UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE HILLMAN GROUP, INC.,
Petitioner

v.

HY-KO PRODUCTS COMPANY LLC,
Patent Owner

Case IPR2022-01201
Patent No. 8,644,619

PETITION FOR *INTER PARTES* REVIEW

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Ex. 1005	U.S. Patent No. 6,064,747 to Wills et al. ("*Wills*")
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I. PRELIMINARY STATEMENT

Petitioner The Hillman Group, Inc. requests *inter partes* review of U.S. Patent No. 8,644,619 (Ex. 1001), assigned to Hy-Ko Products Company LLC, and cancellation of claims 1-8, 10-14, and 19-22.

As the '619 patent admits, "[t]he art of key replication is well known." '619 patent, 1:22. "Commonly," the patent explains, "a key intended for duplication (the master key) is copied on to an appropriately identified key blank utilizing any number of different systems known in the art." *Id.*, 1:1:22-25. "Not surprisingly," the patent acknowledges, "numerous attempts have been made to improve identification systems" for identifying key blanks, and "[m]any of these," the patent admits, "include imaging systems designed to determine the proper key blank based on physical parameters of the key to be copied, such as … groove characteristics." *Id.*, 2:1-6.

The '619 patent claims such an "attempt[]." The sole independent claim, claim 1, recites a "key identification system" that uses "an imaging system" that captures an image of a master key and then "determine[s] characteristics of [a] groove" of the master key to identify a key blank. Consistent with the '619 patent's admissions, the examiner found during prosecution that such a key identification system was known. Ex. 1002, 112-14.

The claims were allowed by the examiner only because of the *angle* at which

the imaging system captures the image of the master key, namely, "an angle between perpendicular and parallel to the blade" of the master key "and not including perpendicular or parallel to the blade" of the master key. Ex. 1002, 130, 149-50.

But capturing an image of a master key at an *angle*—even an angle "between" and "not including perpendicular or parallel to the blade" of a master key—was known. *Wills*, for example, issued in 2000, nearly eight years before the earliest claimed priority date of the '619 patent, and taught a "key regeneration machine" that captures an image of a master key "at an angle θ less than ninety degrees (90°) relative to the side" of a master key." *Wills*, 12:17-21. As explained below, *Wills*, alone or in combination with *Bass* or *Heide*, would have rendered obvious each of the challenged claims.

II. OVERVIEW OF PRIOR ART

A. Wills

U.S. Patent No. 6,064,747 (Ex. 1005) ("*Wills*") issued May 16, 2000, and constitutes prior art under at least pre-AIA 35 U.S.C. §§ 102(a), 102(b), and/or 102(e).

Wills describes a "key regenerating machine in which [a] master key is optically analyzed" and "the appropriate key blank determined." *Wills*, 1:7-10. According to *Wills*, by 2000 already "[i]t [was] well known in the art to duplicate

keys, referred to as master keys, onto a key blank." *Wills*, 1:13-14. *Wills*' key regenerating machine is configured to "identify[] the type of key blank onto which the master key is to be reproduced." *Wills*, 1:48-49.

A master key is illustrated in Figure 7A. *Id.*, 5:22-24. As shown, the master key includes a blade "BD" in which is formed a milling "ML," which *Wills* describes as "a longitudinally-extending groove … in the blade." *Id.*, 5:56-59.

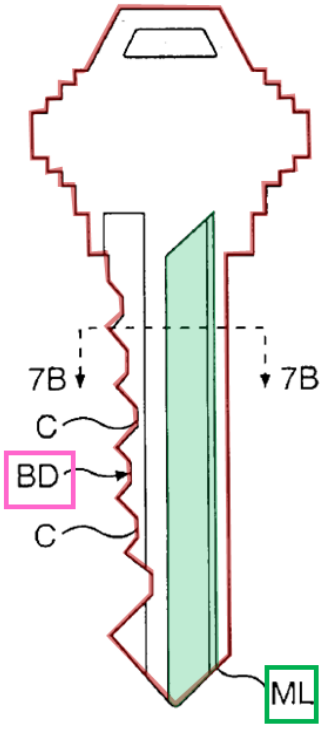


FIG. 7A

The milling of the master key in Figure 7A has particular "surface information," such as a "depth," as shown in Figure 7B, which is a cross-section of Figure 7A. *Wills*, 5:61-65, 11:59-63.

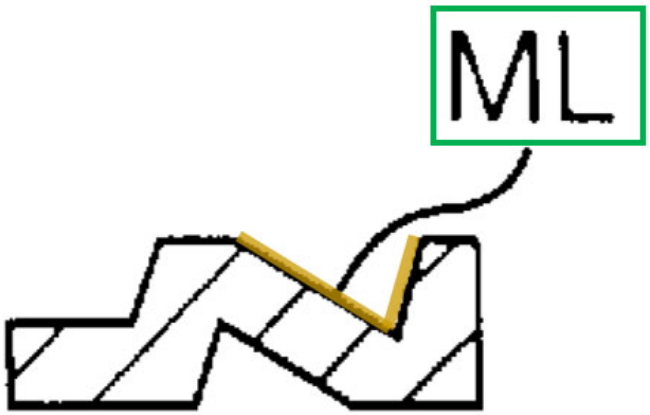


FIG. 7B

Wills, Figure 7B (annotated); Basham, ¶32.

Wills' machine is illustrated in Figure 9. As shown, the master key is placed in the machine, and a "laser line generator 39" is used to generate a light beam "LB" incident on the master key and, in particular, on the milling in the blade of the master key. *Id.*, 11:44-55. A "camera 28" captures an image "that is the result of the light beam interfacing with the surface of the master key." *Id.*, 11:59-63. The image is captured "along a viewing axis V," as shown in Figure 9, that "strik[es] the side of the key[.]" *Id.*, 11:67-12:3. As shown, the viewing axis V is at an angle relative to the master key.

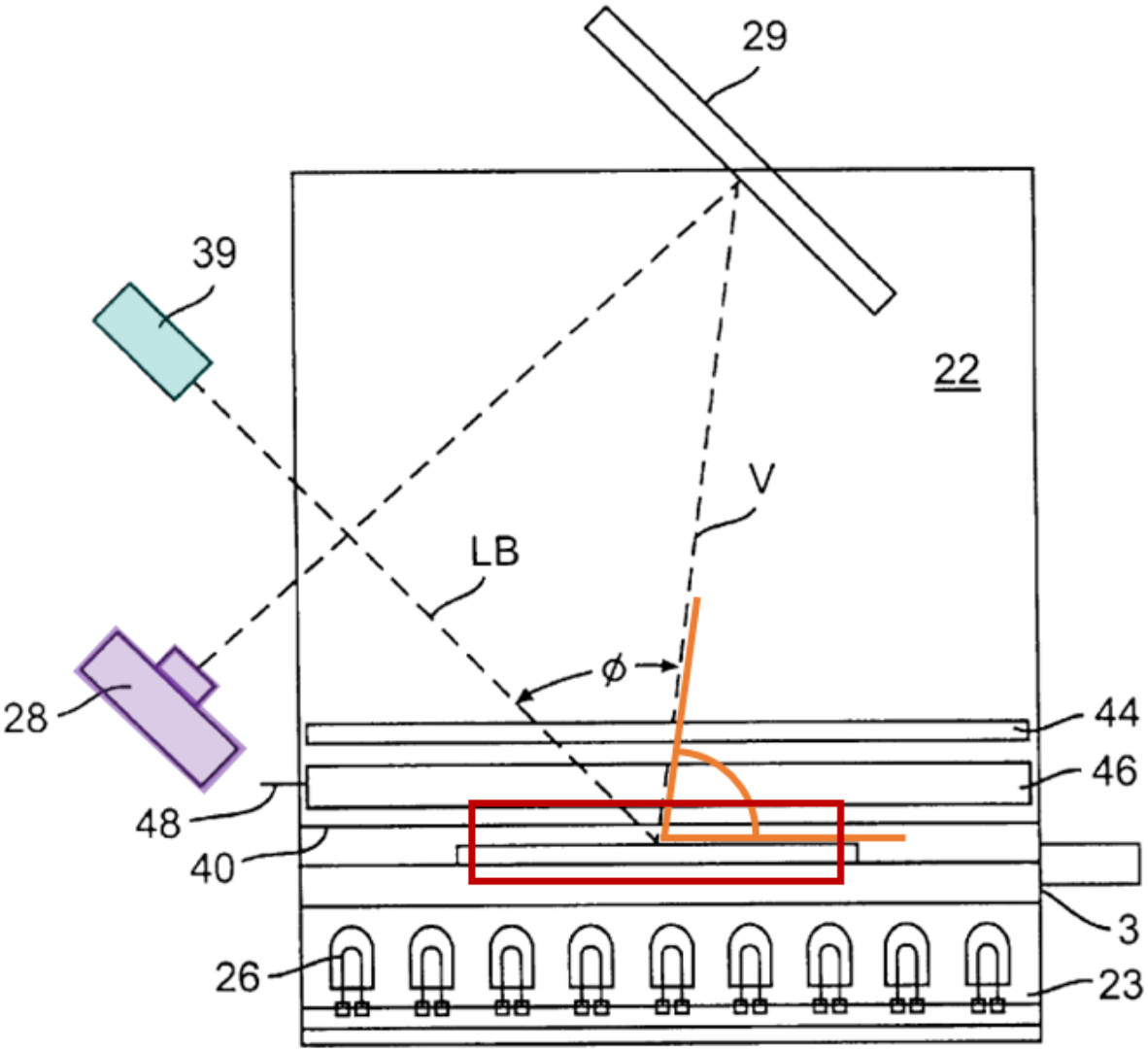


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶33.

As Figure 7D illustrates, the image captured by the camera "is the result of the light beam interfacing with the surface of the master key shown in FIG. 7A,

specifically the surface shown in FIG. 7B[1].” *Id.*, 11:59-63. As shown, the image captured by the camera includes the “surface information” of the master key, including the “depth of [the] milling” in the blade. *Id.*, 13:1-3.

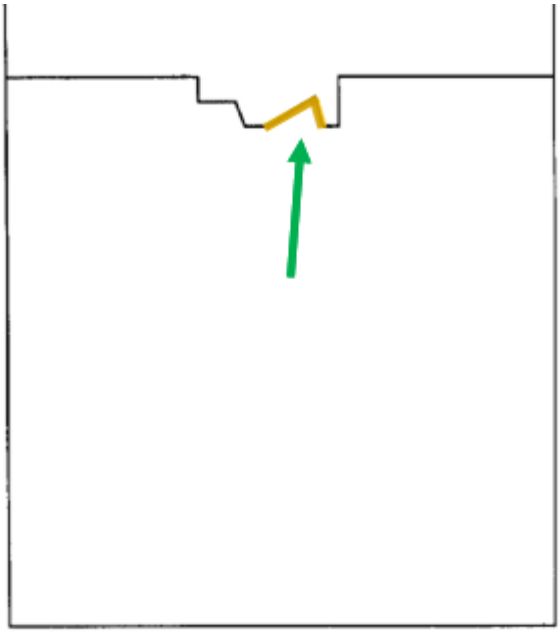


FIG. 7D

Wills, Figure 7D (cropped and annotated); Basham, ¶35.

[1] In particular, Figure 7B, which is a “*cross-sectional* view of FIG. 7A taken along line 7B—7B,” and Figure 7D, which is a “*top plan view* of a light beam, such as a laser, interfacing with the master key of FIG. 7A,” are vertically flipped relative to one another, as may be seen by vertically flipping Figure 7B and superimposing it on Figure 7D. *Wills*, 3:11-12, 3:16-17; Basham, ¶34.

While Figure 7D shows only a "two-dimensional slice[]" of the master key, *Wills* envisions capturing "an entire three-dimensional surface image of the [master] key" by capturing two-dimensional slices "along the length of the key." *Wills*, 15:34-42. As *Wills* explains with reference to Figure 8, "[a]s the light beam LB is swept along the length of the [master] key, illustrated by the second laser line generator 39 in phantom lines, a series of two-dimensional slices is generated," and these "slices are stacked to form the entire three-dimensional representation of the key." *Id.*, 15:40-50. This three-dimensional image includes the "depth of [the] milling across the [master] key." *Id.*, 13:1-2.

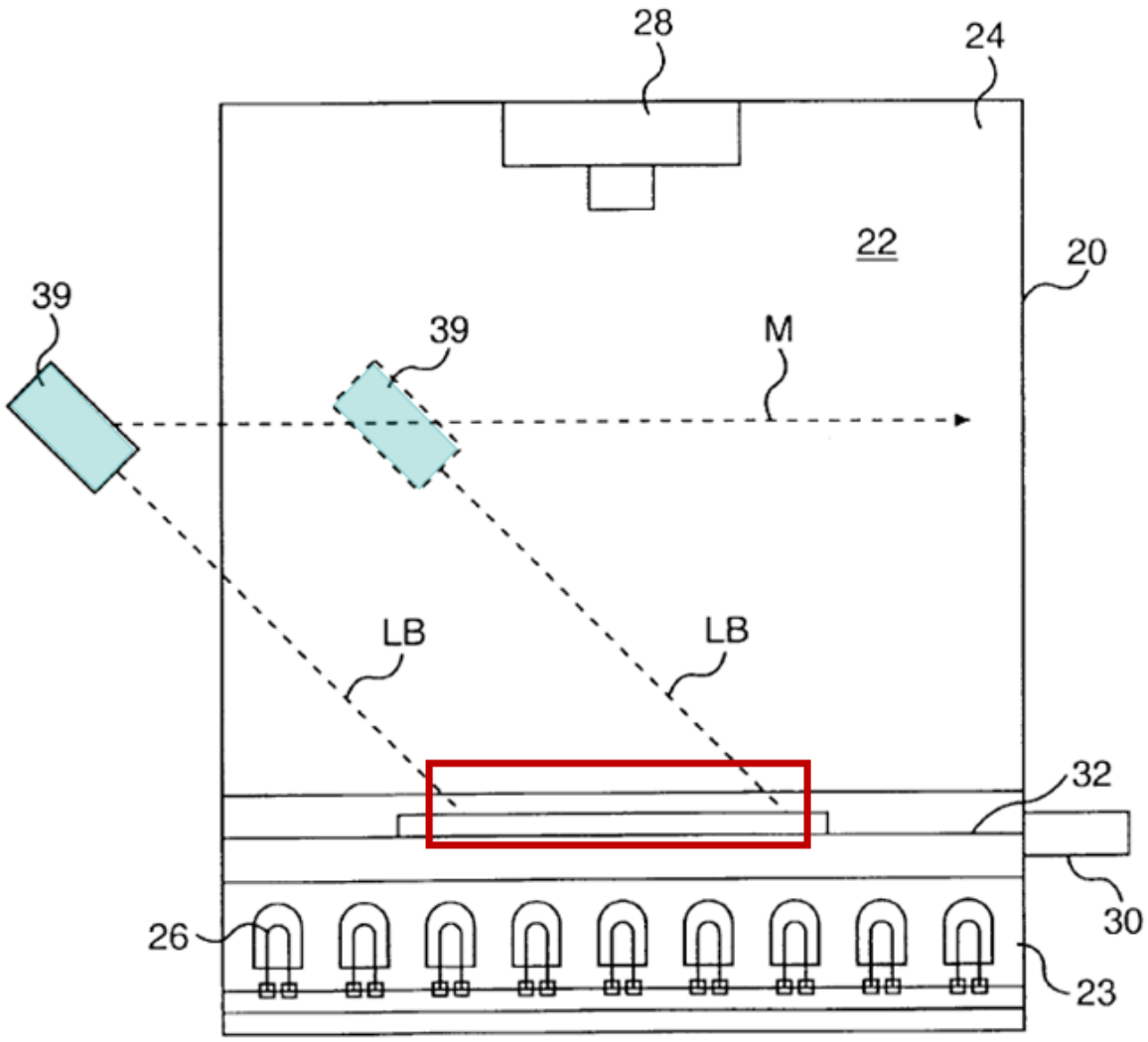


FIG. 8

Wills, Figure 8 (annotated); Basham, ¶36.

According to *Wills*, one aspect of identifying a key blank, also called a "reference key" in *Wills*, is "analyzing the surface information of the master key, specifically the milling." *Wills*, 11:36-39. To this end, *Wills*' machine further includes a "computer subsystem," as illustrated in Figure 23, that includes "means

for obtaining surface information 2375," as shown.

