a first direction; and***
>
> … ***[25.5] substantially preventing movement of the running belt in a second direction opposite the first direction.***

424. Because limitations [25.4]-[25.5] are nearly identical to limitations [1.7][b], I refer back to my analysis of these limitations of claim 1 to establish that they are met by the combination of Socwell and Magid. (*See* ¶¶ 365-369.)

6. Rationale for combining Socwell and Magid

425. It would have been obvious to a POSA to combine the manual treadmill topology with a curved running surface disclosed in Socwell with the known technique of a one-way clutch to prevent treadmill belt motion in a forward direction as disclosed in Magid.

426. Socwell and Magid are from the same field – Exercise Equipment, more specifically treadmills for home exercise use. (Socwell, Ex. 1011, 1:10-12; Magid, Ex. 1012. 1:53-56; 3:23-27.) Both Socwell and Magid disclose treadmills with a running belt that is supported by end rollers and a central deck. (Socwell, Ex. 1011, 5:33-44; 8:7-27, Fig. 3; Magid, Ex. 1012, 4:64-5:18, Fig. 2.) Socwell discloses a curved deck 56 and rollers 98 that cooperate to place the belt 16 in a curved shape. (Socwell, Ex. 1011, 10:5-31, Fig. 2.)

427. It has long been recognized that users may be injured by falling off of a treadmill while mounting or dismounting it, or while using it. This may be due to the treadmill belt moving in an unexpected direction or in such a way that the user cannot regain their equilibrium. It could also be due to the incline of the surface causing the position of user to drift rearwards, and off, over time. (*See* ¶¶ 71-72.)

> A person exercising on this type of treadmill is likely to lose his balance because the frictionless surface offers no resistance to the movement of his feet, and he is therefore unable to obtain the leverage necessary for proper balance. Also, the user is likely to run off the

> lower end of the treadmill because the faster he runs the faster the belt accelerates and moves beneath his feet, carrying him to the rear.

(Chickering, Ex. 1013, 1:30-37.)

> In particular, if the rollers supportably disposed in relation to the endless belt are so easily moveable, the user may potentially lose his equilibrium or balance and fall from the exercise treadmill resulting in possible injuries.

(Socwell, Ex. 1011, 1:32-36.)

> Another meaningful disadvantage of exercise treadmills of the prior art is the inherent danger associated with users tending to fall off the back end of the treadmill and become injured.

(Socwell, Ex. 1011, 2:45-48.)

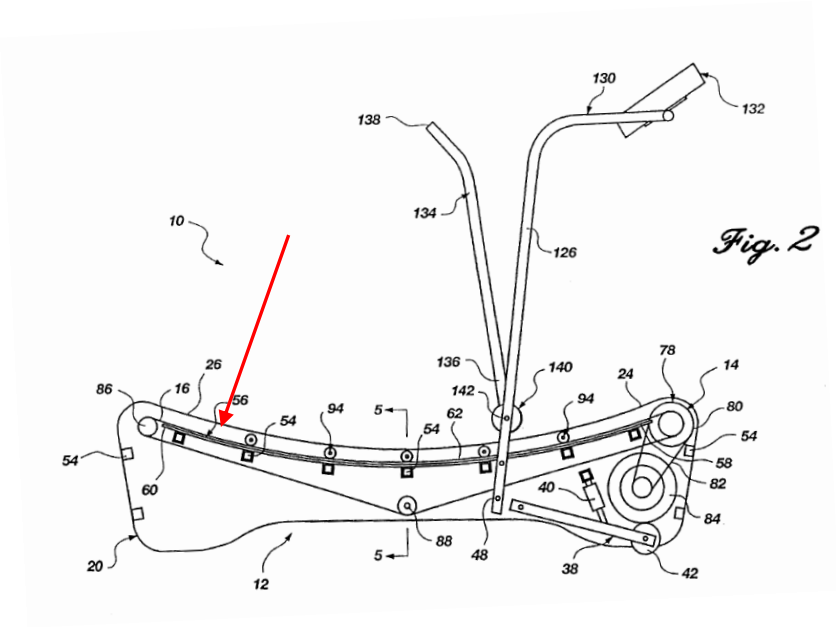
428. Several professional organizations have produced standards to provide guidance to manufacturers regarding both exercise equipment safety in general and other standards specifically for treadmill safety. *See* ASTM Standard, Ex. 1019; ISO Standard, Ex. 1020; and ACCC Product Safety Supplier Guide, Ex. 1007. These standards establish requirements for foot rails and handrails on treadmills to address user stability. (ASTM Standard, Ex. 1019, 3-4; ISO Standard, Ex. 1020, 8.)

429. Socwell recognizes that it is difficult to stabilize the running belt in manual treadmills. According to Socwell, this is due to the difficulty in balancing the frictional and inertial qualities of belt supporting devices. (Socwell, Ex. 1011, 1:30-56.) Socwell describes motorization as the prior-art solution to the problem of

balancing these qualities (Socwell, Ex. 1011, 1:57-67.)

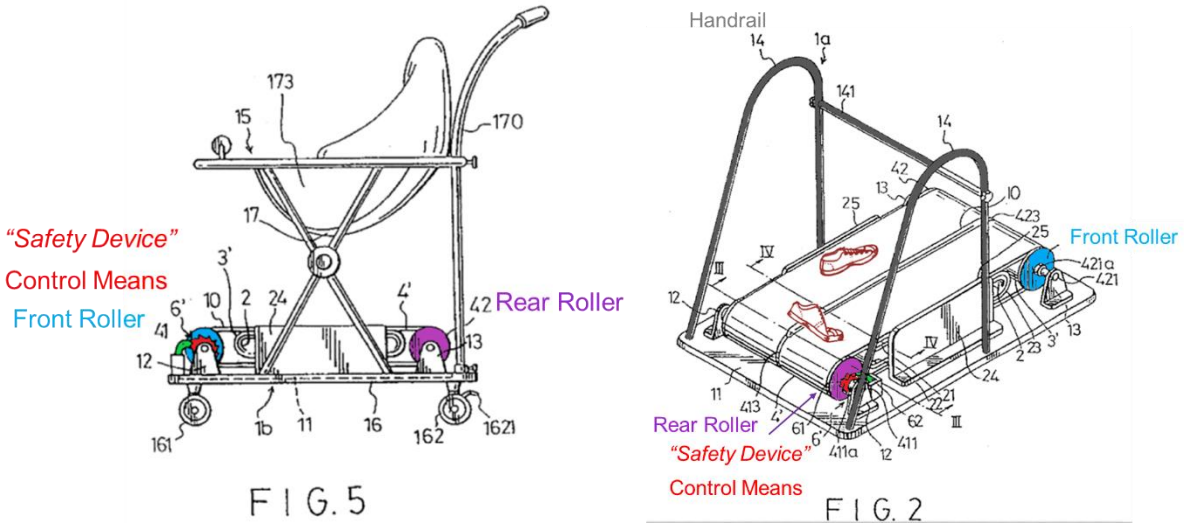
430. Rather than relying on a motor, Socwell discloses to calibrate the rollers and deck to provide optimal frictional resistance of the belt to ensure safety while providing proper resistance for to exercising. (Socwell, Ex. 1011, 11:57-59.) Socwell explains that the curved running surface prevents a user from falling off the back. (Socwell, Ex. 1011, 3:40-45.)

431. Socwell's curved running surface does not address the safety issue of the running belt moving in a forward direction when a user steps onto the treadmill. For example, with a manual curved running surface, such as that disclosed in Socwell, such forward motion is likely to occur if a user were to step onto the rearward end of the running surface (indicated by the red arrow), causing the foot to unexpectedly move towards the lowest portion of the treadmill. In the condition where the user adjusts the frame to a generally horizontal position using the front elevating mechanism, as depicted in the image below, this unexpected motion would be exacerbated and could result in a fall.



Socwell, Ex. 1011, Fig. 2. (Annotated)

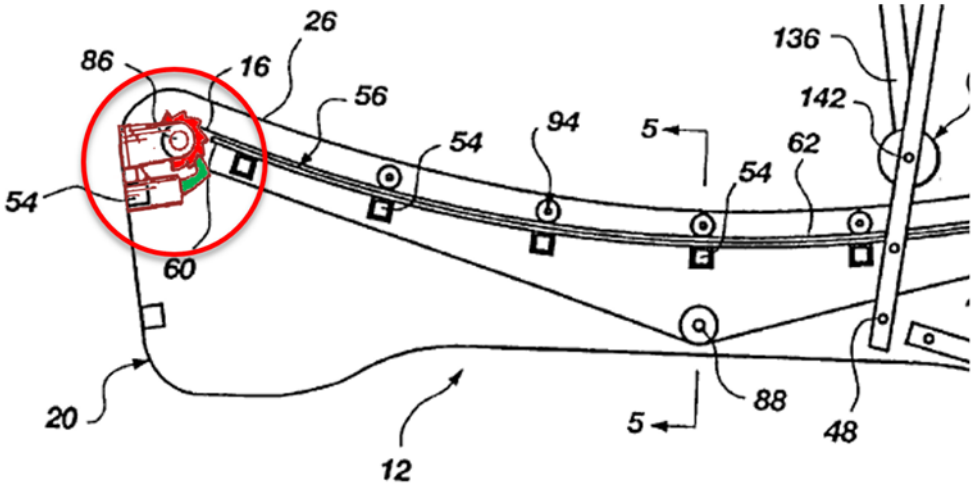
432. Magid discloses a one-way clutch (unidirectional control means 6, 6') that is coupled to a front shaft (Fig. 5) or a rear shaft (Fig. 2) to permit only unidirectional movement of the belt. (Magid, Ex. 1012, Fig. 5, 4:46-60.)



Magid, Ex. 1012, Figs. 5 and 2 (Annotated)

433. It would have been obvious to a POSA to combine Socwell's treadmill with Magid's control means to permit only unidirectional movement of the running belt to reduce the risk of a user stepping onto the running belt of the treadmill and losing their balance when the belt moves in the forward direction.

