

Aug. 31, 1954

E. N. JACOBI

2,687,637

DOOR LATCH OPERATING MECHANISM

Filed June 30, 1951

3 Sheets-Sheet 1

Fig. 1.

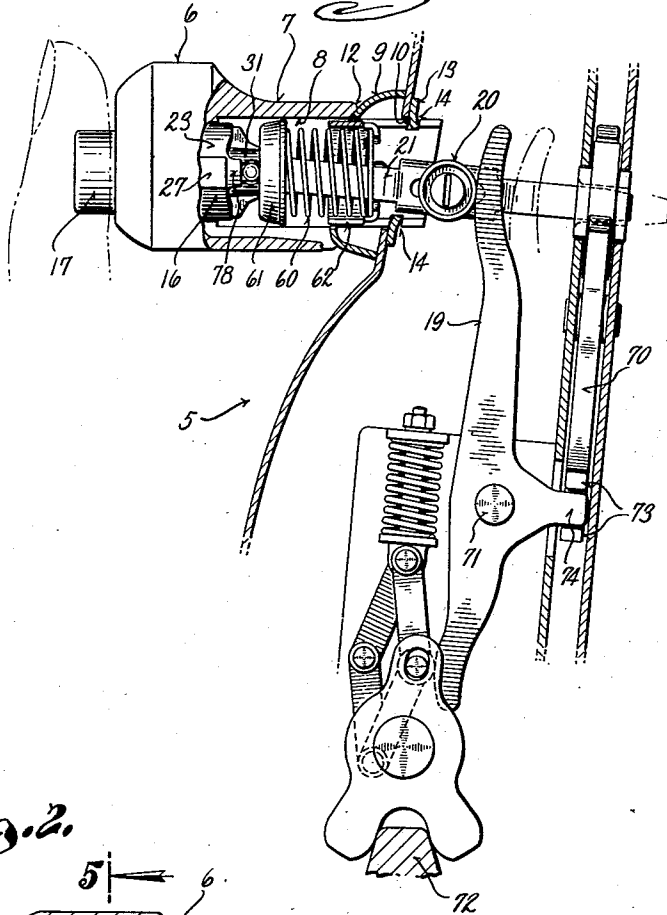
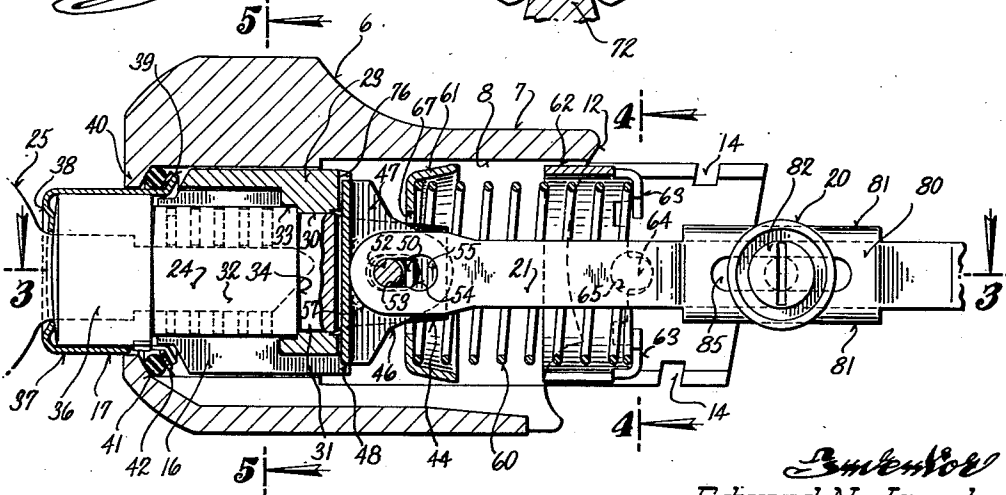


Fig. 2.



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3 Sheets-Sheet 2

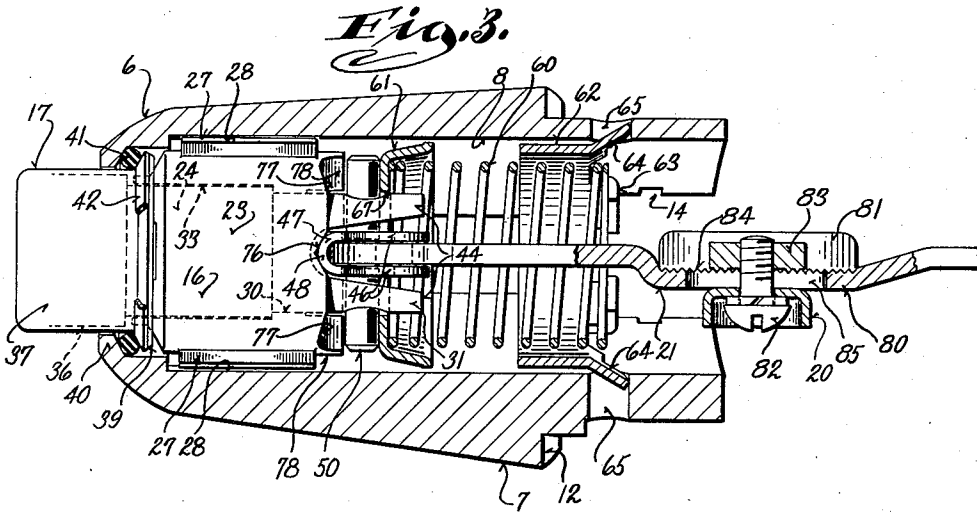


Fig. 4.

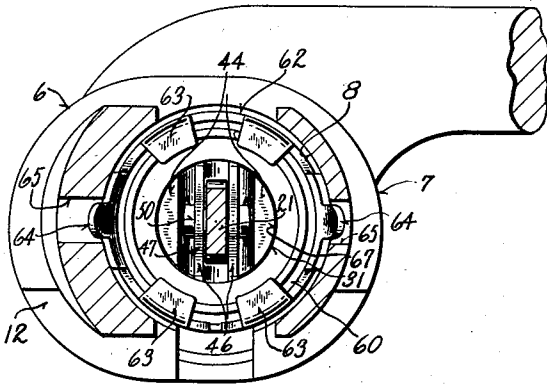


Fig. 5.

