

March 7, 1944.

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2,343,412

CIRCUIT INTERRUPTER

Filed Oct. 16, 1940

2 Sheets-Sheet 1

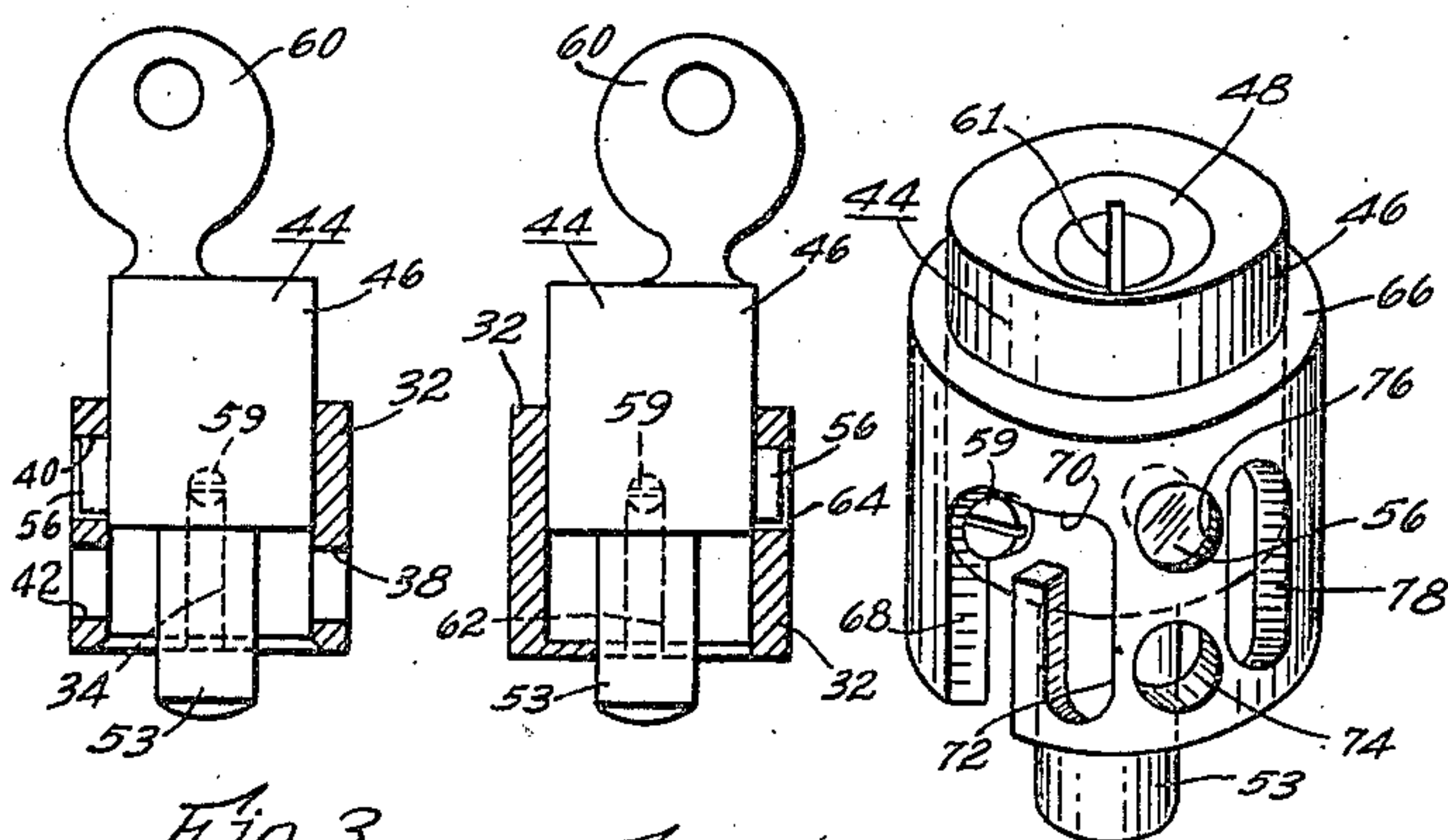
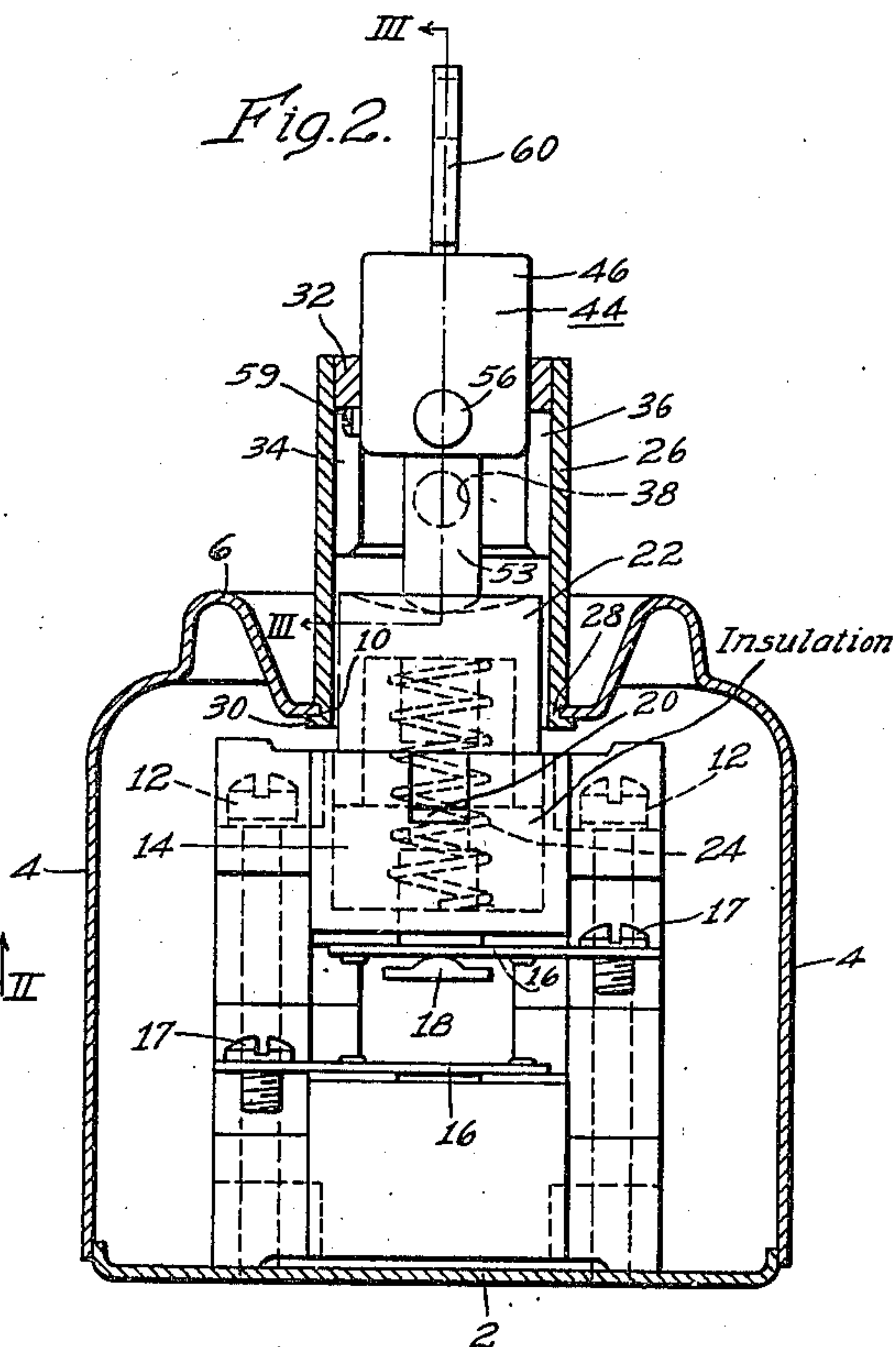
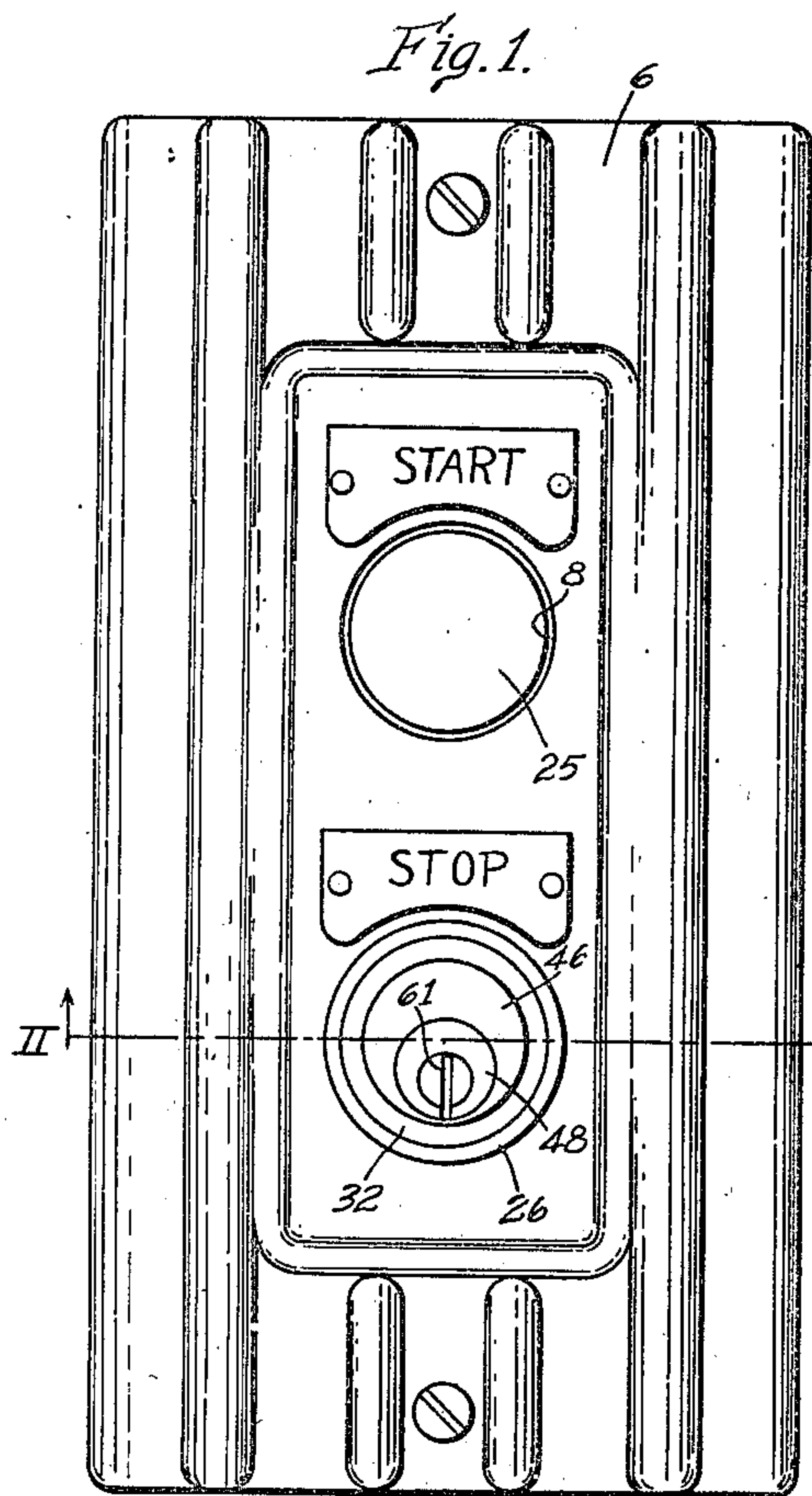
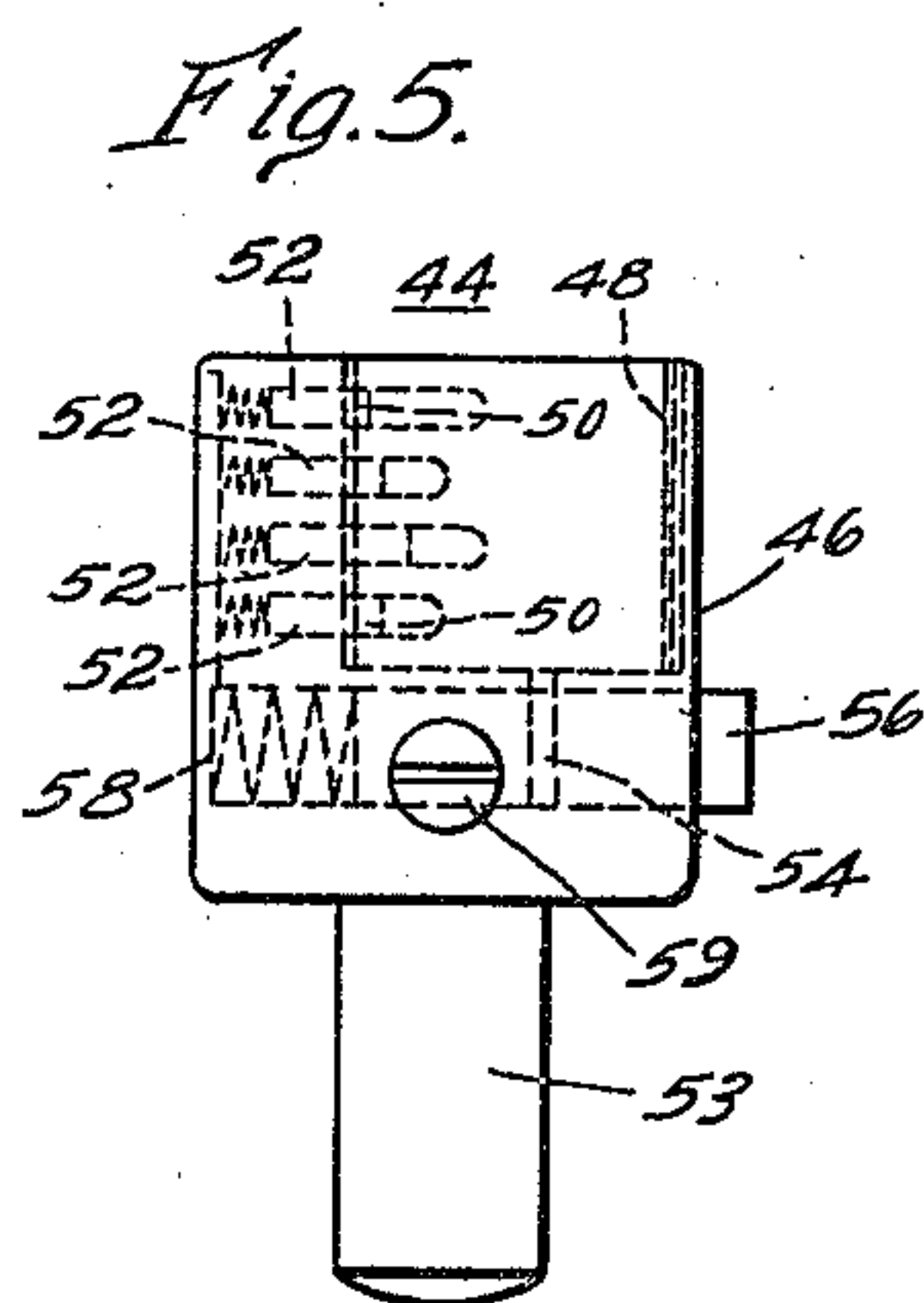


