UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.
Petitioner

v.

MICHIGAN MOTOR TECHNOLOGIES LLC
Patent Owner

Case IPR2020-00446
Patent No. 6,763,804

DECLARATION OF GERALD J. MICKLOW, PH.D., PE

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VW EX1034
VW v. MMT
IPR2020-00446

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I. INTRODUCTION

I, Gerald J. Micklow, Ph.D., PE, declare as follows:

1. I have been retained as an expert in this proceeding by counsel for Volkswagen Group of America, Inc. I previously submitted a declaration (EX1003) in support of the petition for *inter partes* review of U.S. Patent No. 6,763,804 ("the '804 patent"). This declaration is in support of the petitioner's reply to the institution decision and the petitioner's opposition to the patent owner's motion to amend in the same proceeding, IPR2020-00446.

2. I understand that the Board instituted trial and issued an institution decision (Paper 9). I have been asked to provide my technical review, analysis, insights, and opinions regarding the institution decision. *See* Section VI.

3. I understand that the patent owner Michigan Motor Technologies, LLC did not submit a patent owner response to the petition or the institution decision. I also understand that the patent owner submitted a motion to amend (Paper 16) ("MTA"). In the MTA, the patent owner proposed substitute claim 21. I have been asked to provide my technical review, analysis, insights, and opinions regarding the patent owner's motion to amend. *See* Sections VII-X.

4. I provided my background and qualifications in paragraphs 7-18 of my original declaration (EX1003). My CV has been submitted as Exhibit 1004. My statements in my original declaration regarding my review of the '804 patent and

related materials remain unchanged. In reaching my opinions, I carefully reviewed the petition for *inter partes* review of the '804 patent, my original declaration, the materials reviewed as part of my original declaration, the institution decision, and the MTA. I have also reviewed all other materials cited herein.

5. I am being compensated at my customary rate of $450 per hour for my work on this case. My compensation is not dependent upon my opinions, my testimony, or the outcome of this case.

II. UNDERSTANDING OF THE LAW

6. My understanding of the legal principles, including claim construction and obviousness, is set forth in my original declaration. *See* EX1003, ¶¶20-38. I include here certain additional legal understandings.

7. As stated in my original declaration, I understand that a patent claim can be considered obvious to a POSA at the time the application was filed and that the teachings of two or more prior art references may be combined if that combination would have been obvious to a POSA. *See* EX1003, ¶¶29-38.

8. I understand that whether a prior art reference teaches away from the claimed invention is a factor to be considered in determining obviousness. I also understand that it is improper to combine references that teach away from their combination. I understand that though a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from

following the path set out in the reference, the mere disclosure of alternative designs does not teach away.

9. As stated in my original declaration, I understand that the proper construction of any term is how a person of ordinary skill in the art would have understood the term based on the term's use in the claims, specification, and file history of the patent. *See* EX1003, ¶24.

10. I understand that while claims are construed in view of the specification, limitations from the embodiments in the specification should not be read into the claims, unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of exclusion.

11. I understand that using the term "comprising" in the transition between the preamble and the body of the claim indicates that the claim does not preclude the presence of components or steps that are in addition to, though not inconsistent with, those recited in the limitations that follow.

12. I understand that a patent must include a written description that makes clear the full scope of the claimed invention in such full, clear, concise, and exact terms as to enable a person of ordinary skill in the art at the time of the invention to make and use the claimed invention without undue experimentation.

13. I understand that a substitute claim in an *inter partes* review must be supported by the original disclosure of the patent application and cannot introduce

what is referred to as "new matter." I also understand that whether new matter is introduced depends on whether the disclosure in the original application as filed satisfies the written description test stated above.

14. I understand that one way to determine if this written description requirement is satisfied is if a POSA would recognize from reading the patent specification that the inventor possessed the full scope of the subject matter claimed.

15. I understand that when performing an analysis of written description, the knowledge of a POSA may not be used as support to teach limitations that are not in the specification, even if those limitations would be rendered obvious by the disclosure. I understand that written description is not a question of whether a POSA might be able to construct the subject matter claimed from the teachings of the disclosure but instead whether the application necessarily discloses that subject matter, and further that the disclosure must actually or inherently disclose the claimed subject matter.

16. I understand that the disclosure must demonstrate that the inventor possessed the subject matter of a particular claim as a whole and further that it is insufficient to separately analyze written description as a collection of independent limitations, but that rather, such analysis must show that the inventor possessed the particular claimed combination of elements in order to constitute written description support for such claim.

17. I understand that a substitute claim in an *inter partes* review cannot be indefinite. I understand that a claim is indefinite if the claim, when read in view of the specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

III. OVERVIEW OF THE ’804 PATENT

18. My understanding of the ’804 patent, including my discussion of throttle control systems, the problem that the ’804 patent alleges existed in the prior art, and the alleged invention of the ’804 patent is set forth in my original declaration. *See* EX1003, ¶¶39-50, 56-66.

IV. LEVEL OF ORDINARY SKILL IN THE ART

19. My understanding of the person of ordinary skill in the art (“POSA”) is set forth in my original declaration. *See* EX1003, ¶¶25-27, 51. “[A] POSA as of October 9, 2001 (the filing date of the ’804 patent) would have had a B.S. degree in Mechanical Engineering or Electrical Engineering (or equivalent), as well as at least two to four years of academic or industry experience in the relevant field of engine control systems.” EX1003, ¶51. “Through this experience, the POSA would have worked with throttle control systems and would have understood feedback control systems for electric motors.” EX1003, ¶51.

V. CLAIM CONSTRUCTION

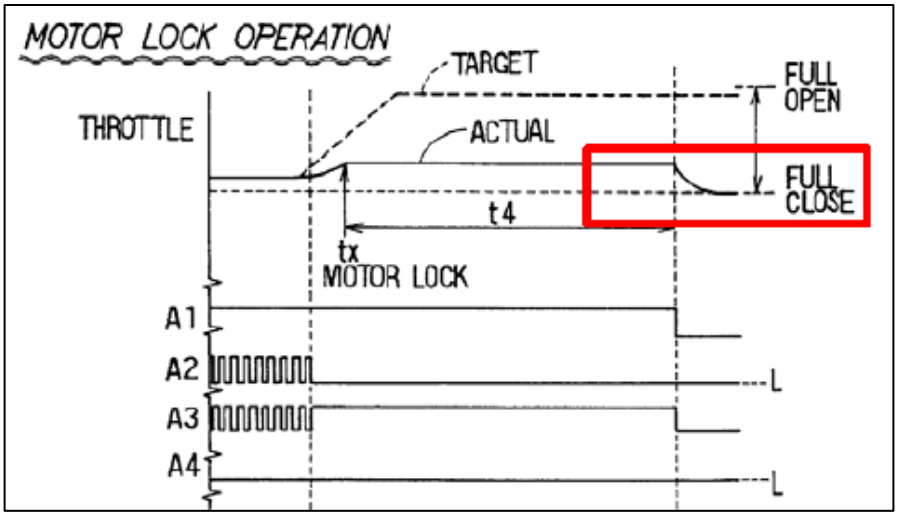
20. As I explained in my original declaration, the term "dose" in claims 1 and 8 should be construed as "close." I understand that the Board agreed with my construction in the institution decision. *See* Institution Decision, 10-12.

21. Other than the term "dose," the challenged claims of the '804 should be given their ordinary and customary meaning as understood by a POSA at the time of the alleged invention in light of the specification and the prosecution history. It is my opinion that all terms in substitute claim 21 should also receive their plain and ordinary meaning in the context of the '804 patent.

VI. RESPONSE TO THE INSTITUTION DECISION

22. I understand that the Board preliminarily found in its Institution Decision that "none of Petitioner's citations to Itabashi's disclosure explicitly mention moving the throttle to a fully open or a fully closed position." Institution Decision, 22. However, I did show that Itabashi teaches or suggests commanding a throttle to a fully open or a fully closed position—or at least that doing so was well known and obvious.

23. I understand that the Petition included the following annotated figure, which was at paragraph 127 of my original declaration. In this figure, the actual position of the throttle valve is commanded to its FULL CLOSE position, not slightly above the full close position.



EX1007, FIG. 4 (excerpted and annotated).

24. I also showed that commanding a throttle to move to a fully closed position was well known. *See*, e.g., EX1003, ¶128 (citing EX1006, 11:7-11, 14:46-56; EX1016, 4:10-15, FIG. 2; EX1009, 4:14-20, 4:51-63, 6:11-14, 6:27-32, 6:40-45, FIGS. 5, 6; EX1011, (57), FIGS. 4A-4D; EX1005, Abstract, 1:25-29); EX1003, ¶¶63-64 (citing EX1006, 11:7-11, 14:46-56; EX1016, 4:10-15, FIG. 2; EX1009, 4:14-20, 4:51-63, 6:11-14, 6:27-32, 6:40-45, FIGS. 5, 6; EX1011, (57), FIGS. 4A-4D; EX1005, Abstract, 1:25-29; EX1007, FIGS. 3, 4; EX1015, FIGS. 7A, 9A; EX1022, 61-62. The references I cited in my original declaration show that commanding a throttle to move to a fully closed position was well known. For example, Burney teaches that its system uses "a motor current that causes the motor M to drive in a direction to release the throttle valve so it may close." EX1006, 14:51-56; *see also* Pet., 29 (citing EX1006, 14:46-56); EX1003, ¶95. If a vehicle is traveling down a steep decline, "[t]he motor M will rotate in a direction that releases

the throttle arm 20 (FIG. 1) toward the force of the bias spring 21, allowing the throttle valve (not shown) to move to the idle position." *See* EX1006, 13:11-19; *see also* EX1006, 11:35-42. Then, the throttle would reach the throttle stop, which is at the fully closed position. *See* EX1006, 13:20-23. From these teachings in Burney, a POSA would have understood that the system commands the motor to drive the throttle to the full close position. There are many reasons to do this. For example, a POSA would have been motivated to drive the throttle to the full close position to close the throttle valve at the speed required for optimal air-fuel mixture. A POSA would have also been motivated to drive the throttle to the full close position as a failsafe operation, such that the throttle could be closed both mechanically using the bias spring and electronically using the motor.

25. Other references also show that commanding a throttle to fully close was well known. Murakami states that "[t]he throttle close-limit switch 7A detects that the throttle 5 is *driven to its fully-closed position* and outputs a throttle fully-closed position signal." EX1009, 4:14-20 (emphasis added); *see also* EX1009, 4:51-63 (driving the throttle to the extreme position "fully-closed"), 6:27-32 ("the throttle valve is closed"), FIGS. 5-6 (showing a "fully closed" position). Matsuda shows a closed throttle angle, suggesting that the system can be commanded to reach this position. EX1016, FIG. 2. Pursifull discloses a throttle that is driven past a limp-home position to a "closed" position. EX1011, (57), FIGS. 4A-4D. In fact, closing a

throttle is taught in undergraduate coursework on automotive control systems. As I show below, the conventional throttle controller taught in an undergraduate textbook commands the throttle to fully open, partially close, and fully close:

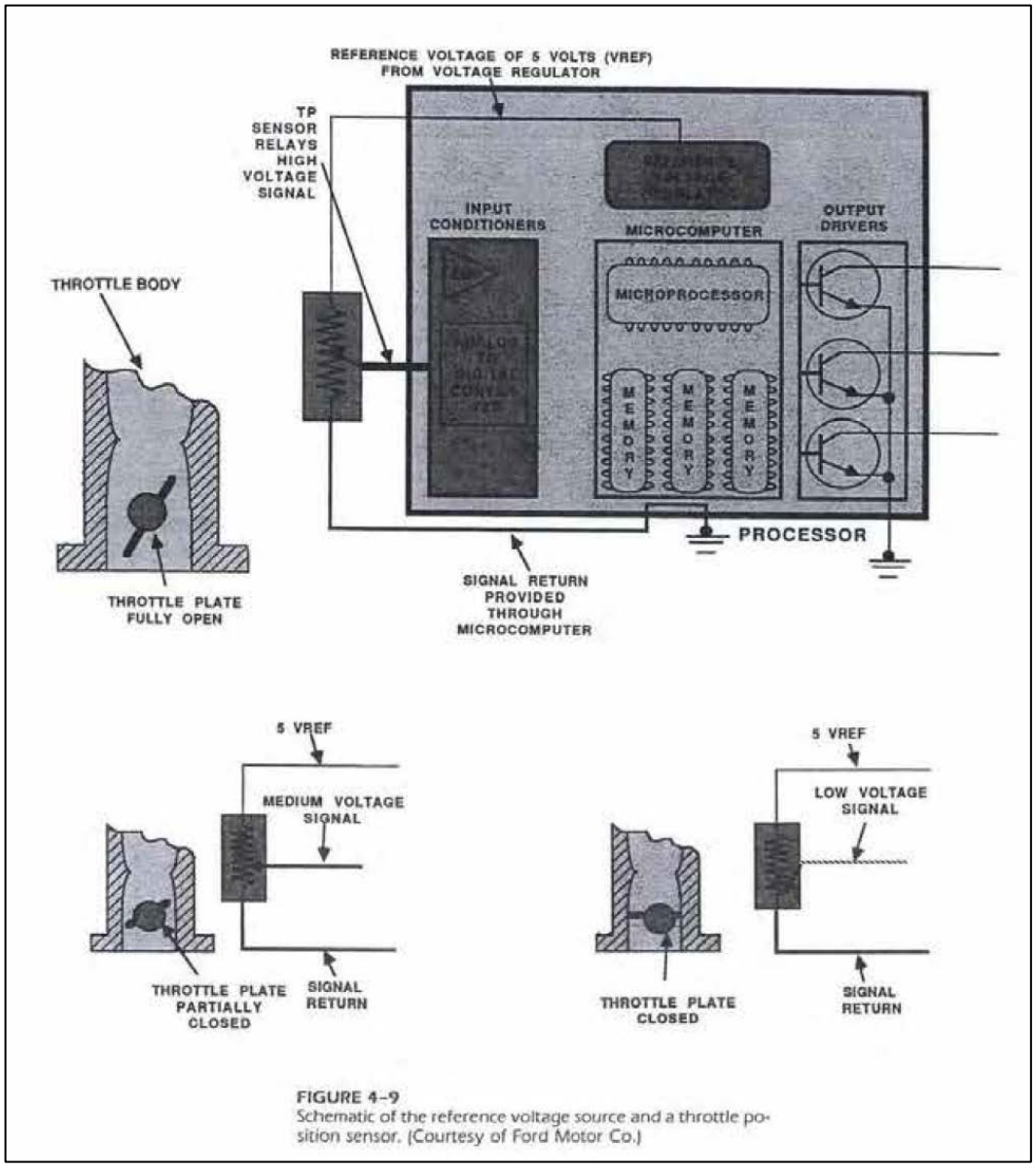


FIGURE 4–9
Schematic of the reference voltage source and a throttle position sensor. (Courtesy of Ford Motor Co.)

EX1022, 61.

26. I'll also note that the '804 patent recognized that prior systems typically commanded the throttle to fully close to a mechanical limit called a "close stop."

See EX1001, 1:36-44; *see also* EX1027, 1:13-14 ("Servosystems are frequently designed to operate between specified limits of mechanical movement."). The '804 patent states that "the actuator or servomotor used to position the throttle plate is designed to have the maximum control effort available (motor voltage, current, duty cycle) to enhance throttle plate position response." EX1001, 1:36-39. It further states that typical mechanical limits of a throttle plate include "an open stop or a close stop." EX1001, 1:43-44. The '804 patent thus confirms that Itabashi's disclosure about commanding the throttle valve to close to its fully closed position and to open to its fully open position was well-known and conventional.

27. A POSA would have also understood that Itabashi would command its throttle valve to open to its fully open position. EX1003, ¶¶124-25. I agree with the Board that the example TARGET position shown in Figures 3 and 4 is slightly below the FULL OPEN position. *See* Institution Decision, 23. That said, a POSA would have understood that the TARGET shown in Figures 3 and 4 is just an example, and the FULL CLOSE and FULL OPEN positions define the limits of the range of available TARGET positions for Itabashi's system.

28. It would have been obvious to command Itabashi's throttle valve to change to a fully open position because Itabashi's figures show the FULL OPEN position, which teaches or suggests that the system commands the throttle to fully open. Indeed, as I explained in my original declaration, commanding a throttle to

fully open was well known. *E.g.*, EX1003, ¶¶63-64. Again, a POSA would have also understood that the TARGET position shown in Figure 3 is just an example. The target position varies based on factors, such as the position of the accelerator pedal, to achieve a desired air-fuel mixture. *See* EX1007, 3:7-10.