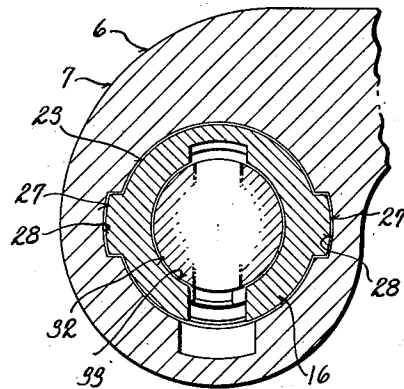


Fig. 8.

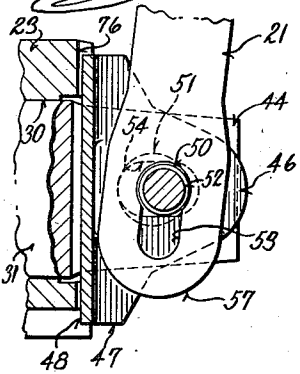
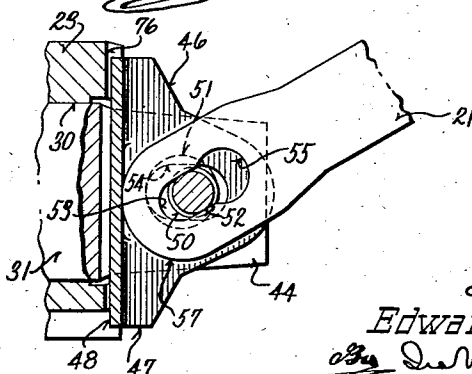


Fig. 8a.



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DOOR LATCH OPERATING MECHANISM

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3 Sheets-Sheet 3

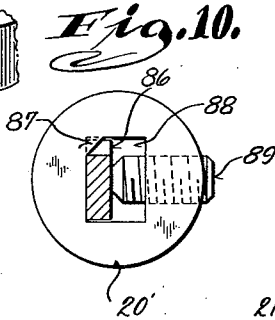
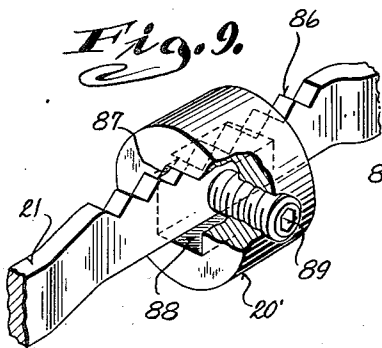
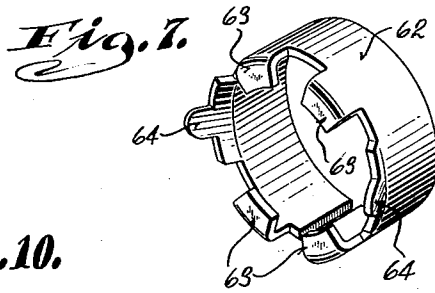
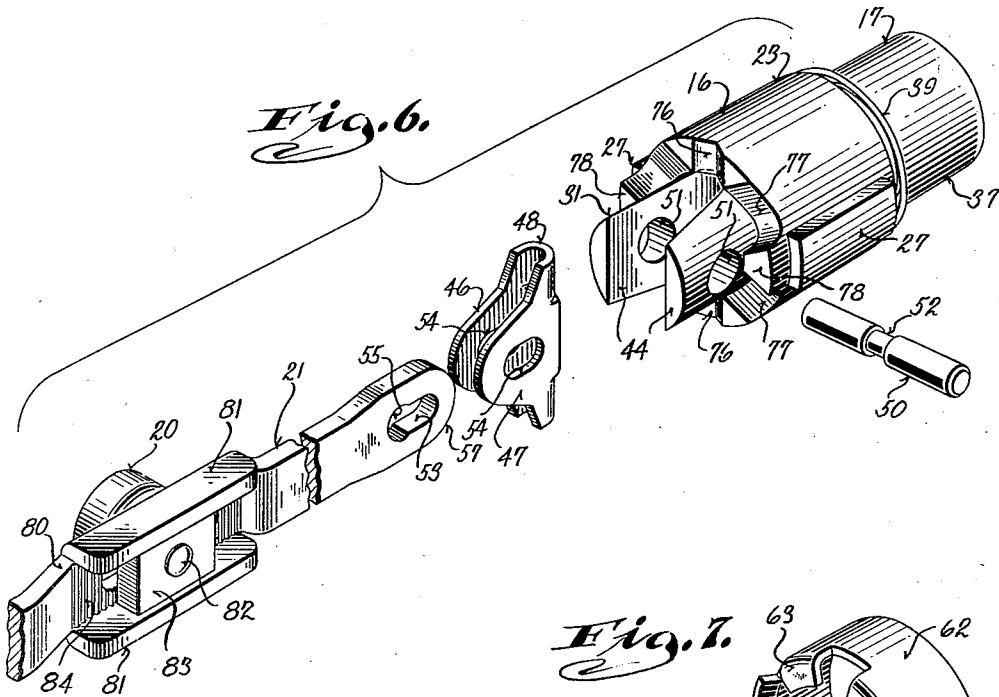
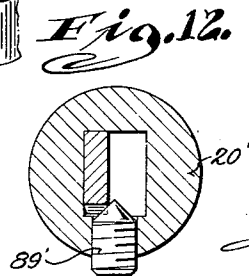
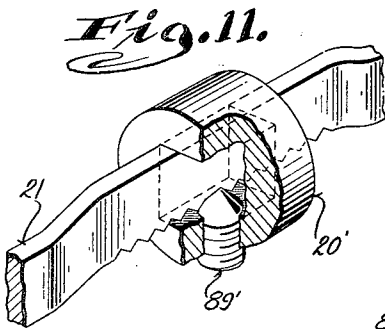
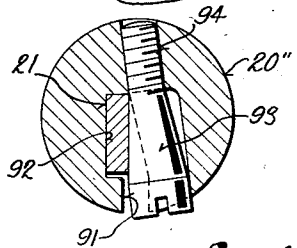


Fig. 13.