Fig. 3.

Fig. 4.

Fig. 6.



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2 Sheets-Sheet 2

Fig. 7.

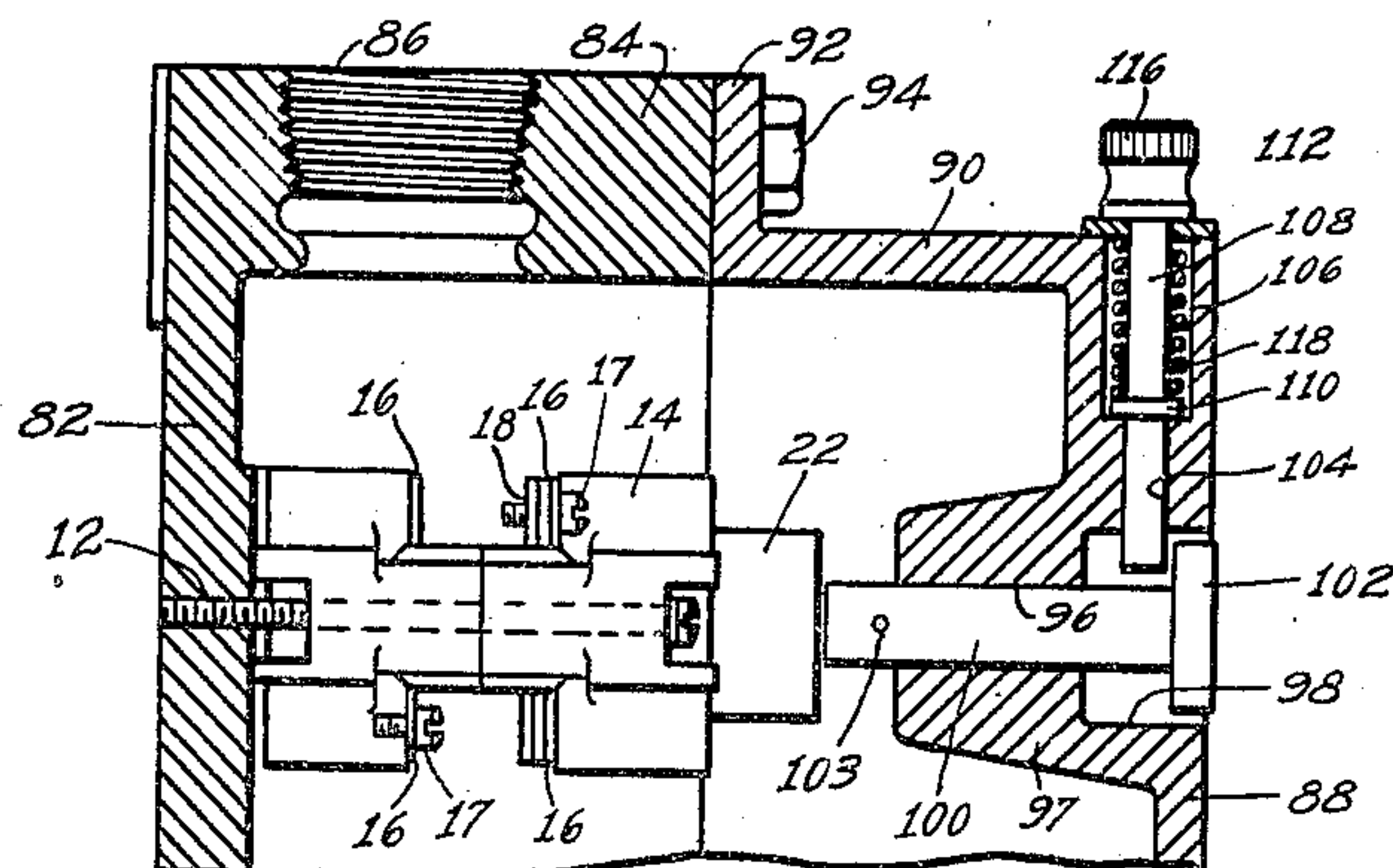


Fig. 8.