29. Additionally, a POSA would have understood that Itabashi's system would command the throttle to fully open because the fully open position is defined by the maximum opening the system can reach. As background art shows, the fully open position varies from system to system. For example, the throttle shown below on the left has a fully open position "parallel with the axis of the passageway 72"—at 90 degrees. *See* EX1015, 6:16-19, FIG. 7A. But for a different throttle shown below on the right, "fully open" is at "80 to 85 degrees." EX1022, 60-61.

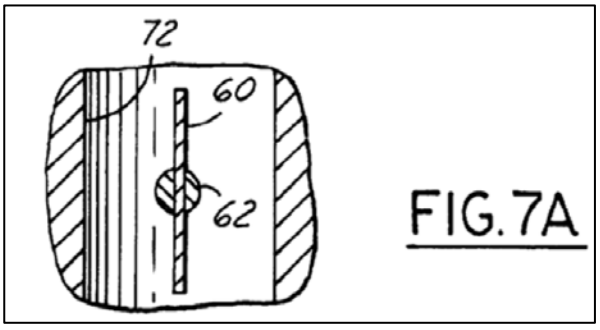
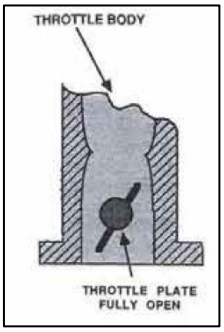


FIG. 7A



Compare EX1015, 6:16-19, FIG. 7A, *with* EX1022, 60-61.

30. As this background art shows, the fully open position varies—it depends on the limits of the system. If Itabashi's throttle was controllable to 90°, that would be its FULL OPEN position. If Itabashi's throttle was controllable to only 80°, that would be its FULL OPEN position. Regardless of where the FULL

OPEN position is, Itabashi's system would command the throttle to reach FULL OPEN because it is by definition the maximum opening the throttle can be commanded to move.

31. For these reasons, a POSA would have understood that Itabashi's TARGET position may fall anywhere in the range from FULL CLOSE to FULL OPEN, inclusive of the limits.

VII. SUBSTITUTE CLAIM 21

32. I understand that the patent owner proposes substitute claim 21 in its MTA. I understand that substitute claim 21 would amend issued claim 1 as shown below (additions underlined, deletions stricken or in double brackets).

> Substitute Claim 21. A method for controlling a positioning device of an internal combustion engine, the method comprising the steps of:
>
> providing an electric motor for actuating the positioning device;
>
> <u>detecting whether a control effort required to change a position of the positioning device has exceeded a first limit for at least a first predetermined time period;</u>
>
> <u>in the event the control effort is detected to have exceeded the first limit for at least the first predetermined time period,</u> commanding the positioning device to change to a <u>first</u> commanded <u>hold open</u> position;
>
> detecting [[a]] <u>the</u> control effort required to change to said <u>first</u> commanded <u>hold open</u> position;

determining whether said control effort exceeds a first threshold for a second predetermined time period; and

reducing said control effort when said control effort exceeds said first threshold for said second predetermined time period;

detecting whether the control effort has exceeded a second limit for at least a third predetermined time period;

in the event the control effort is detected to have exceeded the second limit for at least the third predetermined time period, commanding the positioning device to change to a second commanded hold close position;

detecting the control effort required to change to said second commanded hold close position;

determining whether said control effort exceeds a second threshold for a third predetermined time period; and

reducing said control effort when said control effort exceeds said second threshold for said third predetermined time period.

~~wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to dose to a hold close mode.~~

VIII. THE DISCLOSURE DOES NOT HAVE WRITTEN DESCRIPTION SUPPORT FOR SUBSTITUTE CLAIM 21.

33. Contrary to the patent owner's contentions in the motion to amend, the '804 patent's original disclosure does not provide written description support for substitute claim 21. First, the patent owner has not shown how the '804 patent's original disclosure describes the "detecting" in Elements [21.B] and [21.G]. Second, the patent owner has not shown how the '804 patent's original disclosure describes a "hold open position" or a "hold close position" as recited in Elements [21.C] and [21.H], respectively. Third, the patent owner has not shown how the '804 patent's original disclosure describes the "detecting" in Elements [21.D] and [21.I]. Fourth, the '804 patent's original disclosure does not describe determining whether a control effort "exceeds" a threshold for a predetermined time period as recited in Elements [21.E] and [21.J]. The original disclosure would not have demonstrated to a POSA that the inventor possessed the subject matter recited Substitute Claim 21. Nor would the original disclosure have demonstrated to a POSA that the inventor possessed the claimed combination of elements recited in substitute claim 21. Accordingly, substitute claim 21 lacks written description support.

A. "detecting" whether a control effort has exceeded a limit

34. First, the patent owner has not shown that the '804 patent's original disclosure describes "*detecting* whether a control effort . . . has exceeded a first limit" or "*detecting* whether the control effort has exceeded a second limit" as

recited in Elements [21.B] and [21.G]. The patent owner argues that the following discloses the "detecting" recited in substitute claim 21. However, the alleged support describes *determining* if the control effort has been more positive or more negative than a limit.

Patent Owner's Alleged Written-Description Support	
"***detecting*** whether a control effort . . . has exceeded a first limit for at least a first predetermined time period"	Block 42 of FIG. 2, which states: "Has control effort been more positive than a given limit for at least a predetermined time period?" (EX1002, 0026) [0017] "In step 42, the controller preferably ***determines*** if the control effort has been more positive than a predetermined time limit for at least a predetermined time period." (EX1002, 0012-13) Claim 1 (EX1002, 0018)
"***detecting*** whether the control effort has exceeded a second limit for at least a third predetermined time period"	Block 52 of FIG. 2, which states: "Has control effort been more negative than a given limit for at least a predetermined time period?" (EX1002, 0026) [0022] "In step 52, the controller preferably ***determines*** if the control effort has been more negative than a predetermined time limit for at least a predetermined time period." (EX1002, 0015) Claim 1 (EX1002, 0018)

35. According to the disclosure, "[a] throttle control unit (28) determines whether the control effort exceeds a threshold for a predetermined time period." EX1002, 0022 (Abstract). The disclosure also states that "[i]n step 42, the controller

preferably determines if the control effort has been more positive than a predetermined limit for at least a predetermined time period." EX1002, 0012 (¶17). And "[i]n step 52, the controller preferably determines if the control effort has been more negative than a predetermined limit for at least a predetermined time period." EX1002, 0015 (¶22). As these excerpts show, the '804 patent's original disclosure describes "determining" whether a control effort has exceeded a threshold. However, the patent owner has not explained why "determining" whether a control effort has exceeded a threshold discloses "detecting" whether a control effort has exceeded a threshold.

B. "hold open position" and "hold close position"

36. Second, the patent owner has not shown that the '804 patent's original disclosure describes a "hold open position" or a "hold close position." For the hold open position and the hold close position, the patent owner relies on the following disclosure.

Patent Owner's Alleged Written-Description Support	
"in the event the control effort is detected to have exceeded the first limit for at least the first predetermined time period, commanding the positioning device to change to ***a first***	Block 44 of FIG. 2, which states: "Call for ***hold_open_mode***" (EX1002, 0026 (emphasis added)) [0017] "In step 42, the controller preferably determines if the control effort has been more positive than a predetermined limit for at least a predetermined time period . . . . If the predetermined threshold has been exceeded, then the sequence proceeds to step 44." (EX1002, 0012-13)

Patent Owner's Alleged Written-Description Support	
commanded hold open position"	[0018] "A ***hold open mode*** is initiated at step 44 and the[n] immediately continued in step 46." (EX1002, 0013 (emphasis added)) Claim 1 (EX1002, 0018)
"in the event the control effort is detected to have exceeded the second limit for at least the third predetermined time period, commanding the positioning device to change to ***a second commanded hold close position***"	Block 52 of FIG. 2, which states: "Has control effort been more negative than a given limit for at least a predetermined time period?" (EX1002, 0026) Block 54 of FIG. 2, which states: "Call for ***hold_close_mode***" (EX1002, 0026 (emphasis added)) [0022] "If the predetermined threshold has been exceeded, then the sequence proceeds to step 54." (EX1002, 0015) [0023] "***A hold close mode*** is initiated in step 54 and then immediately continued in step 56." (EX1002, 0015 (emphasis added)) Claim 1 (EX1002, 0018)

37. The '804 patent's original disclosure refers to "hold open" and "hold close" *modes*. In an exemplary embodiment in the disclosure, the hold open mode applies full voltage for a period to "clear or crush any small debris obstructing movement of the throttle plate." *See* EX1002, 0016 (¶26). The disclosure also states that the hold open mode "[a]ppl[ies] maximum opening control effort" for a "hard open time period." *See* EX1002, 0026 (FIG. 2). Similarly, the disclosure explains that for an exemplary embodiment that the hold close mode "[a]ppl[ies] maximum closing control effort" for a "hard close time period." *See* EX1002, 0026 (FIG. 2).

38. The patent owner did not cite anything in the ’804 patent’s disclosure that refers to the “hold open mode” as a “hold open position.” The patent owner did not cite anything in the disclosure that refers to the “hold close mode” as a “hold close position.” And the patent owner did not cite anything that discloses that “in the event the control effort is detected to have exceeded [a] limit for [a] predetermined time period, commanding the positioning device to change to [a] hold open position [/ hold close position].” Rather, the cited disclosure states that “the controller preferably determines if the control effort has been more positive than a predetermined limit for at least a predetermined time period.” MTA, 5 (quoting EX1002, 0012 (¶17)). “If the predetermined threshold has been exceeded . . . [a] hold open mode is initiated . . . .” MTA, 5 (quoting EX1002, 0012-13 (¶¶17-18).

C. detecting the control effort required to change to a commanded hold open position and a commanded hold close position.

39. Third, the patent owner did not explain how the ’804 patent’s original disclosure describes “detecting the control effort required to change to said first commanded hold open position” ([21.D]) or to “said second commanded hold close position” ([21.I]). For these elements, the patent owner relies on the following disclosure.

Patent Owner’s Alleged Written-Description Support	
“***detecting*** the control effort required to change to said first	Block 46 of FIG. 2, which states: “In hold_open_mode for less than a hard open time period?” (EX1002, 0026)

commanded hold open position"	[0018] "In step 46, the controller preferably ***determines*** if it has called for the hold open mode for less than a hard open time period." (EX1002, 0013 (emphasis added)) Claim 1 (EX1002, 0018)
"***detecting*** the control effort required to change to said second commanded hold close position"	Block 56 of FIG. 2, which states: "In hold_[close] mode for less than a hard close time period?" (EX1002, 0026) [0022] "If the predetermined threshold has been exceeded, then the sequence proceeds to step 54." (EX1002, 0015) [0023] "In step 56, the controller preferably ***determines*** whether it has called for a hold close mode for less than a hard close time period." (EX1002, 0015 (emphasis added)) Claim 1 (EX1002, 0018)

40. For the reasons explained above for Elements [21.C] and [21.H], the patent owner has not shown that the '804 patent's original disclosure supports the "hold open" and "hold closed" positions. Additionally, steps 46 and 56 describe that "the controller . . . determines if it has called for the hold open [or hold close] mode for less than a hard open [or hold close] time period," respectively. EX1002, 0013 (¶18), 0015 (¶23). The disclosure the patent owner cites does not detect a control effort required to change to a hold open or hold close position.

D. determining whether a control effort "exceeds" a threshold for a predetermined time period

41. Fourth, the '804 patent does not refer to determining whether a control effort "exceeds" a threshold for a time period. For this element, the patent owner

refers to the following, which only shows that the system can determine whether a mode has been active for *less than* a time period.

Patent Owner's Alleged Written-Description Support	
"determining whether said control effort exceeds a first threshold for a second predetermined time period"	Block 46 of FIG. 2, which states: "In hold_open_mode for ***less than*** a hard open time period?" (EX1002, 0026) [0018] "In step 46, the controller preferably determines if it has called for the hold open mode for ***less than*** a hard open time period." (EX1002, 0013) Claim 1 (EX1002, 0018)
"determining whether said control effort exceeds a second threshold for a third predetermined time period"	Block 56 of FIG. 2, which states: "In hold_open mode for ***less than*** a hard close time period?" (EX1002, 0026 (emphasis added)) [0023] "In step 56, the controller preferably determines whether it has called for a hold close mode for ***less than*** a hard close time period." (EX1002, 0015 (emphasis added))

42. In the '804 patent's disclosure, steps 46 and 56 determine whether a mode has been active for *less than* a specified time period. As the disclosure explains, a controller in step 46 "determines if it has called for the hold open mode for *less than* a hard open time period." EX1002, 0013 (¶18), (emphasis added). The controller in step 56 "determines whether it has called for a hold close mode for *less than* a hard close time period." EX1002, 0015 (¶23) (emphasis added). In these steps, the controller does not determine whether a control effort "exceeds" a

threshold let alone whether a control effort exceeds a threshold for a predetermined time period. Accordingly, Substitute Claim 21 changes the operation from determining whether something is *less than a time period* to determining whether something *exceeds a threshold for a time period*. There is no written description to support this change.

IX. THE '804 PATENT FAILS TO INFORM A POSA, WITH REASONABLE CERTAINTY, AS TO THE MEANING OF "THIRD PREDETERMINED TIME PERIOD" AND THE "CONTROL EFFORT."

43. The '804 patent is unclear as to the meaning of the "third predetermined time period" in Substitute Claim 21. It is unclear whether "a third predetermined time period" in Element [21.J] refers to the previously recited "third predetermined time period" in Elements [21.G] and [21.H]. Element [21.K] adds to the confusion about claim scope. Element [21.K] recites "reducing said control effort when said control effort exceeds said second threshold for *said third predetermined time period*." However, a POSA would have been unable to ascertain, with reasonable certainty, whether the third predetermined time period in Element [21.K] refers to the third predetermined time period in Element [21.G], the third predetermined time period in Element [21.J], or both.

44. The "control effort" recited throughout the entire claim also creates uncertainty about claim scope. It is unclear, in view of the specification, whether the "control effort" in Element [21.K] refers to the same control effort as some or all of

Elements [21.B]-[21.J]. The disclosure explains that the control effort in steps 42 and 52 is different (one is positive and one is negative). *See* EX1002, 0026 (FIG. 2). Presumably, the control effort for Elements [21.B]-[21.F] and Elements [21.G]-[21.K] should likewise be different. A POSA would have also understood that a control effort for opening the throttle is different than the control effort for closing the throttle. It is therefore unclear whether the control effort for Elements [21.B]-[21.F] is the same control effort as the control effort for Elements [21.G]-[21.K].

45. For these reasons, Substitute Claim 21, when read with the specification and the prosecution history, fails to inform the POSA, with reasonable certainty, about the scope of the invention.

X. ITABASHI TEACHES OR SUGGESTS EVERY ELEMENT IN SUBSTITUTE CLAIM 21.

46. A POSA would have understood that both of Itabashi's embodiments teach or suggest every element in substitute claim 21.

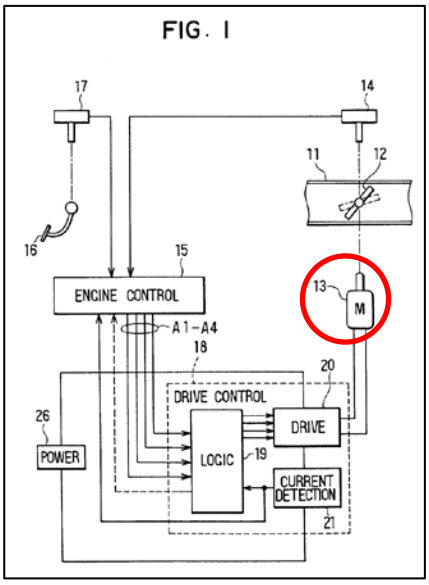
A. Embodiment 1 of Itabashi

1. [21.Pre] "A method for controlling a positioning device of an internal combustion engine"

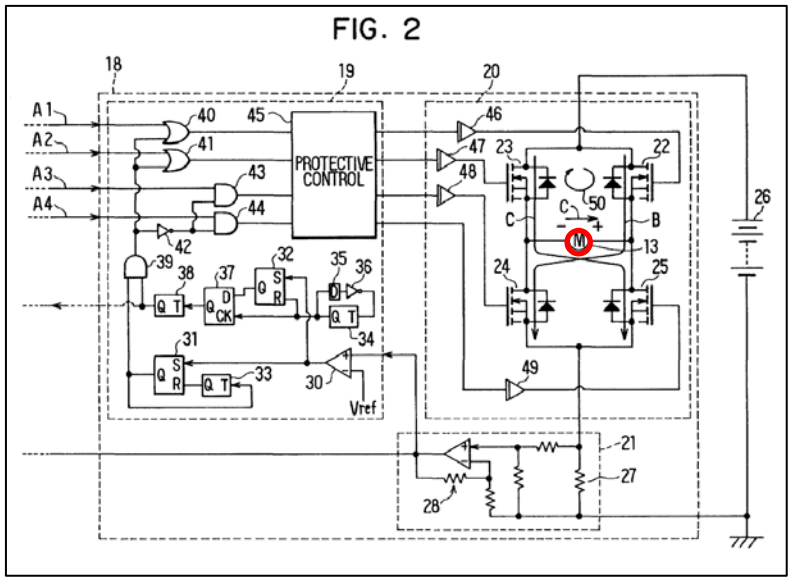
47. To the extent the preamble is limiting, Itabashi discloses the preamble. As Itabashi states, its "invention relates to a motor drive control apparatus and method having a motor current limit function, which can be applied to a motor driven throttle valve control in an internal combustion engine." EX1007, 1:13-16; *see also* EX1007, 8:16-36.

