

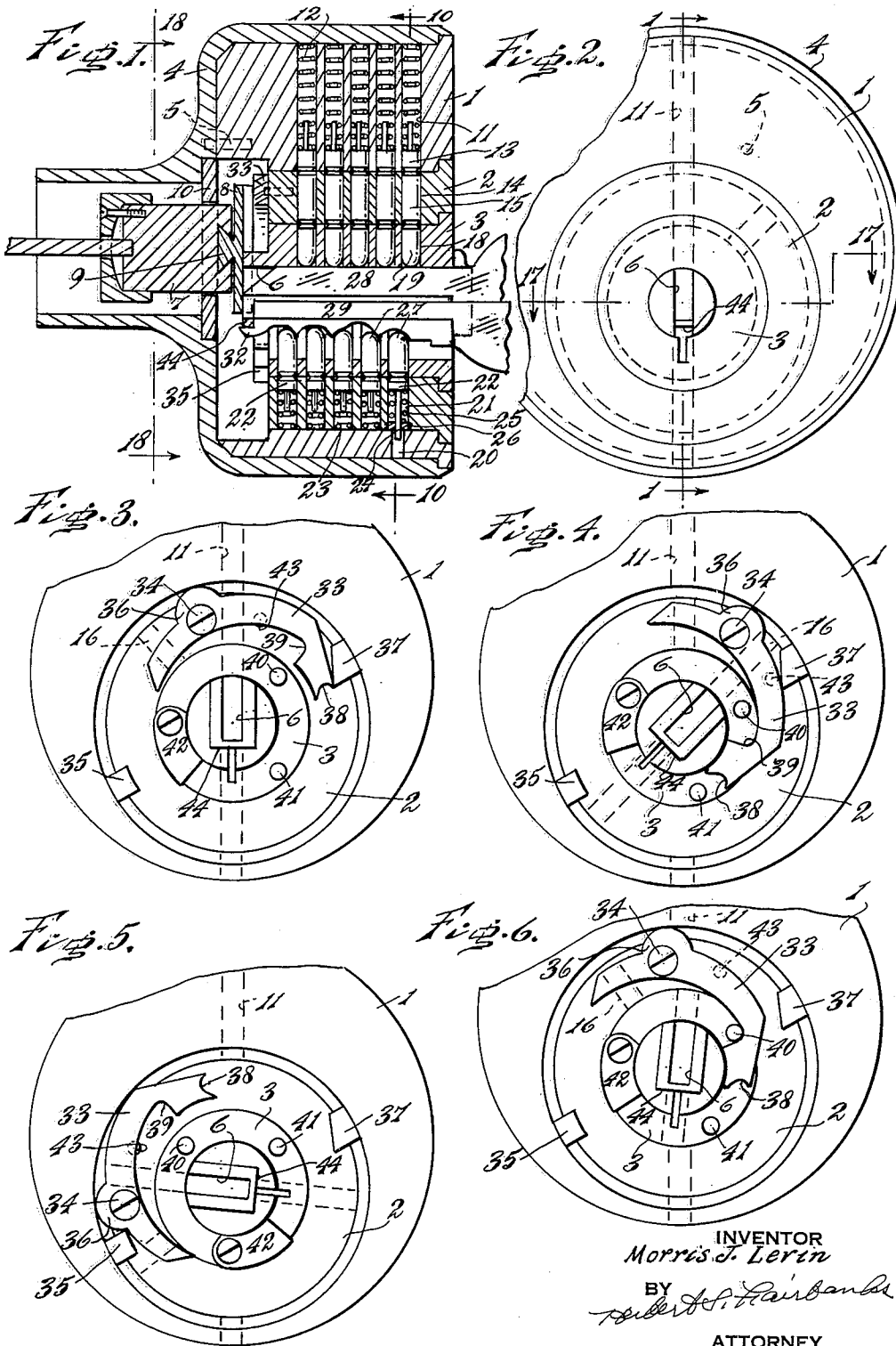
May 21, 1963

M. J. LEVIN
COMBINATION LOCKS

3,090,219

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3 Sheets-Sheet 1



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Fig. 7.