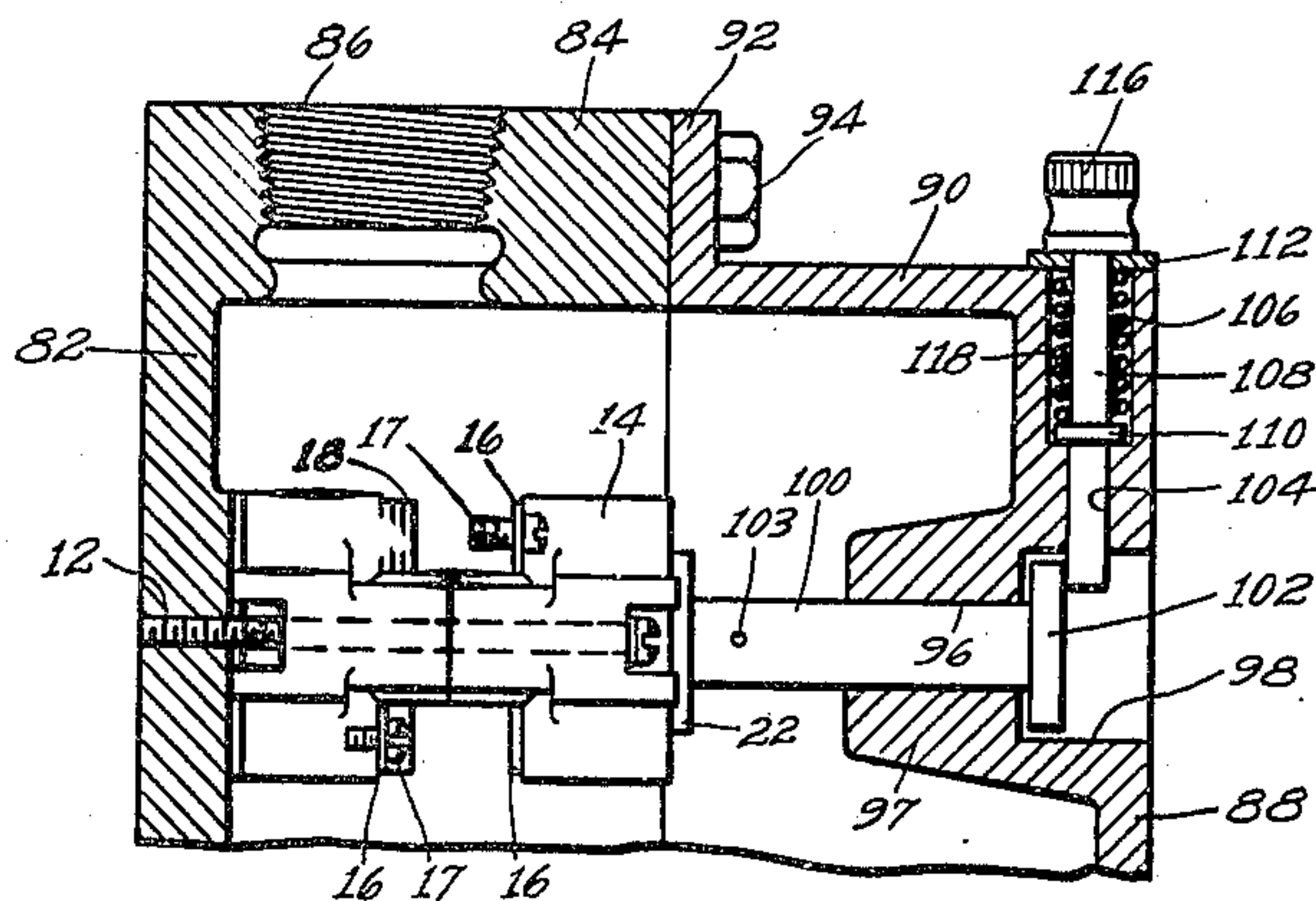
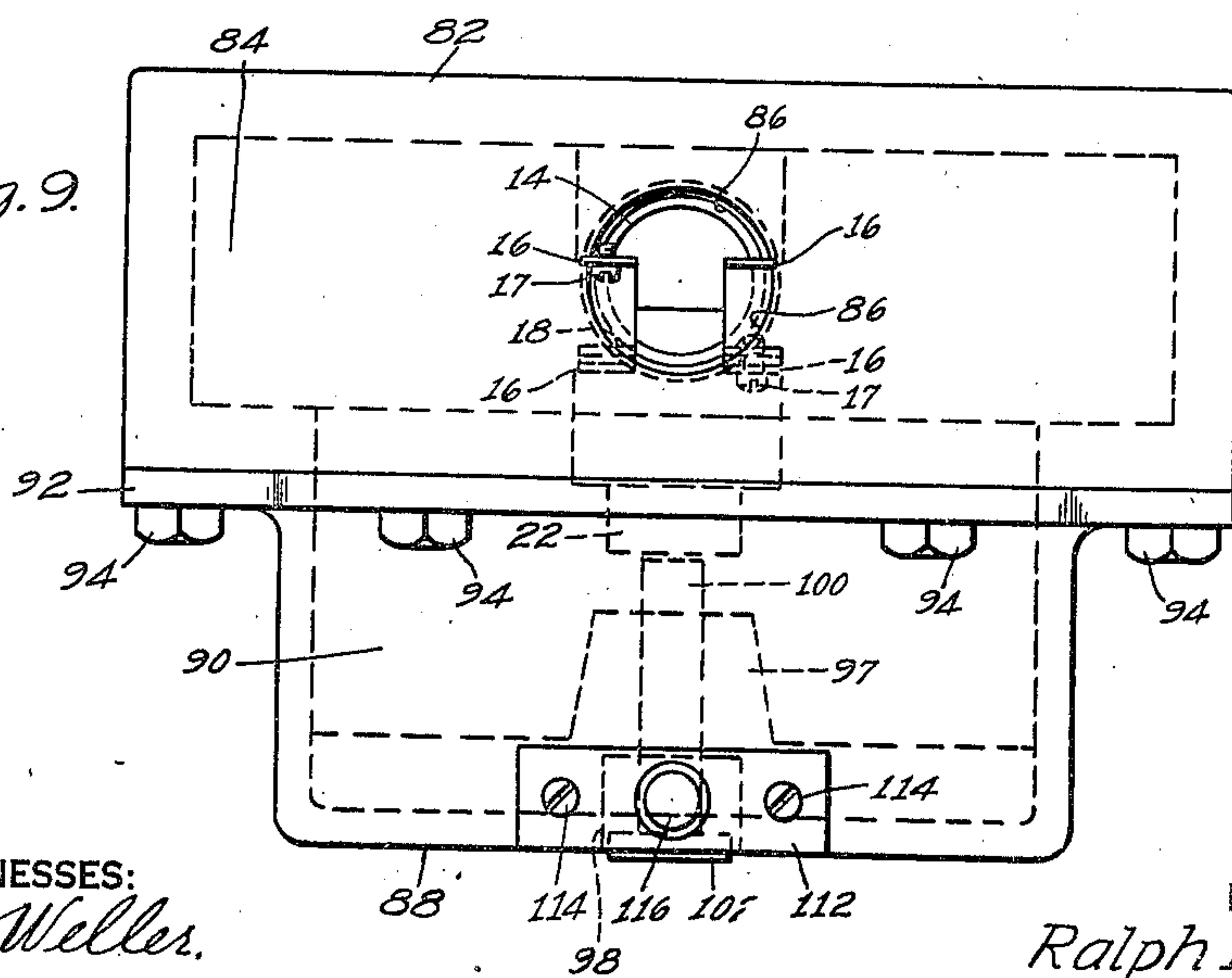


Fig. 9.