434. Accordingly, a POSA would have been motivated to modify Socwell to include Magid's control means mounted to the front roller or the rear roller. For example, the below image shows Magid's control means attached to the rear shaft.



Socwell, Ex. 1011, Fig. 2 (Cropped and Annotated)

435. The modification would include mounting one or more one-way ratchet clutches to the front roller or the rear roller. The rachet gear would be mounted coaxially with the roller 86 (or roller 78) and the pawl is rotationally attached to the frame.

436. This modification would have been a simple combination of known elements in the prior art: Socwell's manual treadmill with a curved running surface and Magid's one-way ratchet clutch. The pawl is arranged forward of the ratchet gear and biased to engage the gear teeth. The profile of the ratchet gear teeth is swept forward to yield predictable results: allowing the ratchet gear to overrun counter-clockwise with rearward motion of the belt and providing a backstop clockwise to prevent forward motion of the belt. (*See* ¶¶ 82-83.)

437. The one-way clutch of Magid would function the same when added to Socwell and provide the predictable result in Socwell's running belt of only rotating in the exercise direction thus providing the same benefit described in Magid. (Magid, Ex. 1012, 4:46-49.) The modification would also be the use of a known technique—using a one-way clutch in a backstopping mode of operation—to improve similar devices, i.e., treadmills and conveyor belts, in the same way, i.e., to provide unidirectional belt motion. (*See* ¶¶ 82-83, 89-90; Emerson, Ex. 1018, 8-9, 52-53.)

E. Ground 5 – The Combination of Socwell, Magid, and Sclater Teaches all the Limitations of Claims 6-9 and 12

1. Dependent Claims 6-9

438. Claims 6-9 depend from claim 1 which I understand means that claims 6-9 require all of the limitations of claim 1 in addition to their additional limitations.

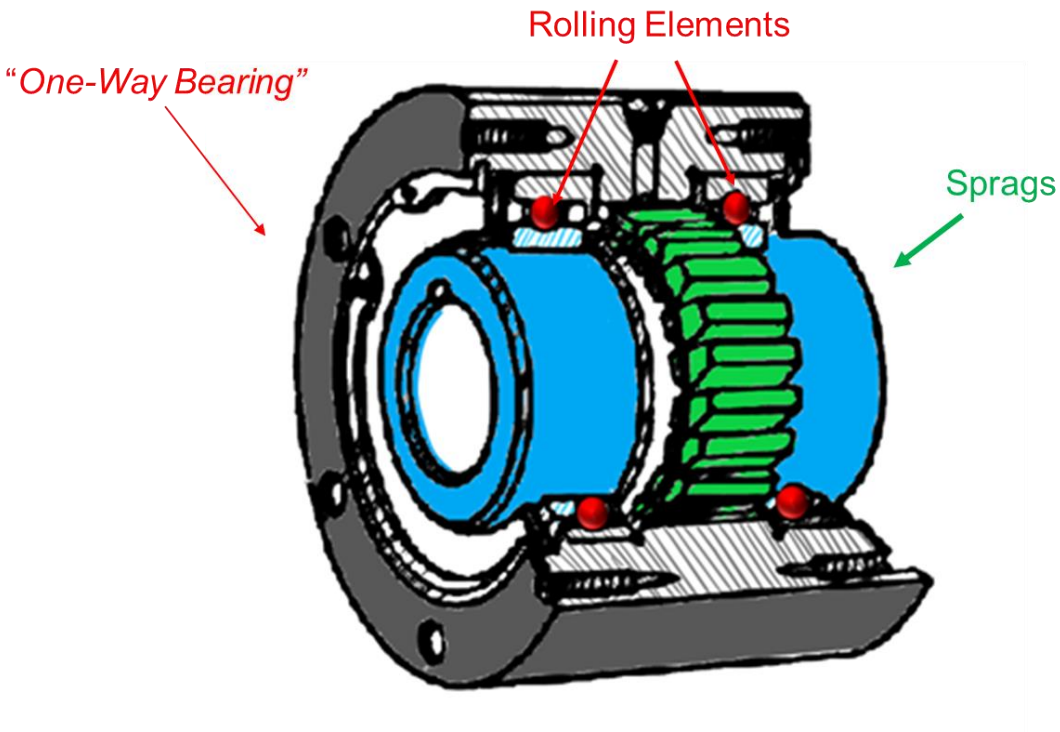
439. The combination of Socwell and Magid disclose all of the limitations of claim 1 as described above. (*See* ¶¶ 335-369.)

… ***[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.***

440. As explained for claim limitation [1.7][a], Magid discloses that each control means 6, 6' includes a ratchet gear 61 and a pawl 62. (Magid, Ex. 1012, 4:46-60, Figs. 2, 5.)

441. As explained in the state-of-the-art section, a ratchet clutch typically includes a ratchet and pawl. (*See* ¶¶ 82-83.) This type of clutch is not typically referred to as a one-way bearing.

442. Sclater discloses a bearing assembly that includes sprags to provide one-way functionality. "Sprags combined with cylindrical rollers in a bearing assembly can provide a simple, low-cost method for meeting the torque and bearing requirements of most machine applications." (Sclater, Ex. 1017 at 312.) Sclater further discloses that this sprag-type bearing assembly functions as a one-way bearing by providing "one-direction only torque transmission in an overrunning clutch." *Id*.



Sclater, Ex. 1017 at 318 (Annotated)

443. Sclater further discloses that:

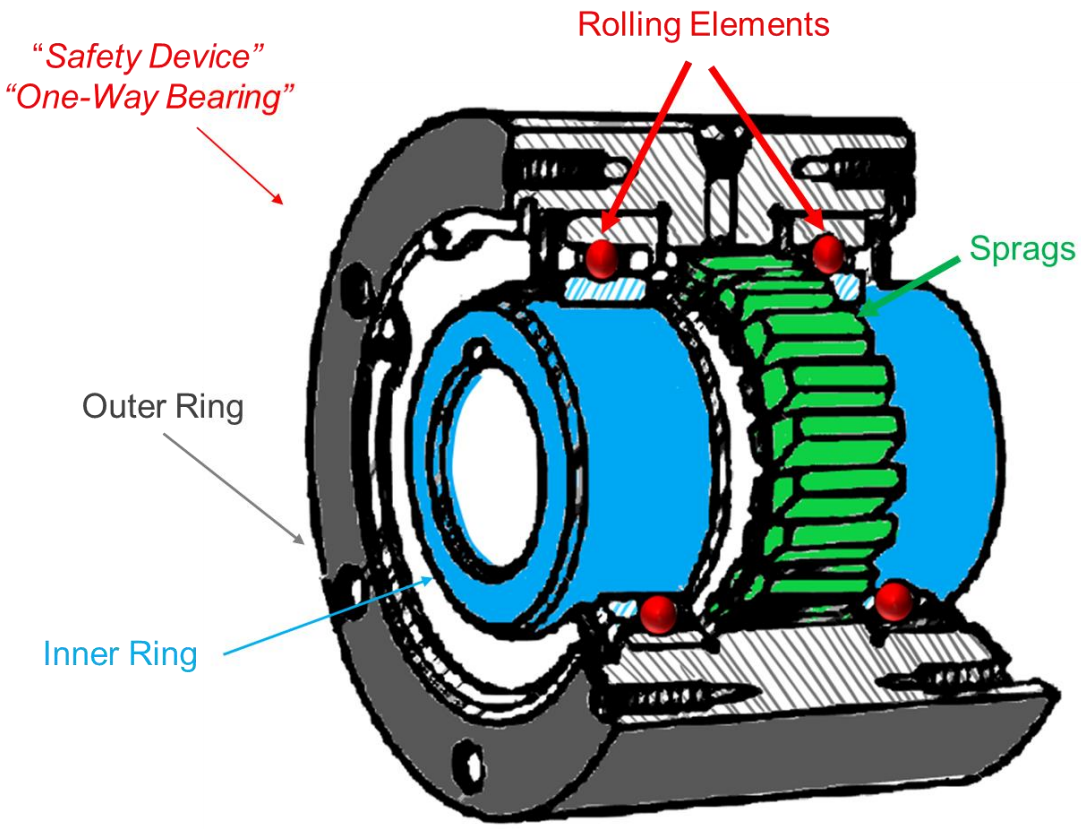
> Precision sprags act as wedges and are made of hardened alloy steel. In the formsprag clutch, torque is transmitted from one race to another by the wedging action of sprags between the races in one direction; in the other direction the clutch freewheels.

(Sclater, Ex. 1017 at 318.)

444. Thus, the combination of Socwell, Magid, and Sclater teach "*wherein the safety device includes a one-way bearing*."

… ***[7.] [a] The manually powered treadmill of claim 6, wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring,***

445. As explained for claim 6, Sclater discloses a sprag-type one-way bearing assembly. As illustrated in the image below, Sclater further discloses that the sprag-type one-way bearing assembly includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and the outer ring.



Sclater, Ex. 1017 at 318 (Annotated)

446. Thus, the combination of Socwell, Magid, and Sclater teach, "*wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring*."