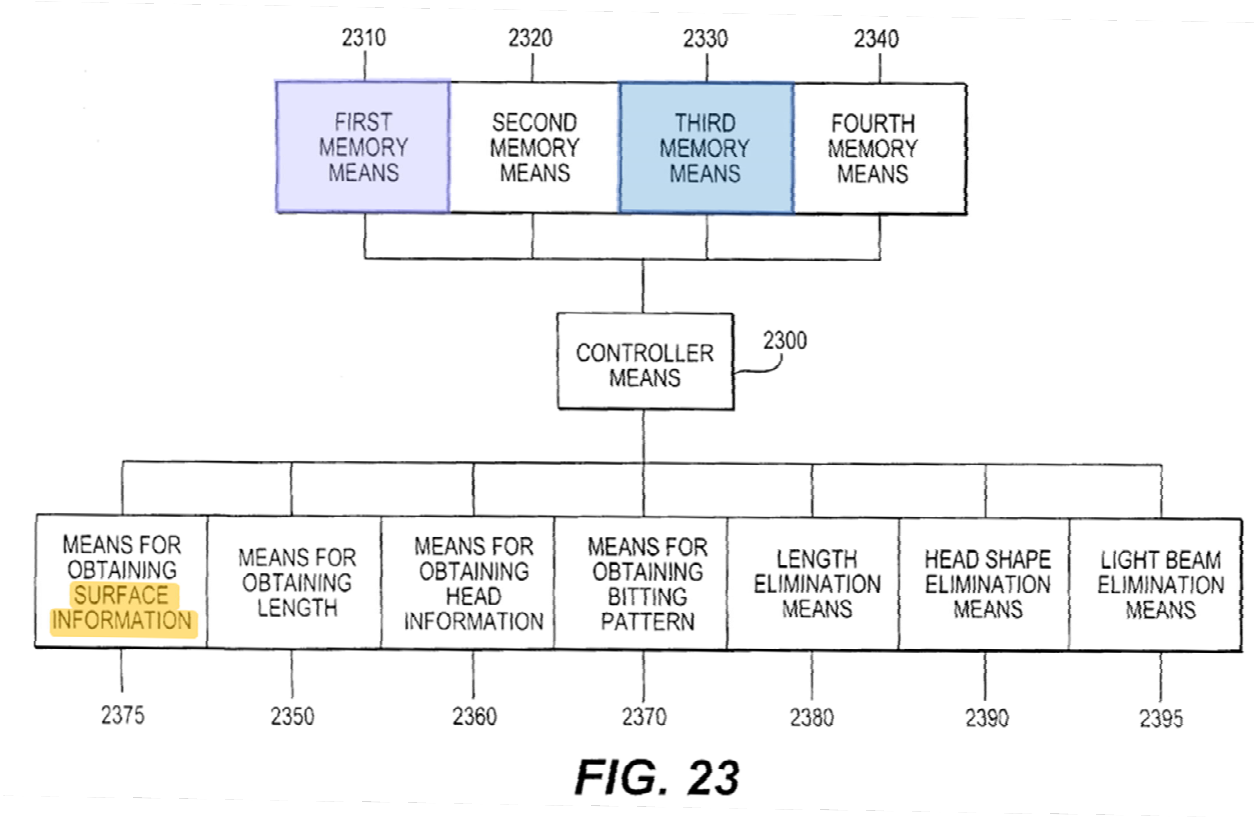


FIG. 23

Wills, Figure 23 (annotated); Basham, ¶37.

As *Wills* explains, "light beam image data represent[ing] the result of the light beam interfacing with the surface of the master key shown in FIG. 7A, specifically the surface shown in FIG. 7B" is "stored in the third memory means 2330" in Figure 23. From the light beam image data, *Wills* explains, *Wills*' machine "extracts depth measurements" for the milling of the master key. *Wills*, 37:16-19; *see also id.*, 37:20-39:1 (discussing pseudocode for extracting depth measurements).

Wills' computer subsystem also stores "surface information of each of the

reference keys" in a "first memory means 2310," as shown, which includes, for each reference key, "depth measurements across the width of the [reference] key." *Id.*, 31:56-51; *see also id.*, 15:2-5 ("The memory means also stores information about the light beam LB interfacing with each of the reference keys[.]").

To identify a reference key for the master key, a "light beam elimination means 2395" of *Wills*' computer subsystem compares the depth measurements for the master key with the depth measurements for the reference keys and, from the comparison, generates a "ranking … from the most likely match" among the reference keys "to the least likely match." *Id.*, 15:6-19; *see also id.*, Figures 31 (calculating a "surface score" for the reference keys) and 32 (factoring the "surface score" into the "overall score" and ranking keys by overall score).

B. Bass

U.S. Patent App. Pub. No. 2007/0224008 (Ex. 1006) ("*Bass*") published September 27, 2007, and constitutes prior art under at least pre-AIA 35 U.S.C. §§ 102(a), 102(b), and/or 102(e).

Bass, like *Wills*, describes a machine for duplicating master keys. *Bass*, [0009]. As in *Wills*, the master key of *Bass* is placed in the machine, and a camera, together with a reflecting plate, is used to capture an image of the master key, as shown in Figure 6. As in *Wills*, where the master key is placed into the machine on a "supporting means," *Wills*, 7:4-8, in *Bass*' machine the master key is placed into

the machine on a "base 16," as shown, *Bass*, [0047], [0050]. *Bass*' machine also employs a "door clamp 14," as shown. *Id.*

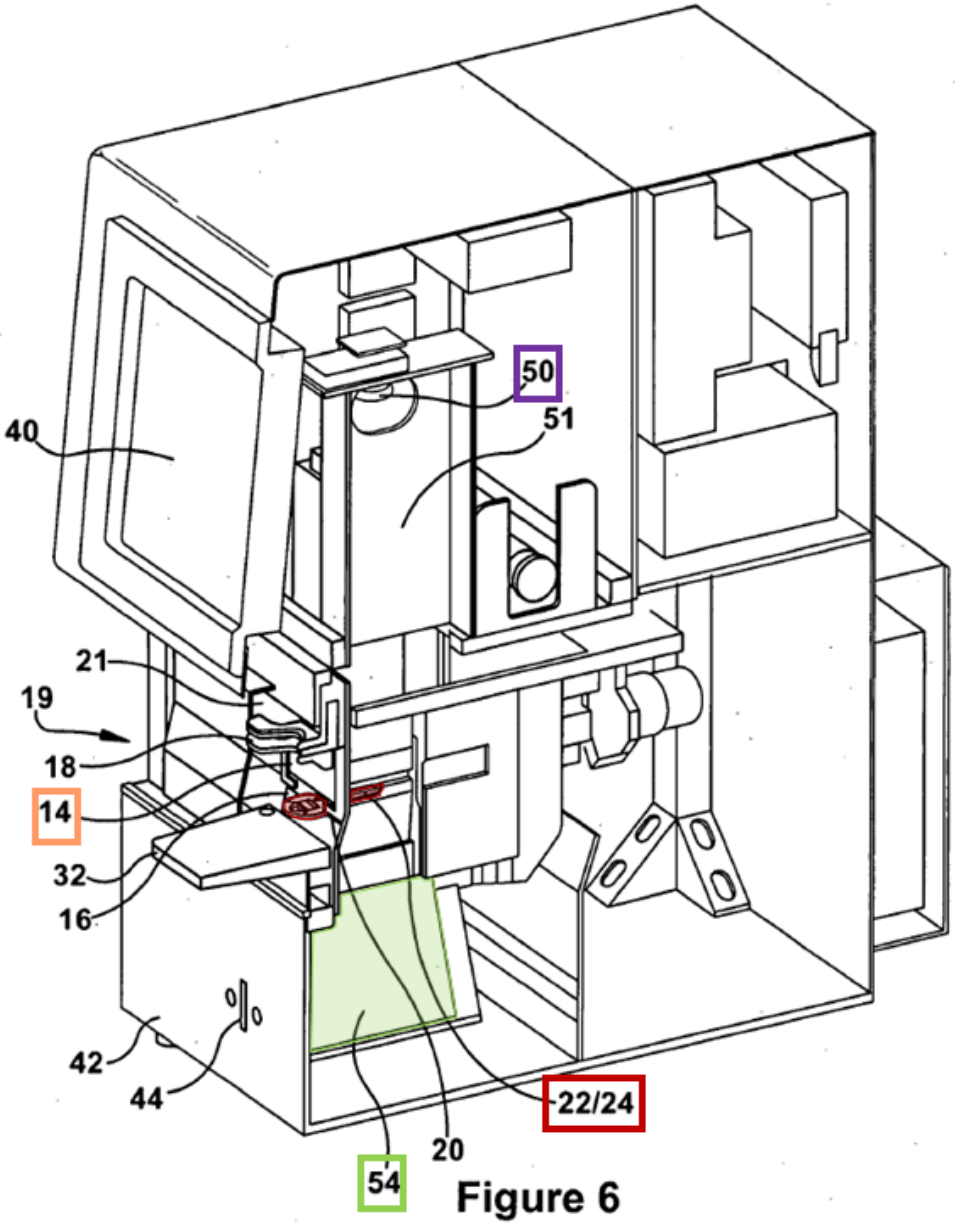


Figure 6

Bass, Figure 6 (annotated); Basham, ¶42.

C. Heide

U.S. Patent App. Pub. No. 2007/0233298 (Ex. 1007) ("*Heide*") published October 4, 2007, and constitutes prior art under at least pre-AIA 35 U.S.C.

§§ 102(a), 102(b), and/or 102(e).

Heide describes a "three-dimensional object" akin to the "three-dimensional image" captured by *Wills*' machine. *Heide*, Abstract; *Wills*, 15:34-42. And just as *Wills* envisions "convert[ing]" its three-dimensional image "by … rotating to a predetermined reference position and orientation," *Wills*, 9:35-38, *Heide* teaches "rotat[ing]" its three-dimensional image "relative to one or more … axes" to arrive at an "optimal spatial orientation," *Heide*, [0037]-[0038].

III. THE '619 PATENT

The '619 patent describes a "key identification system" that "capture[s] an image of a master key" and uses "logic to analyze the image" to identify a key blank for use in duplicating the key. '619 patent, 2:22-29. A master key is illustrated in Figure 1. As shown, the "master key 10" includes a "blade 18" in which a "groove 11" is formed. '619 patent, 3:46-50. A"tip 14" of the master key is shown as well. *Id.*, 5:6-7.

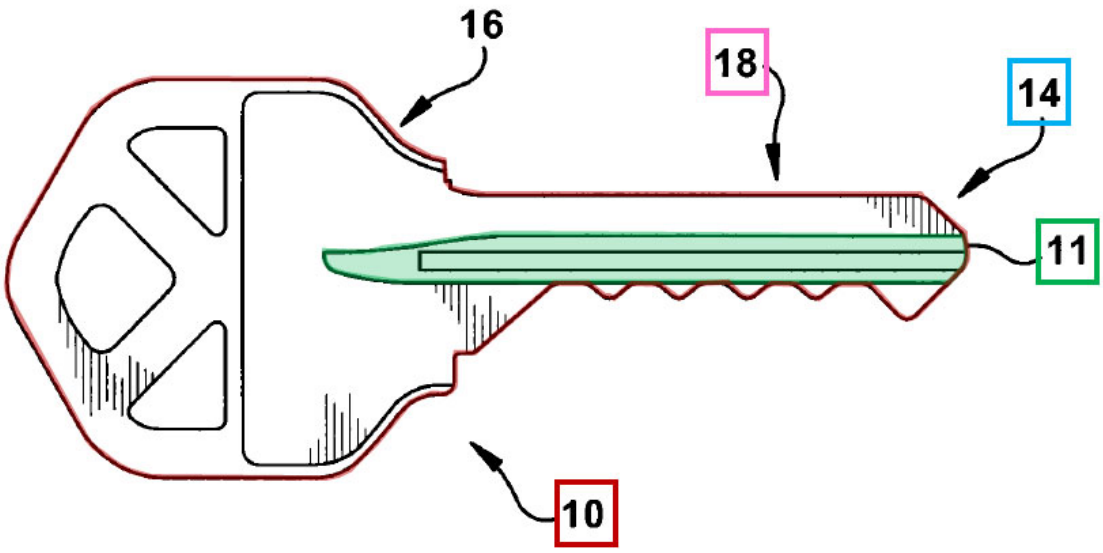


FIG. 1

'619 patent, Figure 1 (annotated); Basham, ¶45.

An embodiment of the key identification system of the '619 patent is illustrated in Figure 2b. As shown, the system includes "an imaging system," shown as a camera, "configured to capture an image of the tip of [the] master key." *Id.*, 10:29-31.

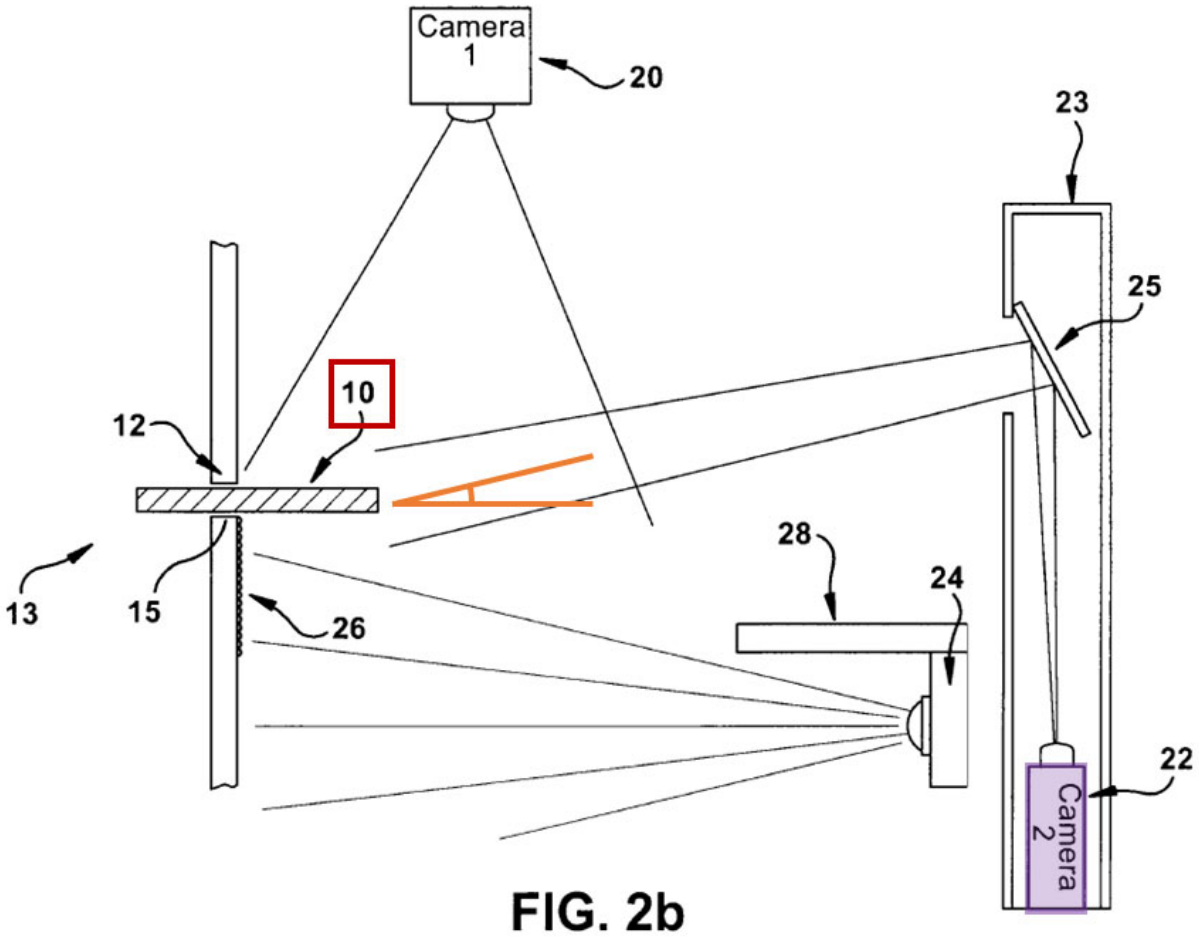


FIG. 2b

’619 patent, Figure 2b (annotated); Basham, ¶46.

The imaging system is configured to capture the image “at an angle between perpendicular and parallel to the blade of [the] master key and not including perpendicular or parallel to the blade of [the] master key.” *Id.*, 10:31-33. As Figure 2b shows, the image “at an angle between perpendicular and parallel to the blade of [the] master key” is obtained through the use of a “mirror 25 directed toward the key 10 tip,” such that the “angle of incidence upon the key 10” is not perpendicular or parallel to the blade of the master key. *Id.*, 6:57-67.

The image captured by the imaging system "includes a contour of a groove in [the] master key," and the key identification system uses a "logic" to "analyze [the] captured image to determine characteristics" of [the] groove based on [the] contour." *Id.*, 10:34-38. *Id.*, 4:52-54. The logic "compare[s] [the] characteristics of [the] groove with groove characteristics of known key blanks to determine the likelihood of a match between [the] master key and a known key blank." *Id.*, 10:38-41.

IV. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art may be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). A person of ordinary skill in the art at the time of the alleged invention would have had a degree in engineering and three years of experience in key duplication equipment. Basham, ¶15. This level of skill is approximate, and more experience would compensate for less formal education, and vice versa. *Id.* For example, an individual having no degree in engineering, but ten years of key duplication experience would qualify as a person of ordinary skill in the art. *Id.* Moreover, a person with no key duplication experience but a masters or doctorate in engineering may also qualify as a person of ordinary skill in the art. *Id.* The experience in the field of key duplication equipment may include experience with various types of key duplication equipment, including vending machines. *Id.*

Additional education could substitute for professional experience and vice versa. *Id.*

V. CLAIM CONSTRUCTION

The Board construes claims in accordance with 37 C.F.R. § 42.200(b) and *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Claims need only be construed to the extent necessary to resolve a controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). No terms (including the term addressed below) need construction at this time because the claims encompass the prior-art mappings below under any construction consistent with *Phillips*.