2. [21.A] "providing an electric motor for actuating the positioning device"

48. Itabashi discloses this element. Itabashi's system provides "an electrically-driven direct current motor 13." EX1007, 2:48-50. The motor 13 is for actuating the positioning device because "the motor 13 is required to produce a torque for driving the throttle valve 12 in the opening direction against the return spring." EX1007, 2:54-56. As shown below, "the drive control circuit 18 drives the motor 13 to rotate the throttle valve 12 to a target position corresponding to the detected actual accelerator pedal position." EX1007, 3:7-10.



EX1007, FIG. 1 (annotated).

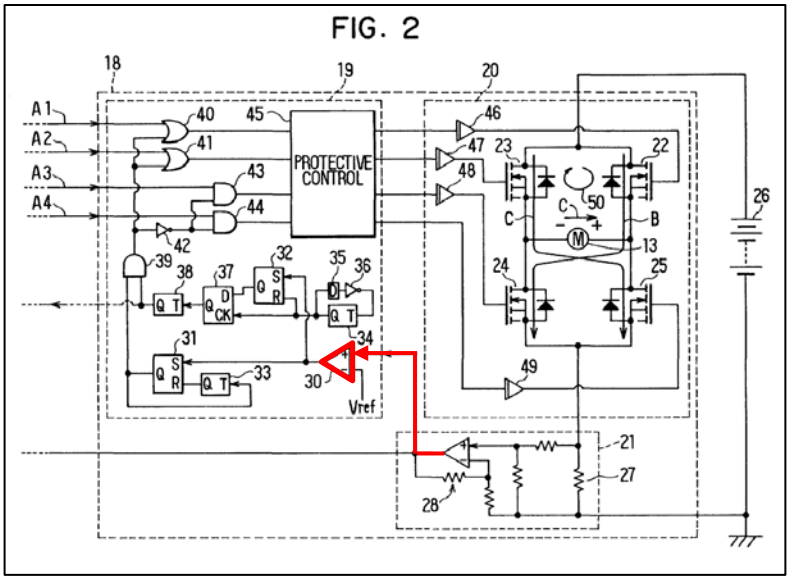


EX1007, FIG. 2 (annotated).

3. [21.B] "detecting whether a control effort required to change a position of the positioning device has exceeded a first limit for at least a first predetermined time period"

49. Itabashi discloses this element. Itabashi's drive logic circuit 19 and current detection circuit 21 detect whether a control effort required to move the throttle has exceeded a first limit (Vref) for a first predetermined time period (t33).

50. Itabashi discloses "detecting whether a control effort . . . has exceeded a first limit." In Itabashi, as shown below, "[t]he output signal of the current detection circuit 21 . . . is applied to the drive logic circuit 19." EX1007, 3:44-47. "In the drive logic circuit 19, a comparator 30 is provided to compare the output signal of the current detection circuit 21 with a reference signal Vref, which is set to correspond to the maximum limit level of the motor current." EX1007, 3:48-51. The drive logic circuit 19 detects that the control effort has exceeded a first limit because, as Itabashi states, "[e]ach time the motor current exceeds the limit current level, the comparator 30 produces a high level output signal." EX1007, 3:58-59.

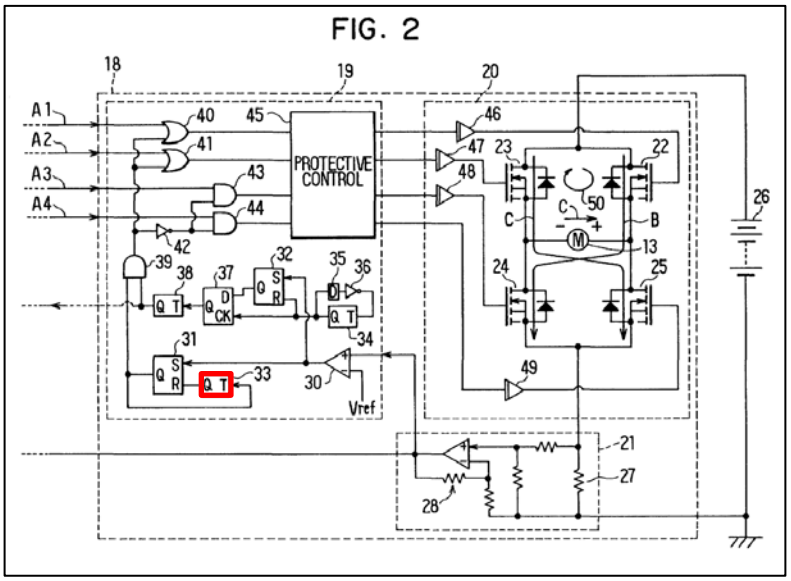


EX1007, FIG. 2 (annotated).

51. The detected control effort at the comparator 30 (outlined in red above) is the control effort required to change a position of the positioning device because "[t]he output signal of the current detection circuit 21 [is] indicative of the motor current flowing in the motor 13 . . . ." EX007, 3:44-47. The motor 13 is the motor that changes the positioning device because the motor 13 "produce[s] a torque for driving the throttle valve 12 in the opening direction . . . ." EX1007, 2:54-56.

52. Itabashi also discloses "detecting whether a control effort . . . has exceeded a first limit *for at least a first predetermined time period*." In Itabashi, the output of comparator 30 is applied to a timing circuit with timer 33 (outlined in red below). *See* EX1007, 3:58-63. The drive logic circuit 19 uses timer 33 to detect whether the control effort exceeds Vref for a predetermined time period t33. RS-latch 31 detects that the control effort exceeds Vref for time period 33 when both the

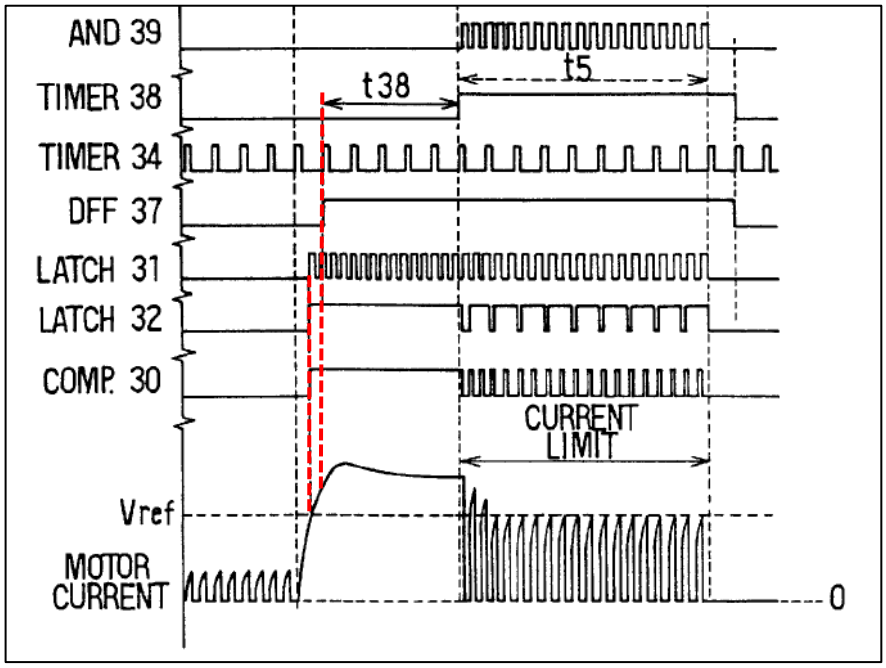
R and S inputs to latch 31 are high. As Itabashi states, "[t]he RS-latch 31 is set in response to the high level signal of the comparator 30 indicative of the motor current being in excess of the limit level (Vref), and produces a high level output signal from its output terminal Q to the timer 33 . . . ." EX1007, 3:64-4:1. "The timer 33 starts a time count in response to the applied high level output signal, and produces a high level output signal from its output terminal Q to a reset terminal R of the RS-latch 31 *when the count time reaches a predetermined or fixed reference time period*." EX1007, 4:4-8 (emphasis added); *see also* EX1007, 4:9-18, FIG. 4.



EX1007, FIG. 2 (annotated).

53. Itabashi's timing diagram in Figure 4 shows that the drive logic circuit 19 detects whether the control effort exceeds Vref for at least a first predetermined time period t33. Shown below, the first predetermined time period occurs between

the two red dashed lines—immediately before the start of the second predetermined time period t38, which I will explain for Element [21.E].



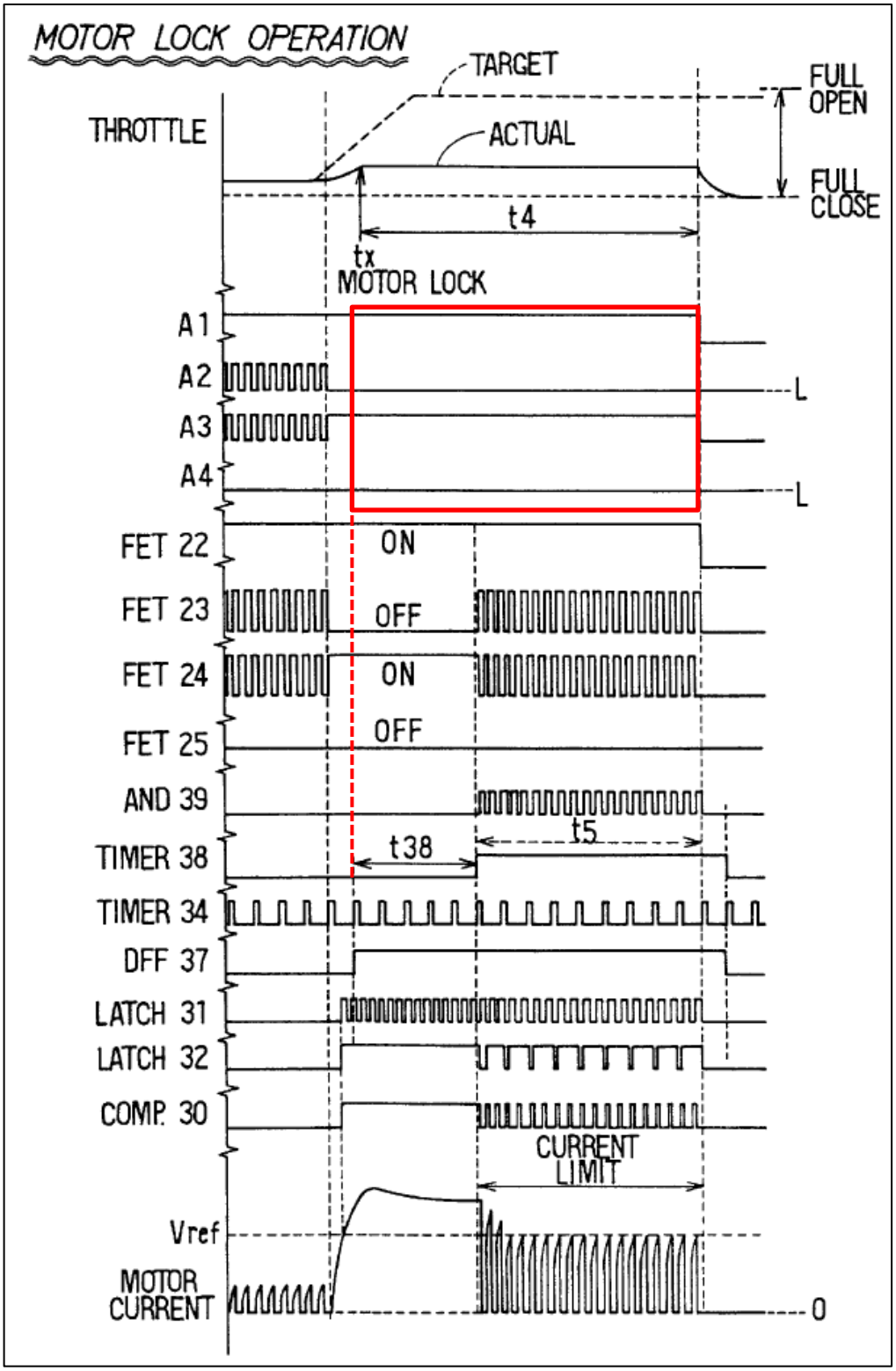
EX1007, FIG. 4 (excerpted and annotated).

54. For these reasons, Itabashi discloses "detecting whether a control effort required to change a position of the positioning device has exceeded a first limit for at least a first predetermined time period."

4. [21.C] "in the event the control effort is detected to have exceeded the first limit for at least the first predetermined time period, commanding the positioning device to change to a first commanded hold open position"

55. Itabashi discloses this element because in the event the control effort exceeds Vref for at least the first predetermined time period, signals A1-A4 command the throttle valve to open and hold open. *See* EX1007, 3:4-7, FIG. 4. In Itabashi, when the control effort is detected to have exceeded Vref for at least t33,

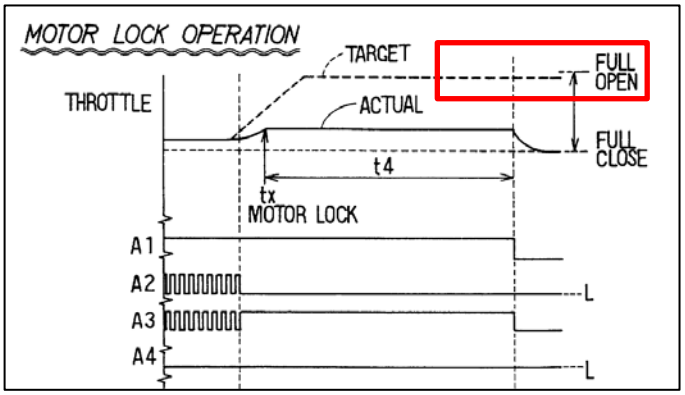
"[t]he engine control circuit 15 produces drive command signals A1-A4 to a drive control circuit 18 in correspondence with the output signals of the throttle sensor 14 and the accelerator sensor 17." EX1007, 3:4-7. These signals A1-A4 command the throttle valve to change position because "the drive control circuit 18 drives the motor 13 to rotate the throttle valve 12 *to a target position* corresponding to the detected actual accelerator position." EX1007, 3:7-10 (emphasis added). As shown below, when the control effort exceeds Vref for at least t33—i.e., at the start of t38—signals A1-A4 command the throttle valve to open. To the extent the patent owner argues that the detection in Element [21.B] must *cause* the command to change, I would disagree. Element [21.C] includes no such limitation. Shown below, Itabashi meets [21.C]—in the event the control effort is detected to have exceeded Vref for at least t33, Itabashi's system commands the positioning device to move to a commanded hold open position.



EX1007, FIG. 4 (annotated).

56. The target position, as shown above, is an *open* throttle position. To reach this target position, signals A1 and A3 are high, and signals A2 and A4 are low. *See* EX1007, FIG. 4. These signals are produced to turn on MOSFETs 22 and 24 and turn off MOSFETs 23 and 25, which drives motor current to open the throttle valve. *See* EX1007, 6:34-39, 6:51-55, FIGS. 2-4. Accordingly, in the event the control effort is detected to have exceeded Vref for at least the first predetermined time period, Itabashi's system commands the throttle valve to open.

57. Signals A1-A4 command the throttle valve to not only open but to *hold open*. As the timing diagram shows below, the target throttle position remains open for an extended period of time. Signals A1-A4 therefore command the throttle valve to change to a commanded "hold open position."