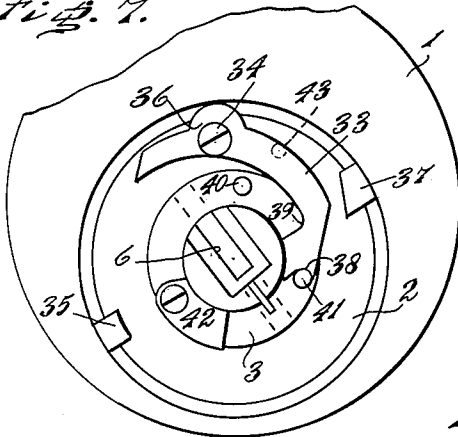


Fig. 8.

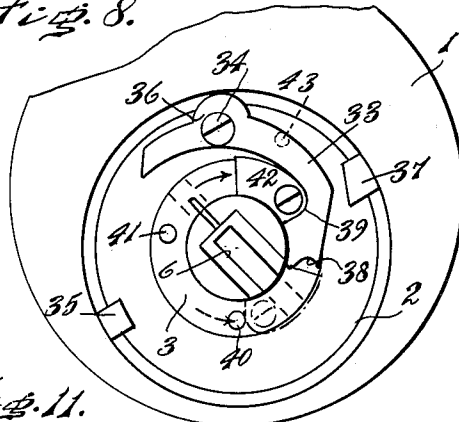


Fig. 9.

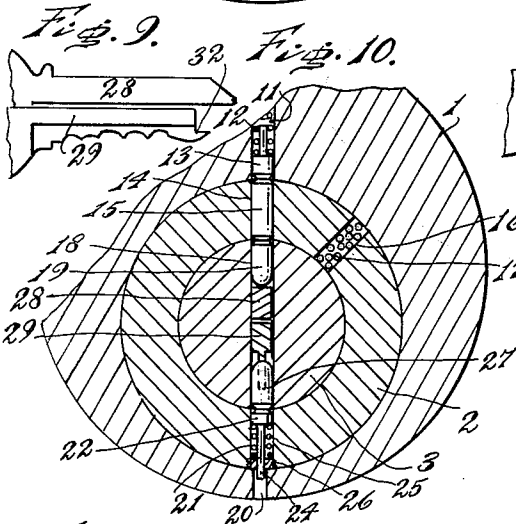


Fig. 10.

Fig. 11.

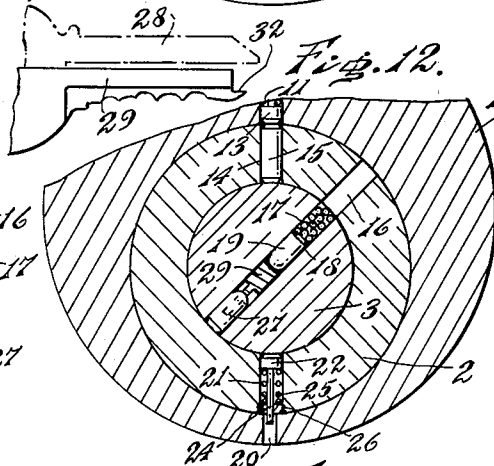


Fig. 12.

Fig. 15.