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2,343,412

CIRCUIT INTERRUPTER

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Application October 16, 1940, Serial No. 361,381

11 Claims. (Cl. 200—44)

This invention relates generally to circuit interrupting devices, and more particularly to locking means therefor.

Although this invention is capable of use with various types of circuit interrupters, it will be specifically disclosed in connection with electric switches having rectilinearly movable operating means, of the push-button type. Switches of this character are commonly used for control purposes, and accordingly, it is desirable, especially for safety purposes, to provide locking means in association with such switches for preventing unauthorized operation of a switch, and consequently, the apparatus which it controls. Depending on the type of apparatus controlled, it may be desirable to provide a locking means for securing the control switch in a position in which the controlled apparatus is energized, or in a stopped position, or both. Thus, for example, when apparatus is being repaired it might be dangerous if it were accidentally set in operation. On the other hand, in certain types of applications, such as in street lighting circuits, apparatus conducting continuous processes, or where the control switch is accessible to the public, unauthorized stoppages are undesirable and may be expensive.

Accordingly, one object of this invention is to provide novel locking means for a switch.

Another object of this invention is to provide novel switch locking means which is effective to lock the switch in two different positions thereof.

Another object of this invention is to provide in a switch of the type described, novel means for automatically locking the switch operating member in a plurality of different positions in response to movement of the operating member to said positions, respectively.

Another object of this invention is to provide novel switch locking means which are adjustable so that the locking function thereof may be varied.

These and other objects of this invention will become more apparent upon consideration of the following detailed description of preferred embodiments thereof, when taken in connection with the attached drawings, in which:

Figure 1 is a front view of a control switch embodying this invention;

Fig. 2 is a cross section through the switch casing shown in Fig. 1 taken substantially on the line II—II thereof, and with a switch unit and its operating parts shown in elevation;

Fig. 3 is a cross sectional view of the lock cylin-

der shown in Fig. 2, taken substantially on the line III—III thereof, with the lock barrel shown in elevation;

Fig. 4 is a view similar to Fig. 3 but showing a slightly modified form of lock cylinder;

Fig. 5 is an enlarged elevational view of the lock barrel used in connection with this invention and illustrating certain interior structure thereof in dotted lines;

Fig. 6 is an enlarged perspective view of a further modified form of lock barrel and cylinder;

Fig. 7 is a partial cross sectional view of a modified form of switch casing, with the switch unit and operating means shown in elevation;

Fig. 8 is a view similar to Fig. 7 but showing the switch in a different operated position; and

Fig. 9 is an end elevational view of the switch casing shown in Figs. 7 and 8.

Referring to Figs. 1 to 3 and 5 of the drawings, there is shown, for the purposes of illustration, a two-button push button switch unit enclosed in a sheet metal casing. As is apparent from Figs. 1 and 2, the switch casing includes a bottom portion having a bottom wall 2, and a top portion having a ribbed top wall 6 and integral depending side walls 4. The top wall 6 of the casing is provided with a pair of apertures 8 and 10 for receiving the operating members for the push button switch units enclosed within the casing. Although there is shown a casing for enclosing two push button units, it will be obvious that this invention is applicable to a single push button unit, or to any desired number of push button units of a plural push button station. The push button units are identical in form, and one of them is illustrated in Fig. 2 of the drawings, wherein the unit is illustrated as being secured to the bottom wall 2 of the casing, by bolts 12 passing through end apertures in insulating blocks 14 which form a support for spaced contact strips 16 at opposite sides thereof. The contact strips at opposite sides of the push button unit are adapted to be bridged by a movable contact strip 18, supported on a movable supporting strip 20 which extends through a substantially central aperture in the insulating blocks 14. A push button 22 is secured to the upper end of movable support 20 and as shown, the push button is hollow to cooperate with a depression in the upper side of insulating block 14, to house a coil compression spring 24 engaged between the push button 22 and block 14, to bias the movable contact 18 into engagement with the upper contact strips 16. The contact strips 16 are provided at one end of each strip with a terminal screw 17

for securing a circuit conductor thereto. As stated above, both push button units may be of identical construction, with the push button 22 extending through the aperture 10 in the casing cover 6, and push button 25 of the other unit extending through aperture 8 in the casing cover. A more complete understanding of the structure of one of these units may be had by reference to the copending application of O. D. Von Mehren, Serial No. 294,071, filed September 9, 1939, now Patent No. 2,303,516, issued December 1, 1942, and assigned to the same assignee as this application, which discloses a unit identical with the units herein, except that a different type of movable contact is illustrated.

In the two button push button station illustrated, one button 25 may be used for controlling a motor starting circuit, and the other button 22 may be used for stopping the motor. Although double throw push button units are illustrated it will be obvious that single throw units may be employed if desired, or as previously stated, a single double-throw unit may be provided with applicant's novel locking means to be described.

A substantially tubular lock casing 26 is provided with a reduced end portion 28 to be received in aperture 10 in the top wall 6 of the switch casing, to be secured thereto by spinning over the end thereof, as at 30. A lock cylinder 32 is preferably secured in the outer end of lock casing 26 in any desired manner, such, for example, as by soldering, welding, or the like. In the embodiment of the invention shown in Figs. 1 to 3 and 5, lock cylinder 32 is provided with substantially diametrically opposed keyway slots 34 and 36, extending substantially longitudinally of the cylinder from one end thereof, and terminating short of the opposite end of cylinder 32. By referring to Figs. 3 it will be noted that intermediate keyway slots 34 and 36 there is provided at one side of the cylinder a locking aperture 38, adjacent one end of the cylinder, and on the other side of the cylinder there are provided spaced locking apertures 40 and 42, all for a purpose to be hereinafter described.

A lock barrel 44 (Fig. 5) is adapted to cooperate with lock cylinder 32, as shown in Figs. 2 and 3. The lock barrel 44 includes a barrel casing 46 having an offset recess in one end thereof, for receiving a rotatable lock plug 48 having pin tumblers 50 therein for cooperating with spring biased tumblers 52 mounted in the barrel casing 46. This type of lock is of the conventional tumbler type and, accordingly, a detailed description of its operation is not believed to be necessary. The opposite end of the barrel casing 46 has integrally secured thereto a reduced operating projection 53 adapted to operate a push button switch unit. The lock plug 48 is provided with an eccentric pin 54 fixed thereto and received in a transverse slot of a lock plunger 56, which is slidably mounted in a transverse bore in the barrel casing 46. Lock plunger 56 is biased to a projecting position with respect to barrel casing 46 by a coil compression spring 58 engaging between the inner end of lock plunger 56 and the bottom of the casing passage in which the plunger is mounted. The barrel casing is further provided with a guide projection 59 fixed thereto, and which may be, as illustrated, a screw threadedly engaged in an aperture in the barrel casing.