> … ***[7.] [b] wherein the plurality of sprags are asymmetric shaped to substantially prevent rotation of the inner ring in the first rotational direction while permitting rotation of the inner ring in the second rotational direction.***

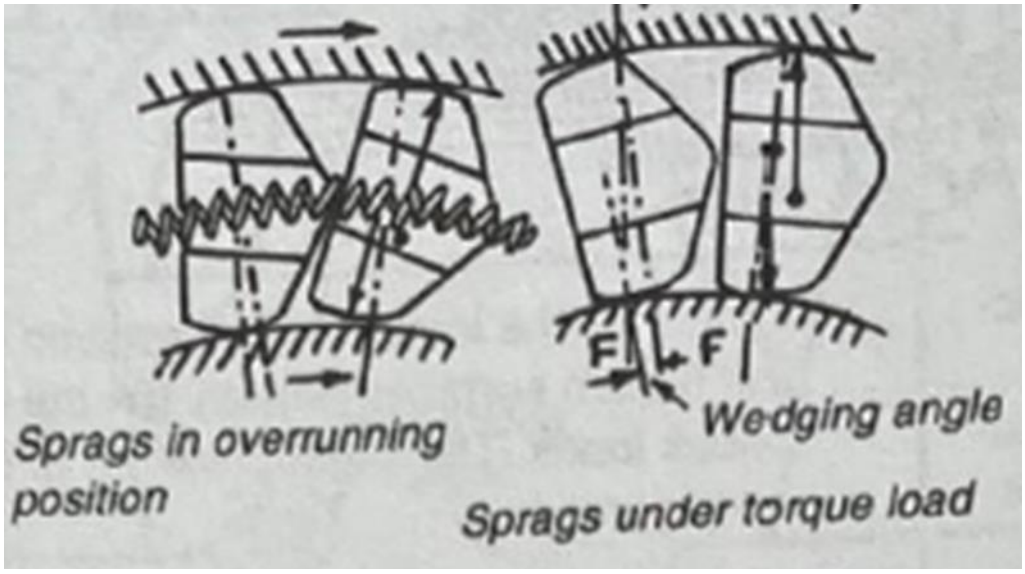
447. Sclater discloses a *"one-way bearing"* having concentric inner and outer races (or rings) and an array of sprags radially disposed therebetween. Each sprag has a "sprag profile, which is composed of two nonconcentric curves of different radius." (Sclater, Ex. 1017 at 312.) This asymmetric sprag profile provides a locking ramp:

> Races are concentric; a locking ramp is provided by the sprag profile, which is composed of two nonconcentric curves of different radius. A spring-loaded pin holds the sprag in the locked position until the torque is applied in the running direction. A stock roller bearing cannot be converted because the hard-steel races of the bearing are too brittle to handle the locking impact of the sprag. The sprags and rollers can be mixed to give any desired torque value.

(Sclater, Ex. 1017 at 312.)

448. As illustrated in the figure below on the left, Sclater discloses that when the inner ring rotates in a first direction relative to the outer ring, the sprags

move out of the locked position such that an overrun condition occurs. However, as illustrated below right, when the inner ring rotates in the opposite direction relative to the outer ring, the sprag profile causes the sprags to wedge into a locked position preventing relative rotation between the inner and outer rings.



Sclater, Ex. 1017 at 318

449. Thus, the combination of Socwell, Magid, and Sclater teach "*wherein the plurality of sprags are asymmetric shaped to substantially prevent rotation of the inner ring in the first rotational direction while permitting rotation of the inner ring in the second rotational direction.*"

> … ***[8.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the rear shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the rear shaft in the first rotational direction while permitting rotation of the rear shaft in the second rotational direction.***

450. As explained for claim [1.7], Magid discloses, with reference to Figure 2, that the control means 6, 6' are attached to the rear roller ("rear shaft"). (Magid, Ex. 1012, 4:46-60.)

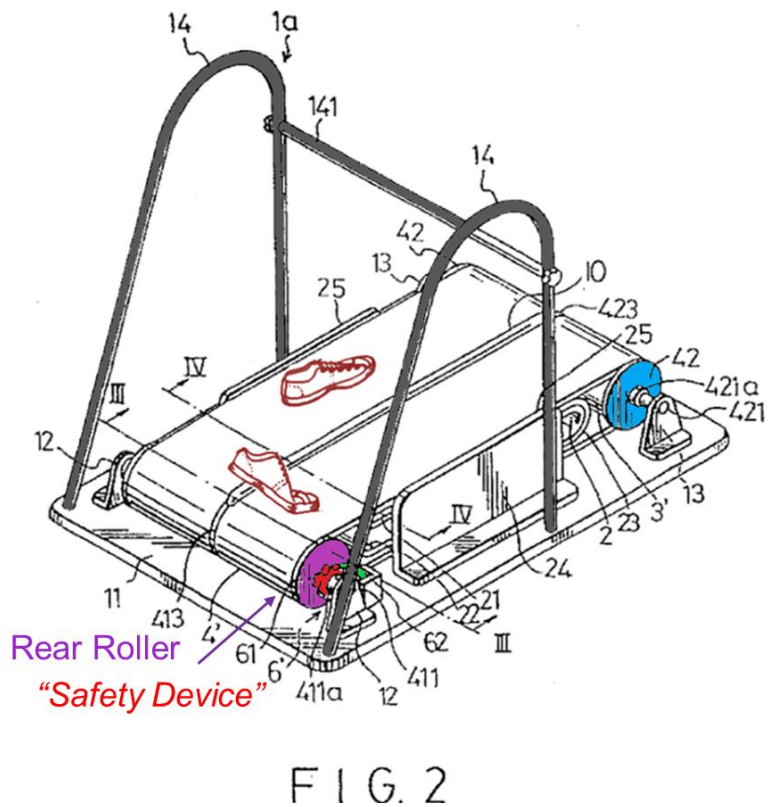
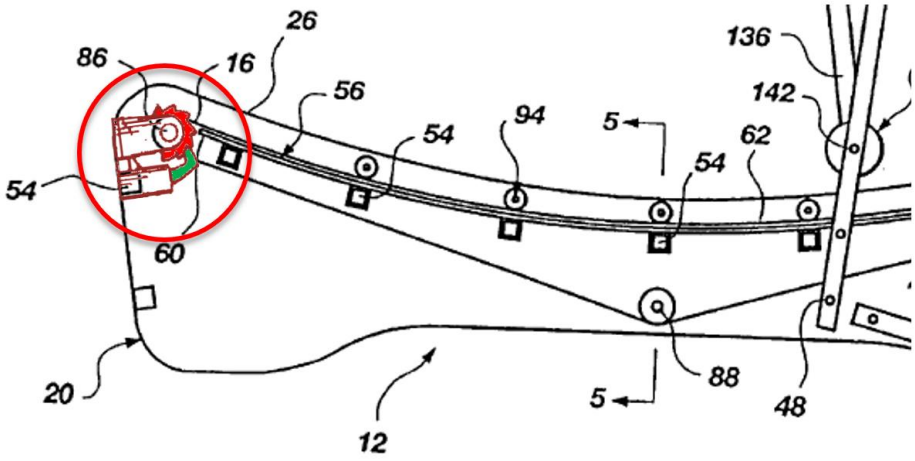


FIG. 2

Magid, Ex. 1012, Fig. 2 (Annotated)

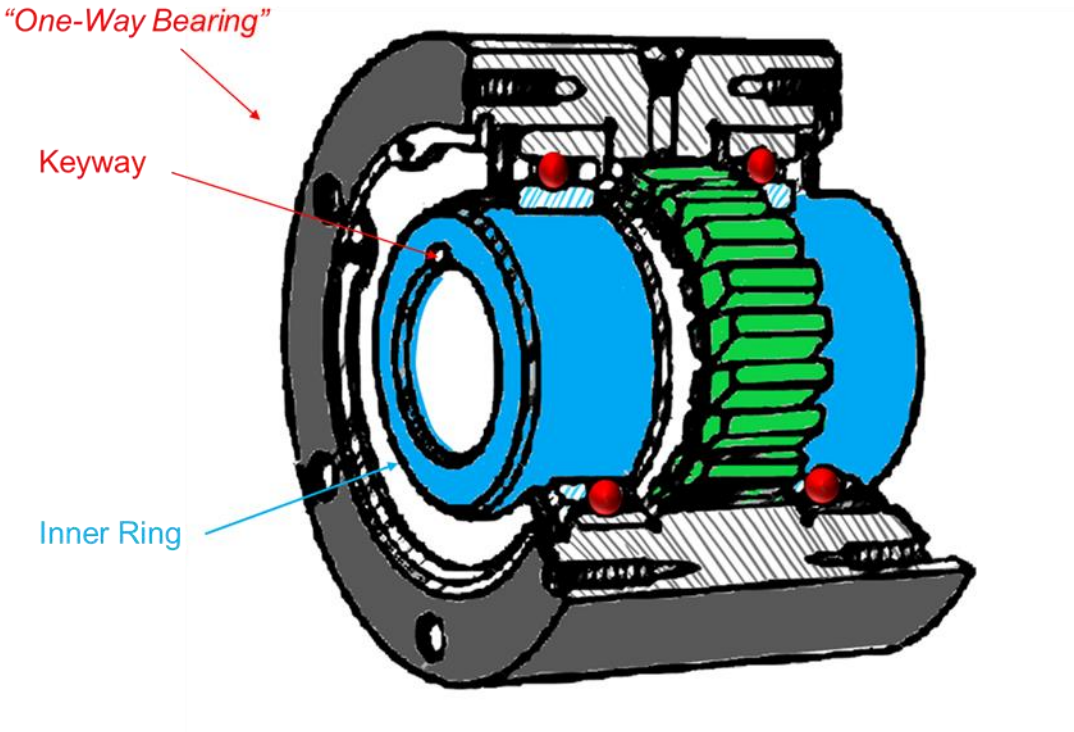
451. Socwell combined with Magid's control means 6, 6' is illustrated

below.



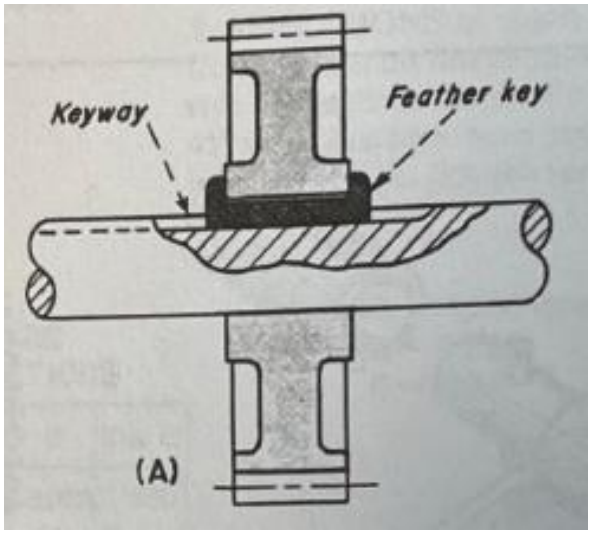
Socwell, Ex. 1011, Fig. 2 (Cropped and Annotated)

452. Sclater discloses a keyway formed into the inner ring of the one-way bearing. The keyway is recessed into the inner circumferential surface of the inner ring adjacent to the shaft.