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UNITED STATES PATENT OFFICE

2,687,637

DOOR LATCH OPERATING MECHANISM

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Application June 30, 1951, Serial No. 234,563

18 Claims. (Cl. 70-224)

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This invention relates to door latch operating mechanisms of the push button type now used extensively on automobile doors, and similar to that of my copending application Serial No. 127,596 filed November 16, 1949, now Patent No. 2,660,046 granted November 24, 1953.

Door latch operating mechanisms of this type are most conveniently, but not necessarily, mounted on a post forming part of the door handle with the push button actuator accessible at the front of the post for manual depression. The actuator preferably comprises a sleeve-like casing constrained to back and forth sliding motion in a bore in the post, and a lock cylinder rotatable in the casing and projecting from the front of the post provides the push button as well as the means for locking and unlocking the door.

Rotation of the lock cylinder as well as inward depression of the actuator is transmitted to the locking and latching mechanism on the door through an operating shaft projecting from the rear of the post into the interior of the door; and it is one of the main objects of this invention to provide an improved rotation and thrust transmitting connection between the push button actuator and the shaft by which a single spring acting upon the actuator through its connection with the shaft may be utilized not only to hold the actuator in its foremost position on the door but to also cooperate with the elements of the thrust transmitting connection between the actuator and the shaft to hold the shaft in any of a number of different positions of angular misalignment with respect to the actuator.

Another object of this invention resides in the provision of a push button door latch operating mechanism of the character described wherein the operating shaft has a substantially universal joint connection with the lock cylinder by which rotation is transmitted from the cylinder to the shaft, and wherein end thrust is transmitted to the operating shaft through the engagement of cooperating parts on the casing for the cylinder and the shaft.

Still another object of this invention resides in the provision of a novel connection between the operating shaft and the lock cylinder by which the lock cylinder may be held against displacement from its casing prior to assembly of the push button latch operating mechanism in the door handle.

Another object of this invention resides in the provision of novel means for transmitting endwise motion of the operating shaft to the

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latch mechanism on the door and which means comprises a collar on the operating shaft, adjustably secured to the shaft to accommodate for variations in the positions of the parts on the automobile door.

A further object of this invention resides in the provision of improved detent means for defining the different positions of rotation of the lock cylinder.

Still another object of the invention resides in the provision of a novel spring seat for anchoring one end of the return spring in the post of the door handle, and which is so constructed that it may be snapped into place in the bore of the door handle post during assembly of the latch operating mechanism therein.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereinafter disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate several complete examples of the physical embodiments of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a fragmentary sectional view through the door of an automobile illustrating the application of the door latch operating mechanism of this invention to the door handle, parts of the handle being broken away and shown in section;

Figure 2 is an enlarged longitudinal sectional view through the door handle post and the latch operating mechanism therein;

Figure 3 is a longitudinal sectional view through Figure 2 taken along the plane of the line 3-3;

Figure 4 is a cross sectional view taken through Figure 2 along the plane of the line 4-4;

Figure 5 is a cross sectional view taken through Figure 2 along the plane of the line 5-5;

Figure 6 is a group perspective view of the push button actuator, the operating shaft, and the elements for coupling the same together, with the parts disconnected;

Figure 7 is a perspective view of the anchor member for the push button return spring;

Figures 8 and 8A are fragmentary detail views partly in side elevation and partly in section

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illustrating the manner in which the operating shaft is connected with the push button actuator to form a subassembly therewith prior to its installation in the post of the door handle;

Figures 9 and 10 are views illustrating a modified construction of the latch operating collar on the operating shaft;

Figures 11 and 12 illustrate a further modification of the latch operating collar; and

Figure 13 is still another form of latch operating collar.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 generally designates an automobile door having a handle 6 mounted on the exterior thereof by means including a post 7 having a bore 8 therethrough to accommodate the latch operating mechanism of this invention. At its inner end the post projects through a molding strip 9 on the exterior of the door and a hole 10 in the outer door panel so that the rear extremity of the post lies inside the door; and the handle may be permanently affixed to the door with a shoulder 12 on the post engaging the molding strip 9 by a clip 13 projecting into opposite notches 14 in the post and sprung against the inner surface of the outer door panel as shown best in Figure 1. The other end of the door handle (not shown) may also be secured to the door in a similar fashion.

The push button door latch operating mechanism of this invention comprises an actuator 16 in the bore 8 of the post, so that the post provides guide means to guide the actuator for back and forth sliding motion substantially perpendicular to the door. The push button 17 normally projects out of the front of the post or guide means and facilitates inward depression of the actuator toward the door in a latch releasing direction, and such inward depression of the actuator is transmitted to a door latch lever 19 through a collar 20 on an operating shaft 21.

The actuator 16 comprises a sleeve-like casing 23 and a lock cylinder 24 rotatable in the casing by means of a suitable key 25. The casing is constrained to back and forth sliding motion in the guide means provided by the post 7 by the engagement of diametrically opposite ribs 27 on the exterior of the casing in longitudinal grooves 28 in the wall of the bore surrounding the casing. At its rear end, the casing has a bore 30 to rotatably receive a reduced rearward extension 31 on the lock cylinder 24, while the barrel proper 32 of the cylinder is rotatably received in a larger bore 33 in the casing opening to its front end. Consequently, the shoulder 34 defined by the junction of the barrel and the reduced end 31 of the lock cylinder is engageable with the forwardly facing shoulder at the bottom of the counterbore 33 in the casing to limit endwise insertion of the lock cylinder into the casing, or stated in another way, to preclude rearward displacement of the lock cylinder out of the casing.

The front end of the lock cylinder has an enlarged head 36 thereon which provides the push button 17 and which in the present case has a shell 37 of thin stainless steel fixed thereover to enhance the appearance of the push button. The sleeve has an annular flange curled radially inwardly as at 38 into tight engagement with the front of the head 36, while the rear end portion of the sleeve is flared radially outwardly as at 39 to provide a forwardly facing annular abutment on the lock cylinder engageable with an annular

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abutment 40 on the front of the post and surrounding the push button to preclude displacement of the lock cylinder as well as the casing from the front of the bore in the post.

In order to preclude the entrance of water, dust or other dirt into the restricted mouth of the bore defined by the annular abutment 40, a resilient gasket 41 is preferably interposed between said abutment and a metallic washer 42 slidingly seated against the outwardly flared flange 39 on the sleeve 37.