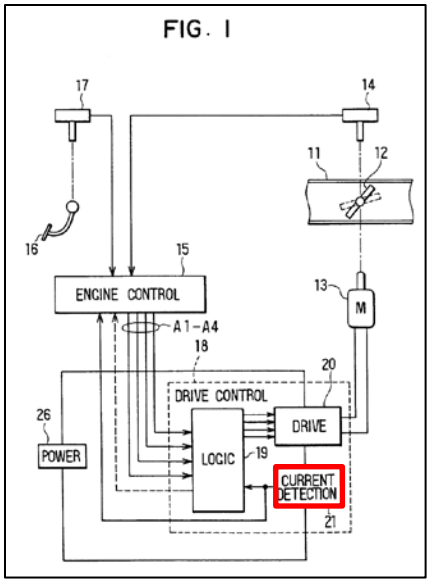
EX1007, FIG. 4 (excerpted and annotated).

58. For these reasons, Itabashi discloses "in the event the control effort is detected to have exceeded the first limit for at least the first predetermined time

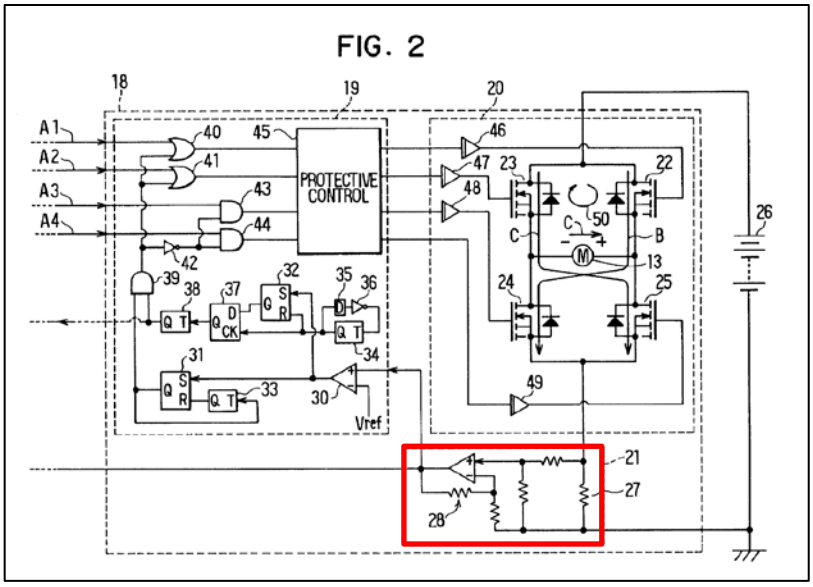
period, commanding the positioning device to change to a first commanded hold open position."

5. [21.D] "detecting the control effort required to change to said first commanded hold open position"

59. Itabashi's current detection circuit 21 "detect[s] the control effort required to change to said first commanded hold open position." Itabashi's system has "a current detection circuit 21 which detects a motor current, i.e., an electric current supplied from the drive circuit 20 to the motor 13." EX1007, 3:11-16. The detected motor current would be the current required to move the throttle to the first commanded hold open position because "the engine control circuit 15 drives the motor 13 with the motor current of 100% duty ratio during the time period t1 so that the actual throttle position approaches the target throttle position in a short period of time." EX1007, 6:46-51. Then, "[t]he motor current flows in the forward direction indicated by an arrow B in FIG. 2 to maintain the opening position of the throttle valve 12 against the return spring." EX1007, 6:36-39.



EX1007, FIG. 1 (annotated).

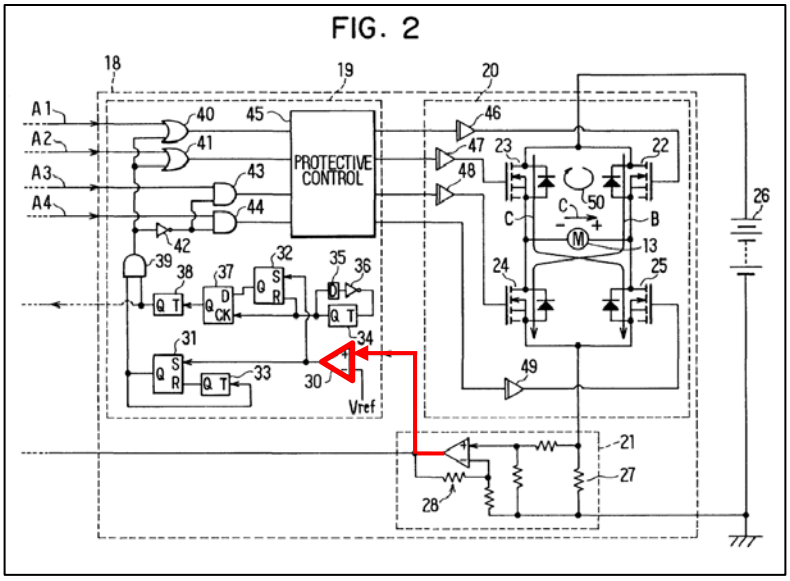


EX1007, FIG. 2 (annotated).

60. For these reasons, Itabashi discloses "detecting the control effort required to change to said first commanded hold open position."

6. [21.E] "determining whether said control effort exceeds a first threshold for a second predetermined time period"

61. Itabashi's drive logic circuit 19 "determin[es] whether said control effort exceeds a first threshold for a second predetermined time period." Figure 2 (annotated below) shows the current detection circuit 21 sending the current indicator to the drive logic circuit 19. *See* EX1007, 3:44-47, FIG. 2. "The output signal of the current detection circuit 21 [is] indicative of the motor current flowing in the motor 13 . . . ." EX1007, 3:44-47. "In the drive logic circuit 19, a comparator 30 is provided to compare the output signal of the current detection circuit 21 with a reference signal Vref, which is set to correspond to the maximum limit level of the motor current." EX1007, 3:48-51.



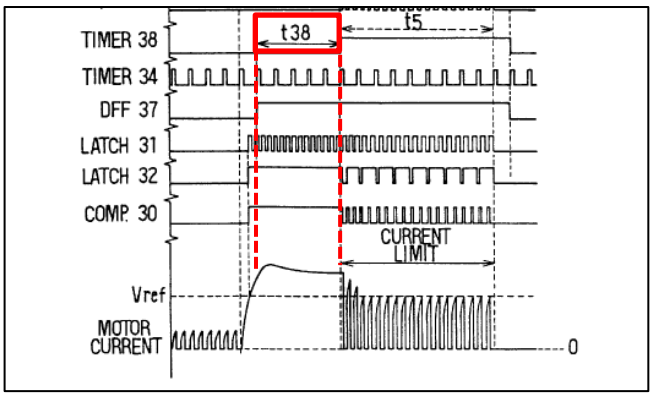
EX1007, FIG. 2 (annotated).

62. Vref is not only a limit (Element [21.B]) but also a threshold.[1] When the output signal of the current detection circuit 21 is higher than Vref, the output of comparator 30 becomes high. EX1007, 3:48-51, 3:58-59, FIG. 2. When the output of comparator 30 becomes high, the drive logic circuit 19 determines that the motor current (the control effort) exceeds Vref (a threshold).

63. The drive logic circuit 19 also determines whether the motor drive current (the control effort) exceeds Vref (a threshold) for a *second* predetermined time period. As I explain for Element [21.B], the system does not immediately

[1] To the extent the patent owner argues that the limit in Element [21.B] must be different than the threshold in Element [21.E], the '804 patent has no written description support for this interpretation. *See* Section VIII.D.

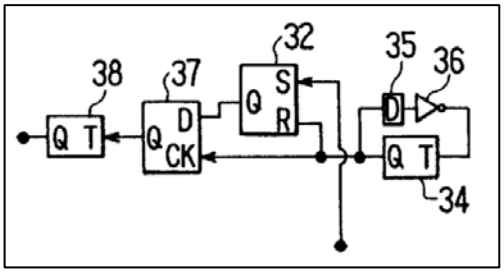
reduce the motor current when the motor current exceeds Vref. Rather, the system allows the motor current to exceed Vref for at least a first predetermined time period. *See* EX1007, 1:58-2:6, 5:21-35, 8:16-24, FIG. 4. In addition to the first predetermined time period t33, the drive logic circuit 19 determines whether the motor current exceeds Vref for a *second* predetermined time period—time period t38. As Figure 4 shows below, the system determines that the motor current exceeds Vref for time period t38. *See* EX1007, FIG. 4.



EX1007, FIG. 4 (annotated).

64. The following circuitry determines the second predetermined time period t38. In the circuitry, timer 34 produces a pulse signal based on a predetermined time period t34. *See* EX1007, 4:18-39, FIGS. 3, 4. This pulse signal is input to the R terminal of RS-latch 32 and a clock input terminal CK of a D-type flip-flop (DEF) 37. EX1007, 4:18-21, 4:40-44. "When the RS-latch 32 receives at its set terminal S the high level signal from the comparator 30 indicating that the motor current is in excess of the limit level, the RS-latch 32 is set to produce a high level

output signal from its output terminal Q to the data input terminal D of the D-type flip-flop 37." EX1007, 4:45-50. The D-type flip-flop 37 then produces a high output signal to an input terminal T of timer 38. EX1007, 4:55-65. After a predetermined time period of timer 38—t38—the output Q of timer 38 becomes high. EX1007, 5:8-16, FIG. 4. As I explain for Element [21.F], the high output from timer 38 causes Itabashi's system to reduce the control effort to the throttle valve.

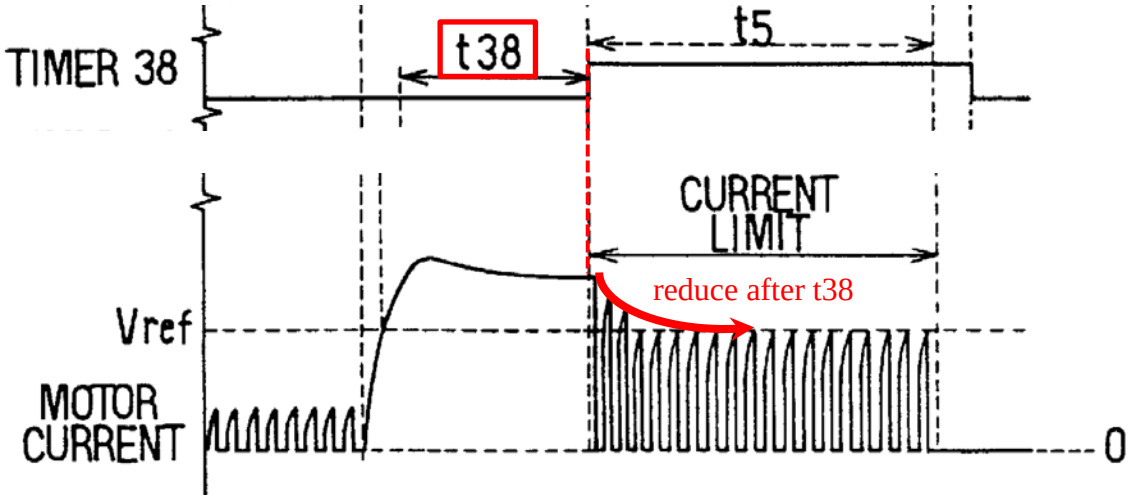


EX1007, FIG. 2 (cropped).

65. For these reasons, Itabashi discloses "determining whether said control effort exceeds a first threshold for a second predetermined time period."

7. [21.F] "reducing said control effort when said control effort exceeds said first threshold for said second predetermined time period"

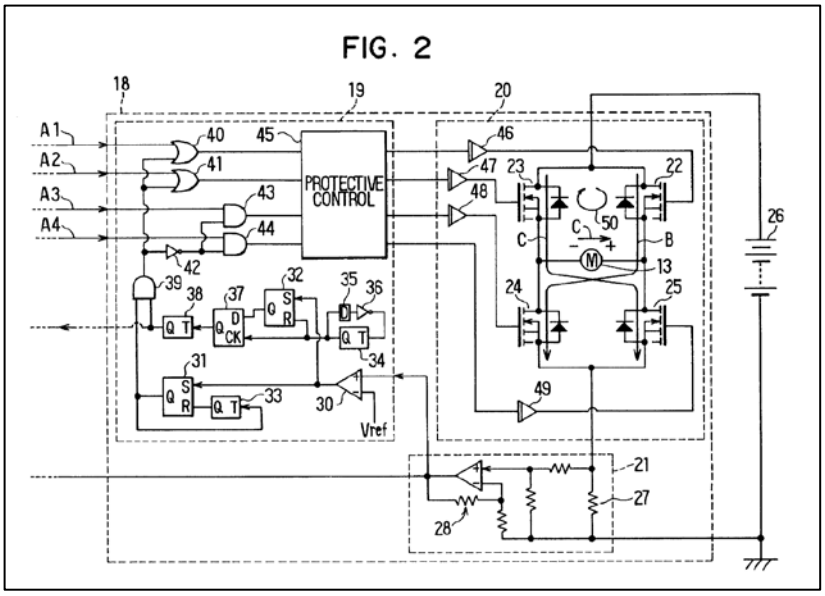
66. Itabashi discloses this element because Itabashi's system reduces the control effort when the control effort exceeds Vref for the predetermined time period t38, as the timing diagram shows below. *See* EX1007, FIG. 4.



EX1007, FIG. 4 (excerpted and annotated).

67. Figure 2 (reproduced again below) also shows how Itabashi's system reduces the motor current when the motor current exceeds Vref for time period t38. After time period t38, the output of timer 38 becomes high, which causes AND gate 39 to turn high (the other input of AND gate 39 was already high from the output of latch 31). EX1007, 5:36-38, 7:28-30, FIG. 4. As Figure 2 shows, the output of AND gate 39 changes the commands A1-A4 via OR gates 40 and 41 and AND gates 43 and 44. EX1007, 5:44-48, FIG. 4. When the output of AND gate 39 is high, the commands A1 and A2 cause MOSFETs 22 and 23 to turn on. *See* EX1007, 5:51-59, 7:44-48, FIG. 4. Also, when the output of AND gate 39 is high, the commands A3 and A4 cause MOSFETs 24 and 25 to turn off. *See* EX1007, 5:60-65, 7:31-43, FIG. 4. This causes the motor supply to limit the current. EX1007, 5:53-59, 6:6-18, FIG. 4. This triggers the "current limit operation," which limits the current during t5 (creating the sawtooth wave during "CURRENT LIMIT"). EX1007, 5:53-59, 6:6-

18, 8:25-30 ("Further, the motor current is limited to a lower level, when the motor current continues to exceed the limit level for more than the predetermined period t38 during the period of the motor drive starting (or motor braking)."), FIG. 4.



EX1007, FIG. 2.

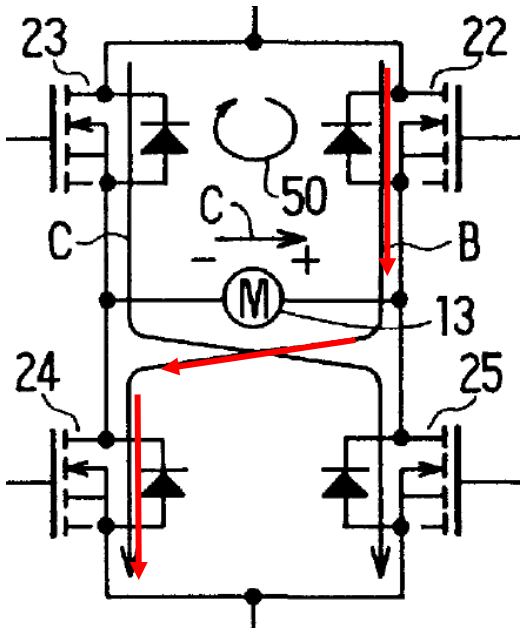
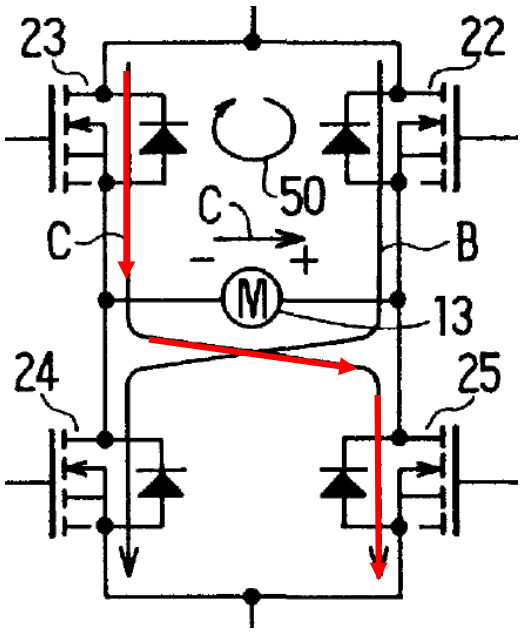
68. For these reasons, Itabashi discloses "reducing said control effort when said control effort exceeds said first threshold for said second predetermined time period."