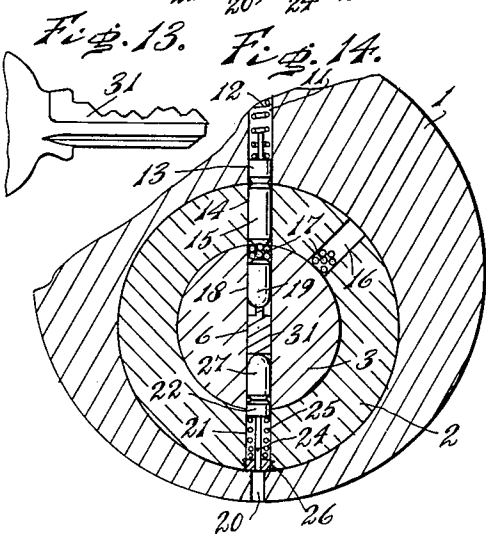
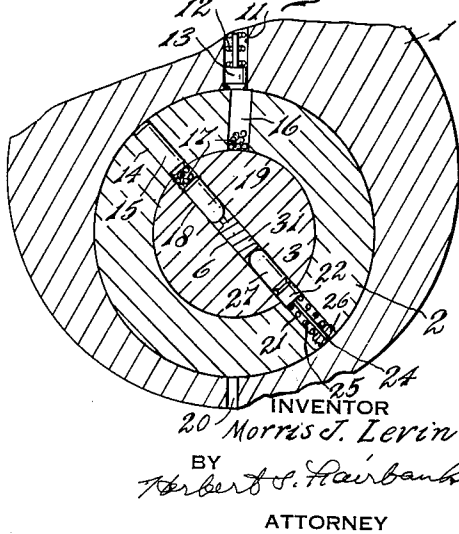


Fig. 14.



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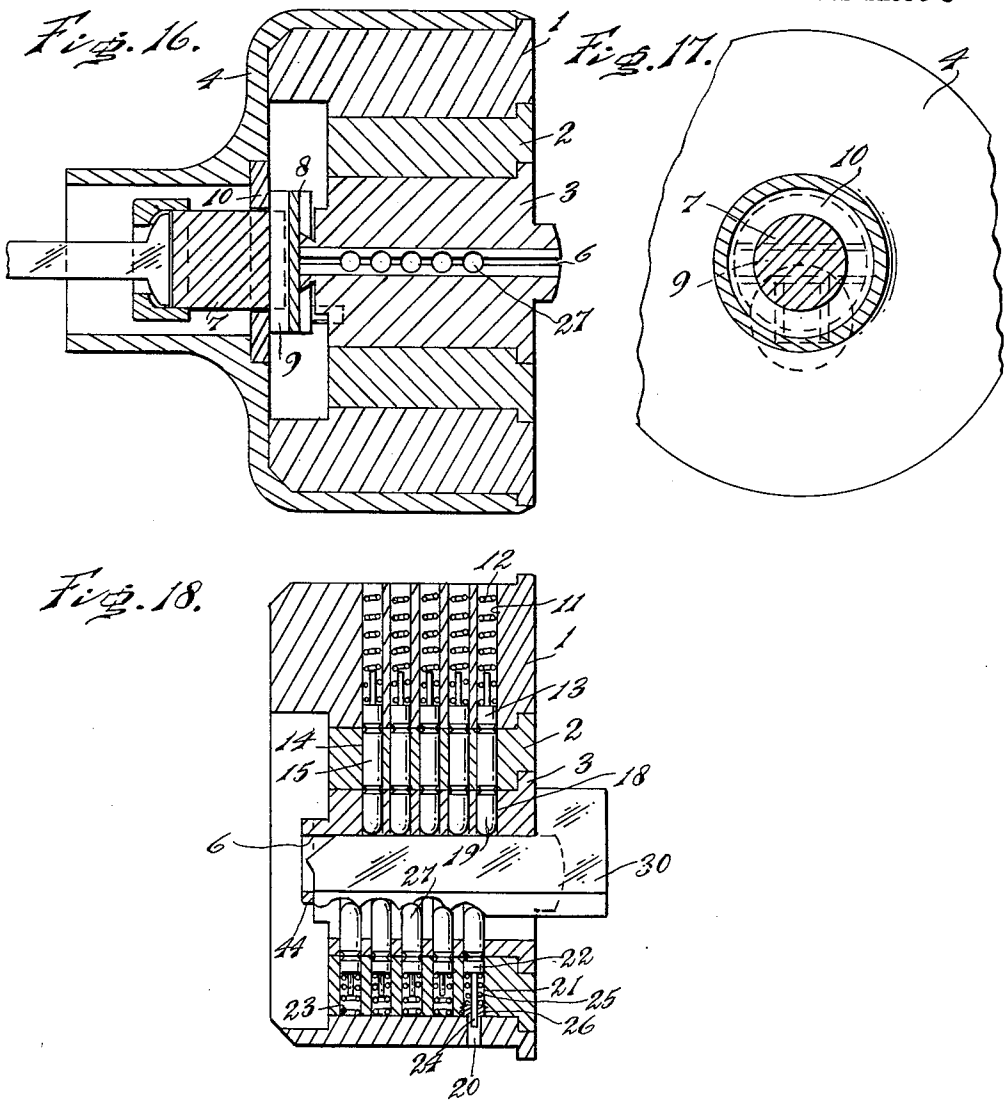
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3 Sheets-Sheet 3