As will be brought out in greater detail hereinafter the lock cylinder is yieldingly held in its foremost position with the push button 17 thereof projecting out of the restricted mouth in the post and to maintain the seal provided by the resilient washer or gasket 41 effective to keep water, dust or other dirt from getting into the mechanism.

According to this invention the operating shaft 21 is flat and has a rotation transmitting connection with the lock cylinder and a thrust transmitting connection with the casing.

For this purpose the reduced rear end 31 of the lock cylinder is bifurcated to provide laterally spaced jaws 44 extending longitudinally rearwardly beyond the casing from a point forwardly of its rear extremity. The flat forward end portion of the operating shaft is positioned between the jaws 44 and is embraced by the legs 46 of a U-shaped clip 47 also received between the jaws with the bight 48 of the clip extending across the front extremity of the operating shaft. Attention is directed to the fact that the legs of the clip are substantially parallel and rather closely overlie the flat sides of the operating shaft, while the inner opposing sides of the jaws 44 converge forwardly toward one another and provide surfaces which lie closely adjacent to the bight end of the clip and thus provide for the transmission of rotation from the lock cylinder to the clip and the shaft.

Also forming a part of the rotation transmitting connection between the lock cylinder and the shaft is a cross pin 50 passing through the front end of the shaft and the legs of the clip 47, and having its opposite ends loosely received in enlarged apertures 51 in the jaws aligning on a common axis normal to the axis of the lock cylinder. The cross pin 50 is of uniform diameter throughout its length except for a reduced medial portion 52 thereof which is normally received in the narrow forward portion 53 of a longitudinally elongated slot in the front end of the operating shaft so that the pin is locked against endwise displacement from the cylinder.

The legs 46 of the U-shaped clip also have slots 54 therein elongated in the direction of the lock cylinder axis to permit limited back and forth rocking motion of the clip and shaft flatwise between the jaws as well as floating motion of the clip and shaft lengthwise of the cylinder axis, limited in one direction by the bridging engagement of the ends of the bight 48 of the clip across the rear end of the casing. At the rear thereof the slot in the operating shaft is enlarged as at 55 to a diameter slightly larger than that of the cross pin, and this enlargement must be aligned with the slots 54 and 51 in the clip and the jaws of the lock cylinder to permit endwise movement of the pin to and from its position connecting the parts together.

Because of the distance of the enlarged portion 55 of the shaft slot from the front extremity of the shaft, it will be readily apparent that the

shaft must be swung to a position substantially crosswise of the lock cylinder axis, as shown in Figure 8, to enable insertion and/or removal of the pin as described. The front extremity of the shaft, however, is preferably rounded as at 57 so that after insertion of the cross pin and a slight amount of endwise motion of the shaft in the direction to engage its narrow slotted portion around the reduced medial portion of the cross pin, the shaft may be pivoted about the pin toward alignment with the cylinder axis, as indicated in Figure 8A. Such pivotal motion, of course, brings the rounded front extremity of the shaft into engagement with the bight of the U-shaped clip with the result that the clip is cammed forwardly in the direction to bridge the ends of the bight across the rear extremity of the casing, and the shaft is cammed rearwardly to carry the enlarged end of its slot further out of alignment with respect to the pin and the holes in the jaws 44.

When the cross pin has been inserted in the manner described, not only is the operating shaft hingedly pinned to the lock cylinder but the latter is held assembled with its casing against forward displacement therefrom by the bridging engagement of the bight of the U-shaped clip across the rear end of the lock casing. This facilitates installation of the latch operating mechanism of this invention as a subassembly in the bore of the door handle post, which installation is effected from the rear of the post.

End thrust, of course, is imparted to the operating shaft in consequence to inward depression of the actuator through the bight of the U-shaped clip interposed between the rear end of the casing and the rounded front extremity of the operating shaft. When properly installed in the post of the door handle all end play between the parts of the thrust transmitting connection described is taken up and the parts held against rattling by the return spring 60 for the push button actuator. The manner in which the spring is anchored to the door handle post and the manner in which its expansive force is applied to the actuator through the operating shaft constitute highly important features of this invention.

The return spring 60 is a helically wound compression spring encircling the forward portion of the operating shaft and is confined in the bore of the post or guide means between front and rear cup-like reaction members 61 and 62, respectively, encircling the ends of the spring. The rear cup member 62 serves as an anchor for the rear of the spring and may be conveniently fabricated from a strip of sheet metal rolled up to form a split sleeve, as shown best in Figure 7. Inwardly directed tangs or flanges 63 on the rear of the sleeve provide a seat against which the spring engages, and outwardly and rearwardly directed tangs 64 also on the rear of the sleeve are sprung into suitable holes 65 in the wall of the post to connect the sleeve thereto and anchor the same against the rearward thrust of the return spring 60.

Inasmuch as the rear spring anchor 62 is a split sleeve it may be contracted sufficiently to enable the same to be inserted into the bore of the door handle post from the rear thereof, while the resiliency of the metal of which it is formed permits the same to assume a radially expanded position as seen in Figure 3 holding its tangs 64 engaged in the apertures 65 in the wall of the door handle post.

The forward cup 61, of course, receives the front end portion of the compression spring 60 and the bottom of the cup has an aperture 67 therein large enough to slidably accommodate the rear extremity of the cylinder. Hence the spring 60 urges the cup 61 forwardly against the opposite projecting ends of the cross pin 50 which in turn is pushed forwardly to bring its reduced medial portion 52 into the forward extremity of the slot 53 in the operating shaft, as seen best in Figure 2. Consequently the force of the return spring is utilized to hold the rounded front extremity of the operating shaft in frictional contact with the bight of the U-shaped clip and the bight engaged across the rear end of the lock casing.

In this manner the lock casing is yieldingly urged forwardly to carry with it the lock cylinder through the engagement of the shoulder at the bottom of the counterbore 33 in the casing with the shoulder 34 at the junction of the barrel and reduced rearward extremity of the lock cylinder, with the result that the outwardly flared flange or abutment 39 on the lock cylinder is pressed against the resilient sealing washer 41 in the front or mouth of the bore in the door handle post.