8. [21.G] "detecting whether the control effort has exceeded a second limit for at least a third predetermined time period"

69. Like how Itabashi's system detects whether the control effort has exceeded a first limit for a first predetermined time period when commanding the throttle to *open*, Itabashi's system detects whether the control effort has exceeded a limit for a predetermined time period when commanding the throttle to *close*. Itabashi refers to driving the motor in the reverse direction. *See, e.g.*, EX1007, 1:66-

2:6, 5:21-35, 8:16-36. For example, Itabashi states that "[t]he motor 13 is driven with the motor current of 100% duty ratio *in the reverse direction* (C) to brake the throttle valve 12." EX1007, 7:57-59.

70. When commanding the throttle to open, MOSFETs 22 and 24 are turned on and MOSFETs 23 and 25 are turned off, as I show below. *See* EX1007, FIGS. 2-3. When slowing the opening of the throttle and closing the throttle, the current flows in the reverse direction because MOSFETs 23 and 25 are turned on and MOSFETs 22 and 24 are turned off. *See* EX1007, 6:66-7:3, FIGS. 2-3.

Current When Opening the Throttle	**Current When Braking and Closing**
	

See EX1007, FIG. 2 (excerpted and annotated).

71. In Itabashi, turning MOSFETs 23 and 25 on and MOSFETs 22 and 24 off would both *slow* the opening of the throttle and/or *close* the throttle. Itabashi

states that "braking" would slow the opening of the throttle valve because "the engine control circuit 15 starts to brake the motor 13 to stop the throttle valve 12 at the target position." EX1007, 6:63-66. As a POSA would have appreciated, continuing to keep MOSFETs 23 and 25 on and MOSFETs 22 and 24 off (or triggering this configuration when the throttle is at a target position) would close the throttle. The current would continue or start passing in the direction of arrow C shown above in the H-bridge circuit, which would drive the throttle toward its fully closed position. *See* EX1007, 6:66-7:3.

72. Similar to how Itabashi uses its current detection circuit for reducing excessive motor current when commanding the throttle to open, Itabashi explains that the current detection circuit reduces excessive motor current when driving the motor in the reverse direction:

> Although the motor current supply is controlled as described above and shown in FIG. 4 when the motor locks at the time of the motor drive starting, *the motor current supply is controlled in the similar manner when the motor locks at the time of motor braking*.

EX1007, 8:11-15 (emphasis added); *see also* EX1007, 8:28-30 (limiting motor current in the reverse direction to reduce the heat generation of MOSFETs 23 and 25). As a POSA would have appreciated from the above disclosure, Itabashi's drive logic circuit and current detection circuit would detect whether the control effort

exceeded a limit when driving the motor in the reverse direction, for example when closing the throttle.

73. As I explain for Element [21.B], Itabashi's system uses comparators to detect the control effort. "Each time the motor current exceeds the limit current level, the comparator 30 produces a high level output signal." EX1007, 3:58-59. However, a POSA would have understood that the limit for Element [21.G] is different from the first limit for Element [21.B]. Whereas the control effort detected when opening the throttle is *positive*, the control effort to close the throttle is *negative* because the current flowing through the H-bridge drive circuit is in the reverse direction, as I showed above. A POSA would have therefore understood that the limit for Element [21.G] would be negative.

74. A POSA would have also appreciated that Itabashi's drive logic circuit and current detection circuit would detect whether the control effort exceeded the limit *for at least a predetermined time period*.[2] As I explain for Element [21.B], Itabashi's motor lock operation does not immediately reduce the motor current when

[2] The "first predetermined time period" in Element [21.B] and the "third predetermined time period" in Element [21.G] can be the same duration because the '804 patent states that the predetermined time periods for steps 42 and 52 of the Figure 2 embodiment can both be 300 milliseconds. *See* EX1001, 3:28-30, 4:19-21.

the motor current exceeds Vref. To allow the motor current to exceed Vref for a certain time period, the system uses a timing circuit with timer 33. *See* EX1007, 3:58-4:54, FIGS. 2-4. As was the case with the motor lock operation when commanding the throttle to open, Itabashi's system would detect whether the control effort exceeds the limit Vref for at least a predetermined time period t33 when driving the motor in the reverse direction. *See* EX1007, 8:16-20.

75. For these reasons, Itabashi discloses "detecting whether the control effort has exceeded a second limit for at least a third predetermined time period."

9. [21.H] "in the event the control effort is detected to have exceeded the second limit for at least the third predetermined time period, commanding the positioning device to change to a second commanded hold close position"

76. Itabashi discloses this element because in the event the control effort exceeds the second limit for at least the third predetermined time period (i.e., the control effort when driving the throttle motor in the reverse direction to close the throttle exceeds Vref), signals A1-A4 would command the throttle valve to close and hold at its closed position.

77. As I explain for Element [21.C], when commanding the throttle to open, Figure 4 shows that signals A1-A4 command the throttle valve to open and hold at its open target position in the event the control effort is detected to have exceeded a limit for a predetermined time period t33. Conversely, when commanding the throttle to close, signals A1-A4 would command the throttle valve

to close and hold at its closed position in the event the control effort is detected to have exceeded a limit for a predetermined time period. As Itabashi states, "[a]lthough the motor current supply is controlled as described above and shown in FIG. 4 when the motor locks at the time of the motor drive starting, the motor current supply is controlled in the similar manner when the motor locks at the time of [driving the motor in the reverse direction]." *See* EX1007, 8:11-15. Itabashi also states that "[t]he drive control circuit 18 is constructed to supply the motor current without limiting it during time periods of starting and [driving the motor in the reverse direction]." *See* EX1007, 3:17-21.

78. Itabashi further discloses that the "direct current motor for an engine throttle control is driven with a motor current of 100% duty ratio, *when a throttle valve is to be moved from one throttle position to another* . . . ." EX1007, Abstract (emphasis added). A POSA would have understood that moving from one throttle position to another includes moving the throttle in the opening direction (from a less open to a more open position, including fully open*) and in the closing direction* (from a more open to a less open position, including fully closed).

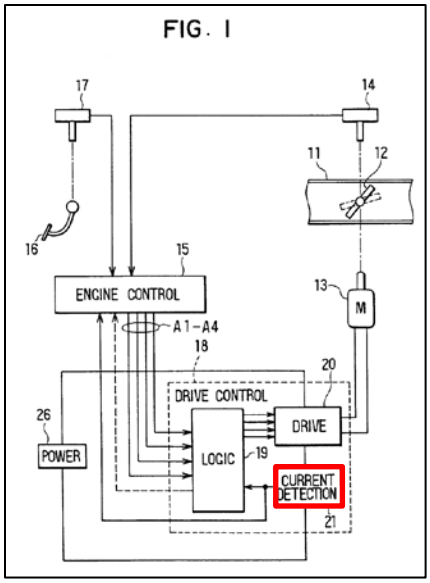
79. As a POSA would have understood, moving the throttle in the closing direction would cause signals A1 and A3 to be low, and signals A2 and A4 to be high. *See* EX1007, FIG. 4. These signals would be produced to turn off MOSFETs 22 and 24 and turn on MOSFETs 23 and 25, which would drive motor current to

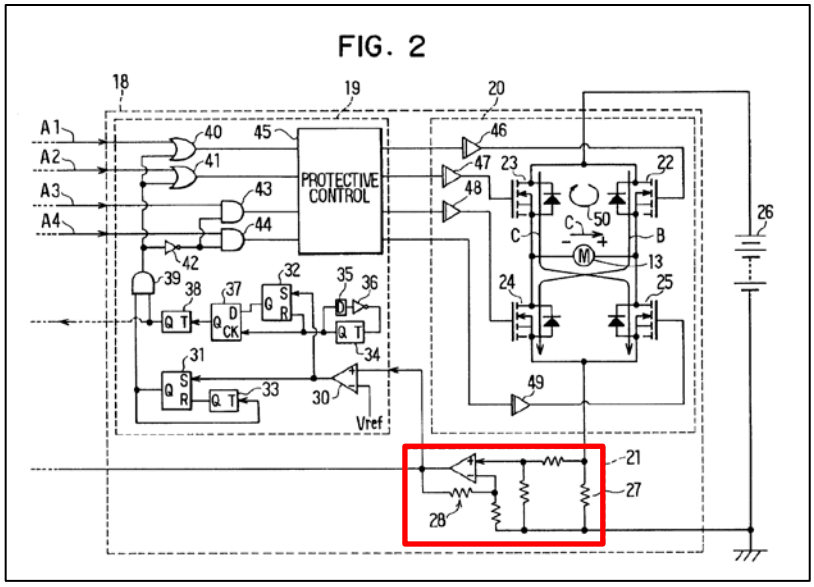
close the throttle valve. *See* EX1007, 6:34-39, 6:51-55, FIGS. 2-4. Accordingly, in the event the control effort is detected to have exceeded Vref for at least the third predetermined time period, Itabashi's system would command the throttle valve to close. And because the target throttle position would remain closed for a period of time, signals A1-A4 would command the throttle valve to change to a commanded "hold close position."

80. For these reasons, Itabashi discloses "in the event the control effort is detected to have exceeded the second limit for at least the third predetermined time period, commanding the positioning device to change to a second commanded hold close position."

10. [21.I] "detecting the control effort required to change to said second commanded hold close position"

81. Itabashi's current detection circuit 21 "detect[s] the control effort required to change to said second commanded hold close position." As I explain for Element [21.D] and show below, Itabashi's system has "a current detection circuit 21 which detects a motor current, i.e., an electric current supplied from the drive circuit 20 to the motor 13." EX1007, 3:11-16. The detected motor current would be the current required to move the throttle to the first commanded hold close position because the engine control circuit 15 uses current to drive the motor 13 to reach and maintain a throttle position, such as a hold close position. *See* EX1007, 6:36-39, 6:46-51.





EX1007, FIG. 1 (annotated). EX1007, FIG. 2 (annotated).

82. For these reasons, Itabashi discloses "detecting the control effort required to change to said second commanded hold close position."

11. [21.J] "determining whether said control effort exceeds a second threshold for a third predetermined time period"

83. Itabashi's drive logic circuit 19 "determin[es] whether said control effort exceeds a second threshold for a third predetermined time period." As I explain for Element [21.E], when commanding the throttle to open, Itabashi's drive logic circuit 19 determines that the motor current (the control effort) exceeds Vref (a threshold) when the output of comparator 30 becomes high. Likewise, when driving the throttle motor in the reverse direction to close the throttle valve, Itabashi's drive logic circuit 19 would determine that the motor current (the control effort) exceeds Vref (a threshold) when the output of comparator 30 becomes high. Indeed, Itabashi states that the system has a set limit level when driving the throttle motor in the

reverse direction: "the limit level is set lower than the level of the motor current which occurs at the time of motor drive starting or motor braking." *See* EX1007, 3:55-57.

84. A POSA would have understood that the threshold for closing Itabashi's throttle (the "second threshold") would be different from the threshold for opening the throttle (the "first threshold"). As I explain for Element [21.G], the control effort to open the throttle is positive whereas the control effort to close the throttle is *negative*. A POSA would have therefore understood that the threshold for closing the throttle in Element [21.J] would be negative.

85. The drive logic circuit 19 also determines whether the motor drive current (the control effort) exceeds Vref (a threshold) for a *third* predetermined time period.[3] As I explain for Element [21.E], the drive logic circuit 19 determines whether the motor current (the control effort) exceeds Vref (a threshold) for a *second* predetermined time period—time period t38—when commanding the throttle to open. Likewise, when driving the throttle motor in the reverse direction to

[3] The "second predetermined time period" in Element [21.E] and the "third predetermined time period" in Element [21.J] can be the same duration because the '804 patent states that the predetermined time periods can both be 30 milliseconds. *See* EX1001, 4:26-27, 5:41-42, 6:39-40.

close the throttle valve, Itabashi's drive logic circuit 19 would determine whether the motor drive current exceeds Vref for time period t38. *See* EX1007, 5:21-24 (emphasis added).

86. For these reasons, Itabashi discloses "determining whether said control effort exceeds a second threshold for a third predetermined time period."

12. [21.K] "reducing said control effort when said control effort exceeds said second threshold for said third predetermined time period"

87. Itabashi discloses this element because, after the motor current exceeds Vref for predetermined time period t38 when trying to *close* the throttle, Itabashi's system would reduce the motor current. As I explain for Element [21.F], Itabashi's system reduces the motor current—when commanding the throttle to *open*—after the motor current exceeds Vref for predetermined time period t38. A similar reduction to motor current would occur when driving the throttle motor in the reverse direction to close the throttle valve. As Itabashi states, "the motor current is limited to a lower level, when the motor current continues to exceed the limit level for more than the predetermined period t38 during the period of the motor drive starting (or [when driving the motor in the reverse direction])." EX1007, 8:25-28. "Thus, the current flowing in the MOSFETs 22-25 can be limited to the lower level to reduce the heat generation of the MOSFETs 22-25." EX1007, 8:28-30.

88. For these reasons, Itabashi discloses "reducing said control effort when said control effort exceeds said second threshold for said third predetermined time period."

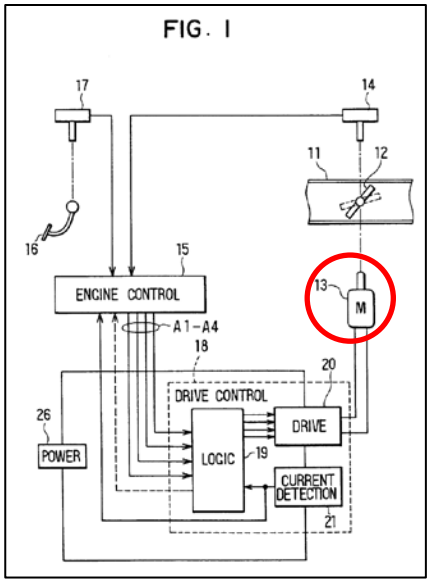
B. Embodiment 2 of Itabashi

1. [21.Pre] "A method for controlling a positioning device of an internal combustion engine"

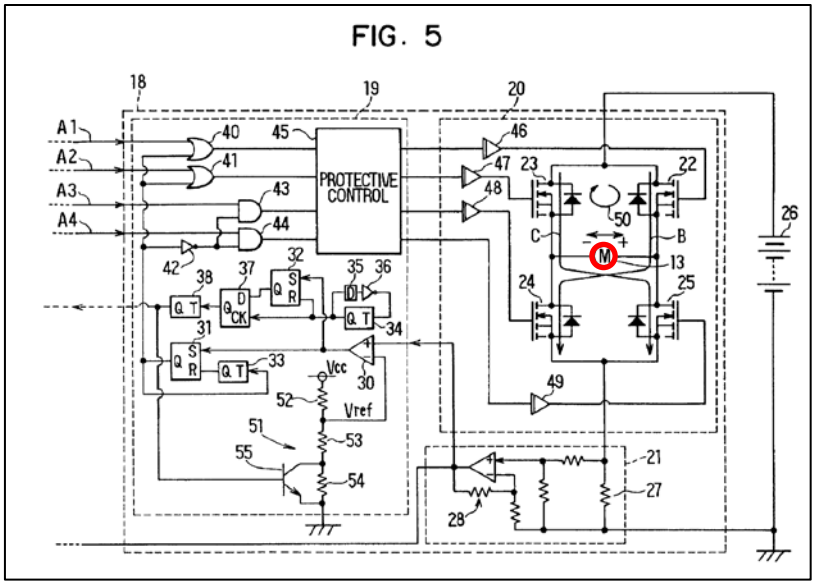
89. To the extent the preamble is limiting, Itabashi discloses the preamble. As Itabashi states, its "invention relates to a motor drive control apparatus and method having a motor current limit function, which can be applied to a motor driven throttle valve control in an internal combustion engine." EX1007, 1:13-16; *see also* EX1007, 8:16-36.

2. [21.A] "providing an electric motor for actuating the positioning device"

90. Itabashi discloses this element because the system provides "an electrically-driven direct current motor 13." EX1007, 2:48-50. The motor 13 is for actuating the positioning device because "the motor 13 is required to produce a torque for driving the throttle valve 12 in the opening direction against the return spring." EX1007, 2:54-56. As shown below, "the drive control circuit 18 drives the motor 13 to rotate the throttle valve 12 to a target position corresponding to the detected actual accelerator pedal position." EX1007, 3:7-10.