Claim 1 recites "a logic configured to analyze said captured image to determine characteristics of said groove based on said contour and further to compare said characteristics of said groove with groove characteristics of known key blanks to determine the likelihood of a match between said master key and a known key blank." The claimed "logic" should not be construed as a means-plus-function term under pre-AIA 35 U.S.C. § 112, ¶6, at least because the term does not recite a "means," creating a presumption that means-plus-function claiming does not apply, and no evidence of record overcomes that presumption. *Williamson v. Citric Online, LLC*, 792 F.3d 1339, 1348-49 (Fed. Cir. 2015). Further, the term "logic" itself connotes sufficiently definite structure to a person of ordinary skill in

the art (POSITA). *Id.* at 1349, 1351; *see also TecSec, Inc. v.* IBM, 731 F.3d 1336, 1348 (Fed. Cir. 2013) ("the term 'digital logic' designates structure to skilled artisans"); *Analog Devices, Inc. v. Xilinix, Inc.*, IPR2020-01597, Paper 12 at 17-18 (PTAB April 8, 2021) (describing "logic" as a "hardware structure"). To the extent the term "logic" could encompass a variety of possible structures, that alone does not warrant construing the term under § 112. *See, e.g.*, *Mass. Inst. of Tech. v. Abacus Software*, 462 F.3d 1344, 1356 (Fed. Cir. 2006) ("[I]t is sufficient [to avoid the application of § 112, ¶6] if the claim term is used in common parlance or by persons of skill in the pertinent art to designate structure, even if the term covers a broad class of structures and even if the term identifies the structures by their function.").

The claimed "logic" need not be construed. *Nidec*, 868 F.3d at 1017. To the extent the Board determines the claimed "logic" should be construed as a means-plus-function term, the function of the "logic" is "analyz[ing] said captured image to determine characteristics of said groove based on said contour and further to compare said characteristics of said groove with groove characteristics of known key blanks to determine the likelihood of a match between said master key and a known key blank[.]" The corresponding structure is described in the '619 patent at 4:12-27. As explained below, the claimed "logic," even if construed, is disclosed by *Wills*.

VI. STATEMENT OF PRECISE RELIEF REQUESTED FOR EACH CLAIM CHALLENGED

Hillman requests review of claims 1-8, 10-14, and 19-22 under the following grounds:

Ground	References	Basis	Claims
1	*Wills*	§ 102	1-6, 8, 10, 12, 14, 19-20
2	*Wills*	§ 103	1-6, 8, 10, 12, 14, 19-20
3	*Wills* and *Bass*	§ 103	7, 21-22
4	*Wills* and *Heide*	§ 103	11, 13

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

As described below, *Wills*, alone or in combination with *Bass* or *Heide*, would have anticipated and/or rendered obvious claims 1-8, 10-14, and 19-22 of the '619 patent.

A. Grounds 1 and 2: *Wills* Would Have Anticipated and/or Rendered Obvious Claims 1-6, 8, 10, 12, 14, 19-20

1. Claim 1

Wills anticipates and/or renders obvious claim 1.

a. 1[p] A key identification system comprising:

To the extent this preamble is limiting, *Wills* describes "[a] key identification system." *Wills* describes a "key regenerating machine in which [a] master key is optically analyzed [and] the appropriate key blank determined." *Wills*, 1:7-11.

b. 1[a] an imaging system configured to capture an image of the tip of a master key at an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to the blade of said master key, wherein said captured image of said tip includes a contour of a groove in said master key; and

Wills anticipates and/or renders obvious "an imaging system configured to capture an image of the tip of a master key at an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to the blade of said master key" because *Wills*' machine includes a camera configured to capture an image of the tip of a master key at a range of angles, including an angle between perpendicular and parallel to the blade of the master key and not including perpendicular or parallel to the blade of the master key. Basham, ¶55.

Wills describes a "master key" that includes a "tip" and a "blade." As *Wills* explains with reference to Figure 1A, "the keys discussed [in *Wills*] each have a head H [and] a length LH that is the combination of the head H and a blade B." *Wills*, 5:11-13. "More specifically," *Wills* explains, "the length LH of the key extends from the tip TP of the blade B to the top of the head H." *Id.*, 5:13-15.

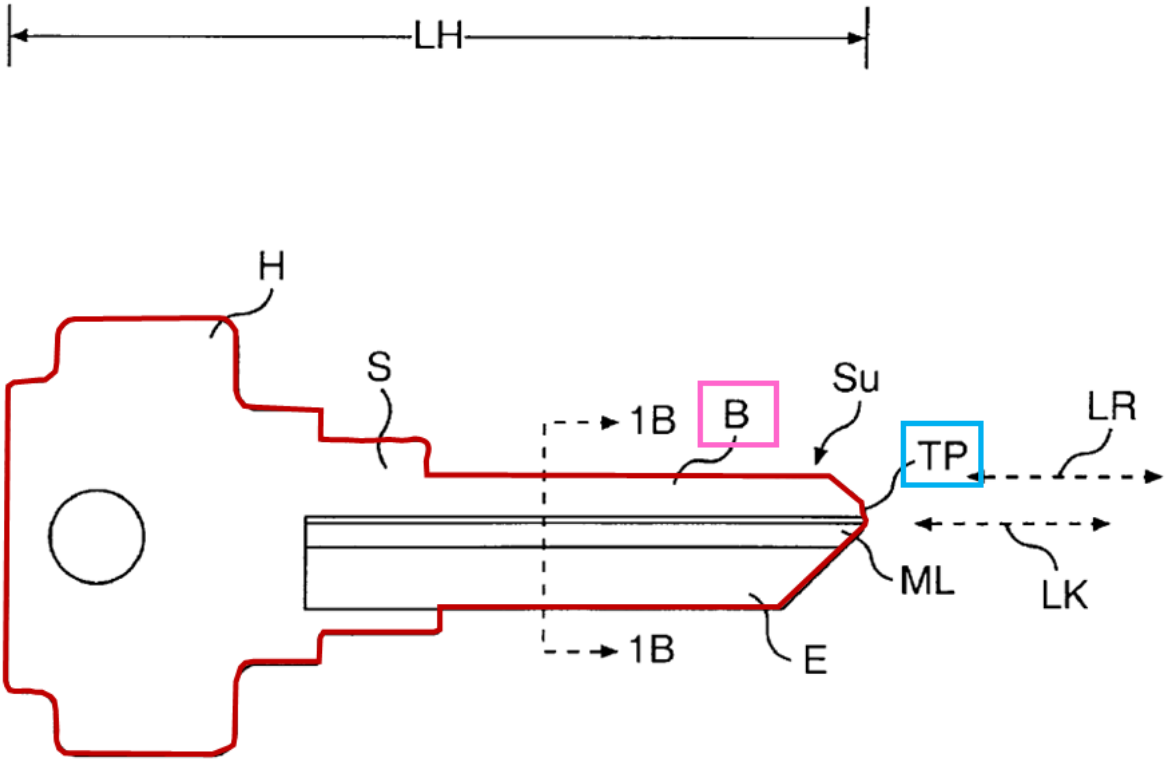


FIG. 1A

Wills, Figure 1A (annotated); Basham, ¶56.

Wills' machine includes an "imaging system configured to capture an image of the tip of the master key." Basham, ¶57. *Wills*' machine, including a "camera 28," is shown in Figure 9. *Id.*, 7:39-41. *Wills*' camera is "configured to capture an image of the tip of a master key," because *Wills*' camera is used to capture "an entire three-dimensional surface image of the [master] key" by capturing two-dimensional slices "along the length of the key," which includes the tip. *Wills*, 15:34-42.

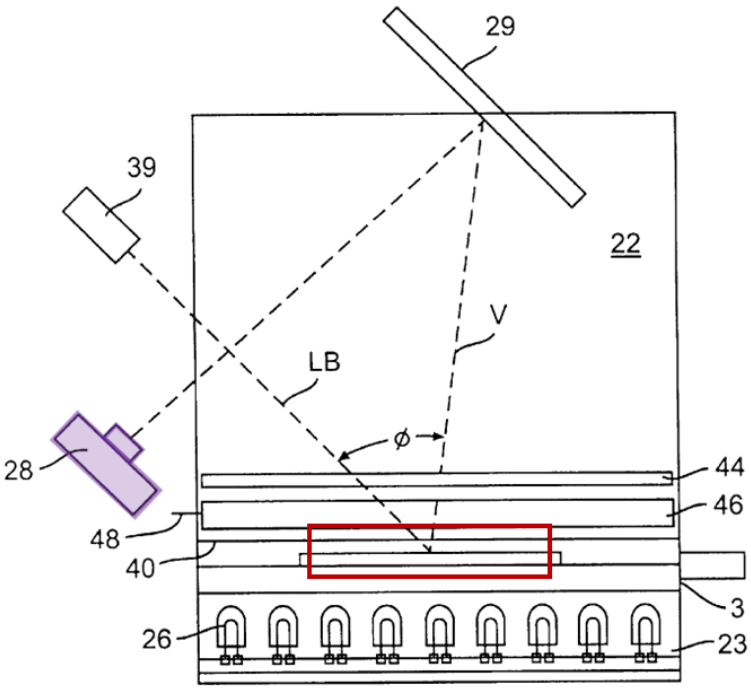


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶57.

In particular, as *Wills* explains with reference to Figure 8, "[a]s [a] light beam LB is swept along the length of the [master] key, illustrated by the second laser line generator 39 in phantom lines, a series of two-dimensional slices is generated," and these "slices are stacked to form the entire three-dimensional representation of the key." *Id.*, 15:40-50. Because *Wills* describes capturing the two-dimensional slices "along the length of the key," which includes the tip, *id.*, 5:11-15, a POSA would have understood from *Wills* that either (i) a two-dimensional slice captured at the tip of the master key or (ii) the resulting three-dimensional representation, which would include the tip of the master key, is "an

image of the tip of the master key." In this manner, *Wills*' camera is an "imaging system configured to capture an image of the tip of the master key."

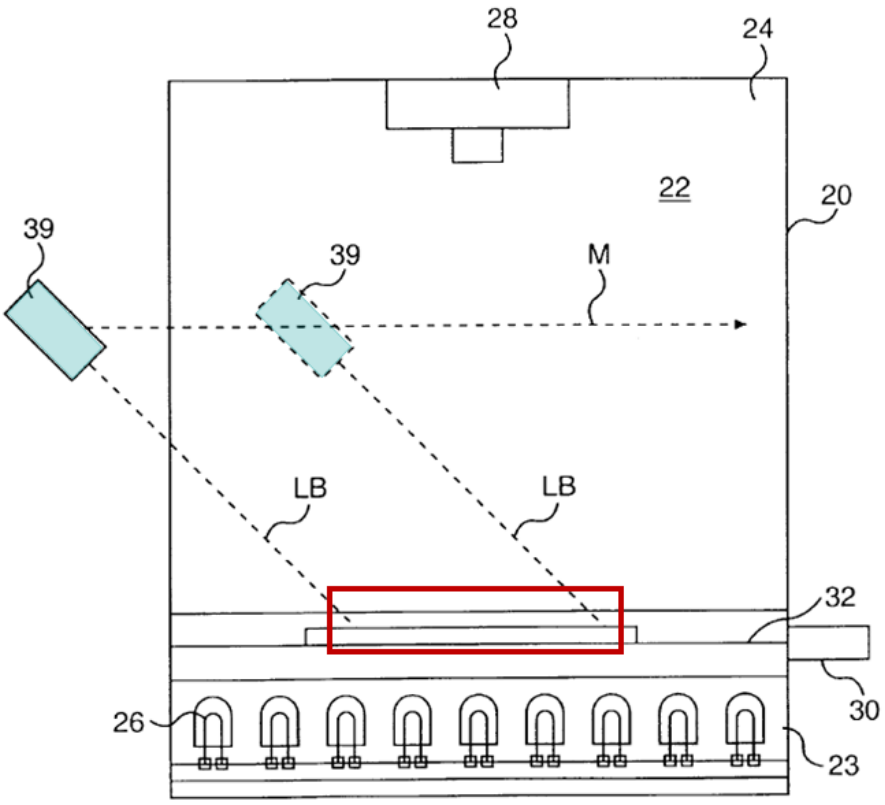


FIG. 8

Wills, Figure 8 (annotated); Basham, ¶58.

Wills also discloses and/or would have rendered obvious that the image of the tip of the master key captured by its camera is captured "at an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to the blade of said master key." As Figure 9 shows, the image captured by *Wills*' camera is an image of "the side of the master key …

along a viewing axis V." *Wills*, 11:67-12:1. *Wills* envisions a range of angles for the viewing axis V, including an angle between perpendicular and parallel to the side of the master key and not including perpendicular or parallel to the side of the master key. Basham, ¶59.

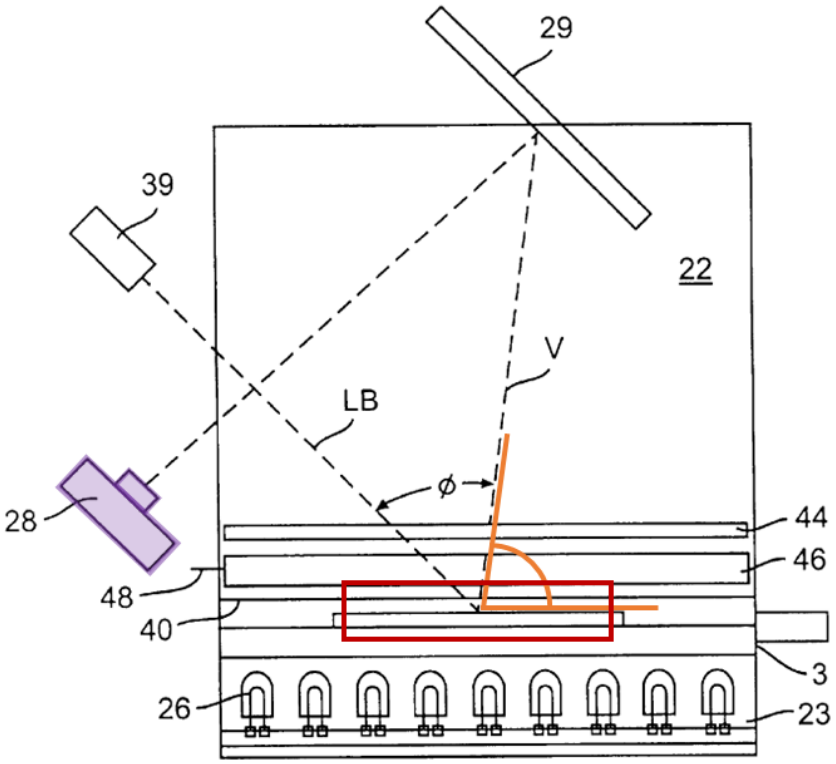


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶59.

In particular, as one example, *Wills* proposes that an angle at which the laser beam LB (shown in Figure 9 below) strikes the master key be "ten to eighty degrees (10-80°)" relative to the side"— "of the master key, and that the angle Φ between the laser beam LB and the viewing axis V be, for example, "at sixty

degrees (60°)." *Wills*, 12:12-25. Thus, as illustrated below, *Wills* contemplates an embodiment in which, for example, the angle at which the laser beam LB strikes the master key is 50° relative to the side of the master key, and the angle Φ between the laser beam LB and the viewing axis V is 60°, such that the angle between the viewing axis V and the side of the master key is 70°. *Id.*; Basham, ¶60. A POSA would have recognized from *Wills* that the side of the master key is co-planar with "the blade of the master key," such that the angle between the viewing axis V and the side of the master key is likewise the angle between the viewing axis V and "the blade of the master key." Basham, ¶¶61-63; *see, e.g., Wills*, Figures 7A, 7B, 7D; 5:11-24, 5:56-59, 7:5-8, 11:44-49. Because the 70° angle between the viewing axis V and the blade of the master key is between perpendicular (90°) and parallel (0°) to the blade of the master key, a POSA would have understood that *Wills* discloses and/or would have rendered obvious that this angle is "between perpendicular and parallel to the [side] of said master key and not including perpendicular or parallel to the [side] of said master key." Basham, ¶64. *See also* MPEP 2131.03 (acknowledging that "[w]hen the prior art discloses a range which touches or overlaps the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation" because "[i]n order to anticipate the claims, the claimed subject matter must be disclosed in the reference with 'sufficient

specificity'" and recommending "[a] 35 U.S.C. 102/103 combination … if it is unclear if the reference teaches the range with 'sufficient specificity'").