Moreover such transmission of the forward expansive force of the return spring 60 through the thrust transmitting connection between the operating shaft and the casing is utilized to establish engagement between the rounded front extremity of the operating shaft and the bight of the U-shaped clip with sufficient friction therebetween as to enable the shaft to be held in any of a number of different positions of angular adjustment about the axis of the cross pin 50. In this connection also it will be noted that the pin and slot connection between the shaft and the cylinder provides for limited lateral swinging of the shaft flatwise between the jaws on the rear of the lock cylinder. This universal adjustability of the operating shaft thus greatly facilitates the application of the door handle, with the latch operating mechanism in place therein, to the automobile door in the event of variations in the positions of the shaft operated parts on the door.

With the door latch operating mechanism shown in the drawings the lock cylinder may be rotated in opposite directions from an intermediate key inserting and removing position. The door is adapted to be locked by rotation of the cylinder (by the key) in one direction from said intermediate position and unlocked by rotation of the cylinder in the opposite direction from the intermediate key inserting and removing position. Rotation of the lock cylinder in the door unlocking direction actuates a lock bolt 70 on the inner door panel, through the operating shaft 21, to an inoperative position freeing the latch lever 19 for swinging motion about its pivot 71. Such swinging motion of the latch lever is imparted thereto by the collar 20 on the operating shaft in consequence to inward depression of the push button actuator after the return of the cylinder to its intermediate position of rotation. The latch lever 19, of course, operates the door latch mechanism to disengage it from a catch 72 on the door frame.

Rotation of the lock cylinder in the door locking direction actuates the lock bolt 70 to an operative position at which jaws 73 thereon engage around an arm 74 on the latch lever 19 to preclude swinging motion thereof. Consequently

when the door is locked neither the latch lever 19 nor the push button itself can be actuated.

These different positions of rotation of the lock cylinder, that is, the intermediate key inserting and removing position thereof as well as the limits of rotation of the cylinder in the door locking and unlocking directions, are defined by detent means forming part of the thrust transmitting connection between the lock casing and the operating shaft. For this purpose the rear end of the casing has diametrically opposite notches 76 formed therein into which the rounded bight 48 of the U-shaped clip snaps under the influence of the return spring 60 whenever the lock cylinder and the bight connected therewith have been rotated to the intermediate key inserting and withdrawing position to define said position and yieldingly resist rotation of the cylinder in either direction. At circumferentially opposite sides of the notches 76, the rear end of the casing slopes forwardly as at 77 toward diametrically opposite abrupt radial shoulders or rotation stops 78, engageable by the bight 48 of the U-shaped clip to define the limits of rotation of the cylinder in the door locking and unlocking directions.

It is noteworthy that the return spring 60 at all times affords spring pressure for the detent means described, while the sloping rear edge portions 77 on the casing serve to cam the bight of the clip slightly rearwardly in a direction to compress the return spring during return of the lock cylinder to its intermediate position to thus yieldingly resist such return rotation of the cylinder and make it unlikely that the cylinder will be rotated past the key inserting and withdrawing position defined by the engagement of the bight of the clip in the notches 76 of the casing.

It is also highly important to note that the force of the return spring is utilized to hold the bight of the clip engaged in the notches 76 of the casing with sufficient friction as to enable the operating shaft to be yieldingly held in different lateral as well as angular positions of adjustment. In other words, there is sufficient friction in the universal joint connection between the shaft and the cylinder that the shaft can be swung to and yieldingly maintained in any desired angular position relative to the cylinder axis, within the limits of the connection.

Inasmuch as production manufacturing methods preclude absolute accuracy in the disposition of the latch lever 19 with respect to the collar 20 on the operating shaft, it is necessary to make the collar adjustable along the length of the shaft. It is also desirable to make this adjustable connection sufficiently strong to withstand hammer blows exerted upon the push button by unauthorized persons in an attempt to defeat the lock.

For these purposes the collar 20 is preferably connected to the operating shaft as illustrated in Figures 3 and 6 where the shaft is shown provided with a medial laterally offset portion 80 with flanges 81 bent from the opposite side edges thereof to give the offset portion a channel-shaped cross section. The collar 20 is in the form of a stamped sheet metal cup and is fastened to the offset portion of the shaft by means of a screw 82 passing through the bottom of the cup and the shaft with its extremity threading into a square nut 83 fitting between the flanges 81 on the shaft so that the nut cannot rotate relative to the screw. The underside of the nut and the adjacent inner side of the shaft against which

it seats are both provided with relatively closely equi-spaced matching ridges 84 which interlock with one another when the screw is tightened to very effectively hold the collar against longitudinal shifting on the shaft. The hole 85 in the shaft through which the screw passes is elongated lengthwise of the shaft, however, so that upon loosening of the screw, the nut may be shifted lengthwise of the shaft to engage any desired set of matching ridges thereon to thus provide the necessary adjustability of the collar.

Several other ways of adjustably securing the collar to the shaft are illustrated in Figures 9 to 13 inclusive. In Figure 9 the operating shaft has equi-spaced teeth 86 cut in one side edge thereof and engageable with a tooth 87 formed in one corner of an enlarged axial aperture 88 through a circular collar 20'. The teeth are held engaged by means of a set screw 89 threading into the side of the collar and bearing against the side of the operating shaft to hold the shaft against flatwise motion in the aperture 88 in a direction to disengage its teeth from the tooth on the collar. When the screw is loosened, however, the teeth may be disengaged and the collar freed for lengthwise adjustment on the shaft.

A slight variation of this connection between the shaft and collar is shown in Figures 11 and 12, although here it is unnecessary to provide the collar 20' with a tooth as in the previous embodiment. In this case a set screw 89' not only holds the shaft edgewise against one side of the aperture in the collar but also engages the toothed edge of the shaft to adjustably lock the collar in place thereon.

In Figure 13 the collar 20'' is likewise circular and has a longitudinal slot 91 through its side opening into an enlarged aperture 92 extending axially through the collar. In this case the operating shaft 21 is clamped against one side of the aperture 92 by the tapered shank 93 of a screw 94 threaded into the collar and passing through the aperture therein. In this form of the connection, however, the collar is held secured on the shaft by friction.

From the foregoing description taken together with the accompanying drawings it will be readily apparent to those skilled in the art that this invention provides push button latch operating mechanism of improved construction wherein a minimum of parts performing multiple functions assure the simplicity and ruggedness to withstand rough handling as well as ease of assembly in the door handle.