EX1007, FIG. 1 (annotated).



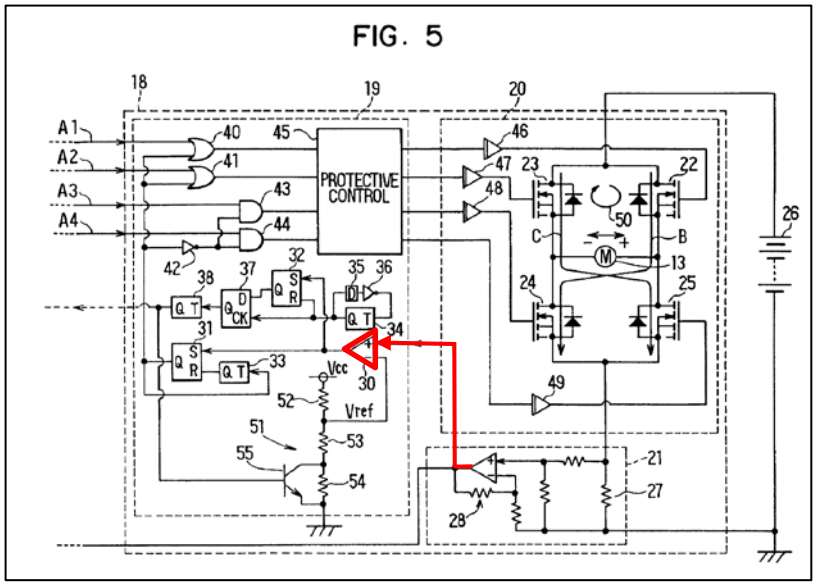
EX1007, FIG. 5 (annotated).

3. [21.B] "detecting whether a control effort required to change a position of the positioning device has exceeded a first limit for at least a first predetermined time period"

91. Itabashi discloses this element because the drive logic circuit 19 and current detection circuit 21 detect whether a control effort required to move the throttle has exceeded a first limit (Vref (H)) for a first predetermined time period (t38).

92. Itabashi discloses "detecting whether a control effort . . . has exceeded a first limit." As shown below, "[t]he output signal of the current detection circuit 21 . . . is applied to the drive logic circuit 19." EX1007, 3:44-47. "In the drive logic circuit 19, a comparator 30 is provided to compare the output signal of the current detection circuit 21 with a reference signal Vref, which is set to correspond to the maximum limit level of the motor current." EX1007, 3:48-51. The drive logic

circuit 19 detects that the control effort has exceeded a first limit because, as Itabashi states, "[e]ach time the motor current exceeds the limit current level, the comparator 30 produces a high level output signal." EX1007, 3:58-59.

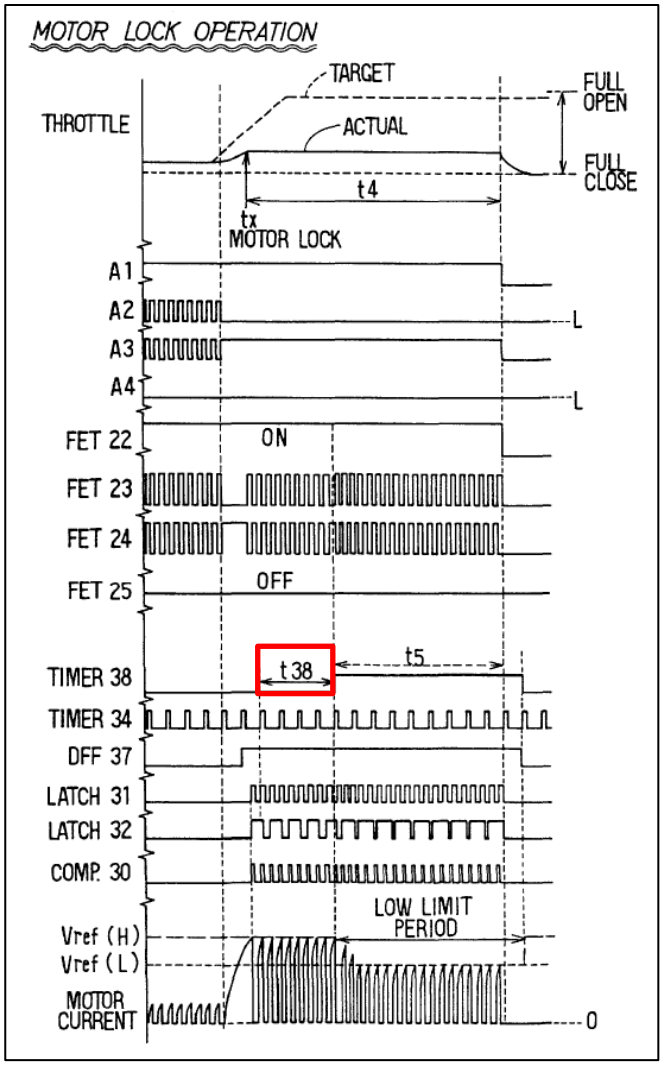


EX1007, FIG. 5 (annotated).

93. The detected control effort at the comparator 30 (outlined in red above) is the control effort required to change a position of the positioning device because "[t]he output signal of the current circuit 21 [is] indicative of the motor current flowing in the motor 13 . . . ." EX007, 3:44-47. The motor 13 is the motor that changes the positioning device because the motor 13 "produce[s] a torque for driving the throttle valve 12 in the opening direction . . . ." EX1007, 2:54-56.

94. Itabashi also discloses "detecting whether a control effort . . . has exceeded a first limit *for at least a first predetermined time period*" because Itabashi's timing circuit determines whether the control effort exceeds Vref(H) for

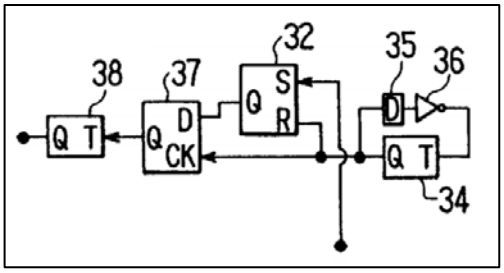
predetermined time period t38. As Figure 7 of Itabashi shows below, the drive logic circuit 19 determines whether the motor current (the control effort) exceeds Vref (H) (a threshold) for t38 (a predetermined time period). *See* EX1007, FIG. 7. Although the timing diagram appears to show that the control effort only *meets* Vref(H) during t38, Itabashi's comparator 30 detects whether the control effort *exceeds* the reference voltage Vref(H). *See* EX1007, 3:58-59 ("Each time the motor current *exceeds* the limit current level, the comparator 30 produces a high level output signal.") (emphasis added). Timer t38 is therefore triggered and runs when the control effort *exceeds* Vref(H)—not when the control effort *meets* Vref(H).



EX1007, FIG. 7 (annotated).

95. In Itabashi, the system does not immediately reduce the motor current when the motor current exceeds Vref(H). *See* EX1007, 1:58-2:6, 5:21-35, 8:16-24, FIG. 7. To allow the motor current to exceed Vref(H) for a predetermined time period, the system uses the following circuitry. In the circuitry, timer 34 produces a pulse signal based on a predetermined time period t34. *See* EX1007, 4:18-39, FIGS. 3, 4. This pulse signal is input to the R terminal of RS-latch 32 and a clock input terminal CK of a D-type flip-flop (DEF) 37. EX1007, 4:18-21, 4:40-44. "When the

RS-latch 32 receives at its set terminal S the high level signal from the comparator 30 indicating that the motor current is in excess of the limit level, the RS-latch 32 is set to produce a high level output signal from its output terminal Q to the data input terminal D of the D-type flip-flop 37." EX1007, 4:45-50. The D-type flip-flop 37 then produces a high output signal to an input terminal T of timer 38. EX1007, 4:55-65. After a predetermined time period of timer 38—t38—the output Q of timer 38 becomes high. EX1007, 5:8-16, FIG. 7.



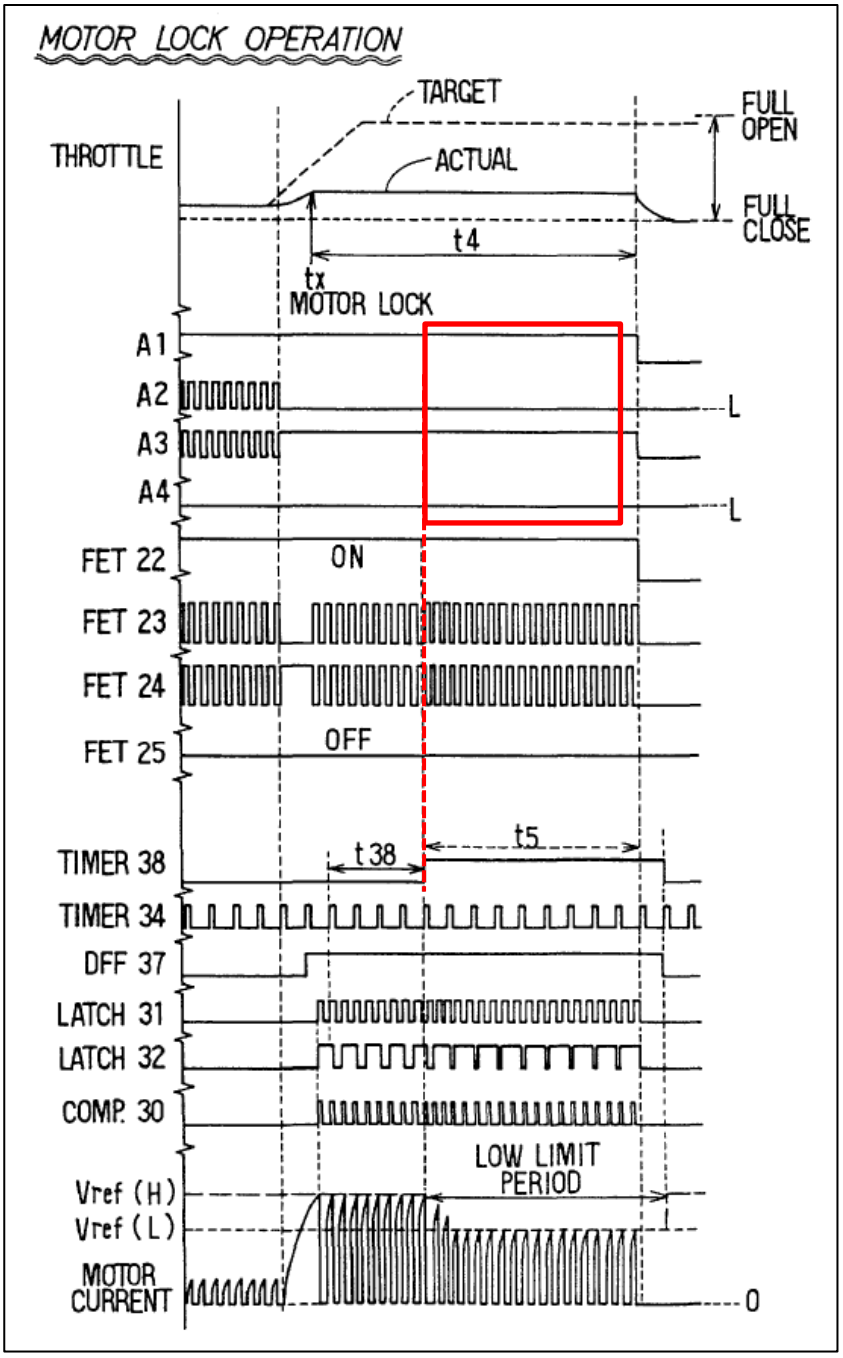
EX1007, FIG. 5 (cropped).

96. For these reasons, Itabashi discloses "detecting whether a control effort required to change a position of the positioning device has exceeded a first limit for at least a first predetermined time period."

4. [21.C] "in the event the control effort is detected to have exceeded the first limit for at least the first predetermined time period, commanding the positioning device to change to a first commanded hold open position"

97. Itabashi discloses this element because in the event the control effort exceeds Vref(H) for at least the first predetermined time period t38, signals A1-A4 command the throttle valve to open and hold open. *See* EX1007, FIG. 7. In Itabashi,

"[t]he engine control circuit 15 produces drive command signals A1-A4 to a drive control circuit 18 in correspondence with the output signals of the throttle sensor 14 and the accelerator sensor 17." EX1007, 3:4-7. These signals A1-A4 command the throttle valve to change position because "the drive control circuit 18 drives the motor 13 to rotate the throttle valve 12 *to a target position* corresponding to the detected actual accelerator position." EX1007, 3:7-10 (emphasis added). As shown below, when the control effort exceeds Vref(H) for at least a predetermined time period t38, signals A1-A4 command the throttle valve to open. To the extent the patent owner argues that the detection in Element [21.B] must *cause* the command to change, I would disagree. Element [21.C] includes no such limitation. Shown below, Itabashi meets [21.C]—in the event the control effort is detected to have exceeded Vref(H) for at least t38, Itabashi's system commands the positioning device to move to a commanded hold open position.

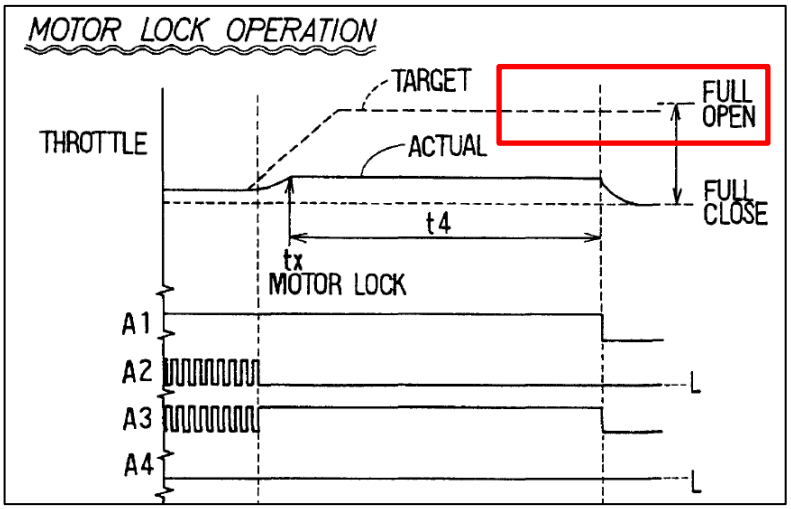


EX1007, FIG. 7 (annotated).

98. The target position, as shown above, is an *open* throttle position. To reach this target position, signals A1 and A3 are high, and signals A2 and A4 are low. *See* EX1007, FIG. 7. These signals are produced to turn on MOSFETs 22 and

24 and turn off MOSFETs 23 and 25, which drives motor current to open the throttle valve. *See* EX1007, 6:34-39, 6:51-55, FIGS. 5-7. Accordingly, in the event the control effort is detected to have exceeded Vref(H) for at least predetermined time period t38, Itabashi's system commands the throttle valve to open.

99. Signals A1-A4 command the throttle valve to not only open but to *hold open*. As the timing diagram shows below, the target throttle position remains open for an extended period of time. Signals A1-A4 therefore command the throttle valve to change to a commanded "hold open position."

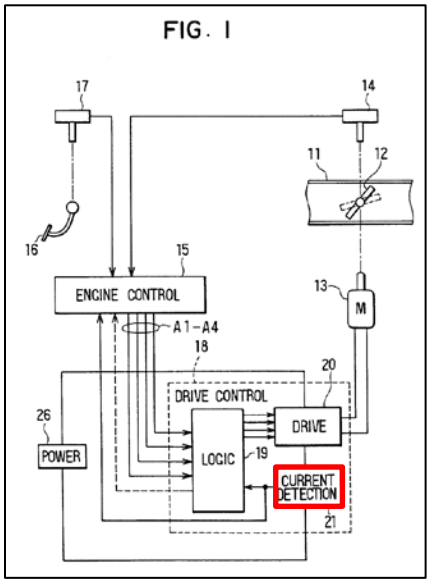


EX1007, FIG. 7 (excerpted and annotated).