Sclater, Ex. 1017 at 318 (Annotated)

453. Key-keyway interfaces are a traditional method of transmitting torque from one rotary element to another. Key-keyway interfaces are old, commonly used, and well understood in the power transmission world. Nevertheless, Sclater discloses fourteen different ways to fasten hubs to shafts, including using a key-keyway interface. (Sclater, Ex. 1017 at 420-421.) For example, Sclater discloses a key that is placed in a keyway in the inner diameter of a gear that also engages a keyway that is formed into the corresponding shaft:



Sclater, Ex. 1017, 420

454. A POSA would have understood that the keyway formed in the inner ring of the bearing assembly is sized to receive a key, i.e., such that the key "*is fixed relative to the inner ring and a keyway formed in the front shaft*."

455. Thus, the combination of Magid and Sclater discloses "*a key that is fixed relative to the inner ring and a keyway formed in the rear shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the rear shaft in the first rotational direction while permitting rotation of the rear shaft in the second rotational direction.*"

> … ***[9.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the front shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the front shaft in the first rotational direction while permitting rotation of the front shaft in the second rotational direction.***

456. As explained for claim [1.7], Magid discloses, with reference to Figure 5, that the control means 6, 6' are attached to the front roller ("*front shaft*"). (Magid, Ex. 1012, 4:46-60.)

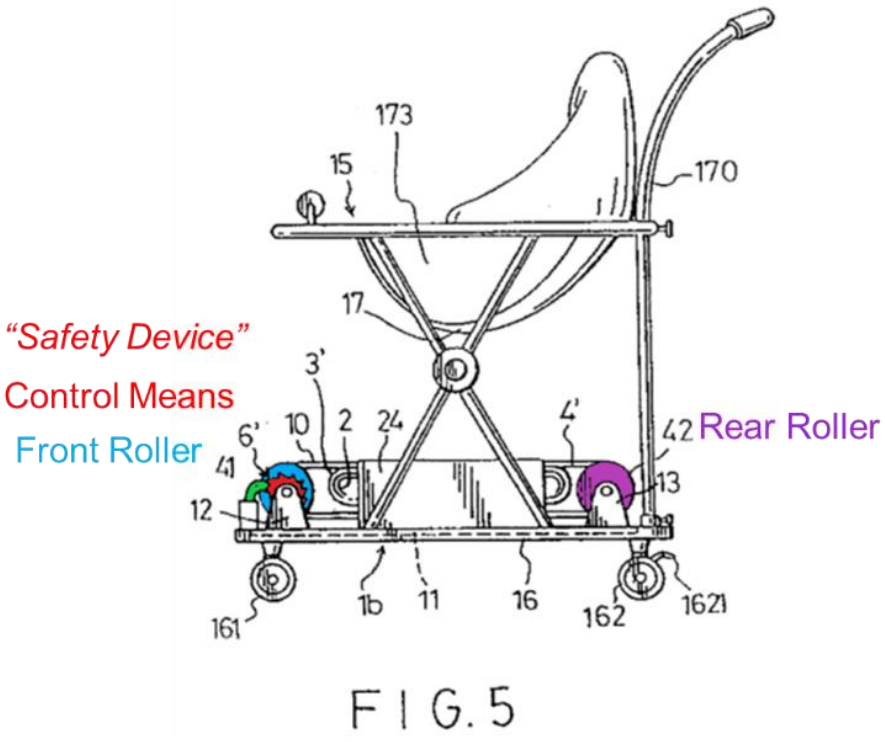
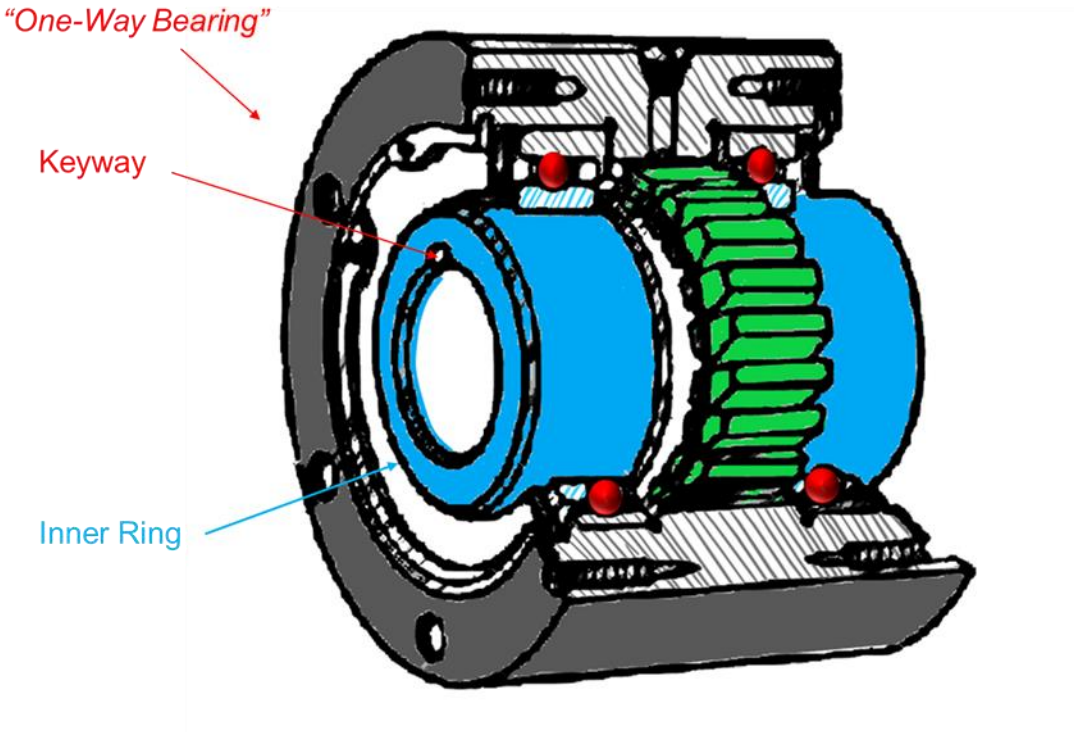


FIG. 5

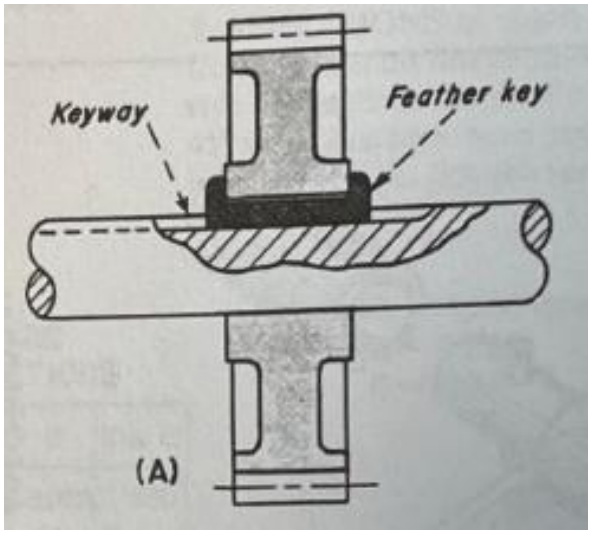
Magid, Ex. 1012, Fig. 5 (Annotated)

457. Sclater discloses a keyway formed into the inner ring of the one-way bearing.



Sclater, Ex. 1017 at318 (Annotated)

458. Key-keyway interfaces are a traditional method of transmitting torque from one rotary element to another. Key-keyway interfaces are old, commonly used, and well understood in the power transmission world. Nevertheless, Sclater discloses fourteen different ways to fasten hubs to shafts, including using a key-keyway interface. (Sclater, Ex. 1017 at 420-421.) For example, Sclater discloses a key that is located in a keyway in the inner diameter of a gear that also engages a keyway that is formed into the corresponding shaft:



Sclater, Ex. 1017 at 420

459. A POSA would have understood that the keyway formed in the inner ring of the bearing assembly is sized to receive a key, i.e., such that the key "*is fixed relative to the inner ring and a keyway formed in the front shaft*."

460. Thus, the combination of Magid and Sclater teaches "*a key that is fixed relative to the inner ring and a keyway formed in the front shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the front shaft in the first rotational direction while permitting rotation of the front shaft in the second rotational direction*."

2. Dependent Claim 12

461. Claim 12 depends from claim 11 which I understand means that claim 12 requires all of the limitations of claim 11 in addition to its additional limitations.

462. The combination of Socwell and Magid disclose all of the limitations of claim 11 as described above. (*See* ¶¶ 387-397.)

… ***[12.] The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.***

463. Claim 12 is duplicative of claim 6. To illustrate, the table below shows a side-by-side comparison of claims 6 and 12. Claim 12 is "marked up" to show the minor differences.

'580 Patent Claim 6	**'580 Patent Claim 12**
[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.	**[12.]** The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.

464. Because the additional limitations of claim 12 are identical to the additional limitations of claim 6, I refer back to my analysis of these limitations of claim 6 to establish that they are met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 440-444.)