What I claim as my invention is:

1. In a lock of the character described: a sleeve-like casing having a forwardly facing shoulder therein; a lock cylinder rotatable in the casing and having a rearwardly facing shoulder thereon to engage the shoulder on the casing for precluding rearward displacement of the cylinder out of the casing; an elongated operating shaft; and means providing an end to end driving connection between the cylinder and shaft affording the shaft a limited degree of universal motion relative to the cylinder, comprising laterally spaced jaws on the rear end portion of the cylinder extending rearwardly out of the casing from a point forwardly of its rear end, said jaws having holes therein arranged on a common axis crosswise of the cylinder axis and spaced a distance behind the rear end of the casing, a U-shaped clip loosely received between said jaws and thereby connected with the cylinder to rotate therewith, the opposite ends of the bight of

the clip projecting laterally from the space between the jaws to bridge across the rear end of the casing, and the legs of the clip extending rearwardly from the bight and having holes therein registering with the holes in the jaws but elongated in a direction perpendicular to the bight, a front end portion on the shaft having flat sides and received between and embraced by the legs of the clip and having a rearwardly elongated hole therein of less width than that of the holes in the legs of the clip, the front end portion of the shaft hole registering with the holes in the legs of the clip and said jaws, and the rear end portion of said hole in the shaft being enlarged at a location rearwardly of the holes in the jaws in the foremost position of the shaft relative to the lock cylinder defined by the engagement of the bight of the clip with both the rear end of the casing and the front extremity of the shaft, and a pin extending through the holes in the shaft and the clip legs with its ends loosely received in the holes of the jaws to pivotally connect the shaft with the cylinder while permitting limited lateral swinging of the shaft and clip between the jaws, said pin having a reduced medial portion received in the narrow forward portion of the shaft hole so that the pin is held against endwise displacement by the shaft, while the shaft is held by the bight of the clip against endwise movement relative to the cylinder to a pin removing position in which the enlarged rear end of the shaft hole aligns with the pin, whereby the connection between the cylinder and the shaft and clip precludes forward displacement of the cylinder out of the casing and the pin can be removed to permit forward displacement of the cylinder out of the casing only when the shaft is swung about the pin axis to a position substantially crosswise of the cylinder axis and in which position the shaft may be moved endwise substantially parallel to the bight of the clip, without interference therefrom, to bring the enlarged rear of the shaft hole into alignment with the pin.

2. In a lock of the character described: a sleeve-like casing having a forwardly facing shoulder therein; a lock cylinder rotatable in the casing and having a rearwardly facing shoulder thereon to engage the shoulder on the casing for precluding rearward displacement of the cylinder out of the casing; an elongated operating shaft; and means providing an end to end driving connection between the cylinder and the shaft affording the latter a limited degree of universal motion relative to the cylinder, comprising laterally spaced jaws on the rear end portion of the cylinder extending rearwardly out of the casing from a point forwardly of its rear end, said jaws having holes therein arranged on a common axis crosswise of the cylinder axis and spaced a distance behind the rear end of the casing, a front end portion on the shaft having flat sides and received between and loosely embraced by said jaws of the cylinder and having a rearwardly elongated hole therein of considerably less width than the diameters of the holes in the cylinder jaws, the rear end portion of said hole in the shaft being enlarged, a pin having its ends loosely received in the holes of the cylinder jaws and having an intermediate portion normally passing through the narrow forward portion of the hole in the shaft to pivotally connect the shaft with the cylinder while permitting limited lateral swinging of the shaft between the cylinder jaws, spaced shoulders on said pin engage-

able with the opposite sides of the front end portion of the shaft adjacent to the narrow portion of the hole therein to preclude endwise displacement of the pin out of its position pivotally connecting the shaft to the cylinder, said shoulders being of a size to pass through the enlarged rear portion of the shaft hole whenever the shaft is moved endwise in a direction to align said enlarged portion of the hole with the pin, and a bridging element connected with the lock cylinder to rotate therewith, said bridging element extending across the rear end of the casing and through the space between the cylinder jaws ahead of the front extremity of the shaft to block forward endwise motion of the shaft to said pin removing position, whereby the lock cylinder is held against forward displacement out of the casing as long as the shaft is substantially in end to end relation with the cylinder, and whereby the shaft must be swung about the axis of the pin to a position substantially crosswise of the cylinder axis to enable endwise motion of the shaft to the pin removing position without interference from said bridging element.

3. Push button door latch operating mechanism of the character described, comprising: guide means having a bore therethrough; an actuator in said bore including a sleeve-like casing constrained to back and forth sliding motion in said bore and having a forwardly facing shoulder thereon, and a lock cylinder rotatable in said casing and having a rearwardly facing shoulder thereon to engage the shoulder on the casing for precluding rearward displacement of the cylinder out of the casing, said cylinder having a portion at its front end accessible at the front of the guide means to provide a push button by which rearward motion may be imparted to the cylinder and the casing; an elongated operating shaft having one end projecting out of the rear of the guide means and having its forward end in the bore thereof adjacent to the rear of the casing; a rotation transmitting connection between the cylinder and the shaft adjacent to the rear of the casing; means for translating rearward motion of the actuator into rearward endwise motion of the shaft, comprising a bridging element interposed between the rear of the casing and the forward extremity of the shaft; a compression spring confined in said bore behind the casing; means connected with the operating shaft for receiving the expansive force of the spring and for translating said force into forward thrust on the lock cylinder through said bridging element interposed between the casing and the shaft, so that the spring yieldingly urges the actuator forwardly in the bore; and cooperating abutments on the guide means and the actuator for precluding forward displacement of the lock cylinder out of the bore and to thus define the forward limit of motion of the actuator.