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COMBINATION LOCKS

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4 Claims. (Cl. 70—315)

In my prior Patent No. 2,818,723, I have described and broadly claimed a novel cylinder lock, and my present application, while embodying some of the features of said prior patent, provides among other things for the eccentric mounting of an inner cylinder within an outer stationary cylinder and with a universal driving connection between a rotatable core concentric within the inner cylinder, and a locking bolt.

A further object of the invention is to devise a novel combination lock having a novel construction and arrangement of an outer stationary cylinder, an inner rotatable cylinder and a rotatable core with tumblers to selectively lock such parts relatively to each other and with novel means for limiting the extent of rotation of the inner cylinder and of the core.

A further object is to devise a novel key for neutralizing the lock, so if any key is inserted it will adjust to the new contour.

A further object is to devise novel means to limit the extent of turning movement of the inner cylinder and the core for the purpose of keeping the master key out by manipulating the guest key.

With the foregoing and other objects in view, as will hereinafter clearly appear in the detailed description and the appended claims, my invention comprehends a novel combination lock.

The invention further comprehends a novel construction, arrangement and assembly of an outer stationary cylinder, and an inner rotatable cylinder having an eccentric mounting in the outer cylinder, a rotatable core mounted concentrically in the inner cylinder, and a universal joint driving connection between the core and a locking bolt; said cylinders and core having tumblers having movements determined by a setting controlled by a novel neutralizing combination key.

Other novel features of construction and advantage will hereinafter be set forth.

For the purpose of illustrating the invention, I have shown in the accompanying drawings a preferred embodiment of it, which I have found in practice to give satisfactory and reliable results. It is, however, to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized, and the invention is not limited, except by the scope of the appended claims, to the exact arrangement and organization of these instrumentalities as herein set forth.

FIGURE 1 is a sectional elevation on line 1—1 of FIGURE 2 of a combination lock embodying my invention.

FIGURE 2 is an end view of FIGURE 1, partly broken away.

FIGURES 3 to 8 inclusive are end views showing the stationary cylinder partly broken away, the inner cylinder, and core in different relative positions as defined by a cam lever.

FIGURE 9 is a side elevation of a neutralizing combination key.

FIGURE 10 is a section on line 10—10 of FIGURE 1, partly broken away showing the parts in position of the neutralizing combination key seen in FIGURE 9.

FIGURE 11 is a side elevation of the neutralizing combination key showing the upper section in thin lines after the core has been moved into position, as shown in FIGURE 12.

FIGURE 12 is a section on line 10—10 of FIGURE 1

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showing the core moved into a different position by the lower half of the neutralizing combination key.

FIGURE 13 is a side elevation of a guest key.

FIGURE 14 is a section on line 10—10 of FIGURE 1 showing the guest key in position.

FIGURE 15 is a section on line 10—10 of FIGURE 1 showing the parts in a different position.

FIGURE 16 is a section on line 17—17 of FIGURE 2.

FIGURE 17 is a section on line 18—18 of FIGURE 1.

FIGURE 18 is a sectional elevation of the cylinders and core with a master key in position.

Similar numerals of reference indicate corresponding parts.

Referring to the drawings:

The combination lock has an outer stationary cylinder 1, having an eccentric bore to receive an inner rotatable cylinder 2, the latter having a concentric bore to receive a rotatable core 3.