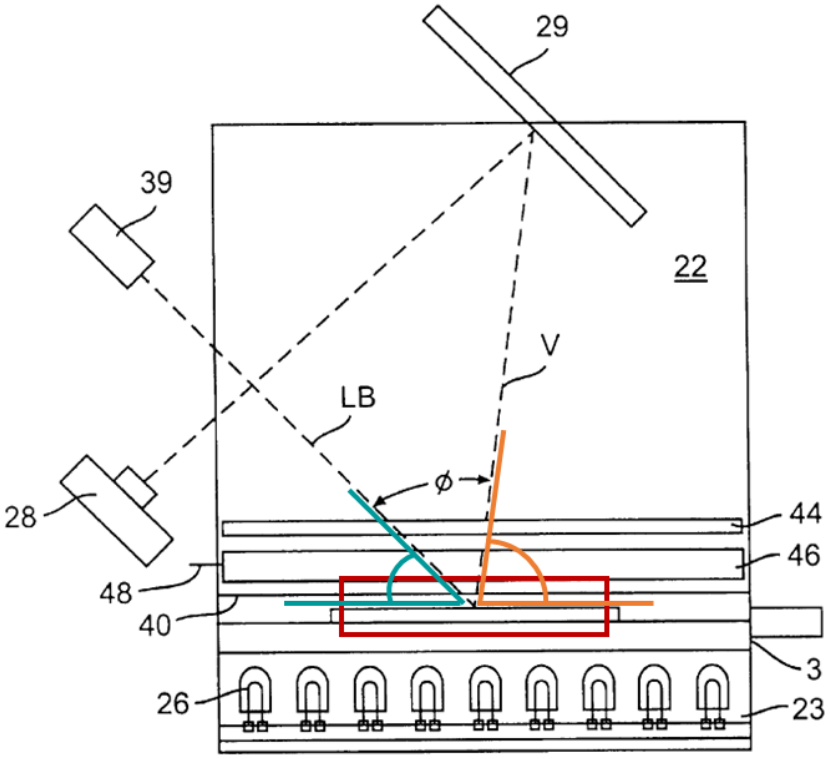


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶64.

Wills discloses this because a claimed range is anticipated "if *one* of [the values in the range] is in the prior art." *Titanium Metals Corp. v. Banner,* 778 F.2d 775, 782 (Fed. Cir. 1985). Here, at least one angle in the range "between perpendicular and parallel to the [side] of said master key and not including perpendicular or parallel to the [side] of said master key" is disclosed by *Wills*, as shown above. Basham, ¶65.

Alternatively, *Wills* would have rendered this obvious because "where there is a range disclosed in the prior art, and the claimed invention falls within that range, there is a presumption of obviousness." *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004). This presumption is only overcome where (1) "the prior art taught away from the claimed invention" or (2) "there are new and unexpected results relative to the prior art," *id.*, neither of which is the case here.

Regarding (1), *Wills* not only does not teach away from "an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to said blade of the master key," *Wills* recognizes the value of such an angle for the viewing axis V. Basham, ¶66. In particular, *Wills* recognizes that placing the camera somewhere other than directly overhead the key (which would result in a viewing axis V "perpendicular … to the blade of said master key") can require a larger machine to accommodate the focal length of the camera. *Wills*, 7:39-50; Basham, ¶67. For this reason, *Wills* proposes employing the "mirror 29" shown in Figure 9, "to minimize the size of the machine[.]" *Id.* Notably, *Wills*' configuration employing the mirror is consistent with one way the "imaging system" and the "angle" are described in the '619 patent. For example, the '619 patent envisions an embodiment in which, as in *Wills*, a camera and a mirror are used together "to allow a single camera at a remote position to capture

multiple angles of the master key, including angles of the tip 14." '619 patent, 5:27-34.

Regarding (2), capturing the image at "an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to said blade of the master key" does not create any "new and unexpected results" not recognized by *Wills*. Basham, ¶68. Rather, *Wills*, like the '619 patent, recognizes that the angle at which the image is captured must be selected to ensure surface information about the master key can be discerned. *Compare Wills*, 12:4-8 ("If the viewing axis V and the light beam LB were parallel, then the segment would appear linear and no information would be easily obtained about the surface of the key.") *with* '619 patent, 5:1-5 ("Neither overhead scanning of the groove 11 nor parallel scanning of the groove 11 provide sufficient contrast between the groove 11 and the rest of the key 10 to effectively determine certain parameters of the groove 11."); Basham, ¶68.

Thus, *Wills* describes a range of angles for the viewing axis V that includes the "angle between perpendicular and parallel to the blade of the master key and not including perpendicular or parallel to the blade of the master key," and this range discloses and/or would have rendered obvious "an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to said blade of the master key."

Finally, *Wills* also describes that the "captured image of said tip includes a contour of a groove in said master key," because the captured image in *Wills*—whether the two-dimensional slice captured at the tip of the master key or the resulting three-dimensional representation, which would include the tip of the master key—includes surface information, including a depth, of the milling in the master key. Basham, ¶70.

As Figure 7A shows, *Wills*' master key includes the blade in which is formed the milling, which *Wills* describes as "a longitudinally-extending groove … in the blade." *Id.*, 5:22-24, 5:56-59.

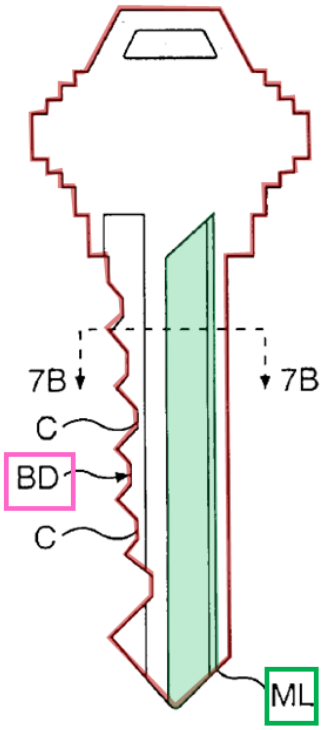


FIG. 7A

Wills, Figure 7A (annotated); Basham, ¶71.

The milling of the master key in Figure 7A has particular "surface information," such as a "depth," as shown in Figure 7B, which is a cross-section of Figure 7A. *Wills*, 5:61-65, 11:59-63.

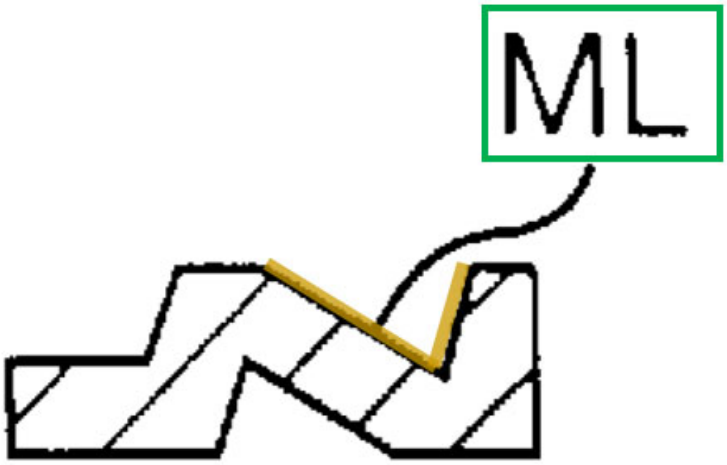


FIG. 7B

Wills, Figure 7B (annotated); Basham, ¶72.

A POSA would have understood the surface information, such as the depth, of the milling of *Wills*' master key to be a "a contour of a groove in said master key." Basham, ¶73. As Figure 3 of the '619 patent shows, the contour of the

groove in the '619 patent, like the surface information of the milling in *Wills*, is a physical geometry of the groove. Basham, ¶73; '619patent, 5:23-24; *see also id.*, Figure 6 (showing "contour data related to contours of the groove" in Figure 3), Figure 7 (showing calculated "groove contours"). 4:51-54 (describing "[c]haracteristics of the grooves," including "the size, location, angle, and other geometric parameters of a given groove"), 5:27-29 (describing "groove geometry").

The image captured in *Wills* includes the surface information, such as the depth, of the milling in the master key. Basham, ¶74. The two-dimensional slice captured by the camera, shown in Figure 7D, "is the result of the light beam interfacing with the surface of the master key shown in FIG. 7A, specifically the surface shown in FIG. 7B," which, as shown above, includes the surface information, such as the depth, of the milling. *Id.*, 11:59-63. As Figure 7D shows, the two-dimensional slice captured by the camera likewise includes the surface information of the master key, including the "depth of [the] milling." *Id.*, 13:1-3. While Figure 7D, which corresponds to "the surface shown in FIG. 7B," illustrates a two-dimensional slice taken along the line 7B–7B in Figure A, *Wills*, 3:11-12, a POSA would have understood from *Wills* that, among the two-dimensional slices taken "along the length of the key" would be the two-dimensional slice captured at the tip of the master key, and this the two-dimensional slice captured at the tip

would, like the two-dimensional slice taken along the line 7B–7B, include the surface information of the master key, including the "depth of [the] milling." Basham, ¶74. Moreover, a POSA would have recognized that the three-dimensional representation in *Wills* would likewise include the surface information, such as the depth, of the milling, as the three-dimensional representation is simply formed by "stack[ing]" the two-dimensional slices—each including surface information for the slice—captured "along the length of the key." *Wills*, 15:40-47; Basham, ¶74.

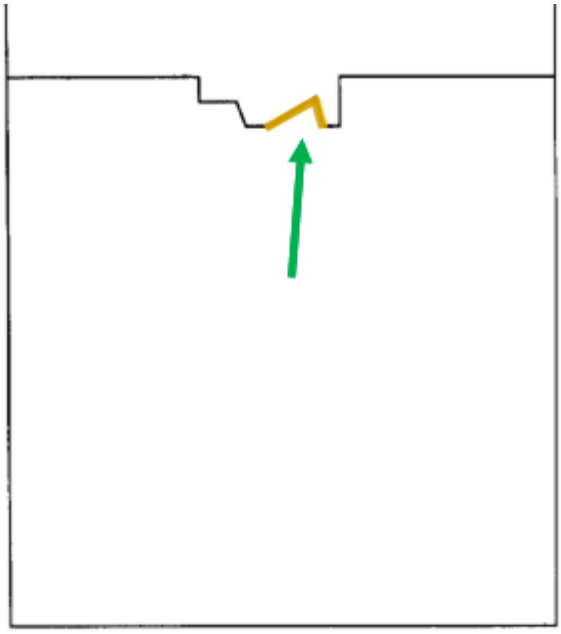


FIG. 7D

Wills, Figure 7D (cropped and annotated); Basham, ¶74.

Thus, because *Wills*' machine includes a camera configured to capture an

image of the tip of a master key at a range of angles, including an angle between perpendicular and parallel to the blade of the master key and not including perpendicular or parallel to the blade of the master key, and because the captured image in *Wills* includes surface information, including a depth, of the milling in the master key, *Wills* discloses and/or would have rendered obvious "an imaging system configured to capture an image of the tip of a master key at an angle between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to the blade of said master key, wherein the captured image of said tip includes a contour of a groove in said master key." Basham, ¶75.

c. 1[b] a logic configured to analyze said captured image to determine characteristics of said groove based on said contour and further to compare said characteristics of said groove with groove characteristics of known key blanks to determine the likelihood of a match between said master key and a known key blank.

Wills discloses "a logic configured to analyze said captured image to determine characteristics of said groove based on said contour" because *Wills* describes a computer subsystem configured to analyze the captured image to determine depth measurements of the milling based on the surface information, including the depth. Basham, ¶76.

Wills describes "analyzing the surface information of the master key,

specifically the milling," to identify a reference key for the master key. *Wills*, 11:36-39. To this end, *Wills*' machine further includes a "computer subsystem," as illustrated in Figure 23, that includes "means for obtaining surface information 2375," as shown. *Id.*, 31:44-47, 32:1-2.

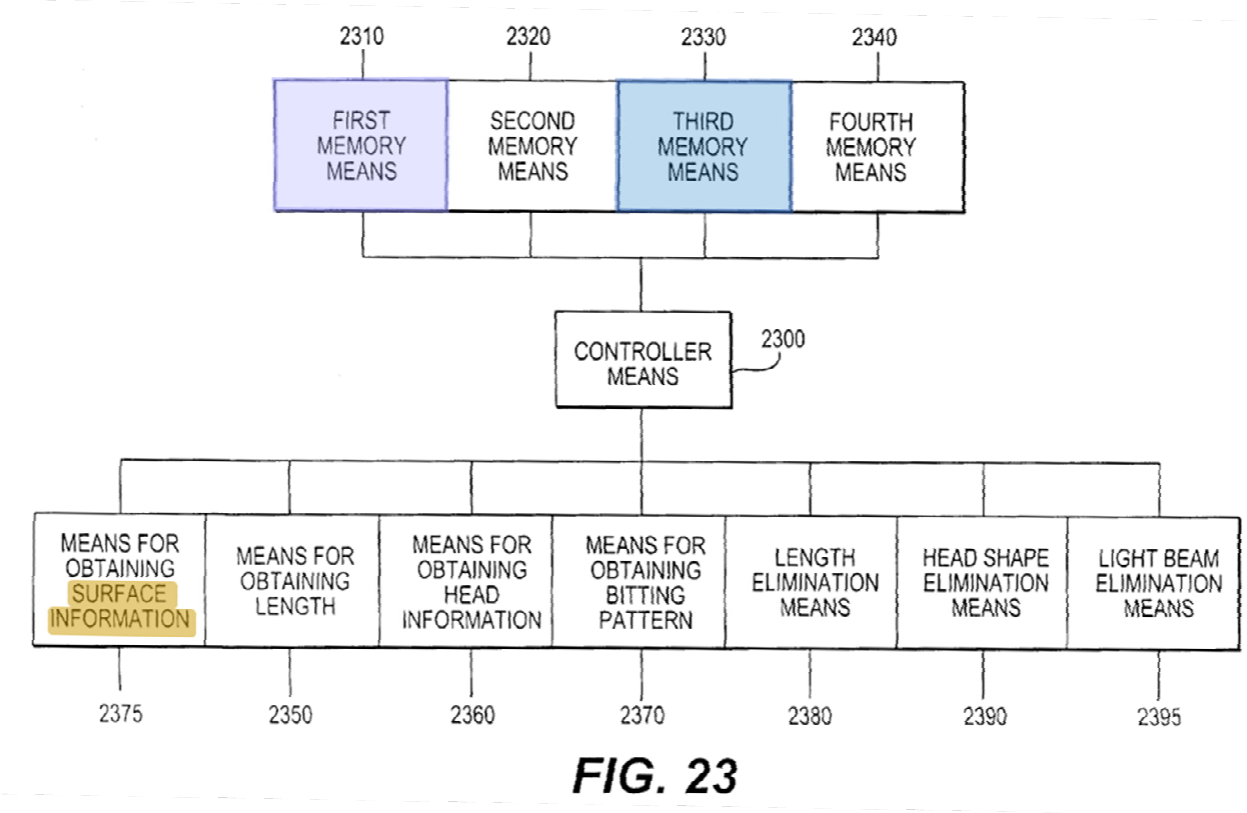


FIG. 23

Wills, Figure 23 (annotated); Basham, ¶77.

As explained for 1[a], *Wills*' image—whether the two-dimensional slice or the three-dimensional representation formed by stacking the two-dimensional slices—includes surface information, including a depth, of the milling in the master key. *Wills* explains that data corresponding to this image is "stored in the

third memory means 2330" in Figure 23. *Wills*, 37:11-15. From the image data, *Wills* explains, the means for obtaining surface information "extracts depth measurements" for the milling in the master key. *Wills*, 37:16-19; *see also id.*, 37:20-39:1 (discussing pseudocode for extracting depth measurements). A POSA would have understood the depth measurements extracted by *Wills*' computer subsystem to be "characteristics of said groove based on said contour" because the depth measurements are measurements of the milling and reflect the surface information, including the depth, captured in the image. Basham, ¶78.

Wills also discloses "a logic configured … further to compare said characteristics of said groove with groove characteristics of known key blanks to determine the likelihood of a match between said master key and a known key blank" because *Wills*' computer subsystem is also configured to compare the depth measurements of the milling with depth measurements of reference keys to determine a likelihood of a match between the master key and each reference key. Basham, ¶79.

As *Wills* explains, the computer subsystem also stores "surface information of each of the reference keys" in a "first memory means 2310," as shown in Figure 23. *Wills*, 31:56-61. This "surface information of each of the reference keys" includes, for each reference key, "depth measurements across the width of the [reference] key." *Id.*; *see also id.*, 15:2-5 ("The memory means also stores

information about the light beam LB interfacing with each of the reference keys[.]").

To identify a reference key for the master key, *Wills* explains, a "light beam elimination means 2395" of *Wills*' computer subsystem compares the depth measurements for the master key with the depth measurements for the reference keys and, from the comparison, generates a "ranking … from the most likely match" to the master key among the reference keys "to the least likely match." *Id.*, 15:6-19; *see also id.*, Figures 31 (calculating a "surface score" for the reference keys) and 32 (factoring the "surface score" into the "overall score" and ranking keys by overall score).

A POSA would have understood *Wills*' computer subsystem to disclose the claimed "logic," because *Wills*' computer subsystem is consistent with how the "logic" is described in the '619 patent. Basham, ¶82. For example, the '619 patent provides that the "logic" may take the form of "a memory device containing instructions." '619 patent, 4:12-20. Similarly, *Wills* describes implementing its computer subsystem using "programs to operate the computer subsystem 16" that "are stored on a hard disk 17," as shown in Figure 5. *Wills*, 6:17-18.

To the extent the Board determines the claimed "logic" should be construed as a means-plus-function term under § 112, *supra* Section V, *Wills* discloses the "logic" in substantially the same manner. *Wills* describes the function of

"analyz[ing] said captured image to determine characteristics of said groove based on said contour and further to compare said characteristics of said groove with groove characteristics of known key blanks to determine the likelihood of a match between said master key and a known key blank," as explained above. Basham, ¶82. And the corresponding structure, described in the '619 patent at 4:12-27, includes "a memory device containing instructions," which *Wills* teaches, as explained above. Basham, ¶82.