The operation of the lock barrel is more or less conventional, that is, insertion of a key 60 in key-slot 61 in locking plug 48 will line up

the ends of tumblers 50 and 52 to thereby permit rotation of the lock plug, and this will cause lock plunger 56 to be moved longitudinally by means of eccentric pin 54 on the lock plug engaging a transverse slot in the lock plunger.

In assembling the lock barrel in lock cylinder 32, cover 6 of the switch housing is preferably removed, whereupon the barrel may be inserted from the under side of the cover into the lock cylinder by depressing lock plunger 56 and aligning key projection 59 with one of the keyway slots 34 or 36 in the lock cylinder. Assuming that projection 59 is aligned with slot 34, as shown in Figs. 2 and 3 of the drawings, with locked plunger depressed, the lock barrel may be pushed upwardly into the lock cylinder until the plunger seats itself under the influence of spring 58 in one of the locking apertures 40 or 42. The switch cover 6 may then be secured to the bottom portion of the switch casing and this will bring operating projection 53 of the lock barrel into alignment with and substantially in contact with push button 22. It can be seen that now if lock plunger 56 be withdrawn by key 60, the lock barrel 44 is free to slide longitudinally in lock cylinder 32, but is prevented from rotating movement by engagement of projection 59 in key slot 34. With locking projection 56 engaged in locking aperture 40, the movable contact 18 of the push button unit will be in engagement with the upper contact strips 16, and these contacts will be locked in this position. The movable contact 18 may be moved into engagement with the lower push button contact strips 16 by inserting key 60 in the lock plug and turning it to withdraw locking projection 56, whereupon the lock barrel may be slid inwardly, thereby moving the push button 22 and movable contact strip 18 into bridging relation with respect to lower contact strips 16, at which point locking plunger 56 will enter locking aperture 42 in the lock cylinder to lock the switch contacts in this position. It can be seen that with the arrangement shown in Figs. 2 and 3, the switch contacts may be locked in two positions thereof in which the movable contact of the push button unit is in engagement with spaced sets of fixed contacts, respectively.

With the particular push button station shown in Fig. 1, it may be desirable merely to lock the stop button in a depressed position to prevent starting of the controlled apparatus. This can be accomplished by the structure illustrated in Figs. 1 to 3 by merely removing the switch casing cover, using key 60 to withdraw locking plunger 56 from its engaged locking aperture, and moving the lock barrel downwardly until key projection 59 emerges from keyway slot 34, whereupon the lock barrel may be turned substantially 180° in either direction until key projection 59 is aligned with keyway slot 36, whereupon by moving locking projection 56 inwardly, with respect to the lock barrel, the entire barrel may be again moved upwardly into the lock barrel, and the cover again assembled with the bottom portion of the switch casing. It will be noted that in this position of the lock barrel, with respect to the lock cylinder, locking projection 56 will be positioned substantially 180° from the position shown in Figs. 2 and 3, and on that side of the lock cylinder having the single locking aperture 38. Obviously, in this position the lock barrel and push button unit cannot be locked in its extended position, but can only be locked in its depressed position when locking projection

55 engages locking aperture 38. Thus in this adjusted position of the lock barrel, if the push button and barrel are in an extended position, they may be manually moved to a depressed position without use of key 60, and automatically locked in this position by movement of the lock plunger 56, under the influence of its spring 58, into locking aperture 38. To again move the barrel and push button to an extended position, it is necessary to use key 60 to retract plunger 56, whereupon the push button unit will be moved outwardly of the casing by compression spring 24 in the push button unit.

From the foregoing it can be seen that in the embodiment of the invention shown in Figs. 1 to 3, there is provided a push button lock which may be adjusted to different locking positions, that is, different positions in which it is operable to lock the push button unit in two different positions or in only one position, by merely removing the switch casing cover, but when the casing cover is in assembled relation with respect to the bottom portion of the casing, the lock cannot be adjusted to perform any other locking function than the one selected.

In Fig. 4, there is illustrated a slightly modified form of this invention, and inasmuch as many of the parts are the same as those described in connection with Figs. 1 to 3 and 5, like reference numerals will be used to designate like parts. The push button locking unit shown in Fig. 4 is designed to have but a single locking position and is not adjustable to provide any other locking arrangement. As shown, the lock cylinder 32 in this embodiment of the invention is provided with a single locking aperture 64 adapted to receive locking projection 56 on the lock barrel, when key projection 59 is received in guide slot 62 in the inner surface of the lock cylinder. It is believed to be readily apparent that in this embodiment of the invention the lock will be operative to lock the push button in an extended position only, and in order to depress the push button, it will be necessary to use a key 60 to withdraw locking projection 56, whereupon the lock barrel 44 may be manually depressed to operate the associated push button unit, and upon release of the lock barrel, push button spring 24 will operate to move the lock barrel upwardly so that it will be automatically locked by entrance of locking projection 56 into locking aperture 64. This construction obviously has certain advantages in that with the use of a single locking aperture, the switch is effectively locked against any operation since, in order to depress the lock barrel, it is necessary to use a key 60 whereupon it may be manually moved, and as soon as manual force is removed, the lock barrel automatically relocks itself in extended position.

In the embodiment of the invention shown in Fig. 6, a lock barrel identical with the lock barrel employed in the embodiments of the invention shown in Figs. 1 to 5 is employed in a lock cylinder 66, having a substantially U-shaped keyway slot therein. This slot has one leg 68 thereof opening at one end of lock cylinder 66, and is joined to the other leg 72 thereof by a cross slot 70 adjacent the opposite end of the lock cylinder. There is also provided through the lock cylinder wall a pair of longitudinally aligned spaced locking apertures 74 and 76, and a longitudinally elongated aperture 78. The aperture 78 is spaced from apertures 74 and 76 angularly, the same

amount as legs 68 and 72 of the U-shaped key slot.