4. Push button door latch operating mechanism of the character described, comprising: guide means having a bore therethrough and having an annular abutment at the front thereof projecting into the bore and defining a restricted mouth for the bore; an actuator in said bore including a sleeve-like casing constrained to back and forth sliding motion in the bore and having a shoulder thereon facing in the direction of the mouth of the bore, and a lock cylinder rotatable in said casing and having a shoulder facing and engageable with the shoulder on the casing for precluding rearward displacement of the cylinder out of the casing, said cylinder having a portion

at its front end projecting through the restricted mouth of the bore to provide a push button by which rearward motion may be imparted to the cylinder and the casing; an annular shoulder on the exterior of the cylinder ahead of the casing engageable with the annular abutment on the guide means to preclude forward displacement of the cylinder and casing out of the bore; an elongated operating shaft having one end projecting out of the rear of the guide means and having its forward end in the bore thereof adjacent to the rear of the casing; a connection between the casing and the operating shaft by which rearward motion of the actuator is translated into rearward endwise motion of the shaft, said connection including a bridging element interposed between the rear of the casing and the forward extremity of the shaft; a compression spring confined in said bore behind the casing; and means connected with the operating shaft for receiving the expansive force of the spring and for translating said force into forward thrust on the casing through said bridging element interposed between the rear of the casing and the shaft so that the spring yieldingly urges the casing and the cylinder forwardly in the bore toward a position defined by the engagement of the abutments on the cylinder and the guide means.

5 The latch operating mechanism of claim 4 further characterized by the provision of a sleeve inside the bore of the guide adjacent to the rear end thereof and in which the rear end portion of the compression spring is received, said sleeve having inwardly directed tangs at its rear end to provide a seat against which the spring reacts and having a plurality of outwardly and rearwardly directed tangs thereon projecting into holes in the wall of the guide means to anchor the sleeve thereto against the rearward thrust of the spring.

6 The door latch operating mechanism set forth in claim 5 wherein said sleeve has a longitudinal slit through the wall thereof and is biased toward a radially expanded position holding said outwardly and rearwardly directed tangs thereon securely seated in the holes in the wall of the guide means, and whereby the sleeve may be radially contracted sufficiently to permit its insertion into the bore of the guide means from the rear thereof.

7 The door latch operating mechanism of claim 4 further characterized by the provision of a rotation transmitting connection between the rear end portion of the lock cylinder and the adjacent end of the operating shaft affording the shaft a limited degree of universal motion relative to the cylinder.

8 Push button door latch operating mechanism of the character described, comprising: guide means having a bore therethrough; an actuator in said bore including a sleeve-like casing constrained to back and forth sliding motion in said bore, and a lock cylinder rotatable in said casing with a portion at its front end accessible at the front of the guide means to provide a push button by which rearward motion may be imparted to the cylinder and the casing; an elongated operating shaft having one end projecting out of the rear of the guide means and having its forward end in the bore thereof adjacent to the rear end portion of the casing; a jaw connection between the rear end of the cylinder and the adjacent forward end of the operating shaft through which the operating shaft may be rotated by the cylinder; means for translating inward depression of

the actuator into rearward endwise motion of the operating shaft comprising a U-shaped clip embracing the forward end portion of the operating shaft and extending from opposite sides of the cylinder into bridging engagement with the casing across the rear end thereof, and a cross pin projecting through a hole in the front end of the operating shaft and loosely received in aligned holes in the legs of the clip and the lock cylinder to pivotally connect the shaft with the cylinder; means defining a spring seat in said bore adjacent to the rear of the guide means; a compression spring confined in the bore of the guide means with its rear end engaging said spring seat; and means for translating the expansive force of said spring into a forward thrust on the casing through the operating shaft and said part thereon, whereby the spring yieldingly urges the actuator forwardly in the bore.

9 The door latch operating mechanism set forth in claim 8 further characterized by the provision of an annular member interposed between said pin and the front end of the compression spring for translating the expansive force of the spring into forward bias on the actuator through the pin, the shaft and the bight of the U-shaped clip, and whereby the spring holds the front extremity of the shaft firmly engaged with the bight of the U-shaped clip with sufficient friction as to enable the shaft to be yieldingly maintained in different positions of angular adjustment about the axis of the pin.

10 In a door latch operating mechanism of the character described: guide means having a bore therethrough; an actuator in said bore including a sleeve-like casing constrained to back and forth sliding motion in said bore, a portion of said actuator being accessible for manual actuation at one end of said guide means; an elongated operating shaft having one end projecting out of the opposite end of the guide means and having its forward end in the bore thereof adjacent to the rear of the actuator; means for translating rearward motion of the actuator in the bore into rearward endwise motion of the shaft comprising a bridging element connected with the front end portion of the shaft and bridging across the rear of the casing; a compression spring confined in said bore behind the casing; means connected with the operating shaft for receiving the expansive force of the spring and for translating said force into forward thrust on the actuator through said bridging element and the casing, said last named means including a pin connecting the operating shaft with the bridging member and the actuator for swinging movement of the shaft relative thereto; and a rounded front extremity on the shaft held in engagement with the bridging member by the compression spring with a force developing sufficient friction as to enable the shaft to be held by such friction in different positions of angular adjustment on the pin axis.

11 Push button door latch operating mechanism of the character described, comprising: elongated guide means having a bore therethrough; an actuator in said bore adjacent to the front end of the guide means, said actuator including a sleeve-like casing constrained to back and forth sliding motion in the bore, and a lock cylinder rotatable in the casing with a portion at its front end accessible at the front of the guide means to provide a push button by which rearward motion may be imparted to the actuator; an elongated operating shaft projecting

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into the bore of the guide means from the rear thereof; a rotation transmitting connection between the rear end portion of the cylinder and the front end portion of the operating shaft; means for translating rearward motion of the actuator into rearward endwise motion of the shaft comprising an element bridging across the rear end of the casing between it and the front extremity of the operating shaft, and means connecting the bridging element with the cylinder to rotate therewith but to move axially relative thereto toward and from engagement with the rear end of the casing; a compression spring in said bore encircling the shaft and having its rear end anchored to the guide means; means connected with the operating shaft for receiving the forward expansive force of the spring so that the spring urges the shaft forwardly into engagement with the bridging element to press the latter against the rear end of the casing, whereby the compression spring yieldingly holds the actuator in a forward position in the bore; and cooperating detent means carried by the rear end of the casing and the portion of the bridging element overlying the same to define different positions of rotation of the cylinder in the casing.