2. Claim 2: The key identification system of claim 1, wherein said logic includes a database containing data related to characteristics of grooves of known key blanks.

Wills discloses that the "logic includes a database containing data related to characteristics of grooves of known key blanks" because *Wills* describes storing the "surface information" for the reference keys, which includes, the depth measurements of the reference keys, in "a memory means such as a database." *Wills*, 32:49-59 ("The surface information consists of depth measurements across the width of the key."); *see also id.*, 33:37-34:35 (example surface information for reference keys). Basham, ¶83.

3. Claim 3: The key identification system of claim 1, wherein said imaging system includes a camera.

Wills discloses that the "imaging system includes a camera" because *Wills*' machine captures the image of the master key using the "camera 28," as shown in Figure 9. *Wills*, 7:38-46; Basham, ¶84.

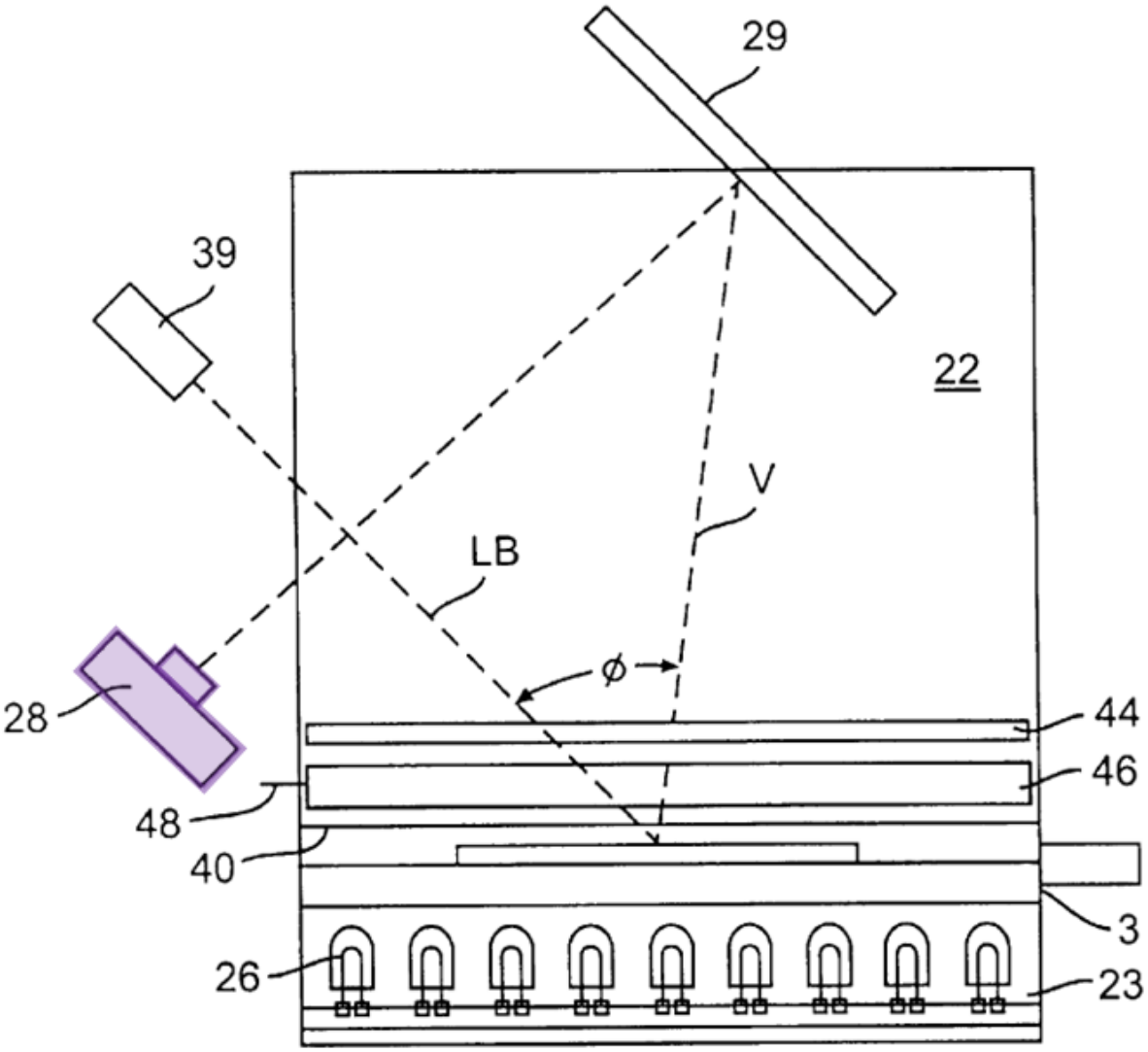


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶84.

4. Claim 4: The key identification system of claim 1, wherein said imaging system includes a reflecting device.

Wills discloses that the "imaging system includes a reflecting device" because *Wills*' machine employs a "mirror 29," shown in Figure 9, that "reflects

the image [of the master key] to the camera 28." *Wills*, 7:47-48; Basham, ¶85.

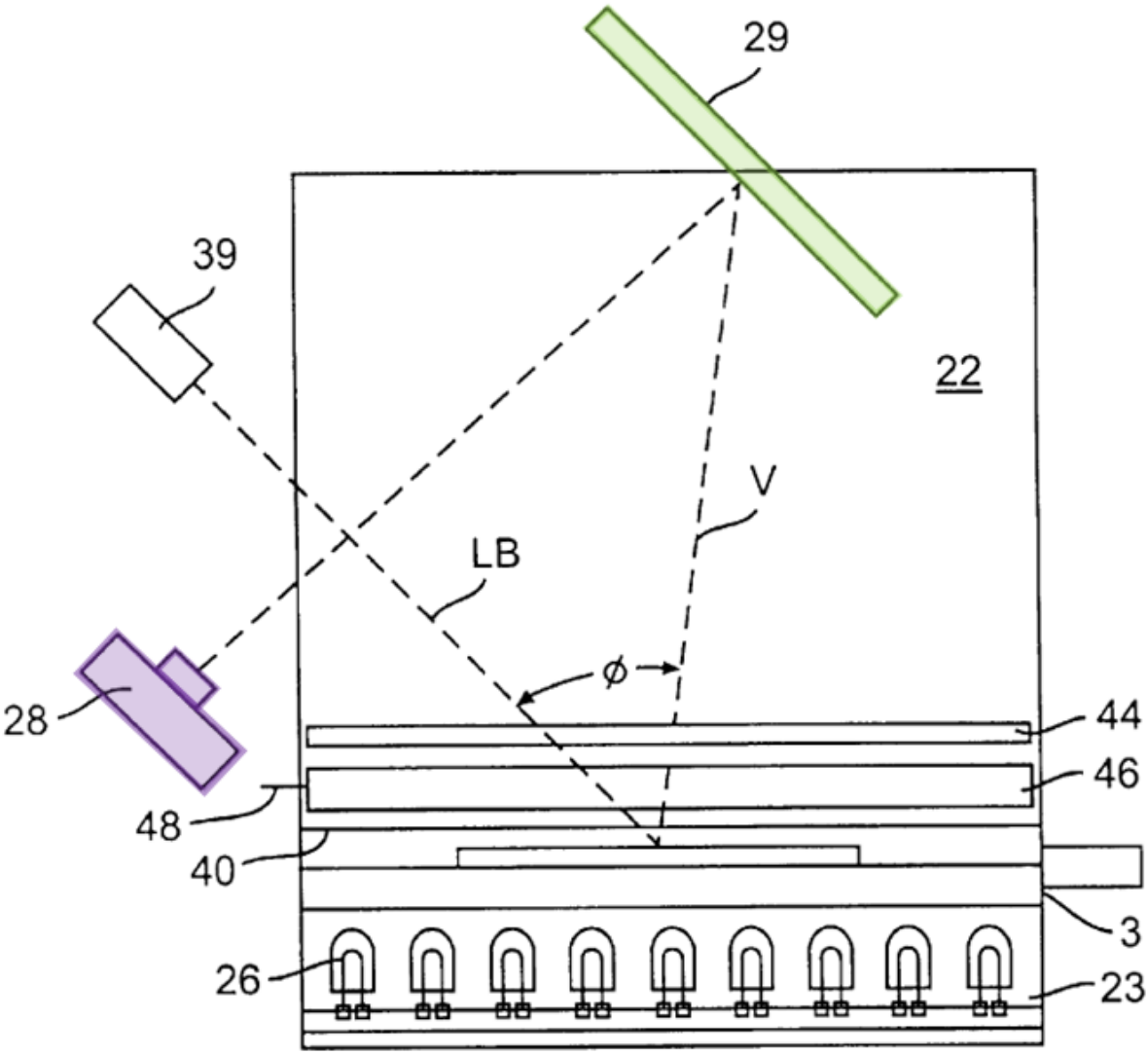


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶85.

5. Claim 5: The key identification system of claim 1, wherein said imaging system includes a light.

Wills discloses that the "imaging system includes a light" because *Wills*'

machine employs a "light emitting means," such as a "laser line generator 39 that produces a laser beam," as shown in Figure 9. *Wills*, 11:48-50; Basham, ¶86.

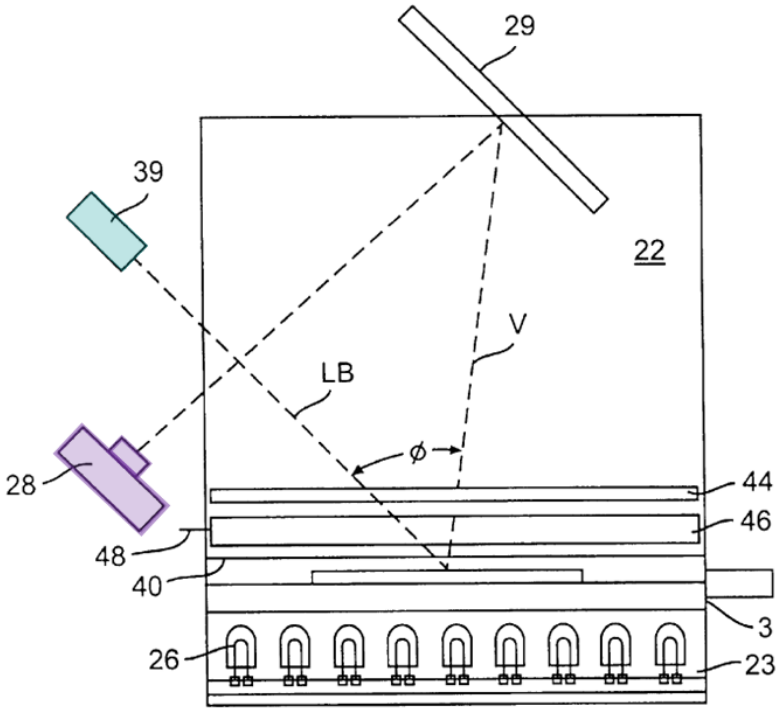


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶86.

Alternatively, *Wills* discloses that the "imaging system includes a light" because *Wills*' machine employs an "array of LEDs 26," as shown in Figure 9. *Wills*, 6:65-7:3; Basham, ¶87.

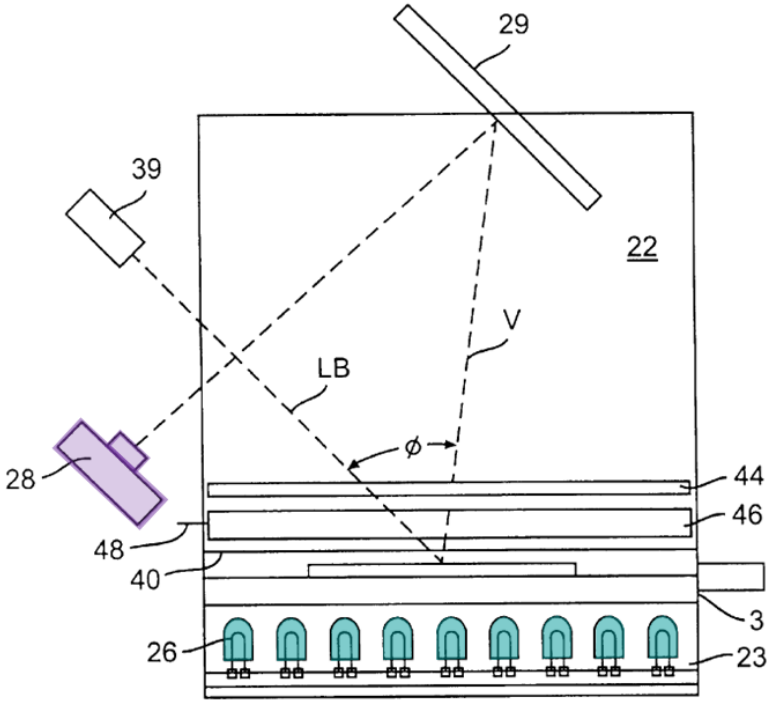


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶86.

6. Claim 6: The key identification system of claim 5, wherein said light is directed toward said reflecting device.

Wills discloses that the "light is directed toward said reflecting device" because, as Figure 9 shows, the light is "directed toward" the mirror when reflected off the master key and before being captured by the camera. Basham, ¶88.

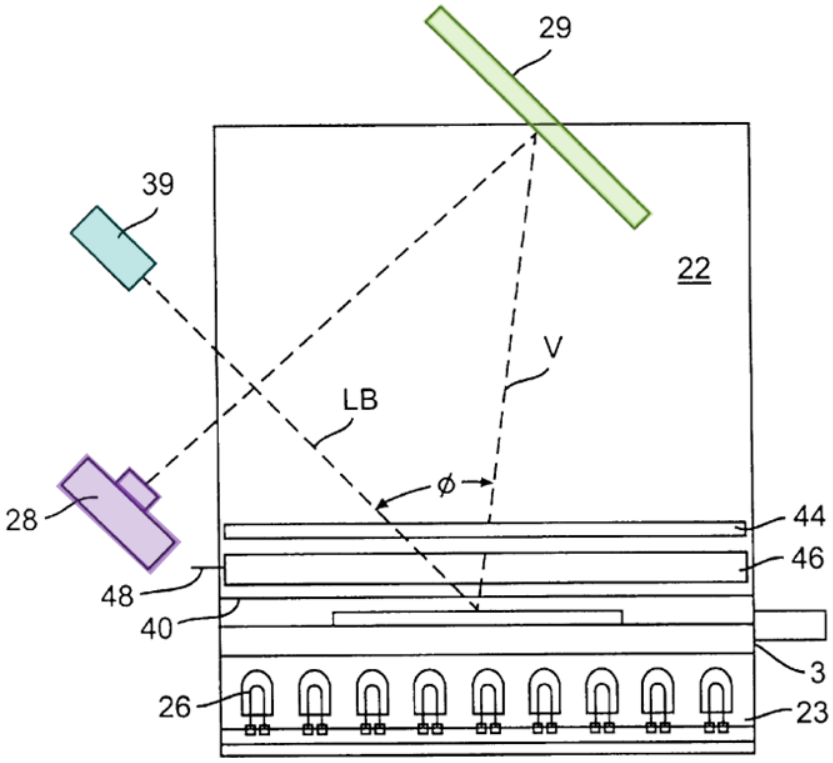


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶88.

Alternatively, *Wills* discloses that the "light is directed toward said reflecting device" because, as Figure 9 shows, the array of LEDs is "directed toward" the mirror. Basham, ¶89.

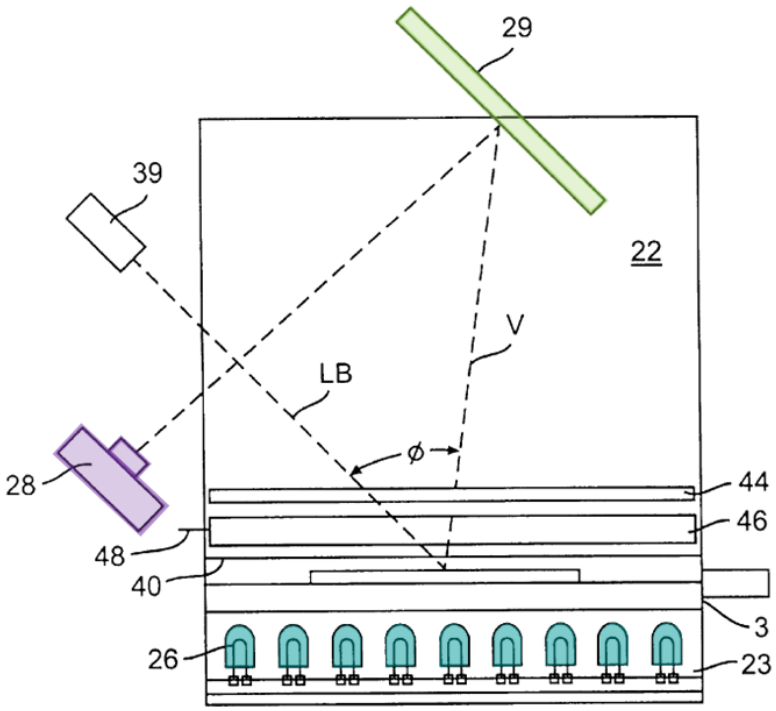


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶89.