It is believed obvious that lock cylinder 66 may be mounted in a lock casing similar to lock casing 26 shown in Figs. 1 and 2, and that the lock barrel 44 may be inserted therein from the bottom, as shown in Fig. 6, with key projection 59 of the barrel entering leg 68 of the U-shaped keyway slot. With key projection 59 in leg 68 of the keyway slot, locking plunger 56 will be longitudinally aligned with locking apertures 74 and 76, and may be received in one of the apertures 76, as shown in Fig. 6. In this position of parts, the lock obviously can operate in the same manner as the lock shown in Fig. 3 to lock the barrel and consequently a push button switch with which it may be associated in either an extended or a depressed position, depending upon whether the locking projection enters locking aperture 76, or 74, respectively. However, in this embodiment of the invention, lock barrel 44 may be angularly adjusted without removing it from its lock casing, or without disassembling the switch casing on which it may be mounted. This may be accomplished by withdrawing lock projection 56 from locking aperture 76 by the use of key 60, and then rotating the entire barrel 44 in a substantially counter-clockwise direction, as shown in Fig. 6, so that key-projection 59 traverses the connecting portion 70 of the U-shaped keyway slot to become aligned with leg 72 thereof, and locking projection 56 will then be aligned with elongated aperture 78 in the lock cylinder 66. In this position of the parts, locking projection 56 can perform no locking function, inasmuch as it is free to move in its projected position throughout the length of slot 78. Accordingly, it is obvious that with this embodiment of the invention, the lock may be rendered entirely inoperative to perform any locking function by a simple manipulation thereof. It should be noted, however, that this manipulation cannot be performed by any unauthorized person inasmuch as it requires the use of key 60. It will also be readily apparent that although there is illustrated in Fig. 6 a lock which is adjustable from a locking position to a non-locking position, that these two positions of the lock barrel may be two different locking positions, instead of a locking and a non-locking position. In other words, in one position, lock plunger 56 could be aligned with spaced locking apertures, as shown at 74 and 76 in Fig. 6, while in the other adjusted position of the lock barrel a single locking aperture might be provided in the lock cylinder to provide for locking the barrel in either an extended or a depressed position.

In Figs. 7 to 9 of the drawings, there is illustrated, a push button unit similar to that previously described, mounted in an explosion-proof casing. The casing illustrated in this embodiment of the invention embodies relatively thick wall portions and is constructed preferably of cast metal. The casing is divided into two parts including a lower portion having a bottom wall 82 and end walls 84, only one of which is shown, and this one is provided with a threaded aperture 86 for threadedly receiving a conductor conduit. The upper portion of the casing includes a top 88 having integral laterally extending end walls 90, only one of which is shown, and provided with outwardly extending flanges 92 which are adapted to be secured to the top of end walls 84, as for example by the screws 94. Inasmuch as the push button unit illustrated in Figs. 7 to 9 is identical with that previously described,

the detailed description of its construction will not be repeated. The top wall 88 of the casing shown in Figs. 7 to 9 is provided with an integral inwardly extending projection 97 for each switch unit in the casing, which is substantially aligned with push button 22 of the push button unit. The projection is provided with a bore 96 terminating in an enlarged counter-sunk portion 98 for slidably receiving the push button operating rod 100, having a flanged head 102 adapted to be received in the counter-sunk portion 98. As shown, the push button operating rod 100 is provided with a pin 103 secured therein and adapted to cooperate with cover projection 97 to limit outward movement of operating rod 100. The inner end of operating rod 100 is adapted to contact the outer end of push button 22, so that movement of the operating rod will actuate the push button contacts.

A transverse bore 104 is provided in the casing cover 88 and extends between the adjacent end of the casing and the counter-sunk portion 98 of bore 96. This bore is adapted to slidably receive a locking rod 108, having a flange 110 intermediate the ends thereof located in an enlarged portion 106 of the bore, and forming a seat for a coil compression spring 118. A plate 112 is secured across the outer end of bore 104 as, for example, by screws 114, and is provided with an aperture the same size as locking rod 108 to guide the outer end thereof. Coil compression spring 118 abuts against the inner surface of plate 112 and thereby tends to bias the locking bolt 108 into counter-sunk bore 98. As shown in the drawings, the outer end of locking rod 108 is provided with a manual operating knob 116.

In the position of the parts shown in Fig. 7 of the drawings, the push button 22 is in an extended position, thereby maintaining operating rod 100 in an extended position with the flanged end 102 thereof positioned outwardly of locking rod 108. Locking rod 108 is maintained in a position beneath flange 102 of the operating rod by spring 118 and before the push button contacts can be moved from this position, that is, before the push button and its operating rod can be depressed it will be necessary for the operator to grasp operating knob 116 and pull locking rod 108 outwardly against the bias of spring 118, and while holding the knob in this extended position, push button operating rod 100 may then be depressed to the position shown in Fig. 8. Now, if operating knob 116 is released, the parts will be maintained in the position shown in Fig. 8. It is to be noted that in this position the push button contacts and, therefore, the push button and operating rod 100 are locked in a depressed position by engagement of locking rod 108 over the outer face of flange 102 on the operating rod. However, in this position, the push button contacts and push button may be moved to the position shown in Fig. 7 of the drawings by merely withdrawing locking rod 108, whereupon the push button spring 24 shown in Fig. 2 of the drawings will operate to automatically move the push button together with its associated contact and operating rod 100 to the extended position shown in Fig. 7.

From the foregoing it should be obvious that there is disclosed herein novel forms of locking means particularly adapted for use in conjunction with push button switch units maintained in enclosing casings, with the locking means pref-

erably supported on the casing cover and cooperating with operating means for the push buttons extending through apertures in the casing cover. The locking means disclosed are capable of locking the push button units in one or more operative positions, and the particular lock shown in Figs. 1 to 3 may be adjusted by removing the cover to perform a different locking function, whereas the lock illustrated in Fig. 6 may be adjusted for the same purpose without dismantling any part of the switch; and all of the forms of the invention disclosed provide efficient locking means, particularly for push button switches, which locking means cannot be released without manual manipulation in addition to actuation of the push button actuating means, and in the species of the invention shown in Figs. 1 to 6, a key operated tumbler lock is employed so that in these embodiments of the invention the switches may be further safeguarded by distribution of keys only to authorized persons.

Having described preferred embodiments of the invention in accordance with the patent statutes, it is desired that the invention be not limited to these particular embodiments, inasmuch as it will be obvious, particularly to persons skilled in the art that many changes and modifications may be made in these particular structures without departing from the broad spirit and scope of this invention. Therefore, it is desired that this invention be interpreted as broadly as possible, and that it be limited only as required by the prior art.

I claim as my invention:

1. A switch including a substantially rectilinearly movable contact operating means, guide means therefor, said operating means including a lock barrel slidably mounted in said guide means and contacting an outwardly biased slidable contact member, cooperating keying means on said barrel and guide means for preventing rotation of said barrel in said guide means but permitting relative longitudinal sliding movement thereof, one of said keying means including angularly spaced means cooperating, respectively, with the other of said keying means in different angular positions thereof, said key guide means extending to the end of the member on which it is mounted to permit removal of said barrel from its guide means, said barrel including a laterally extending retractable lock plunger, and said guide including angularly spaced means for cooperating with said plunger in its different angular positions, respectively.