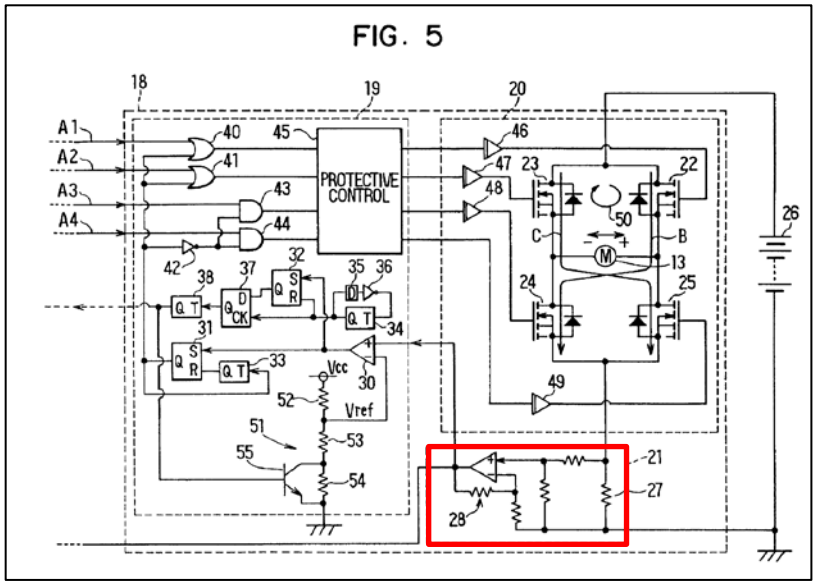
100. For these reasons, Itabashi discloses "in the event the control effort is detected to have exceeded the first limit for at least the first predetermined time period, commanding the positioning device to change to a first commanded hold open position."

5. [21.D] "detecting the control effort required to change to said first commanded hold open position"

101. Itabashi's current detection circuit 21 "detect[s] the control effort required to change to said first commanded hold open position." Itabashi's system has "a current detection circuit 21 which detects a motor current, i.e., an electric current supplied from the drive circuit 20 to the motor 13." EX1007, 3:11-16. The detected motor current would be the current required to move the throttle to the first commanded hold open position because "the engine control circuit 15 drives the motor 13 with the motor current of 100% duty ratio during the time period t1 so that the actual throttle position approaches the target throttle position in a short period of time." EX1007, 6:46-51. Then, "[t]he motor current flows in the forward direction indicated by an arrow B in FIG. 2 to maintain the opening position of the throttle valve 12 against the return spring." EX1007, 6:36-39.



EX1007, FIG. 1 (annotated).

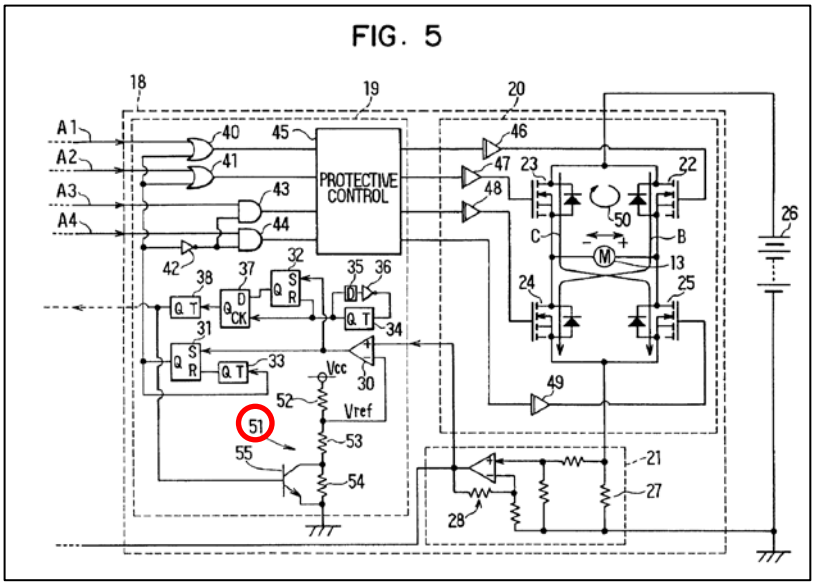


EX1007, FIG. 5 (annotated).

102. For these reasons, Itabashi discloses "detecting the control effort required to change to said first commanded hold open position."

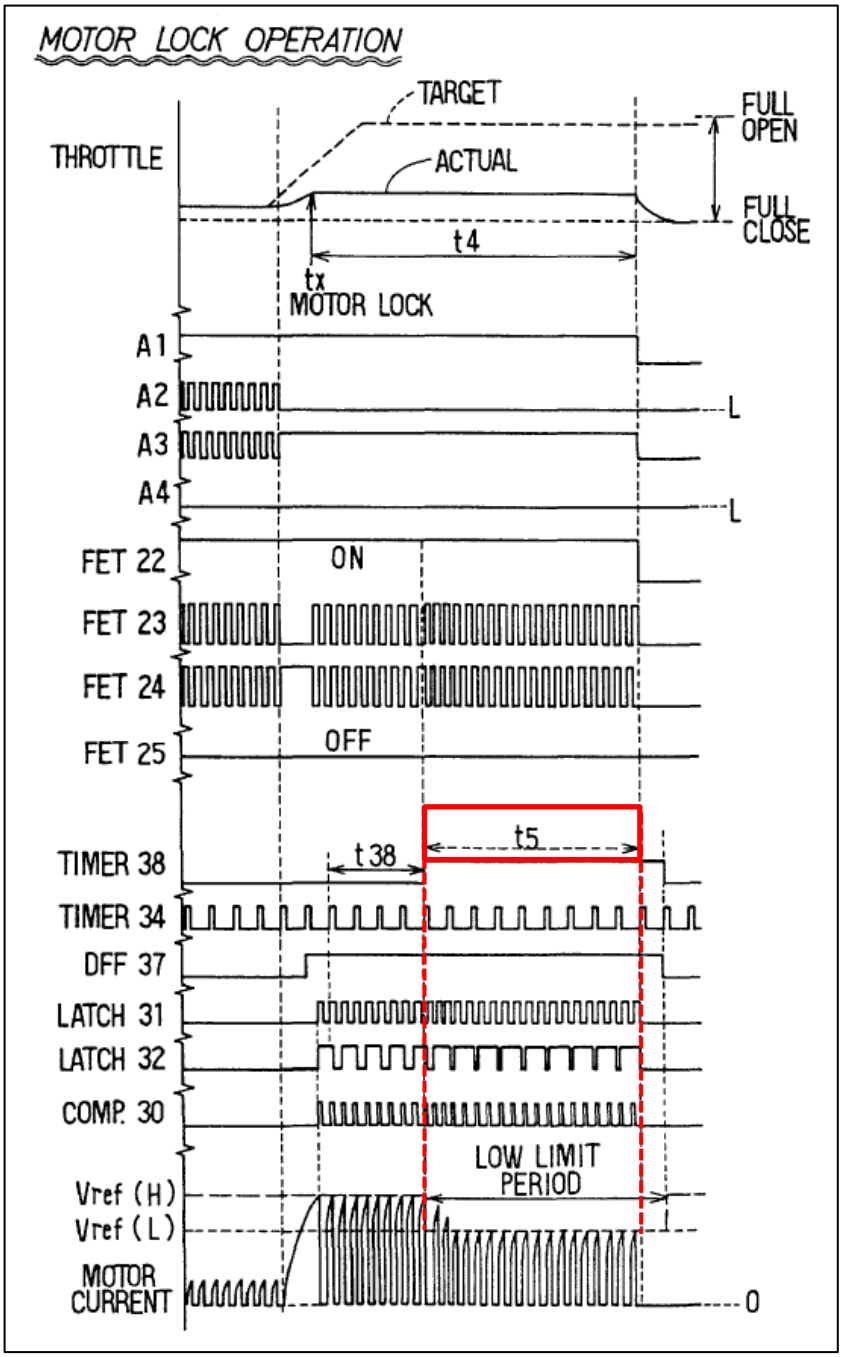
6. [21.E] "determining whether said control effort exceeds a first threshold for a second predetermined time period"

103. Itabashi discloses this element because the system determines whether the control effort exceeds a first threshold Vref(L) for a second predetermined time period t5. Itabashi determines whether the control effort exceeds a "first threshold" less than the "first limit" in Element [21.B] because the drive logic circuit 19 has "a reference signal switching circuit 51 . . . to switch the reference signal Vref applied to the comparator 30 between a high level Vref(H) for the high limit level and a low level Vref(L) for the low current limit level." EX1007, 8:47-51.



EX1007, FIG. 5 (annotated).

104. As Itabashi's timing diagram shows below, the system determines whether the control effort exceeds Vref(L) for "a second predetermined time period"—predetermined time period t5. *See* EX1007, 7:67-8:2, FIG. 7.



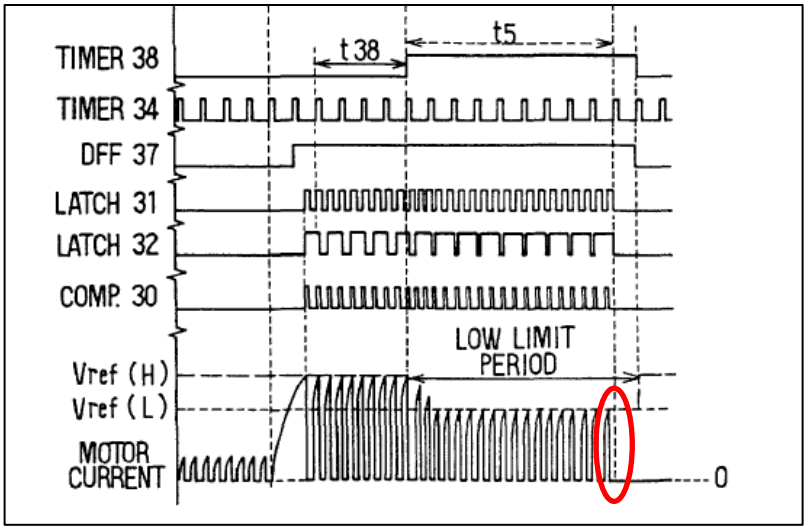
EX1007, FIG. 7 (annotated).

105. Although the timing diagram above appears to show that the control effort only *meets* Vref(L) during t5, Itabashi's comparator 30 detects whether the control effort *exceeds* the reference voltage Vref(L). *See* EX1007, 3:58-59 ("Each time the motor current *exceeds* the limit current level, the comparator 30 produces a high level output signal.") (emphasis added). Timer t5 is thus triggered and runs when the control effort *exceeds* Vref(L)—not when the control effort *meets* Vref(L).

106. For these reasons, Itabashi discloses "determining whether said control effort exceeds a first threshold for a second predetermined time period."

7. [21.F] "reducing said control effort when said control effort exceeds said first threshold for said second predetermined time period"

107. Itabashi discloses this element because the system reduces the control effort when the control effort exceeds Vref(L) for time period t5. If the control effort still exceeds Vref(L) after time period t5, "the engine control circuit 15 determines it as the motor lock and changes all the drive signal levels to low." EX1007, 7:67-8:2. Accordingly, "[i]f the throttle valve 12 cannot be rotated to the target throttle position after the continuation of the supply of the motor current limited to the low limit level, the motor current is shut off in the similar manner as in the first embodiment." EX1007, 10:12-16; *see also* EX1007, 8:3. As shown in the timing diagram below, Itabashi reduces the control effort to zero when the control effort exceeds Vref(L) for predetermined time period t5.



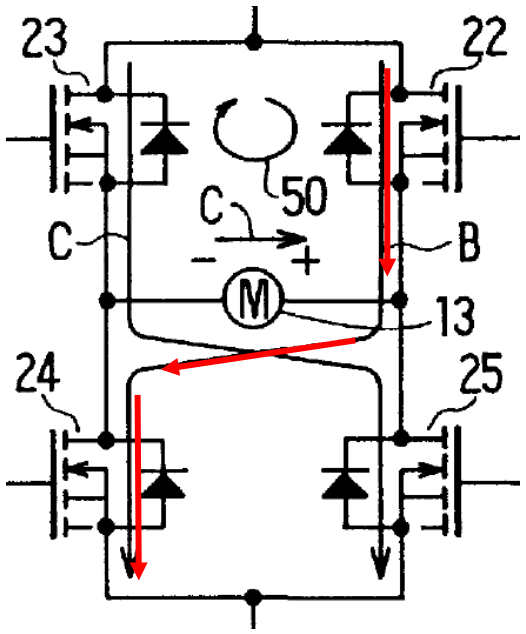
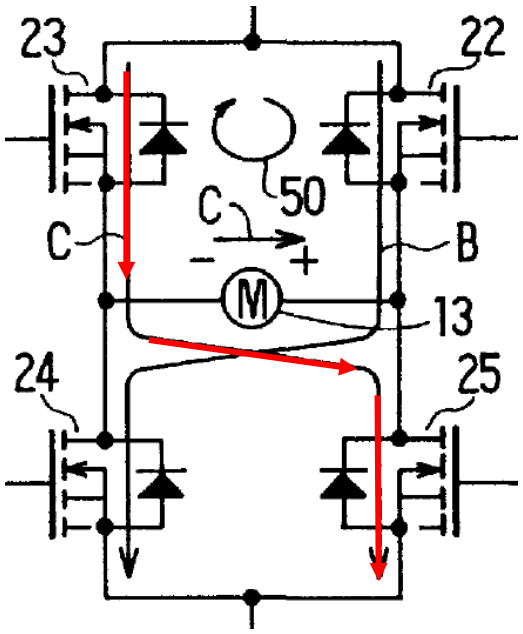
EX1007, FIG. 7 (excerpted and annotated).

108. For these reasons, Itabashi discloses "reducing said control effort when said control effort exceeds said first threshold for said second predetermined time period."

8. [21.G] "detecting whether the control effort has exceeded a second limit for at least a third predetermined time period"

109. Like how Itabashi's system detects whether the control effort has exceeded a first limit for a first predetermined time period when commanding the throttle to *open*, Itabashi's system detects whether the control effort has exceeded a limit for a predetermined time period when commanding the throttle to *close*. Itabashi refers to driving the motor in the reverse direction. *See, e.g.*, EX1007, 1:66-2:6, 5:21-35, 8:16-36. For example, Itabashi states that "[t]he motor 13 is driven with the motor current of 100% duty ratio *in the reverse direction* (C) to brake the throttle valve 12." EX1007, 7:57-59.

110. When commanding the throttle to open, MOSFETs 22 and 24 are turned on and MOSFETs 23 and 25 are turned off, as I show below. *See* EX1007, FIGS. 2-3. When slowing the opening of the throttle and closing the throttle, the current flows in the reverse direction because MOSFETs 23 and 25 are turned on and MOSFETs 22 and 24 are turned off. *See* EX1007, 6:66-7:3, FIGS. 2-3.

Current When Opening the Throttle	Current When Braking and Closing
	

See EX1007, FIG. 2 (excerpted and annotated).

111. In Itabashi, turning MOSFETs 23 and 25 on and MOSFETs 22 and 24 off would both *slow* the opening of the throttle and *close* the throttle. Itabashi states that "braking" would slow the opening of the throttle valve because "the engine control circuit 15 starts to brake the motor 13 to stop the throttle valve 12 at the target position." EX1007, 6:63-66. As a POSA would have appreciated, continuing

to keep MOSFETs 23 and 25 on and MOSFETs 22 and 24 off (or triggering this configuration when the throttle is at a target position) would close the throttle. The current would continue or start passing in the direction of arrow C shown above in the H-bridge circuit, which would drive the throttle toward its fully closed position. *See* EX1007, 6:66-7:3.

112. Similar to how Itabashi uses its current detection circuit for reducing excessive motor current when commanding the throttle to open, Itabashi explains that the current detection circuit reduces excessive motor current when driving the motor in the reverse direction:

> Although the motor current supply is controlled as described above and shown in FIG. 7 when the motor locks at the time of the motor drive starting, *the motor current supply is controlled in the similar manner when the motor locks at the time of motor braking*.

EX1007, 10:16-20 (emphasis added); *see also* EX1007, 8:28-30 (limiting motor current in the reverse direction to reduce the heat generation of MOSFETs 23 and 25). As a POSA would have appreciated from the above disclosure, Itabashi's drive logic circuit and current detection circuit would detect whether the control effort exceeded a limit when driving the motor in the reverse direction, for example when closing the throttle.

113. As I explain for Element [21.B], Itabashi's system uses comparators to detect the control effort. "Each time the motor current exceeds the limit current

level, the comparator 30 produces a high level output signal." EX1007, 3:58-59. However, a POSA would have understood that the limit for Element [21.G] is different from the first limit for Element [21.B]. Whereas the control effort detected when opening the throttle is *positive*, the control effort to close the throttle is *negative* because the current flowing through the H-bridge drive circuit is in the reverse direction, as the annotations show below. A POSA would have therefore understood that the limit for Element [21.G] would be negative.