7. Claim 8: The key identification system of claim 1, wherein said captured image is a digital image.

Wills discloses that the "captured image is a digital image" because *Wills* explains that the camera "captures the image of the master key and converts it into an electrical signal, which [a] digitizing means, or digitizing subsystem, converts into a digital image." *Wills*, 8:10-13; *see also id.*, 8:46-54 (describing using the "digitizing means," "digitizing subsystem," and a "digital camera" for "the image of the light beam interfacing with the … master key"), 12:40 ("the image of the light beam LB is captured and digitized"); 14:66-15:2 ("the digitized image of the light beam LB"). From *Wills*, a POSA would have understood that the two-

dimensional slices captured along the length of the key are thus "digital image[s]" and, accordingly, that the three-dimensional representation formed by stacking the digital two-dimensional slices is a "digital image" as well. Basham, ¶90.

8. Claim 10: The key identification system of claim 1, wherein said characteristics of said groove include the geometric shape of said groove.

Wills discloses that the "characteristics of said groove include the geometric shape of said groove" because a POSA would have recognized that the depth measurements of the milling are a "shape" of the milling. Basham, ¶91.

Wills states that the "light beam image data" of the two-dimensional slices (and, when formed by stacking the two-dimensional slices, the three-dimensional representation) "represents the result of the light beam interfacing with … the surface [of the milling] shown in FIG. 7B." *Wills*, 37:11-14.

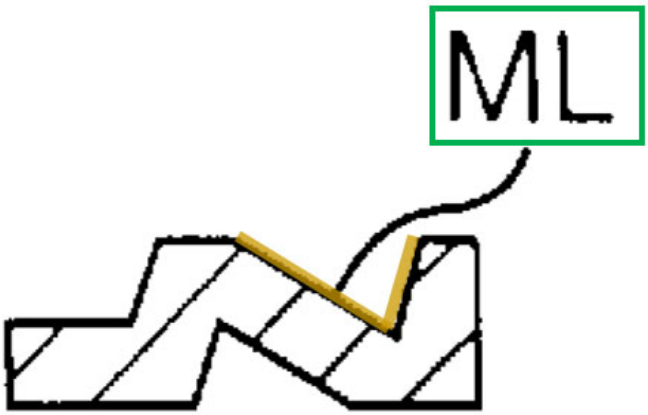


FIG. 7B

Wills, Figure 7B (annotated); Basham, ¶92.

The surface of the milling, as shown, has a "surface shape" having particular depth measurements. Basham, ¶93*; Wills*, 15:38-39 ("A light beam scan in one position gives a two-dimensional slice of the surface shape."). Thus, a POSA would recognize, in "extract[ing] [the] depth measurements" for the milling, as *Wills* describes, *Wills*' machine extracts the "surface shape" of the milling. *Wills*, 37:16-19; *see also id.*, 37:20-39:1 (discussing pseudocode for extracting depth measurements). Because *Wills* thus discloses that the depth measurements of the milling are a "shape" of the milling, *Wills* discloses that the "characteristics of said

groove include the geometric shape of said groove." Basham, ¶93.

9. Claim 12: The key identification system of claim 1, wherein said logic accounts for tilting of said master key with respect to said imaging system to determine characteristics of said groove.

Wills discloses that the "logic accounts for tilting of said master key with respect to said imaging system to determine characteristics of said groove" because *Wills*' machine accounts for in-plane movement of the master key with respect to the camera in extracting the depth measurements of the milling. Basham, ¶94.

A POSA would have understood "tilting" in the '619 patent to encompass in-plane movement of the master key, as shown in Figure 14 below. Basham, ¶95; '619 patent, 7:2-4 ("With reference to FIG. 14, the key may be tilted or yawed in a plane perpendicular to the orientation of the outline camera 20."). The '619 patent seeks to account for tilting of the master key so that "[t]he key[] is not constrained to a particular orientation or position." '619 patent, 7:1-2.

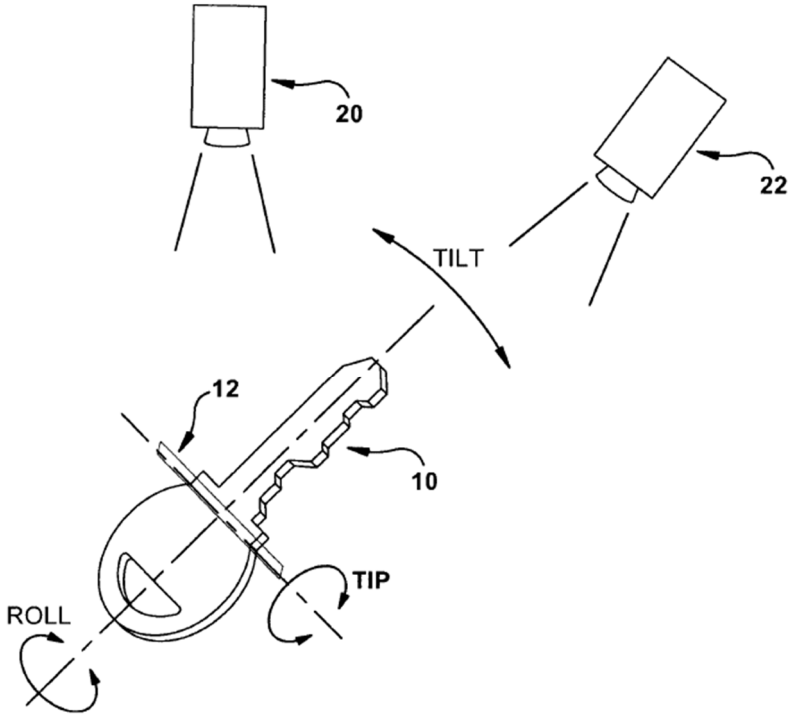


FIG. 14

’619 patent, Figure 14.

Similarly, in *Wills*’ machine, “[t]he image” of the master key “is converted by translating … to a predetermined reference position and orientation, independent of the position at which the key is placed in” the machine. *Wills*, 9:35-38. A POSA would have understood “translating … to a predetermined reference position and orientation” in *Wills* to describe in-plane movement of the master key akin to the “tilting” of the ’619 patent. Basham, ¶96. As *Wills* explains, this translating allows the “key information” of the master key, including the extracted depth measurements, to be “standardized” so as “to be comparable to” the

information about the reference keys. *Wills*, 9:38-43. As a result, *Wills*' machine, like the system of the '619 patent, "does not require the master key to be precisely aligned to operate efficiently." *Wills*, 7:29-31.

10. Claim 14: The key identification system of claim 3 further comprising a mirror positioned to reflect an image of said master key to be captured by said camera.

Wills discloses "a mirror positioned to reflect an image of said master key to be captured by said camera" because *Wills*' machine employs a "mirror 29," shown in Figure 9, that "reflects the image [of the master key] to the camera 28" to be captured. *Wills*, 7:47-48; Basham, ¶97.

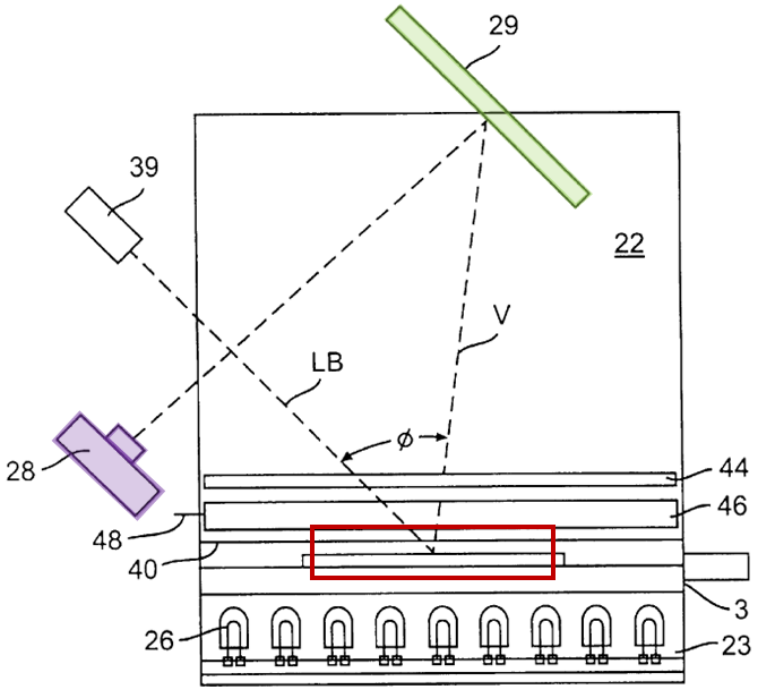


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶97.

11. Claim 19: The key identification system of claim 1 further comprising a key holder configured to hold said master key.

Wills discloses "a key holder configured to hold said master key" because *Wills*' machine includes a "supporting means" for the master key, such as a "drawer 30" that has "a bottom 32 against which one side of the master key is disposed." *Wills*, 7:4-8; 11:44-46 ("the master key remains on the supporting means, specifically on the drawer 30" during the surface information analysis"). *Wills'* drawer is consistent with one way in which the "key holder" is described in the '619 patent, namely, as "any device capable of holding or supporting a master key." '619 patent, 3:58-60. Basham, ¶98.

12. Claim 20: The key identification system of claim 19, wherein said key holder includes a lower support.

Wills discloses that the "key holder includes a lower support" because *Wills*' "supporting means" for the master key has "a bottom 32 against which one side of the master key is disposed." *Wills*, 7:4-8; 11:44-46 ("the master key remains on the supporting means, specifically on the drawer 30" during the surface information analysis). Basham, ¶99.

B. Ground 3: *Wills* and *Bass* Would Have Rendered Obvious Claims 7, 21, and 22

Bass, like *Wills*, describes a machine for duplicating master keys. *Bass*, [0009]. As in *Wills*, the master key is placed in the machine, and a camera is used to capture an image of the master key, as shown in Figure 6. *Id.*, [0055].

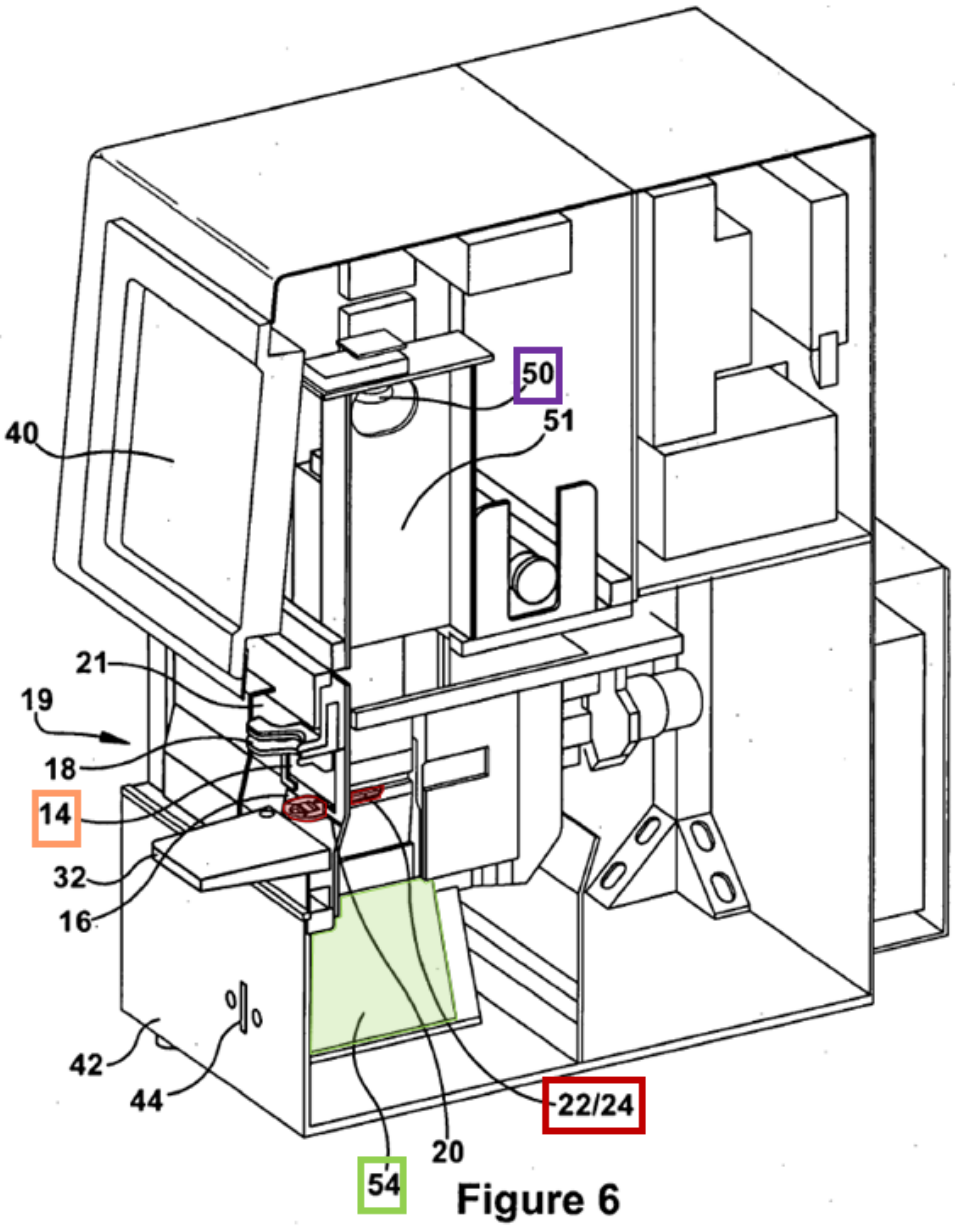


Figure 6

Bass, Figure 6 (annotated); Basham, ¶100.

As in *Wills*, where the master key is placed into the machine on a "supporting means," *Wills*, 7:4-8, in *Bass*' machine in the master key is placed into the machine on a "base 16," as shown, *Bass*, [0047], [0050]. *Bass*' machine also employs a "door clamp 14," as shown. *Id.*

Bass' machine, like *Wills*, uses light to illuminate the master key being imaged by the camera. *Wills*, 6:65-7:3; *Bass*, [0057]. *Bass*' "lighting panel 52" is shown in Figure 7. *Bass*, [0057]. Also, just as *Wills*' machine employs a mirror, *Wills*, 7:39-50, *Bass*' system employs a "reflector plate 54," as shown, *Bass*, [0047].

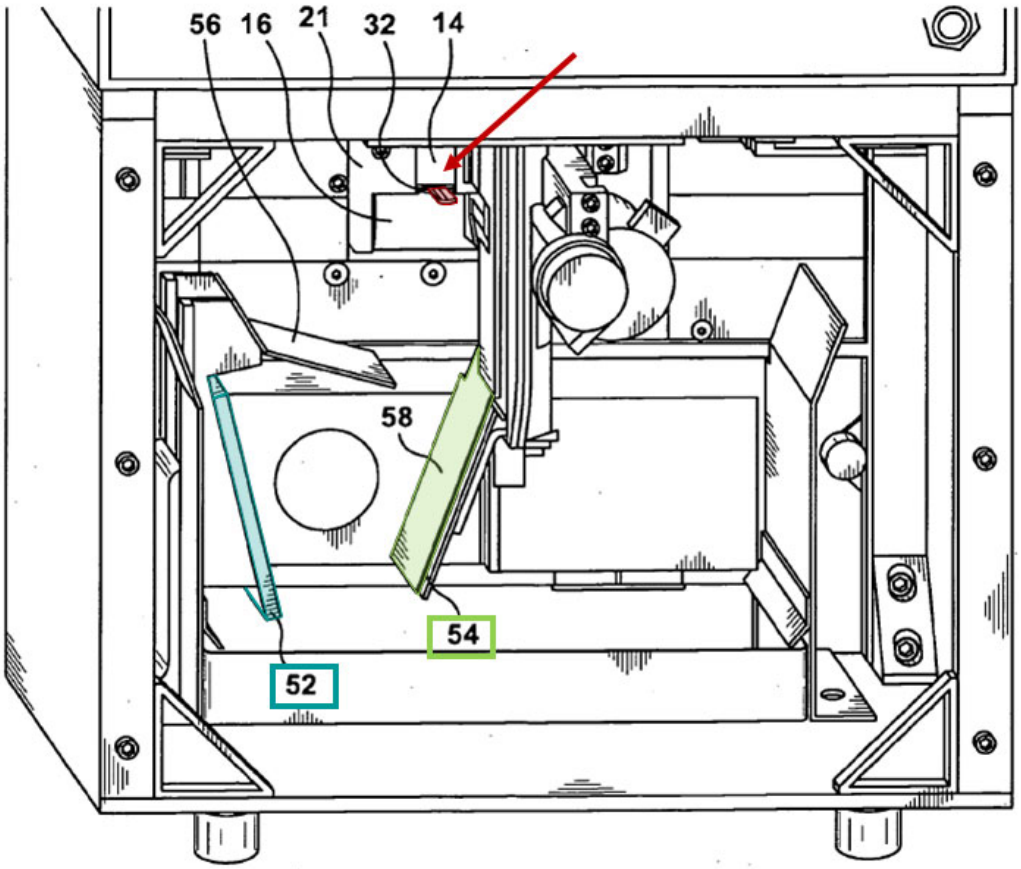


Figure 7

Bass, Figure 7 (annotated); Basham, ¶102.

Together, *Wills* and *Bass* would have rendered obvious each of claims 7, 21,

and 22, as explained below.