The outer cylinder 1 is fixed within a housing 4 by a pin 5.

The core has a keyway 6 extending longitudinally through it, and the lower portion of its slot is of less diameter than the upper portion. The inner end of the core is connected with a bolt actuating member 7 by a universal joint 8, having a member 9 in keyed relationship with the core and the member 9 and contacting a bearing washer 10 in the housing.

The stationary cylinder 1 is provided with a series of radial bores 11 in each of which a spring 12 presses against a headed pin 13 said pin 13 having a portion thereon over which the spring 12 is mounted for the purpose of saving space.

A series of bores 14 extend radially through the inner cylinder 2 and contain tumblers 15. The inner cylinder is also provided with a series of radial bores 16 which are circumferentially offset from the bores 11 and form magazines to receive balls 17.

The core has a series of radially disposed bores 18 which open into the keyway and contain tumblers 19.

The outer cylinder is provided with an opening 20 and the inner cylinder has a series of bores 21 containing tumblers 22 with springs 23, and a headed locking pin in the bore 21 which aligns with the hole 20, a spring 25 mounted in the bore between the head of the locking pin and a nut 26 threaded into the bore, and a tumbler 27 in a bore in the rotatable core 3 which is adapted to align with the tumbler 22 and locking pin 24.

The lower bores 21 for the neutralizing key are so placed that they do not completely register with the upper bores 11. The lower bores 21 are slightly offset in a longitudinal direction from the upper bores 11. See FIG. 18.

Referring now more particularly to FIGURES 3 to 8, I provide means to limit the extent of rotation of the inner cylinder 2 and the core 3 when the core is turned by one of the keys such as the neutralizing combination key having an upper section 28 and a lower section 29, a master or service key 30 or a guest key 31. The key lower section 29 terminates in a hook 32.

The inner cylinder has a stop lever 33 pivoted on it at 34. A cam 37 on the outer cylinder lies in the path of lever 33 to engage and rotate said lever into a position with respect to the spaced stops 40 and 41 on the rotatable core 3. The stop lever 33 having a recessed end 38 and a shoulder 39 which are adapted to cooperate with the spaced stops 40 and 41 on the core 3. When the cylinder 2 is operated in a counter-clockwise direction the cam 37 on cylinder 1 presses the lever 33 down between the stops.

If the guest prefers to keep all the master and service keys out after the door is locked, by inserting the guest key 31 and turning the cylinder 2 in a clockwise or in

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the opposite direction of unlocking the door, the lever 33 will meet stop 37 pressing it down toward the core 3, end 38 and shoulder 39 will be trapped between 40 and 41 (see FIGURES 3 and 4) and the core will limit its rotation only enough to neutralize the lock, but not enough to open the lock. By rotation of the cylinder 2 when the guest opens the door lock, stop 35 will be in the path of lever 33 and will free stops 40 and 41. Following this the master or service key 30 will function again (FIG. 18).

The top key section 28 is flat on its top and bottom faces, and the bottom key section 29 has a flat top face and a contoured bottom face, and its bottom portion is of reduced thickness and the keyway has a reduced thickness to receive the key.

It will now be apparent that in addition to the upper series of radially movable tumblers in the outer cylinder 1, the inner cylinder and the core, I provide a bottom series of radially movable tumblers in the inner cylinder and core and utilize one of the tumblers in the core to actuate a locking pin to selectively interlock the inner and outer cylinders.

In order to change the combination it is first necessary to neutralize the lock. The rear end of the bottom key 29 is tilted upwardly and inserted into the keyway and then moved downwardly so that the lower portion is received in the keyway and the hook 32 contacts the shoulder 44 on the core, thereby releasing the core from the inner cylinder, and at the same time the pin 24 interlocks the inner cylinder with the outer cylinder. To release the core from the inner cylinder at the top, insert the top part of the key 28 thereby pushing the pins 19 upward.