114. A POSA would have also appreciated that Itabashi's drive logic circuit and current detection circuit would detect whether the control effort exceeded the limit *for at least a predetermined time period*.[4] As I explain for Element [21.B], Itabashi's motor lock operation does not immediately reduce the motor current when the motor current exceeds Vref(H). To allow the motor current to exceed Vref(H) for a certain time period, the system uses a timing circuit with timer 38. *See* EX1007, 4:59-65, 5:8-27, FIGS. 5-7, 7:28-30, 8:62-65, 9:50-57. As was the case with the motor lock operation when commanding the throttle to open, Itabashi's

[4] The "first predetermined time period" in Element [21.B] and the "third predetermined time period" in Element [21.G] can be the same duration because the '804 patent states that the predetermined time periods for steps 42 and 52 of the Figure 2 embodiment can both be 300 milliseconds. *See* EX1001, 3:28-30, 4:19-21.

system would detect whether the control effort exceeds the limit Vref(H) for at least a predetermined time period t38 when driving the motor in the reverse direction. *See* EX1007, 8:25-28. As Itabashi states, "the motor current is limited to a lower level, when the motor current continues to exceed the limit level for more than the predetermined period t38 during the period of the motor drive starting (or [when driving the motor in the reverse direction])." EX1007, 8:25-28.

115. For these reasons, Itabashi discloses "detecting whether the control effort has exceeded a second limit for at least a third predetermined time period."

9. [21.H] "in the event the control effort is detected to have exceeded the second limit for at least the third predetermined time period, commanding the positioning device to change to a second commanded hold close position"

116. Itabashi discloses this element because in the event the control effort exceeds the second limit for at least the third predetermined time period (i.e. the control effort when driving the throttle motor in the reverse direction to close the throttle exceeds Vref), signals A1-A4 would command the throttle valve to close and hold at its closed position. As I explain for Element [21.C], when commanding the throttle to open, Figure 7 shows that signals A1-A4 command the throttle valve to open and hold at its open target position in the event the control effort is detected to have exceeded a limit for a predetermined time period (t38). Conversely, when commanding the throttle to close, signals A1-A4 would command the throttle valve to close and hold at its closed position in the event the control effort is detected to

have exceeded a limit for a predetermined time period. As Itabashi states, "[a]lthough the motor current supply is controlled as described above and shown in FIG. 7 when the motor locks at the time of the motor drive starting, the motor current supply is controlled in the similar manner when the motor locks [when driving the motor in the reverse direction]." *See* EX1007, 10:16-20. Itabashi also states that "[t]he drive control circuit 18 is constructed to supply the motor current without limiting it during time periods of starting and [driving the motor in the reverse direction]." *See* EX1007, 3:17-21.

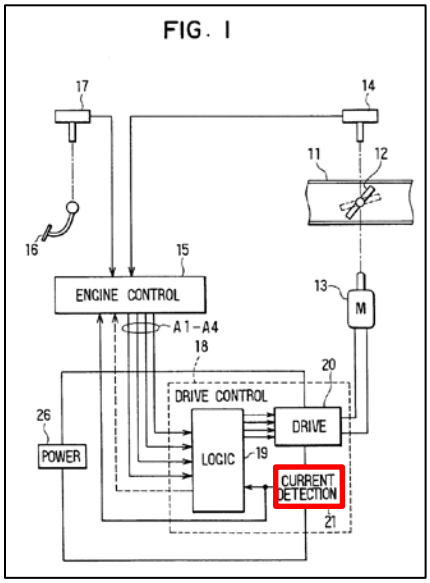
117. As a POSA would have understood, the target position would be a *closed* position. To reach this target position, signals A1 and A3 would be low, and signals A2 and A4 would be high. *See* EX1007, FIG. 7. These signals would be produced to turn off MOSFETs 22 and 24 and turn on MOSFETs 23 and 25, which would drive motor current to close the throttle valve. *See* EX1007, 6:34-39, 6:51-55, FIGS. 5-7. Accordingly, in the event the control effort is detected to have exceeded Vref(H) for at least the third predetermined time period t38, Itabashi's system would command the throttle valve to close. And because the target throttle position would remain closed for a period of time, signals A1-A4 would command the throttle valve to change to a commanded "hold close position."

118. For these reasons, Itabashi discloses "in the event the control effort is detected to have exceeded the second limit for at least the third predetermined time

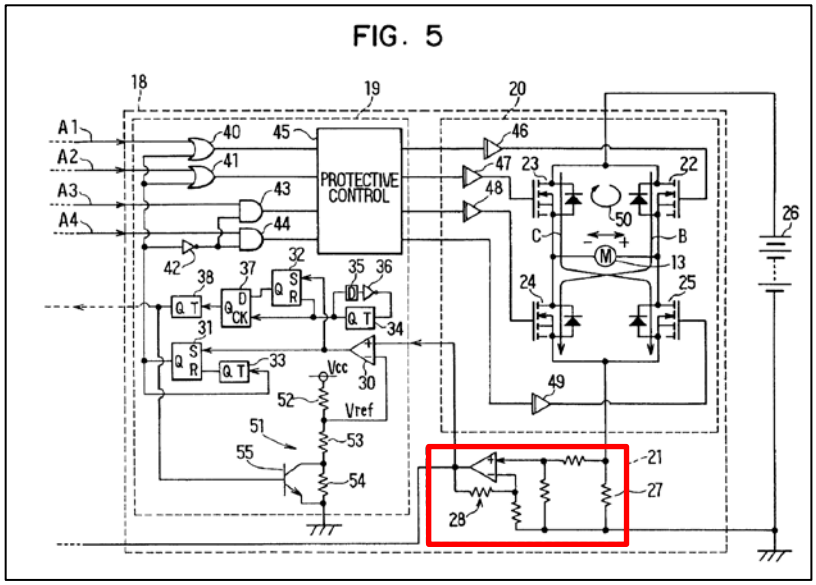
period, commanding the positioning device to change to a second commanded hold close position."

10. [21.I] "detecting the control effort required to change to said second commanded hold close position"

119. Itabashi's current detection circuit 21 "detect[s] the control effort required to change to said second commanded hold close position." As I explain for Element [21.D] and show below, Itabashi's system has "a current detection circuit 21 which detects a motor current, i.e., an electric current supplied from the drive circuit 20 to the motor 13." EX1007, 3:11-16. The detected motor current would be the current required to move the throttle to the first commanded hold close position because the engine control circuit 15 uses current to drive the motor 13 to reach and maintain a throttle position, such as a hold close position. *See* EX1007, 6:36-39, 6:46-51.



EX1007, FIG. 1 (annotated).



EX1007, FIG. 5 (annotated).

120. For these reasons, Itabashi discloses "detecting the control effort required to change to said second commanded hold close position."

11. [21.J] "determining whether said control effort exceeds a second threshold for a third predetermined time period"

121. Itabashi's drive logic circuit 19 "determin[es] whether said control effort exceeds a second threshold for a third predetermined time period." As I explain for Element [21.E], when commanding the throttle to open, Itabashi's drive logic circuit 19 determines that the motor current (the control effort) exceeds Vref(L) (a threshold) when the output of comparator 30 becomes high. Likewise, when driving the throttle motor in the reverse direction to close the throttle valve, Itabashi's drive logic circuit 19 would determine that the motor current (the control effort) exceeds Vref(L) (a threshold) when the output of comparator 30 becomes high. Indeed, Itabashi states that the system has a set limit level when driving the throttle motor in the reverse direction. *See* EX1007, 3:55-57.

122. A POSA would have understood that the threshold for closing Itabashi's throttle (the "second threshold") would be different from the threshold for opening the throttle (the "first threshold"). As I explain for Element [21.G], the control effort to open the throttle is positive whereas the control effort to close the throttle is *negative*. A POSA would have therefore understood that the threshold for closing the throttle in Element [21.J] would be negative.

123. The drive logic circuit 19 also determines whether the motor drive current (the control effort) exceeds Vref (a threshold) for a *third* predetermined time period.[5] As I explain for Element [21.E], the drive logic circuit 19 determines whether the motor current (the control effort) exceeds Vref (a threshold) for a *second* predetermined time period—time period t5—when commanding the throttle to open. Likewise, when driving the throttle motor in the reverse direction to close the throttle valve, Itabashi's drive logic circuit 19 would determine whether the motor drive current exceeds Vref(L) for time period t5. Indeed, Itabashi states that "[a]lthough the motor current supply is controlled as described above and shown in FIG. 7 when the motor locks at the time of the motor drive starting, the motor current supply is controlled in the similar manner when the motor locks [when driving the motor in the reverse direction." *See* EX1007, 10:16-20.

124. For these reasons, Itabashi discloses "determining whether said control effort exceeds a second threshold for a third predetermined time period."

[5] The "second predetermined time period" in Element [21.E] and the "third predetermined time period" in Element [21.J] can be the same duration because the '804 patent states that the predetermined time periods can both be 30 milliseconds. *See* EX1001, 4:26-27, 5:41-42, 6:39-40.

12. [21.K] "reducing said control effort when said control effort exceeds said second threshold for said third predetermined time period"

125. Itabashi discloses this element because, after the motor current exceeds Vref(L) for predetermined time period t38 when trying to *close* the throttle, Itabashi's system would reduce the motor current. As I explain for Element [21.F], Itabashi's system reduces the motor current—when commanding the throttle to *open*—after the motor current exceeds Vref(L) for predetermined time period t5. A similar reduction to motor current would occur when driving the throttle motor in the reverse direction to close the throttle valve. *See* EX1007, 10:16-20. Accordingly, Itabashi's system—at the end of t5—would reduce the control effort to zero when commanding the throttle to close: "[i]f the throttle valve 12 cannot be rotated to the target throttle position after the continuation of the supply of the motor current limited to the low limit level, the motor current is shut off . . . ." EX1007, 10:12-16. "Thus, the current flowing in the MOSFETs 22-25 can be limited to the lower level to reduce the heat generation of the MOSFETs 22-25." EX1007, 8:28-30.

126. For these reasons, Itabashi discloses "reducing said control effort when said control effort exceeds said second threshold for said third predetermined time period."

XI. OBJECTIVE INDICIA DO NOT SUPPORT PATENTABILITY.

127. I understand that the obviousness analysis includes considering evidence of secondary indicia of nonobviousness (if available). I understand that any

secondary indicia of nonobviousness must have a nexus, or a close connection, to the novel aspects of the claimed invention. I understand that secondary indicia of nonobviousness include the following: commercial success, long-felt but unmet need, failure of others, copying, praise in the industry, and unexpectedly superior results as compared with the closest prior art.

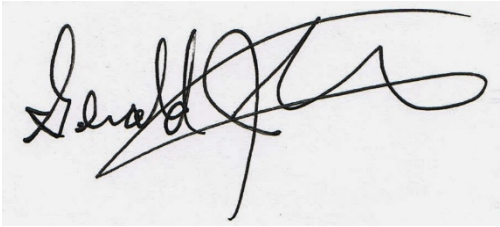
128. Considering the information I have reviewed, my general knowledge of the field of engine control systems, and publications within that and related fields, I am unaware of any objective evidence that might support the patentability of substitute claim 21. Further, from my review of the prosecution history of the ’804 patent (EX1002), the applicant never raised secondary indicia of nonobviousness. 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.

XII. CONCLUSION

In signing this declaration, I recognize that this declaration will be filed as evidence in an *inter partes* review before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required, I will appear for cross-examination within the United States during the time allotted.

I hereby declare that all statements made herein are made of my own knowledge and are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on this 9th day of February, 2021.



Gerald J. Micklow, PhD, PE

APPENDIX A: MATERIALS CONSIDERED

Paper	Description
2	Petition
9	Institution Decision
16	Patent Owner's Motion to Amend

Exhibit	Description
1001	U.S. Patent No. 6,763,804 to Pursifull ("'804 patent")
1002	Prosecution File History of U.S. Patent No. 6,763,804 B2 ("'804 history")
1003	Declaration of Gerald J. Micklow, Ph.D., PE, in Support of Petition for Inter Partes Review of U.S. Patent No. 6,763,804
1004	Curriculum Vitae of Gerald J. Micklow, Ph.D., PE
1005	U.S. Patent No. 4,850,319 to Imoehl, titled "Electronic Throttle Actuator," issued July 25, 1989 ("Imoehl")
1006	U.S. Patent No. 4,656,407 to Burney, titled "Electric Motor Servo Control System and Method," issued April 7, 1987 ("Burney")
1007	U.S. Patent No. 6,329,777 to Itabashi et al., titled "Motor Drive Control Apparatus and Method Having Motor Current Limit Function Upon Motor Lock," filed Sept. 7, 1999 ("Itabashi")
1008	U.S. Patent No. 6,073,610 A to Matsumoto et al., titled "Control Apparatus of Internal Combustion Engine Equipped with Electronic Throttle Control Device," issued June 13, 2000 ("Matsumoto")
1009	European Patent Pub. No. 0121938 B1 to Murakami, titled "Throttle Control System for Automotive Vehicle," published Dec. 30, 1986 ("Murakami")
1010	European Patent Application No. EP 0874148 A2 to Matsumoto et al., titled "Control Apparatus for a Vehicle," published Oct. 28, 1998 ("Matsumoto II")
1011	UK Patent Application No. GB 2339850 to Pursifull, titled "A Throttle Valve for an Internal Combustion Engine with a Limp Home Position," published Feb. 9, 2000 ("Pursifull")
1012	U.S. Patent No. 4,313,408 to Collonia, titled "Device for the Control of the Traveling Speed of a Motor Vehicle," issued Feb. 2, 1982 ("Collonia")
1013	U.S. Patent No. 5,078,110 A to Rodefeld, titled "Method and Arrangement for Detecting and Loosening Jammed Actuators," issued January 7, 1992 ("Rodefeld")
1014	U.S. Patent No. 4,854,283 to Kiyono et al., titled "Throttle Valve Control Apparatus," issued Aug. 8, 1989 ("Kiyono")

Exhibit	Description
1015	U.S. Patent No. 6,286,481 to Bos et al., titled "Electronic Throttle Return Mechanism with a Two Spring and One Lever Default Mechanism," issued Sept. 11, 2001 ("Bos")
1016	U.S. Patent No. 4,771,850 to Matsuda, titled "Automotive Traction Control System with Feature of Enabling and Disabling Control Depending Upon Vehicle Speed," issued September 20, 1988 ("Matsuda")
1017	U.S. Patent No. 5,712,550 to Boll et al., titled "Apparatus for Controlling a Power Control Element of a Drive Unit of a Motor Vehicle," issued Jan. 27, 1998 ("Boll")
1018	U.S. Patent No. 5,749,343 to Nichols et al., titled "Adaptive Electronic Throttle Control," issued May 12, 1998 ("Nichols")
1019	William M. Erickson, Protecting Servomotors from Self Destruction, Machine Design (Sept. 1, 2000) ("Erickson")
1020	U.S. Patent No. 4,982,710 to Ohta et al., titled "Electronic Throttle Valve Opening Control Method and System Therefor," issued Jan. 8, 1991 ("Ohta")
1021	Snap-on, BMW Reference Manual (Aug. 2001, 1st ed.) ("BMW Manual")
1022	William L. Husselbee, Automotive Computer Control Systems, Harcourt Brace (1989) ("Husselbee")
1023	Snap-on, General Motors Reference Manual (Apr. 1995, 7th ed.) ("GM Manual")
1024	Chrysler Front Wheel Drive 1981-92 Repair Manual (1992) ("Chrysler Manual")
1027	U.S. Patent No. 4,645,992 to Ritenour, titled "Electronically Controlled Servomotor Limit Stop," issued Feb. 24, 1987 ("Ritenour")
1028	U.S. Patent No. 4,364,111 to Jocz, titled "Electronically Controlled Valve Actuator," issued Dec. 14, 1982 ("Jocz")
1031	Milestones on the Automotive Information Super-Highway, Snap-on Diagnostics (Apr. 13, 2001), *available* at https://web.archive.org/web/20010413220224/http://www.snapondiag.com/mileston.htm
1032	MT2500 Scanner Home, Snap-on Diagnostics (June 11, 2001), *available at* https://web.archive.org/web/20010611023000/http://www.snapondiag.com:80/scanner.htm
1033	Domestic Combo Primary Cartridge, Snap-on Diagnostics (April 11, 2001), *available at* https://web.archive.org/web/20010411032033/http://www.snapondiag.com/99combo.htm

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