1. Claim 7: The key identification system of claim 5, wherein said light includes a shield to direct light away from said master key.

Wills and *Bass* teach that the "light includes a shield to direct light away from said master key" because *Bass* teaches using a shield to direct light away from a master key to be imaged and, from *Bass*, a POSA would have been motivated and found it obvious to modify *Wills*' machine to include a shield as in *Bass*. Basham, ¶104.

As explained for claim 6, *Wills*' machine for imaging a master key includes an array of LEDs and a mirror, as shown in Figure 9. *Wills*, 6:65-7:3; Basham, ¶105.

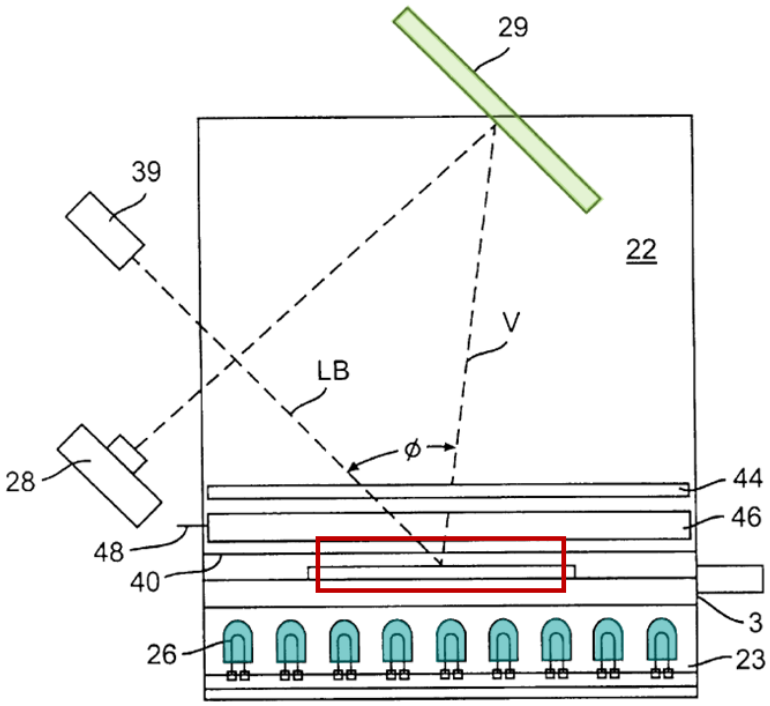


FIG. 9

Wills, Figure 9 (annotated); Basham, ¶105.

Bass' machine similarly images the master key using both a "lighting panel 52" and a "reflector plate 54," as shown in Figure 7. *Bass*, [0057]. In addition, *Bass* recommends using a "blocking plate 56." *Id.* As *Bass* explains, the "blocking plate 56" serves "[t]o enhance an image captured by the optical imaging device," because "the positioning of" the reflector plate and the blocking plate can be "adjusted to improve … captured images." *Id.*, [0057], [0059]. A POSA would have understood *Bass*' blocking plate to be a "shield" because, just as the shield of the '619 patent shields light from the light, *Bass*' blocking plate blocks light from the lighting panel. *Compare* '619 patent, 6:32-40 *with Bass*, [0057].

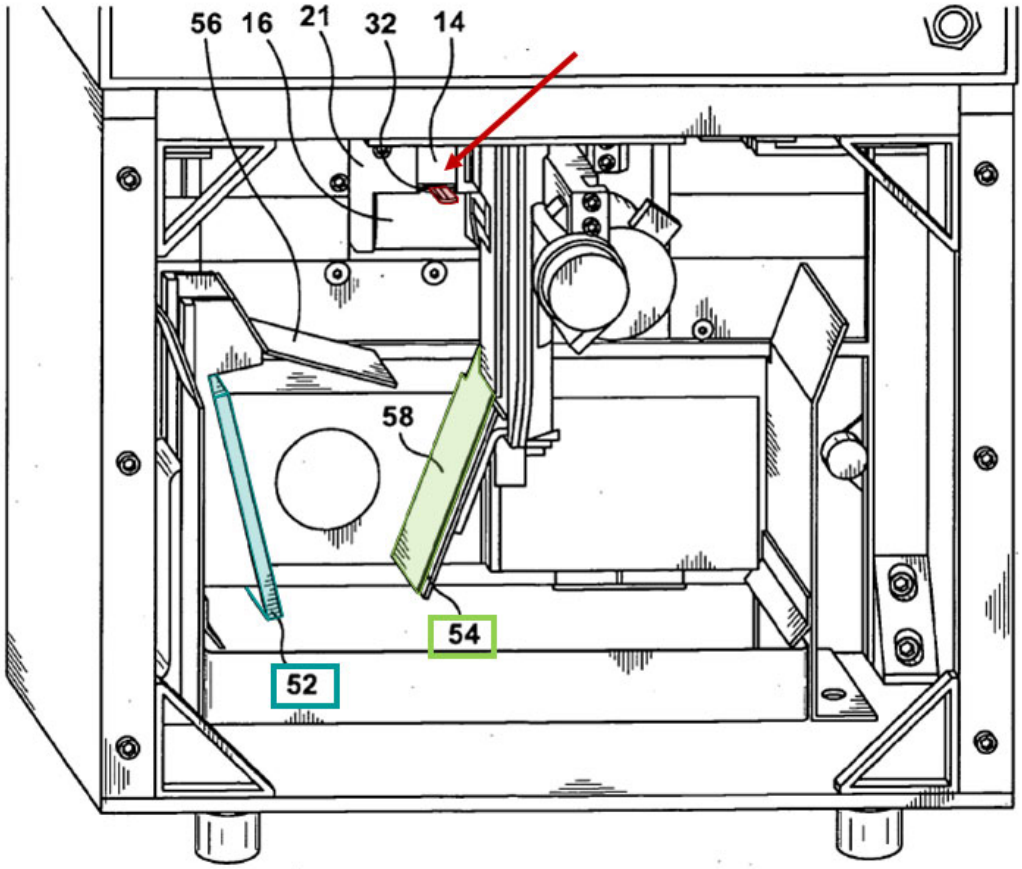


Figure 7

Bass, Figure 7 (annotated); Basham, ¶106.

From *Bass*, a POSA would have been motivated and found it obvious to modify *Wills*' machine to similarly include a blocking plate for use with *Wills*' LEDs and mirror, in the same manner that *Bass*' blocking plate is used with *Bass*' lighting panel and reflector plate. Basham, ¶107. A POSA would have been motivated by *Bass*' teaching that such a blocking plate, together with a reflector plate like *Wills*' mirror, serves "[t]o enhance an image captured by [an] optical

imaging device," like *Wills*' camera, because "the positioning of" the mirror and the blocking plate can be "adjusted to improve … captured images." *Id.*, [0057], [0059]; Basham, ¶107. A POSA would have found such a modification obvious because it would have involved nothing more than the use of a known technique—*Bass*' blocking plate in a key duplicating machine—to improve a similar device—*Wills*' key regenerating machine—in the same way, namely, by serving to enhance an image of a master key captured by a camera. Basham, ¶107. Given the similarities between *Wills*' and *Bass*' machines, such a modification would have been within the skill of the POSA and yielded nothing more than predictable results. Basham, ¶107.

2. Claim 21: The key identification system of claim 20, wherein said key holder includes an upper door.

Wills and *Bass* teach that the "key holder includes an upper door" because *Bass* teaches supporting the master key using a door clamp, and, from *Bass*, a POSA would have been motivated and found it obvious to modify the supporting means of *Wills*' machine to include a door clamp as in *Bass.* Basham, ¶108.

In *Wills*, the master key is placed into the machine on a "supporting means," which in some embodiments includes "clear protrusions" or "a cut-out template … into which the master key is placed." *Wills*, 7:4-20. Similarly, in *Bass*' machine, the master key is placed into the machine on a "base 16," as shown in Figure 6, *Bass*, [0047], [0050]. In addition, as shown, *Bass*' machine employs a "door clamp

14." *Id.*

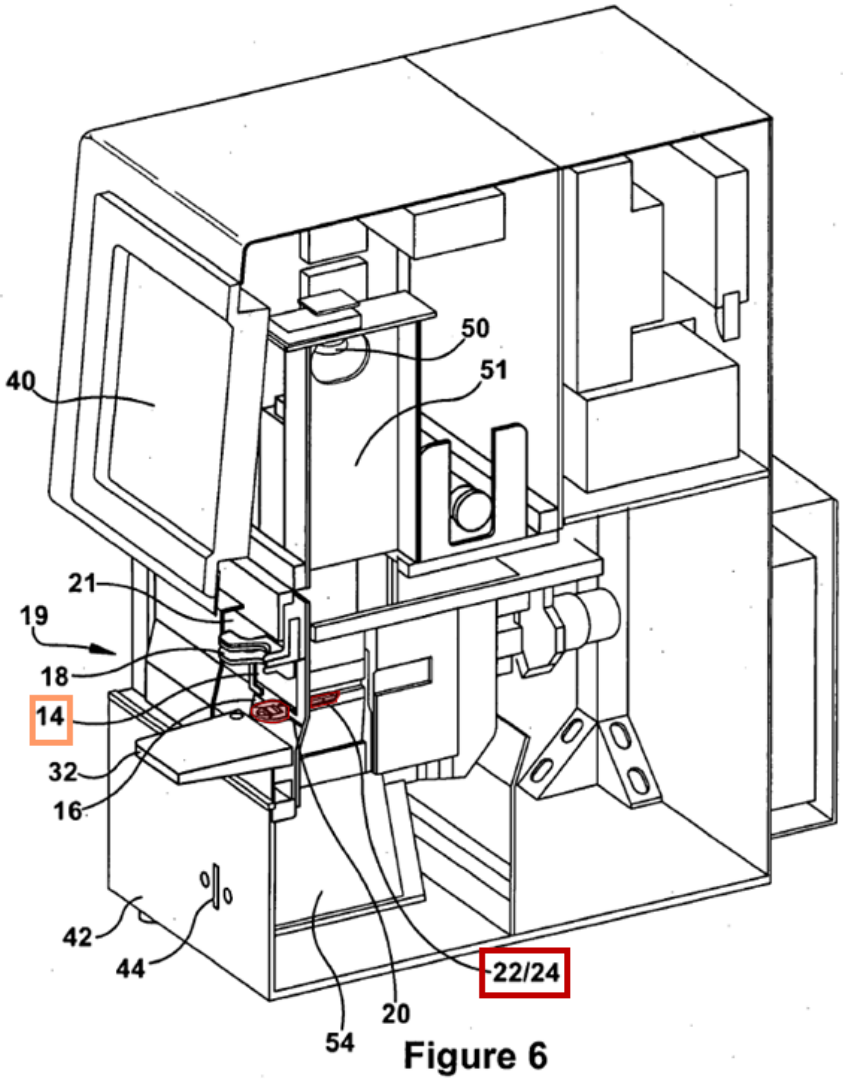


Figure 6

Bass, Figure 6 (annotated); Basham, ¶109.

Bass' door clamp 14 and base 16 are further illustrated in Figure 5, below.

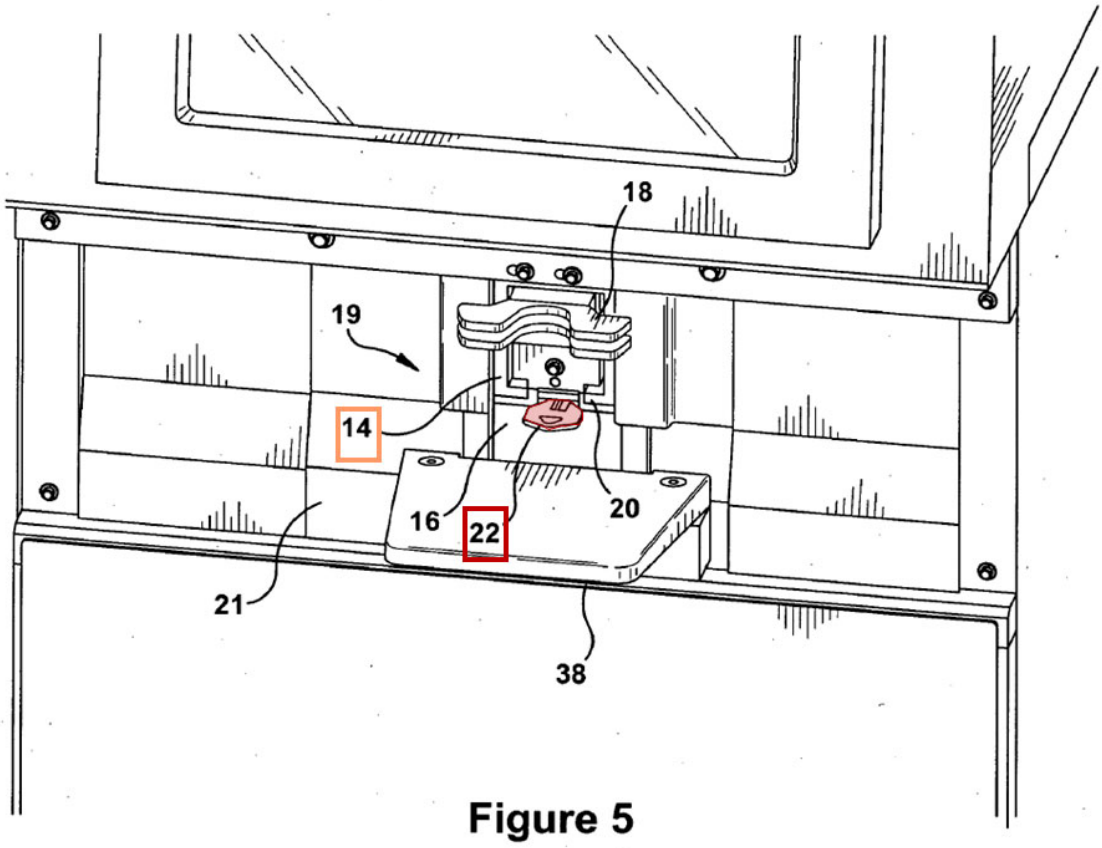


Figure 5

Bass, Figure 5 (annotated); Basham, ¶110.

A POSA would have understood *Bass*' door clamp to be an "upper door." Basham, ¶111. Like the "upper door" of the '619 patent, which together with a "lower support" serves to "close onto the key," '619 patent, 3:59-64, *Bass* teaches that the door clamp, together with the base, "secure[s] [the] master key" by applying a "force … sufficient to retain or hold the key … in place," *Bass*, [0047].

From *Bass*, a POSA would have been motivated and found it obvious to modify *Wills*' machine to include a door clamp as in *Bass*, to the extent this is not disclosed in *Wills*. Basham, ¶112. A POSA would have been motivated by *Bass*'

teaching that the door clamp, together with a base like the bottom of the drawer in *Wills*, "secure[s] [the] master key" by applying a "force … sufficient to retain or hold the key … in place." *Bass*, [0047]; Basham, ¶112. A POSA would have recognized that *Bass*' door clamp, when implemented in *Wills*' drawer, would have improved the ability of *Wills*' machine to hold the master key in place, thereby improving the accuracy of the captured image as well as the ultimate duplication of the master key. A POSA would have found such a modification obvious because it would have involved nothing more than the use of a known technique—*Bass*' door clamp in a key duplicating machine—to improve a similar device—*Wills*' key regenerating machine—in the same way. Basham, ¶112. Given the similarities between *Wills*' and *Bass*' machines, such a modification would have been within the skill of the POSA and yielded nothing more than predictable results. Basham, ¶112.

3. Claim 22: The key identification system of claim 19, wherein said key holder includes a clamp.

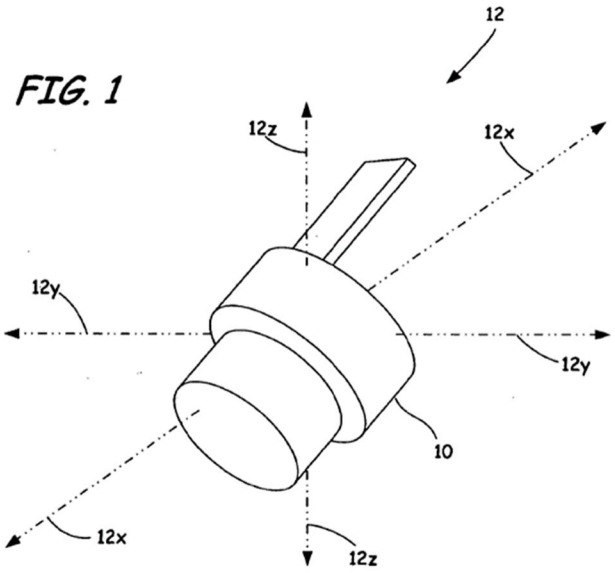
As explained for claim 21, a POSA would have been motivated and found it obvious to modify *Wills*' machine to include a door clamp, as in *Bass*, to the extent this is not disclosed in *Wills*. A POSA would have understood the door clamp to be a "clamp." Basham, ¶113. Like the "clamp" of the '619 patent, which is merely an alternative to the "upper door" and similarly serves together with a "lower support" to "close onto the key," '619 patent, 3:59-64, *Bass* teaches that the door clamp,

together with the base, provides additional functionality to "secure [the] master key" by applying a "force … suficient to retain or hold the key … in place," *Bass*, [0047].