The core is free to turn and is turned from the position seen in FIGURE 10 to the position of parts shown in FIGURE 12 and the top key 28 removed. The core bores 18 register with the ball magazines 16 and balls pass therefrom into the bores 18. The core is now turned backwards to align the bores 18 with the bores 14 and any balls therein of previous combination will pass into the bores in the core. The core is then turned back to register with the bores of the magazine and bottom key 29 removed. The bores are then in proper alignment for the reception of the guest key.

The guest key is now inserted in the keyway in the position seen in FIGURE 12 and balls will be picked up in accordance with contour of the top of the guest key 31 and any excess balls will be returned to the magazine, and at this position the core is then turned back aligning the core bores vertically with respect to the bores 14 and 21 in the inner cylinder, releasing the locking pin 24 from inner and outer cylinders, thereby having the core and inner cylinder locked together.

I provide stop means to limit the relative turning movement of the inner cylinder with the outer cylinder, and to limit the relative turning movement of the core and the inner cylinder. The relative position of the cylinders and core corresponds with the showing of the stop mechanisms in FIGURES 10 and 13, and the relative position of the cylinders and core in FIGURE 4 corresponds with the showing of the stop mechanism in FIGURE 15.

When the guest key for the lock is inserted in the keyway and turned in a counterclockwise direction, the front end portion of the stop lever 33 contacts the cam 37 and is moved inwardly, the extent of such inward movement being limited by the stop 40.

The front end of the stop lever 33 contacts the stop 41 to stop the counterclockwise movement.

When the guest key is now turned in a clockwise direction, the stop lever contacts the stop 35 and the stop lever is returned to its normal position, see FIGURES 3, 4 and 5. Thus, the extent of rotation of the core and inner cylinder is limited in both directions.

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The bores of the two series of bores in the outer cylinder are slightly off center with the bores of the inner cylinder when the latter are in a vertical position. This prevents the pins in the outer cylinder at such time passing into the bores of the inner cylinder.

The stops 35 and 41 are so spaced that the guest key does not neutralize the lock.

It will be clear from FIGURES 1 and 18 that when the parts are in the position shown the bores in the outer cylinder are laterally spaced or offset from the bores of the inner cylinder, thus forming a staggered alignment therewith.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A combination lock, comprising an outer stationary cylinder having a series of radially disposed bores opening through its inner periphery, spring pressed pins in said bores, an inner cylinder rotatable in the outer cylinder having a series of radially disposed bores in alignment with said bores in said outer cylinder, each of said bores in said inner cylinder having a ball magazine offset therefrom, each ball magazine being open at its outer and inner end, balls in each ball magazine, tumblers in the bores of the inner cylinder, a core connectible to a locking bolt, said core being rotatable in the inner cylinder, said core having a plurality of openended bores and a keyway in said core into which the bores open, said inner cylinder having a second series of bores in longitudinal alignment with the outer cylinder bores but being laterally offset with respect thereto, a spring pressed locking member in one of the bores of the second series of bores in said inner cylinder, a tumbler in said one bore, said outer cylinder having means to receive said locking member, a combination key insertable into the keyway and a guest key insertable in the keyway to form a new combination, the bores of the inner cylinder and core being at such time in longitudinal alignment with the outer cylinder bores and the locking member being out of engagement with the outer stationary cylinder.

2. The combination lock defined in claim 1, wherein a stop lever is pivoted on the inner cylinder and the core has spaced stops cooperating with the stop lever to limit rotation of the core in either direction by a master key inserted in the keyway, said master key actuating said locking member to lock the inner cylinder with the outer cylinder and with the core free to revolve.

3. The combination lock defined in claim 1, wherein a two part combination key is insertable in the keyway one part actuating said locking member to lock the inner cylinder to the outer cylinder and the other part turning the core to bring one of its series of bores into and out of alignment with said ball magazines.

4. The construction defined in claim 1, wherein a stop lever is pivoted on an inner cylinder, a stop on the core, a cam on the outer cylinder in the path of the stop lever on movement of the inner cylinder in one direction to move said stop lever to engage the stop on the core and a stop on the outer cylinder in the path of the stop lever and contacted thereby to limit movement of the inner cylinder in the opposite direction.

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