12. Push button door latch operating mechanism of the character described, comprising: guide means having a bore therethrough; an actuator in said bore adjacent to the front of the guide means and including a sleeve-like casing constrained to back and forth sliding motion in the bore, and a lock cylinder rotatable in the casing with a portion thereof exposed at the front of the guide means to provide a push button by which the actuator may be manually moved rearwardly in the bore; an elongated operating shaft having one end projecting out of the rear of the guide means and having its forward end in the bore thereof adjacent to the rear of the actuator; a rotation transmitting connection between the cylinder and the operating shaft providing for limited endwise movement of the shaft axially of the cylinder; bridging means on the front end portion of the shaft bridging across and engageable with the rear end of the casing to define the forward limit of motion of the operating shaft relative to the cylinder and by which rearward motion of the actuator is translated into rearward endwise motion of the operating shaft; a compression spring confined in said bore and encircling the operating shaft behind the actuator; means connected with the guide means providing an abutment against which the rear of the compression spring seats; means connected with the operating shaft for receiving the forward expansive force of the spring and by which the shaft is urged forwardly to carry the bridging means thereon into engagement with the rear end of the casing; and detent means on the rear end of the casing at different angular locations thereon engageable by said bridging means under the force of the compression spring for defining different positions of rotation of the lock cylinder and operating shaft.

13. The door latch operating mechanism set forth in claim 12 wherein said bridging means comprises a U-shaped clip having its legs connected with the cylinder to rotate therewith while permitting limited motion of the clip axially of the cylinder, said clip having its bight interposed between the front of the operating shaft and the rear end of the casing to be pressed against the latter by the expansive force of the spring acting upon the operating shaft; and fur-

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ther characterized by the fact that the operating shaft is pivotally connected with the lock cylinder to swing about an axis crosswise of the cylinder axis between the legs of the U-shaped clip, and has a rounded front extremity engaged with the bight of the clip under the force of the expansion spring so that the shaft may be held by frictional engagement between its front extremity and the bight of the clip in different positions of angular adjustment on the pin axis.

14. The door latch operating mechanism set forth in claim 12 wherein the rear end of the casing is provided with diametrically opposite notches engaged by the bridging element to define a key inserting and removing position of the cylinder, and has radial rotation stops spaced circumferentially from and at opposite sides of said diametrically opposite notches defining the limits of rotation of the cylinder, the rear edge of the casing sloping forwardly from said notches toward the rotation stops so that the compression spring yieldingly resists rotation of the lock cylinder toward the key inserting and removing position defined by engagement of the bridging means in said casing notches.

15. Push button door latch operating mechanism of the character described, comprising: guide means having a bore therethrough; an actuator in said bore adjacent to the front of the guide means and including a sleeve-like casing constrained to back and forth sliding motion in the bore, and a lock cylinder rotatable in the casing with a portion thereof exposed at the front of the guide means to provide a push button by which the actuator may be manually moved rearwardly in the bore; an elongated operating shaft having one end projecting out of the rear of the guide means and having its forward end in the bore thereof adjacent to the rear of the actuator; a rotation transmitting connection between the cylinder and the shaft including a loose hinge connection between the cylinder and shaft whereby the shaft may swing about an axis crosswise of the axis of the cylinder, relative thereto, said hinge connection permitting the shaft a limited degree of motion in a direction generally crosswise of the hinge axis; bridging means loosely connected with the forward end of the shaft to rotate with the shaft and the cylinder, said bridging means engaging across the rear end of the casing between the latter and the shaft to provide an axial thrust transmitting connection between the casing and the shaft; a compression spring confined in said bore and encircling the operating shaft behind the actuator; means on the guide means defining an abutment against which the rear of the compression spring seats; means connected with the operating shaft for receiving the forward thrust of the spring and by which the shaft is urged forwardly against said bridging means to hold the latter in engagement with the rear end of the casing, so that the spring urges the casing and consequently the actuator forwardly in the bore through the axial thrust transmitting connection between the casing and the shaft, and whereby the shaft is held engaged with the bridging means with sufficient friction therebetween as to enable the shaft to be yieldingly held in different positions of adjustment about the axis of its hinge connection with the cylinder; and detent means on the rear end of the casing engaged by the bridging member under the force of said compression spring for yieldingly holding the cylinder in an intermediate position of rotation and

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defining a swivel connection between the shaft and the casing permitting swinging of the shaft in a direction generally crosswise of its hinge axis, the force of the compression spring assuring sufficient friction at said swivel connection as to enable the shaft to be yieldingly held in different positions of angular adjustment thereabout.

16. In a push button door latch operating mechanism of the type having an endwise slidable actuator: an elongated operating shaft movable endwise with the actuator; a collar on the operating shaft a distance rearwardly of the actuator for transmitting endwise movement of the actuator and shaft in one direction to a latch mechanism to be operated; and a connection between the collar and the shaft by which the collar may be secured to the shaft in any one of a number of different positions along the length of the shaft, said connection including spaced teeth on the shaft, and means connected with the collar and releasably engaged with the shaft teeth to preclude lengthwise displacement of the collar relative to the shaft.

17. In a lock of the character described: a sleeve-like casing having a forwardly facing shoulder in its bore; a lock cylinder rotatable in the casing bore and having a rearwardly facing shoulder thereon to engage the shoulder on the casing for precluding rearward displacement of the cylinder out of the casing; an elongated operating shaft; means providing an end-to-end driving connection between the cylinder and the shaft, comprising laterally spaced jaws on the rear end portion of the cylinder extending rearwardly out of the casing from a point forwardly

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of its rear end, a front end portion on the shaft having flat sides and received between and loosely embraced by said jaws of the cylinder, and a pin connection between the shaft and said jaws providing for rocking motion of the shaft about an axis crosswise of the cylinder axis as well as limited lateral motion of the shaft; and a retaining member between the jaws and interposed between the front end of the shaft and the rear of the cylinder, said retaining member extending across the rear of the casing to preclude forward displacement of the cylinder out of the casing.

18. The lock of claim 17 further characterized by spring means acting upon the retaining member and an adjacent portion of the shaft to frictionally interconnect the same, whereby displacement of the shaft from a position in which its axis is substantially parallel to that of the cylinder is yieldingly resisted and the shaft may be maintained in any of a number of positions of angular misalignment reached by rocking the shaft about the axis of its pin connection with the cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,700,858	Segal -----	Feb. 5, 1929
1,874,877	Brauning -----	Aug. 30, 1932
2,174,200	Boland -----	Sept. 26, 1939
2,206,462	Jacobi -----	July 2, 1940
2,446,113	Spiller -----	July 27, 1948
2,468,644	Springer -----	Apr. 26, 1949