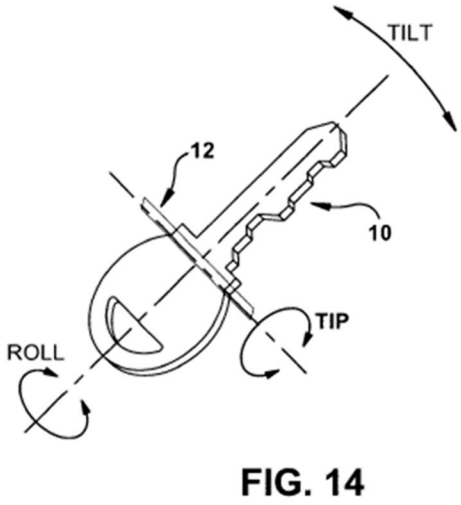
C. Ground 4: *Wills* and *Heide* Would Have Rendered Obvious Claims 11 and 13

Heide describes a "three-dimensional object" akin to the "three-dimensional image" captured by *Wills*' machine. *Heide*, Abstract; *Wills*, 15:34-42. And just as *Wills* envisions "convert[ing]" its three-dimensional image "by … rotating to a predetermined reference position and orientation," *Wills*, 9:35-38, *Heide* teaches "rotat[ing]" its three-dimensional image "relative to one or more … axes" to arrive at an "optimal spatial orientation," *Heide*, [0037]-[0038].

A POSA would have recognized that rotation about the "axes" described in *Heide* corresponds to the "rolling" and "tilting" described in the '619 patent, as a comparison of *Heide*'s Figure 1 and Figure 14 of the '619 patent shows. Basham, ¶115. In particular, a POSA would have understood rotation about Heide's axis "12x" to correspond to the "rolling" of the '619 patent. Basham, ¶115. Similarly, a POSA would have understood rotation about Heide's axis "12z" to correspond to the "tilting" of the '619 patent. Basham, ¶115.¶



Heide, Figure 1



'619 Patent, Figure 14

Together, *Wills* and *Heide* would have rendered obvious each of claims 11 and 13, as explained below.

1. **Claim 11: The key identification system of claim 1, wherein said logic accounts for rolling of said master key with respect to said imaging system to determine characteristics of said groove.**

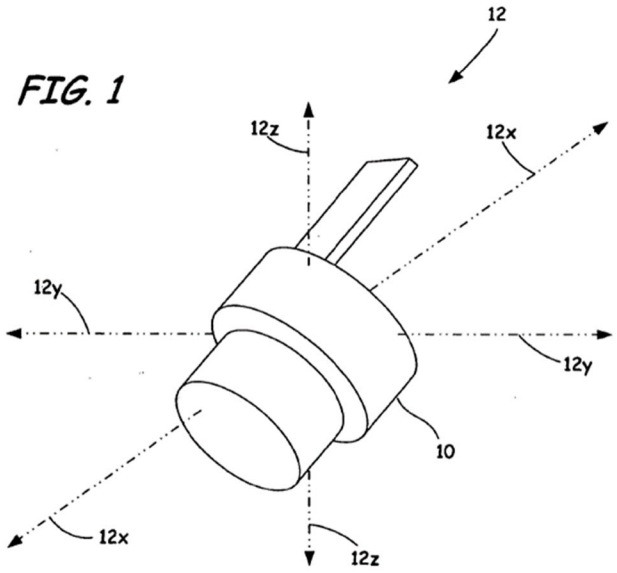
Wills teaches that the "logic accounts for rolling of said master key with respect to said imaging system to determine characteristics of said groove" because *Wills* envisions accounting for variations of the master key with respect to the camera in extracting the depth measurements of the milling by "rotating" the three-dimensional image captured by its camera "to a predetermined reference position and orientation," *Wills*, 9:35-38; *Heide* teaches rotating a three-dimensional object to an optimal spatial orientation by rotating the three-dimensional object about any

of the three axes, *Heide*, [0037]-[0038]; and, from *Heide*, a POSA would have been motivated and found it obvious to implement *Wills*' "rotating to a predetermined reference position and orientation" to be rotating along any of the three axes, including that called "rolling" in the '619 patent. Basham, ¶117.

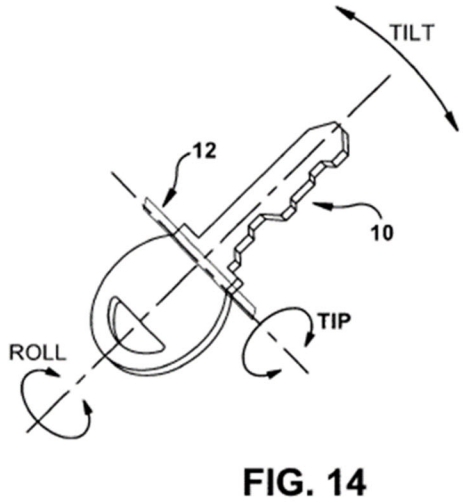
Wills envisions accounting for variations of the master key with respect to the camera in extracting the depth measurements of the milling by "rotating" the three-dimensional image captured by its camera "to a predetermined reference position and orientation." *Wills*, 9:35-38. A POSA would have recognized that a key in *Wills*' machine may deviate from a "predetermined reference position and orientation" and require "rotating" for several reasons, including, for example, deformation of the master key that commonly results from use, such as bending or chipping, or aspects of the master key's design, such as a rubberized head that prevents the key from lying flat. Basham, ¶118; *see also Wills*, 1:35-37 (recognizing that keys may deviate "from factory specifications" once "worn from use"). As *Wills* explains, such "rotating" allows the "key information" of the master key, including the extracted depth measurements, to be "standardized" so as "to be comparable to" the information about the reference keys. *Wills*, 9:38-43. As a result, *Wills*' machine "does not require the master key to be precisely aligned to operate efficiently." *Wills*, 7:29-31. This is akin to the stated purpose of the "rolling" in the '619 patent, namely, so that "[t]he key[] is not constrained to a

particular orientation or position." '619 patent, 7:1-2.

While *Wills* thus describes "rotating" the three-dimensional image, *Wills* does not expressly teach along which axes the "rotating" occurs. Basham, ¶120. *Heide* teaches rotating a three-dimensional object, like the three-dimensional image in *Wills*, to an optimal spatial orientation by rotating the three-dimensional object about any of the three axes. *Heide*, [0037]-[0038].



Heide, Figure 1



'619 Patent, Figure 14

A POSA would have recognized that rotation about the "12x" axis described in *Heide* corresponds to the "rolling" described in the '619 patent, as a comparison of *Heide*'s Figure 1 and Figure 14 of the '619 patent shows. Basham, ¶121. Such rotation about the "12x" axis of the three-dimensional object is consistent with one way that "rolling" is described in the '619 patent, namely, "rotat[ing] the master

key "around the axis of the key" itself. '619 patent, 7:6-7.

From *Heide*, a POSA would have been motivated and found it obvious to implement *Wills*' "rotating to a predetermined reference position and orientation" to include rotating along any of the three axes, including that called "rolling" in the '619 patent. Basham, ¶122. A POSA would have been motivated by *Wills*' stated intent to "rotat[e]" the three-dimensional image captured by its camera "to a predetermined reference position and orientation" so that *Wills*' machine "does not require the master key to be precisely aligned to operate efficiently." Basham, ¶122; *Wills*, 7:29-31, 9:35-38. A POSA would have been further motivated by *Heide*'s teaching that rotating a three-dimensional object along all three axes facilitates achieving an "optimal spatial orientation" of the three-dimensional object. Basham, ¶122; *Heide*, [0037]-[0038]. A POSA would have found it obvious because implementing "rotating" along all three axes in *Wills*, as *Heide* describes, would have involved nothing more than the use of a known technique—*Heide*'s rotation of a three-dimensional object along all three axes—to improve a similar context—*Wills*' rotation of a three-dimensional image—in the same way, namely, by facilitating conversion of the three-dimensional image to an "optimal spatial orientation." Basham, ¶122.

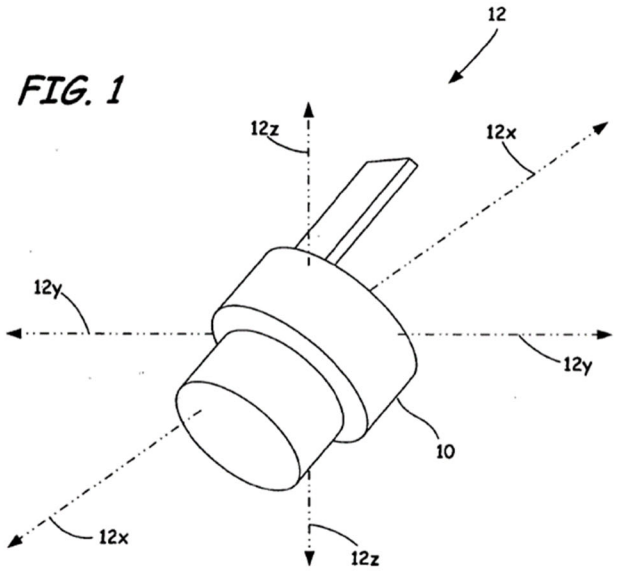
2. Claim 13: The key identification system of claim 1, wherein said logic accounts for tipping of said master key with respect to said imaging system to determine characteristics of said groove.

Wills teaches that the "logic accounts for tipping of said master key with respect to said imaging system to determine characteristics of said groove" because *Wills* envisions accounting for variations of the master key with respect to the camera in extracting the depth measurements of the milling by "rotating" the three-dimensional image captured by its camera "to a predetermined reference position and orientation," *Wills*, 9:35-38; *Heide* teaches rotating a three-dimensional object to an optimal spatial orientation by rotating the three-dimensional object about any of the three axes, *Heide*, [0037]-[0038]; and, from *Heide*, a POSA would have been motivated and found it obvious to implement *Wills*' "rotating to a predetermined reference position and orientation" to be rotating along any of the three axes, including that called "tilting" in the '619 patent. Basham, ¶123.

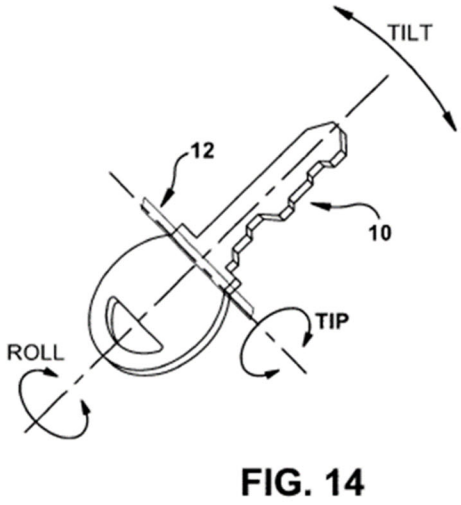
Wills envisions accounting for variations of the master key with respect to the camera in extracting the depth measurements of the milling by "rotating" the three-dimensional image captured by its camera "to a predetermined reference position and orientation." *Wills*, 9:35-38. A POSA would have recognized that a key in *Wills*' machine may deviate from a "predetermined reference position and orientation" and require "rotating" for several reasons, including, for example, deformation of the master key that commonly results from use, such as bending or chipping, or aspects of the master key's design, such as a rubberized head that prevents the key from lying flat. Basham, ¶124; *see also Wills*, 1:35-37

(recognizing that keys may deviate "from factory specifications" once "worn from use"). As *Wills* explains, such "rotating" allows the "key information" of the master key, including the extracted depth measurements, to be "standardized" so as "to be comparable to" the information about the reference keys. *Wills*, 9:38-43; Basham, ¶125. As a result, *Wills*' machine "does not require the master key to be precisely aligned to operate efficiently." *Wills*, 7:29-31. This is akin to the stated purpose of the "tipping" in the '619 patent, namely, so that "[t]he key[] is not constrained to a particular orientation or position." '619 patent, 7:1-2; Basham, ¶125.

While *Wills* thus describes "rotating" the three-dimensional image, *Wills* does not expressly teach along which axes the "rotating" occurs. Basham, ¶126. *Heide* teaches rotating a three-dimensional object, like the three-dimensional image in *Wills*, to an optimal spatial orientation by rotating the three-dimensional object about any of the three axes. *Heide*, [0037]-[0038].



Heide, Figure 1



'619 Patent, Figure 14

A POSA would have recognized that rotation about the "12y" or "12z" axis described in *Heide* corresponds to the "tipping" described in the '619 patent, as a comparison of *Heide*'s Figure 1 and Figure 14 of the '619 patent shows. Basham, ¶127. Such rotation about the "12y" or "12z" axis of the three-dimensional object is consistent with one way that "tipping" is described in the '619 patent, namely, "tipped up or down relative to the plane defined perpendicular to the door opening 12." '619 patent, 7:4-6.

From *Heide*, a POSA would have been motivated and found it obvious to implement *Wills*' "rotating to a predetermined reference position and orientation" to include rotating along any of the three axes, including that called "tipping" in the '619 patent. Basham, ¶128. A POSA would have been motivated by *Wills*'

stated intent to "rotat[e]" the three-dimensional image captured by its camera "to a predetermined reference position and orientation" so that *Wills*' machine "does not require the master key to be precisely aligned to operate efficiently." Basham, ¶128; *Wills*, 7:29-31, 9:35-38. A POSA would have been further motivated by *Heide*'s teaching that rotating a three-dimensional object along all three axes facilitates achieving an "optimal spatial orientation" of the three-dimensional object. Basham, ¶128; *Heide*, [0037]-[0038]. A POSA would have found it obvious because implementing "rotating" along all three axes in *Wills*, as *Heide* describes, would have involved nothing more than the use of a known technique—*Heide*'s rotation of a three-dimensional object along all three axes—to improve a similar context—*Wills*' rotation of a three-dimensional image—in the same way, namely, by facilitating conversion of the three-dimensional image to an "optimal spatial orientation." Basham, ¶128.

VIII. THE BOARD SHOULD NOT DENY INSTITUTION UNDER § 325(d)

The Board should not exercise its discretion to deny institution under 35 U.S.C. § 325(d). The relevant considerations for such a denial are: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material

to the patentability of challenged claims. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020).

Neither of the *Advanced Bionics* factors warrant denial of institution. During prosecution, the Examiner did not consider, let alone rely on, any of *Wills*, *Bass*, or *Heide*. Ex. 1002; *but see id.* 112-114 (examiner citing a single paragraph of U.S. Patent App. Pub. No. 2001/0033781 to Wills et al., unrelated to *Wills*, for a disclosure of "determin[ing] the *likelihood* of a match between said master key and a known key blank"). *Bass* is incorporated by reference in the '619 patent, '619 patent, 10:14-20, and child applications of the '619 patent indicate the examiner considered it there. Ex. 1008, 4; Ex. 1009, 4; Ex. 1010, 4. *Wills* was similarly identified by Patent Owner to the Office beginning in child applications. Ex. 1008, 3; Ex. 1009, 4; Ex. 1010, 4. But each of *Bass* and *Wills* was first relied on by the Office only during prosecution of U.S. Patent No. 11,227,181—the great-grandchild of the '619 patent—nearly six years after the '619 patent issued. Ex. 1011, 162, 211. The '181 patent was allowed over *Bass* only when the claims were amended to recite "us[ing] a single camera to capture images of multiple angles of the master key … without removing the master key from the slot"—a feature the claims of the '619 patent do not recite. *Id.*, 50, 79-80. And while the examiner of the '181 patent asserted *Wills* teaches capturing "a view from an angle

between perpendicular and parallel to the blade of said master key and not including perpendicular or parallel to the blade of said master key," Hy-Ko did not dispute the examiner's assertion. *Id.*, 183-92, 211-12. *Heide* has never been considered by the Office at all.

Thus, the examiner of the '619 patent did not consider the same (or substantially the same) prior art and arguments during prosecution that are presented in this Petition, and the Examiner's failure to consider references such as *Wills*, *Bass*, and *Heide* constitutes an error material to the patentability of the challenged claims. The Board should not exercise its discretion to deny institution under 35 U.S.C. § 325(d).

IX. MANDATORY NOTICES

A. Real Party-in-Interest

The real party-in-interest is The Hillman Group, Inc.

B. Related Matters

Petitioner is not aware of any related matters.

C. Lead and Back-Up Counsel, and Service Information

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Please address all correspondence to lead counsel and back-up counsel at the addresses shown above. Petitioner also consents to electronic service by email.

X. GROUNDS FOR STANDING

Petitioner certifies that the ’619 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the patent claims on the grounds identified herein.

XI. CONCLUSION

The Board should institute IPR and cancel the claims. The Office may charge any required fees to Deposit Account No. 06-0916.

Dated: June 27, 2022

Respectfully submitted,

/Joshua L. Goldberg/
Joshua L. Goldberg
Reg. No. 59,369

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(a)(1)(i), the undersigned hereby certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,644,619 contains 10,145 words, excluding parts of this Petition exempted under § 42.24(a), as measured by the word-processing system used to prepare this paper.

Dated: June 27, 2022

/Joshua L. Goldberg/
Joshua L. Goldberg (Reg. No. 59,369)
Lead Counsel for Petitioner.

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing **Petition for *Inter Partes* Review**, the associated **Power of Attorney**, and **Exhibits 1001 through 1011** are being served on June 27, 2022, by FedEx Priority Overnight® at the following address of record for the subject patent.

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