3. Rationale for combining Socwell, Magid, and Sclater

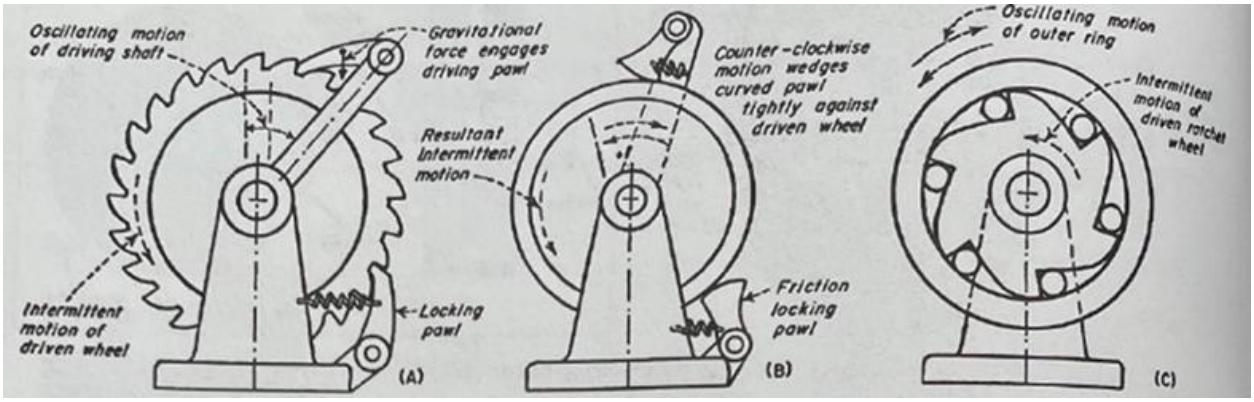
465. A POSA would have been motivated to substitute Sclater's one-way sprag-type bearing assembly for Magid's ratchet-and-pawl one-way clutch mechanism to obtain predictable results, e.g., reduced noise and improved durability.

466. Ratchet and pawl clutch mechanisms make noise during operation.

The pawl is spring-loaded to engage each gear tooth of the ratchet and it would make an audible "click" when colliding with the gear tooth root after overrunning or passing over each tooth. For example, a POSA would have been aware of this noise from other common ratchet clutches, such as those included in a ratchet wrench and an automotive parking brake. Sclater acknowledges that a "friction-type clutch" is quieter than a ratchet type clutch:

> Fig. 1 Elementary overriding clutches: (A) A ratchet and pawl mechanism converts reciprocating or oscillating movement to intermittent rotary motion. This motion is positive but limited to a multiple of the tooth pitch. (B) **A friction-type clutch is quieter**, but it requires a spring device to keep the eccentric pawl in constant engagement. (C) Balls or rollers replace the pawls in this device. Motion of the outer race wedges the rollers against the inclined surfaces of the ratchet wheel.

(Sclater, Ex. 1017, 316.)



Sclater, Ex. 1017 at 316

467. Sclater further discloses that roller clutches are better suited for high

speed freewheeling than pawl-and-ratchet clutches. This is because the pawl may skip past a few teeth before backstopping the ratchet gear, whereas the sprags are always in contact with the rings and do not need to find a discrete gear tooth to stop. Additionally, because there are multiple sprags, they distribute the load over a larger surface area:

> Fig. 9 Cam and Roller Clutch: This over-running clutch is better suited for higher-speed free-wheeling than a pawl-and-ratchet clutch. The inner driving member has cam surfaces on its outer rim that hold light springs that force the rollers to wedge between the cam surfaces and the inner cylindrical face of the driven member. While driving, friction rather than springs force the rollers to wedge tightly between the members to provide positive clockwise drive. The springs ensure fast clutching action. If the driven member should begin to run ahead of the driver, friction will force the rollers out of their tightly wedged positions and the clutch will slip.

(Sclater, Ex. 1017 at 303.)

> Overrunning sprag clutches transmit torque in one direction and reduce speed, rest, hold, or free-wheel in the reverse direction. Applications include overrunning, back stopping and indexing. Their selection – similar to other mechanical devices – requires a review of the torque to be transmitted, overrunning speed, type of lubrication, mounting characteristics, environmental conditions, and shock conditions that might be encountered.

(Sclater, Ex. 1017 at 320.)

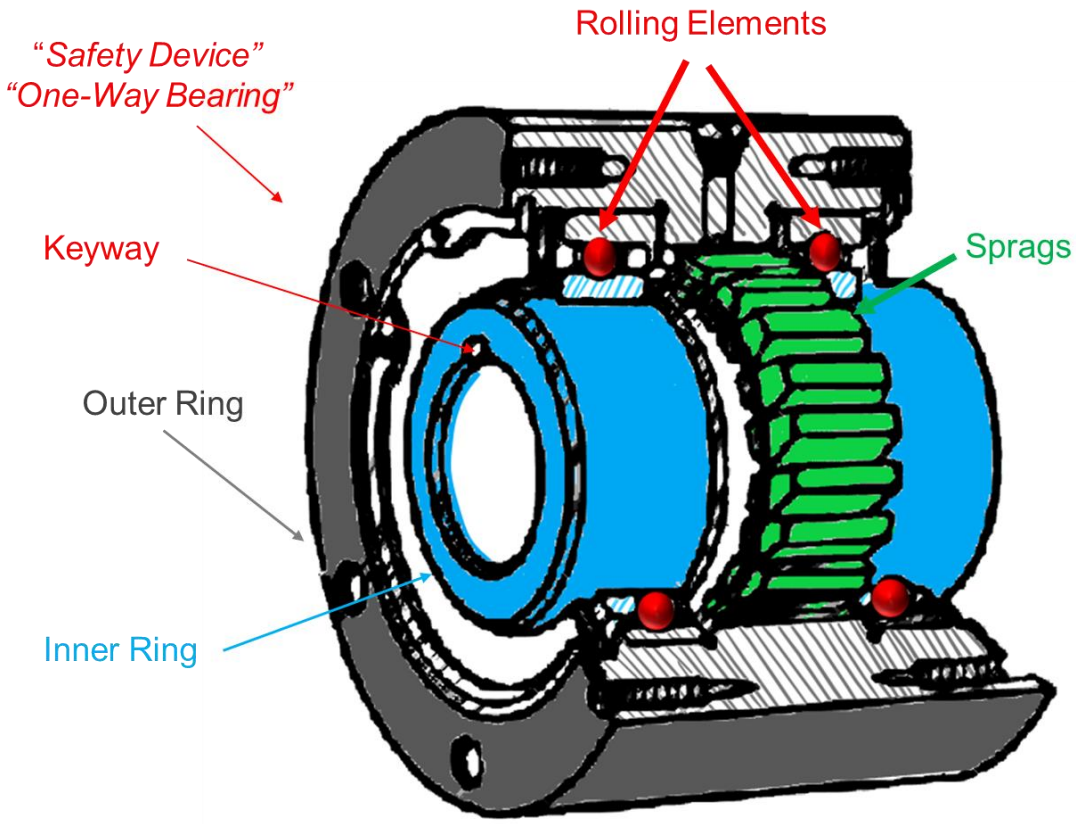
468. Sclater further describes a backstopping mode of operation for a conveyor:

> An example is a clutch mounted on the headshaft of a conveyor. The outer race is restrained by torque-arming the stationary frame of the conveyor.

(Sclater, Ex. 1017 at 320.)

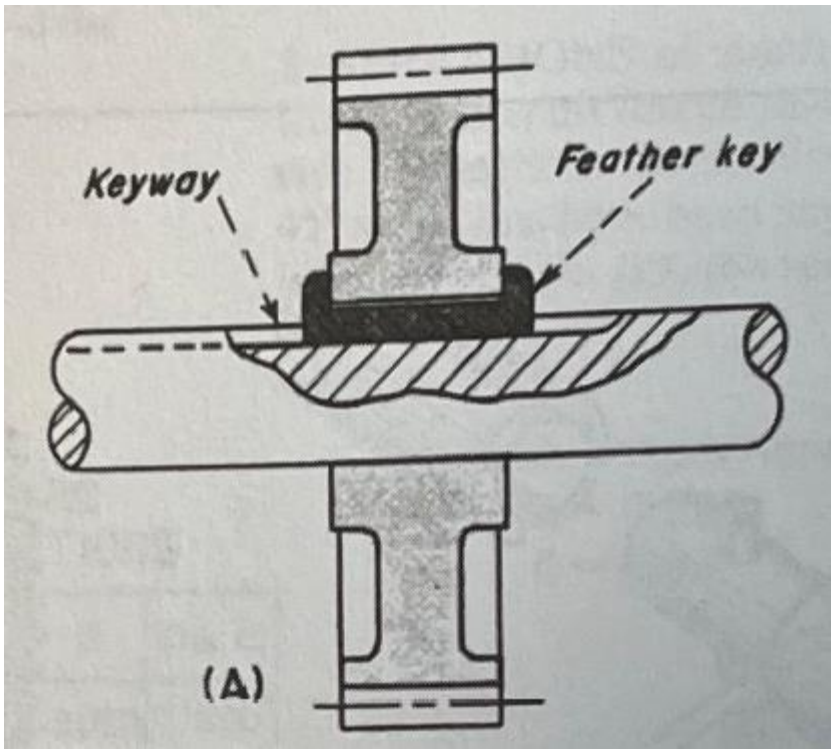
469. A POSA would have considered a sprag-type one-way clutch bearing for an exercise equipment application, such as a treadmill. For example, Emerson is a bearing catalog from 2001 that describes its NSS Series sprag type one-way clutch as an option for multiple "Field Applications," including "Exercise equipment," "Food processing equipment," "Printing presses," and "Roll conveyors." (Ex. 1018 at 52-53.)

470. A POSA would have known how to replace Magid's control means with Sclater's one-way bearing assembly. For example, the outer ring would be fixed to the frame either directly or through one or more intermediaries, e.g., a bracket, or support structure. For example, Sclater illustrates below that the outer ring includes tapped holes for receiving fasteners for mounting the one-way bearing to a support structure, and Emerson describes examples of commercially available brackets or torque arms. (*See* Ex. 1018, 38-43.)