2. A switch including a substantially rectilinearly movable contact operating means, guide means therefor, said operating means including a lock barrel slidably mounted in said guide means and contacting an outwardly biased slidable contact member, cooperating keying means on said barrel and guide means for preventing rotation of said barrel in said guide means but permitting relative longitudinal sliding movement thereof, one of said keying means including angularly spaced means cooperating, respectively, with the other of said keying means in different angular positions thereof, said angularly spaced means including connecting means at one end thereof whereby said barrel may be angularly adjusted at one end of its path of movement without removal from said guide means to different angularly related positions corresponding to the positions of said angularly spaced means, said barrel including a laterally

extending retractible lock plunger, and said guide including means for cooperating with said plunger in at least one of said different angular positions for locking said barrel and contact member in at least one longitudinally adjusted position.

3. In a device of the type described, a lock cylinder having angularly spaced keyways therein at least one of which extends to the end of said cylinder, a lock barrel having key means fixed thereto for cooperation with one of said keyways to longitudinally slidably but non-rotatably mount said barrel in said cylinder, retractible locking means carried by said barrel angularly spaced from said key means for cooperation with means in said cylinder, angularly spaced correspondingly to said keyways, each of said last-mentioned means being of different character whereby said locking means is cooperable therewith, respectively, to perform different locking functions.

4. In a device of the type described, a lock cylinder having angularly spaced longitudinally extending keyways therein opening to one end of said cylinder, a lock barrel having key means fixed thereto for cooperation with one of said keyways to slidably but non-rotatably mount said barrel in said cylinder, retractible locking means carried by said barrel and angularly spaced from said key means for cooperation with means in said cylinder angularly spaced correspondingly to said keyways, each of said last-mentioned means being of different character whereby said locking means is cooperable therewith, respectively, to perform different functions, at least one of which is a locking function.

5. In a device of the type described, a lock cylinder having angularly spaced longitudinally extending keyways therein one of which opens to one end of said cylinder, another of said keyways having a connecting keyway at one end thereof with said one keyway, a lock barrel having key means fixed thereto for cooperation with one of said keyways to slidably but non-rotatably mount said barrel in said cylinder, retractible locking means carried by said barrel and angularly spaced from said key means for cooperation with means in said cylinder angularly spaced correspondingly to said keyways, each of said last-mentioned means being of different character whereby said locking means is cooperable therewith, respectively, to perform different functions, at least one of which is a locking function.

6. A switch including a substantially rectilinearly movable contact operating means, guide means therefor, said operating means including a lock barrel adapted to be longitudinally slidably and non-rotatably mounted in a plurality of different angularly related positions, respectively, in said guide means, said barrel including a laterally extending retractible lock plunger, and said guide including angularly spaced means for cooperating with said plunger in said different angular positions, respectively, including a pair of longitudinally spaced means engageable with said plunger at one angular position of said barrel to lock said contact operating means at two different longitudinal positions, and a single means at another angular position of said barrel for locking said contact operating means at but one longitudinal position thereof.

7. A switch including a substantially rectilinearly movable contact operating means, guide means therefor, said operating means including

a lock barrel slidably mounted in said guide means and contacting an outwardly biased slidable contact member, cooperating keying means on said barrel and guide means for preventing rotation of said barrel in said guide means but permitting relative longitudinal sliding movement thereof, one of said keying means including angularly spaced means cooperable, respectively, with the other of said keying means in different angular positions thereof, said angularly spaced means including connecting means at one end thereof whereby said barrel may be angularly adjusted at one end of its path of movement without removal from said guide means to different angularly related positions corresponding to the positions of said angularly spaced means, said barrel including a laterally extending retractible lock plunger, and said guide including means for cooperating with said plunger at only one of said different angular positions for locking said barrel and contact member at only one longitudinally adjusted position at said one angular position, whereby said barrel is freely longitudinally movable at another angular position thereof.

8. In a switch, a switch casing having a removable cover, separable contacts in said casing, reciprocable actuating means for said contacts extending through an opening in said cover, said actuating means including a movable lock barrel, a lock cylinder secured in said cover opening, a longitudinal guide slot in the inner surface of said cylinder, a guide pin on said barrel adapted to be received in said slot, said barrel having a laterally extending retractible plunger for engaging a shoulder on said cylinder to lock said barrel against longitudinal movement at least at one position in said cylinder, and said slot terminating short of the outer end of said cylinder and opening to the inner end of said cylinder so that said barrel may be removed only from the inner side of said cover.

9. In a switch, a switch casing having a removable cover, separable contacts in said casing, reciprocable actuating means for said contacts extending through an opening in said cover, said actuating means including a movable lock barrel, a lock cylinder secured in said cover opening, angularly spaced longitudinally extending guide slots in the inner surface of said cylinder, a guide pin on said barrel adapted to be received in said slots at different angular positions of said barrel in said cylinder, respectively, said barrel having a retractible lock plunger, said cylinder having angularly spaced means of different character for cooperating with said plunger at said different angular positions, respectively, to provide different locking functions, said slots terminating short of the outer end of said cylinder and opening to the inner end of said cylinder so that said barrel may be removed only from the inner side of said cover.

10. In a switch, a switch casing having a removable cover, separable contacts in said casing, reciprocable actuating means for said contacts extending through an opening in said cover, said actuating means including a movable lock barrel, a lock cylinder secured in said cover opening, angularly spaced longitudinally extending guide slots in the inner surface of said cylinder, a guide pin on said barrel adapted to be received in said slots at different angular positions of said barrel in said cylinder, respectively, said barrel having a retractible lock plunger, said cylinder having angularly spaced means of different char-

acter for cooperating with said plunger at said different angular positions, respectively, to provide different locking functions, one of said slots terminating short of the outer end of said cylinder and opening to the inner end of said cylinder, the other of said slots terminating short of both ends of said cylinder, and a connecting slot between said first two mentioned slots.

11. A switch including a substantially rectilinearly movable contact operating means, guide means therefor, said operating means including a lock barrel slidably mounted in said guide means and contacting an outwardly biased slidable contact member, cooperating keying means on said barrel and guide means for preventing rotation of said barrel in said guide means but permitting relative longitudinal sliding movement thereof, one of said keying means including

angularly spaced means cooperable, respectively, with the other of said keying means in different angular positions thereof, said angularly spaced means including connecting means at one end thereof whereby said barrel may be angularly adjusted at one end of its path of movement without removal from said guide means to different angularly related positions corresponding to the positions of said angularly spaced means, said barrel including a laterally extending retractible lock plunger, and said guide including means for cooperating with said plunger at only one of said different angular positions for locking said barrel and contact member in at least one longitudinally adjusted position, whereby said barrel is freely longitudinally movable at another angular position thereof.

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