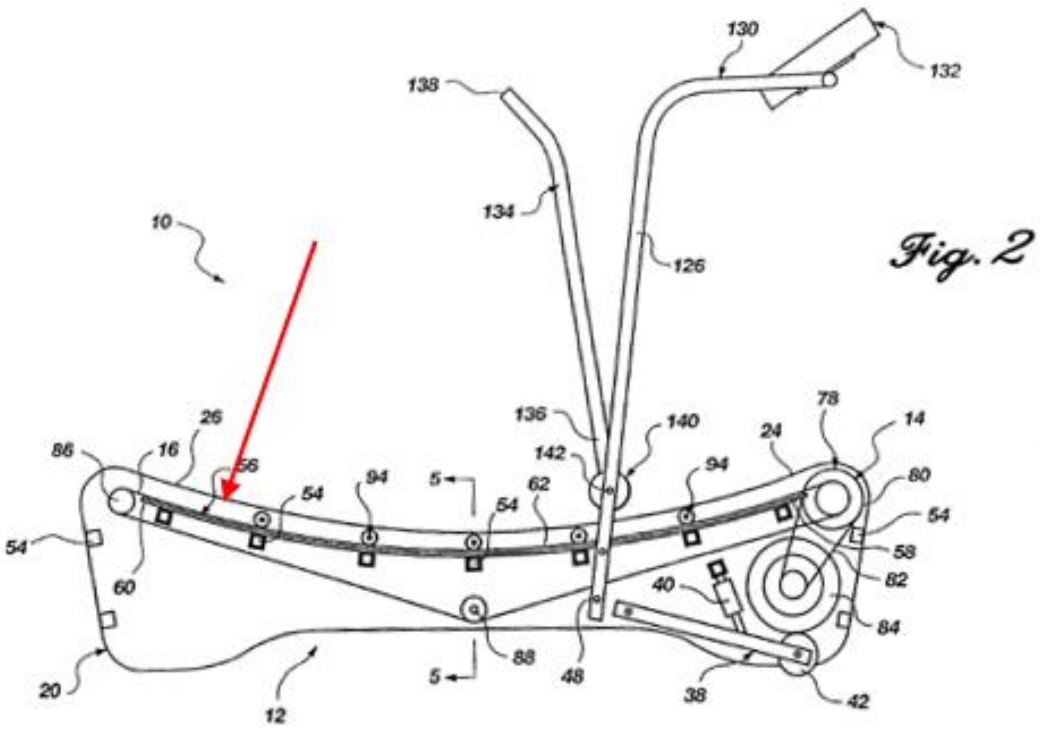
Sclater, Ex. 1017 at 318 (Annotated)

471. The inner ring of the one-way bearing would be secured to the front roller or rear roller, e.g., with a key/keyway interface, such as that disclosed by Sclater:

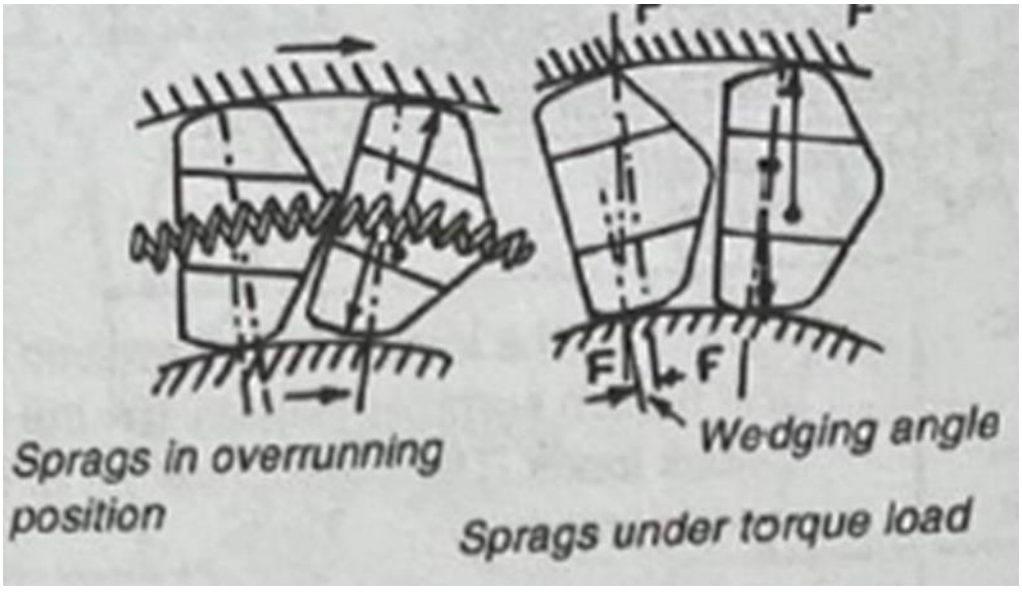


Sclater, Ex. 1017 at 420

472. With this arrangement, rearward motion of the endless belt 16 would rotate the front/rear roller and inner ring so that the inner ring would overrun and move the sprags out of the locked position. However, forward motion of the endless belt 16 would rotate the inner ring in the opposite direction and wedge the sprags into the locked position to backstop and prevent forward motion of the belt.



Socwell, Ex. 1011, Fig. 2 (Annotated)



Sclater, Ex. 1017 at 318

F. Ground 6 – The Combination of Socwell, Magid, and Sclater Teaches all of the Limitations of Claims 1-12, 14, 18 and 25

473. In Ground 6, I consider certain claim constructions that I did not consider in Grounds 4 and 5.

1. Independent Claim 1

474. I have given each of the limitations of claim 1 a unique numerical identifier, as shown in the chart below:

U.S. Patent No. 9,039,580
[1.0] A manually powered treadmill comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to the frame at the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and
[1.7] a safety device coupled to at least one of the front shaft and the rear shaft,

wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

… ***[1.0] A manually powered treadmill comprising:***

… ***[1.1] a frame having a front end and a rear end positioned opposite the front end;***

475. Because limitations [1.0]-[1.1] do not include any claim constructions, I refer back to my analysis of these limitations in Ground 4 to establish that they are met by the combination of Socwell and Magid. (*See* ¶¶ 335-339.)

… ***[1.2] a front shaft rotatably coupled to the frame at the front end;***

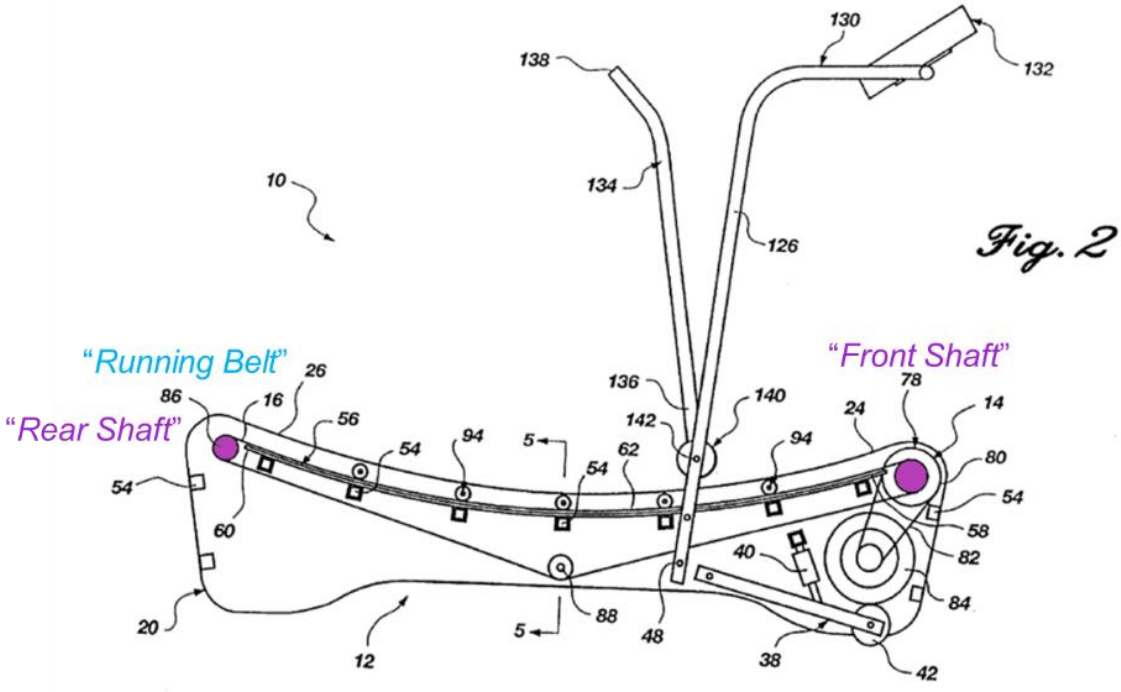
476. I understand that the proposed construction of the term "*shaft*" is "a rotating element used to transmit power from one part to another."

477. It is therefore my understanding that claim limitation [1.2] should be interpreted as "*a front* [rotating element used to transmit power from one part to another] *rotatably coupled to the frame at the front end*."

478. Regarding the original claim limitations, I refer back to my analysis of claim limitation [1.2] in Ground 4. (*See* ¶¶ 340-343.)

479. Regarding the claim limitation as construed, Socwell discloses that the

first roller 78 is coupled to the second roller 86 through the belt 16. (Socwell, Ex. 1011, Fig. 2.) The first roller 78 receives power from the user through the belt. As a user walks/runs on the belt 16, the resultant force on the belt 16 is transferred to the first roller 78. The first roller 78 then transfers this power to the second roller 86 through the belt.



Socwell, Ex. 1011, Fig. 2 (Annotated)

480. Thus, Socwell discloses "*a front* [rotating element (first roller 78) used to transmit power from one part to another] *rotatably coupled to the frame at the front end*."

… ***[1.3] a rear shaft rotatably coupled to the frame at the rear end;***

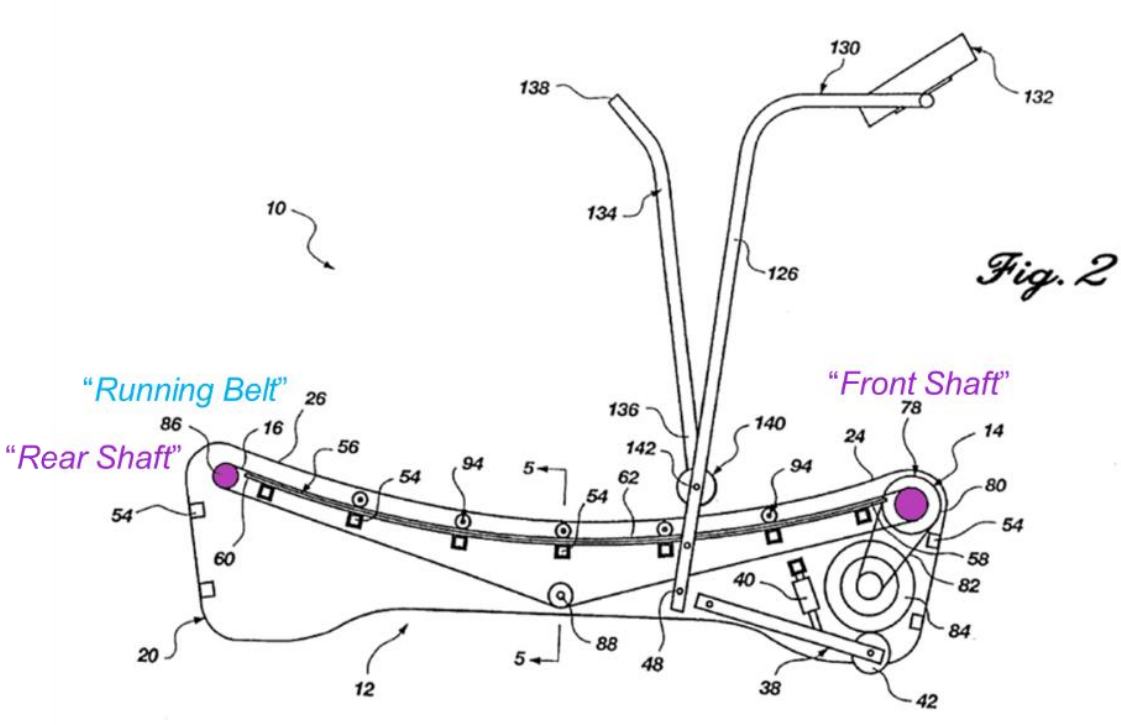
481. I understand that the proposed construction of the term "*shaft*" is "a

rotating element used to transmit power from one part to another."

482. It is therefore my understanding that claim limitation [1.3] should be interpreted as "*a rear* [rotating element used to transmit power from one part to another] *rotatably coupled to the frame at the rear end*."

483. Regarding the original claim limitations, I refer back to my analysis of claim limitation [1.3] in Ground 4. (*See* ¶¶ 340-343.)

484. Regarding the claim limitation as construed, Socwell discloses that the second roller 86 is coupled to the first roller 78 through the belt 16. The second roller 86 receives power from the user through the belt. As a user walks/runs on a belt 28 the resultant force on the belt 28 is transferred to the second roller 86. The second roller 86 then transfers this power to the first roller 78 through the belt.



Socwell, Ex. 1011, Fig. 2 (Annotated)

485. Thus, Socwell discloses "*a rear* [rotating element (second roller 86) used to transmit power from one part to another] *rotatably coupled to the frame at the rear end*."

> … ***[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***
>
> … ***[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

486. Because limitations [1.4]-[1.5] do not include any claim constructions, I refer back to my analysis of these limitations in Ground 4 to establish that they are met by the combination of Socwell and Magid. (*See* ¶¶ 344-354.)

> … ***[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and***

487. Although limitation [1.6] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of [1.6], therefore I refer back to my analysis of limitation [1.6] in Ground 4 to establish that it is met by the combination of Socwell and Magid. (*See* ¶¶ 355-358.)

> … ***[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft,***

488. I understand that the proposed construction of the term "*safety device*" is as a means plus function requiring the structure disclosed in the '580 Patent for fulfilling this function. The '580 Patent discloses the following safety device structure: a) a one-way bearing assembly having inner and outer rings and sprags; b) a cam locking system; c) a taper lock; d) a user operated pin system; and e) a band brake system with a lever. ('580 Patent, Ex. 1001, 27:15-29; 29:23-28; Figs. 2, 36.)

489. It is therefore my understanding that claim limitation [1.7][a] should be interpreted as "*a* [one-way bearing assembly having inner and outer rings and sprags; b) a cam locking system; c) taper locks; d) a user operated pin system; or e) a band brake system with a lever] *coupled to at least one of the front shaft and the*

rear shaft."

490. Regarding the original claim limitations, I refer back to my analysis of claim limitation [1.7][a] in Ground 4. (*See* ¶¶ 359-364.)

491. However, Magid's rachet and pawl control means is not one of the safety devices expressly disclosed in the '580 Patent.

492. The proposed construction of the "*safety device*" in Claim [1.7][a] as a "one-way bearing assembly having inner and outer rings and sprags" is similar to the limitations of claim [7.][a], i.e., "*wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring*."

493. Accordingly, I refer back to my analysis of claim limitation [7.][a] in Ground 5 to establish that claim limitation [1.7][a] as construed is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 445-446.)

494. Thus, Sclater discloses "*a* [one-way bearing assembly having inner and outer rings and sprags] *coupled to at least one of the front shaft and the rear shaft*."

> … ***[1.7] [b] wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

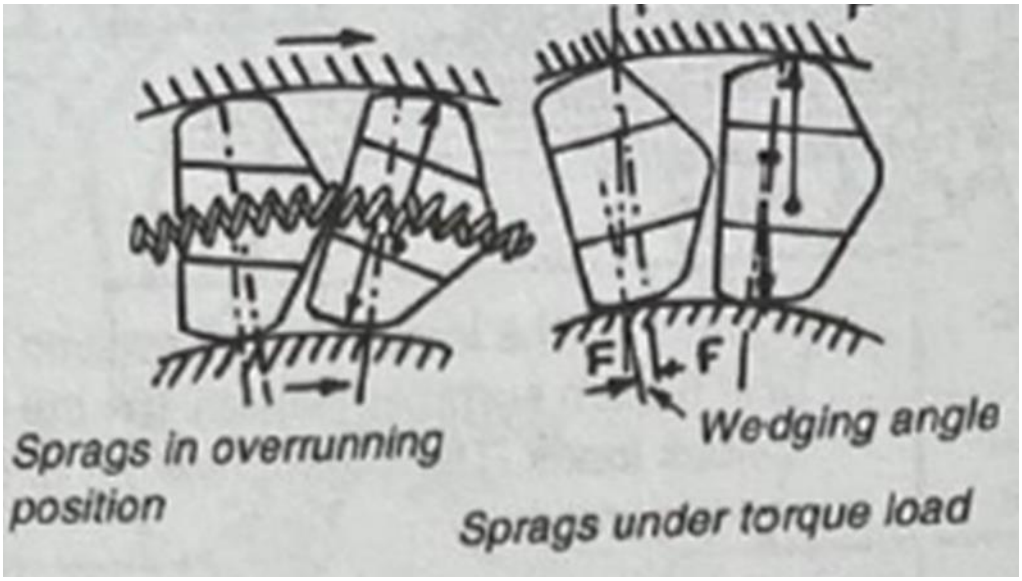
495. I understand that the proposed construction of the term "*substantially prevent rotation*" is "prevent any movement after allowing no or minimal movement."

496. It is therefore my understanding that claim limitation [1.7][b] should be interpreted as "*wherein the* [one-way bearing assembly having inner and outer rings and sprags] *is structured to* [prevent any movement after allowing no or minimal movement] *rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction*."

497. Regarding the original claim limitations and the "*safety device*" construction, I refer back to my analysis of claim limitation [7.][b] in Ground 5. (*See* ¶¶ 447-449.)

498. Regarding the proposed construction for "*substantially prevent rotation*," a sprag-type one-way bearing allows minimal movement before the

sprags rotate into a locked position. As illustrated in the figure below on the left, Sclater discloses that when the inner ring rotates in a first direction relative to the outer ring, the sprags move out of the locked position such that an overrun condition occurs. However, as illustrated below right, when the inner ring rotates in the opposite direction, the sprag profile wedges the sprags into a locked position preventing relative motion between the inner and outer rings.



Sclater, Ex. 1017 at 318

499. Thus, Magid combined with Sclater discloses "*wherein the* [one-way bearing assembly having inner and outer rings and sprags] *is structured to* [prevent any movement after allowing no or minimal movement] *rotation of . . . the front shaft . . . in a first rotational direction* [counterclockwise] *while permitting rotation of . . . the front shaft . . . in a second rotational direction* [clockwise] *opposite the first rotational direction*."

2. Dependent Claims 2-10

500. Claims 2-10 depend directly or indirectly from claim 1, which I understand means that claims 2-10 require all of the limitations of claim 1 and the limitations of any intervening claims in addition to their additional limitations.

501. The combination of Socwell, Magid, and Sclater disclose all of the limitations of claim 1 as described above. (*See* ¶¶ 475-499.)

> … ***[2.] The manually powered treadmill of claim 1, wherein the frame includes at least one cross-member, a left side member, and a right side member; and wherein the at least one cross-member extends between the left side member and the right side member.***
>
> … ***[3.] The manually powered treadmill of claim 2, wherein each one of the first and second bearing rails are coupled to at least one of the at least one cross-member.***

502. Because claims [2]-[3] do not include any claim constructions, I refer back to my analysis of these limitations in Ground 4 to establish that they are met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 372-375.)

> … ***[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

503. Although claim [4] includes the term "*shaft*," the proposed

construction of "*shaft*" does not impact the additional limitations of claim [4], therefore I refer back to my analysis of claim [4] in Ground 4 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 376-378.)

> … ***[5.] The manually powered treadmill of claim 1, wherein each one of the first bearing rail and the second bearing rail define in part a top profile corresponding to the curved running surface.***

504. Because claim [5] does not include any claim constructions, I refer back to my analysis of claim [5] in Ground 4 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 379-382.)

> … ***[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.***

505. I understand that the proposed construction of the term "*safety device*" is as a means plus function requiring the structure disclosed in the '580 Patent for fulfilling this function. The '580 Patent discloses the following safety device structure: a) a one-way bearing assembly having inner and outer rings and sprags; b) a cam locking system; c) a taper lock; d) a user operated pin system; and e) a band brake system with a lever. ('580 Patent, Ex. 1001, 27:15-29; 29:23-28; Figs. 2, 36.)

506. It is therefore my understanding that claim [6] should be interpreted as "*wherein the* [one-way bearing assembly having inner and outer rings and sprags;

b) a cam locking system; c) taper locks; d) a user operated pin system; or e) a band brake system with a lever] *includes a one-way bearing*."

507. Claim 6 as construed is similar in scope as original claim 6, therefore I refer back to my analysis of claim 6 in Ground 5 to establish that claim 6 is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 440-444.)

> … ***[7.] [a] The manually powered treadmill of claim 6, wherein the one-way bearing includes an inner ring, an outer ring, and a plurality of sprags disposed between the inner ring and outer ring, [b] wherein the plurality of sprags are asymmetric shaped to substantially prevent rotation of the inner ring in the first rotational direction while permitting rotation of the inner ring in the second rotational direction.***

508. Because claim [7] does not include any claim constructions, I refer back to my analysis of claim [7] in Ground 5 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 445-449.)

> … ***[8.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the rear shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the rear shaft in the first rotational direction while permitting rotation of the rear shaft in the second rotational direction.***

509. Although claim [8] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of claim [8], therefore I refer back to my analysis of claim [8] in Ground 5 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 450-455.)

> … ***[9.] The manually powered treadmill of claim 7, further comprising a key that is fixed relative to the inner ring and a keyway formed in the front shaft, wherein the key is configured to cooperate with the keyway to prevent rotation of the front shaft in the first rotational direction while permitting rotation of the front shaft in the second rotational direction.***

510. Although claim [9] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of claim [9], therefore I refer back to my analysis of claim [9] in Ground 5 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 456-460.)

> … ***[10.] The manually powered treadmill of claim 1, further comprising a handrail attached to the frame and structured to provide a support structure for the user of the manually powered treadmill.***

511. Because claim [10] does not include any claim constructions, I refer back to my analysis of this claim in Ground 4 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 383-384.)

3. Independent Claim 11

512. Independent claim 11 is largely duplicative of independent claim 1. To illustrate, the table below shows a side-by-side comparison of claims 1 and 11. Claim 11 is "marked up" to show the minor differences.

'580 Patent Claim 1	**'580 Patent Claim 11**
[1.0] A manually powered treadmill comprising:	**[11.0]** A manually powered treadmill, comprising:
[1.1] a frame having a front end and a rear end positioned opposite the front end;	**[11.1]** a frame having a front end and a rear end positioned opposite the front end;
[1.2] a front shaft rotatably coupled to	**[11.2]** a front shaft attached to the frame

‘580 Patent Claim 1	‘580 Patent Claim 11
the frame at the front end;	adjacent the front end;
[1.3] a rear shaft rotatably coupled to the frame at the rear end;	**[11.3]** a rear shaft attached to the frame adjacent the rear end;
[1.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;	**[11.4]** a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;
[1.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;	**[11.5]** a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;
[1.6] a running belt supported by the first bearing rail and the second bearing rail and disposed about the front shaft and the rear shaft, wherein the running belt follows a curved running surface; and	**[11.6] [a]** a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail, **[b]** wherein the running belt includes a front belt portion

‘580 Patent Claim 1	‘580 Patent Claim 11
	proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and
[1.7] [a] a safety device coupled to at least one of the front shaft and the rear shaft, **[b]** wherein the safety device is structured to substantially prevent rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational	**[11.7]** a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.

‘580 Patent Claim 1	‘580 Patent Claim 11
direction opposite the first rotational direction.	

513. As illustrated above, limitations [11.0]-[11.5] and [11.7] are nearly identical to corresponding limitations of claim 1. The only substantial modification to claim 11 to differentiate it from claim 1 was to claim various positions and locations of the running belt in limitation [11.6].

> … ***[11.0] A manually powered treadmill, comprising:***
>
> … ***[11.1] a frame having a front end and a rear end positioned opposite the front end;***

514. Because limitations [11.0]-[11.1] are identical to limitations [1.0]-[1.1], I refer back to my analysis of these limitations of claim 1 in Ground 6 to establish that they are met by the combination of Socwell, Magid, and Sclater. (*See* ¶ 475.)

> … ***[11.2] a front shaft attached to the frame adjacent the front end;***

515. Because Claim limitation [11.2] is substantially similar to limitation [1.2] of claim 1, I refer back to my analysis of this limitation of claim 1 in Ground 6 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 476-480.)

… ***[11.3] a rear shaft attached to the frame adjacent the rear end;***

516. Because claim limitation [11.3] is substantially similar to limitation [1.3] of claim 1, I refer back to my analysis of this limitation of claim 1 in Ground 6 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 481-485.)

… ***[11.4] a first bearing rail having a plurality of bearings, the first bearing rail attached to a left side of the frame;***

… ***[11.5] a second bearing rail having a plurality of bearings, the second bearing rail attached to a right side of the frame;***

517. Because limitations [11.4]-[11.5] are identical to limitations [1.4]-[1.5], I refer back to my analysis of these limitations of claim 1 in Ground 6 to establish that they are met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 486.)

… ***[11.6][a] a running belt at least partially disposed about the front shaft and the rear shaft and at least partially supported by the first bearing rail and the second bearing rail,***

… ***[11.6][b] wherein the running belt includes a front belt portion proximate the front end, a rear belt portion proximate the rear end, and a central belt portion intermediate the front and rear belt portions, wherein the central belt portion is positioned vertically closer to a ground surface supporting the frame than the front and rear belt portions such that the running belt follows a curved running surface; and***

518. Although limitation [11.6] includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of [11.6], therefore I refer back to my analysis of limitation [11.6] in Ground 4 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 393-395.)

… ***[11.7] a safety device for substantially preventing rotation of at least one of the front shaft and the rear shaft in a first rotational direction while permitting rotation of the at least one of the front shaft and the rear shaft in a second rotational direction opposite the first rotational direction.***

519. As illustrated in the above table, limitation [11.7] includes the same limitations as limitation [1.7] of claim 1, however the limitations are rearranged

and use slightly different language. These differences are not substantial; therefore I refer back to my analysis of limitation [1.7] of claim 1 of Ground 6 to establish that limitation [11.7] is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 488-499.)

4. Dependent Claims 12, 14 and 18

520. Claims 12, 14, and 18 depend from claim 11 which I understand means that claims 12, 14 and 18 require all of the limitations of claim 11 in addition to their additional limitations.

521. The combination of Socwell and Magid disclose all of the limitations of claim 11 as described above. (*See* ¶¶ 514-519.)

… ***[12.] The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.***

522. Claim 12 is duplicative of claim 6. To illustrate, the table below shows a side-by-side comparison of claims 6 and 12. Claim 12 is "marked up" to show the minor differences.

'580 Patent Claim 6	**'580 Patent Claim 12**
[6.] The manually powered treadmill of claim 1, wherein the safety device includes a one-way bearing.	**[12.]** The manually powered treadmill of claim 11, wherein the safety device includes a one-way bearing.

523. Because the additional limitations of claim 12 are identical to the additional limitations of claim 6, I refer back to my analysis of these limitations of claim 6 in Ground 6 to establish that they are met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 505-507.)

> … ***[14.] The manually powered treadmill of claim 11, further comprising support feet coupled to the frame, wherein the support feet are vertically adjustable to adjust an incline of the manually powered treadmill relative to the ground surface.***

524. Because claim [14] does not include any claim constructions, I refer back to my analysis of claim [14] in Ground 4 to establish that it is met by the combination of Socwell, Magid, and Sclater. (*See* ¶¶ 400-404.)

> … ***[15.] The manually powered treadmill of claim 11, further comprising at least one front pulley coupled to the front shaft and at least one rear pulley coupled to the rear shaft, wherein a radius of the at least one front pulley is greater than a radius of the at least one rear pulley.***

525. Although claim 15 includes the term "*shaft*," the proposed construction of "*shaft*" does not impact the additional limitations of [15], therefore I refer back to my analysis of claim 15 in Ground 4 to establish that it is met by the combination of Socwell and Magid. (*See* ¶¶ 405-408.)

> … ***[18.] The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.***

526. Claim 18 is duplicative of claim 4. To illustrate, the table below shows a side-by-side comparison of claims 4 and 18. Claim 18 is "marked up" to show the minor differences.

'580 Patent Claim 4	**'580 Patent Claim 18**
[4.] The manually powered treadmill of claim 1, wherein each one of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.	**[18.]** The manually powered treadmill of claim 11, wherein each of the first and second bearing rails are attached longitudinally to the frame between the front shaft and the rear shaft.

527. Because the additional limitations of claim 18 are identical to the additional limitations of claim 4, I refer back to my analysis of these limitations of claim 4 in Ground 6 to establish that they are met by the combination of Socwell, Magid, and Sclater. (*See* ¶ 503.)

5. Rationale for combining Socwell with Magid and Sclater

528. The rationale to combine Socwell with Magid and Sclater is the same

as the rationale to combine Socwell with Magid in Ground 4; and the rationale to combine Socwell and Magid with Sclater in Ground 5. Accordingly, I refer back to my rationale to combine references in Grounds 4 and 5. (*See* ¶¶ 425-437; 465-472.)

X. Objective Indicia Does Not Support Patentability

529. Considering the information that I have reviewed, my general knowledge of the field of exercise equipment, including manual treadmills with curved running surfaces, and publications within that and related fields, I am not aware of any objective evidence that might support the patentability of the claims of the ’580 Patent. Further, from my review of the file history (Ex. 1002) of the ’580 patent, I did not see that the applicant raised any secondary indicia of nonobviousness during prosecution. I am not otherwise aware of any publicly available evidence of secondary indicia of nonobviousness. Should any alleged secondary indicia of nonobviousness be presented, I reserve the right to provide an opinion thereon.

XI. Conclusion

530. In my opinion, all the elements of the Challenged Claims are disclosed by the references discussed above and that the claims are unpatentable in view of these prior art references.

531. I reserve the right to supplement my opinions to address any information obtained, or positions taken, based on any new information that comes

to light throughout this proceeding.

I declare under penalty of perjury that the foregoing is true and accurate to the best of my ability.

Executed on: April 11, 2023

Robert Giachetti, Ph.D.