March 4, 1958 D. W. GLASS 2,825,220

REMOVABLE CYLINDER LOCK AND KNOB

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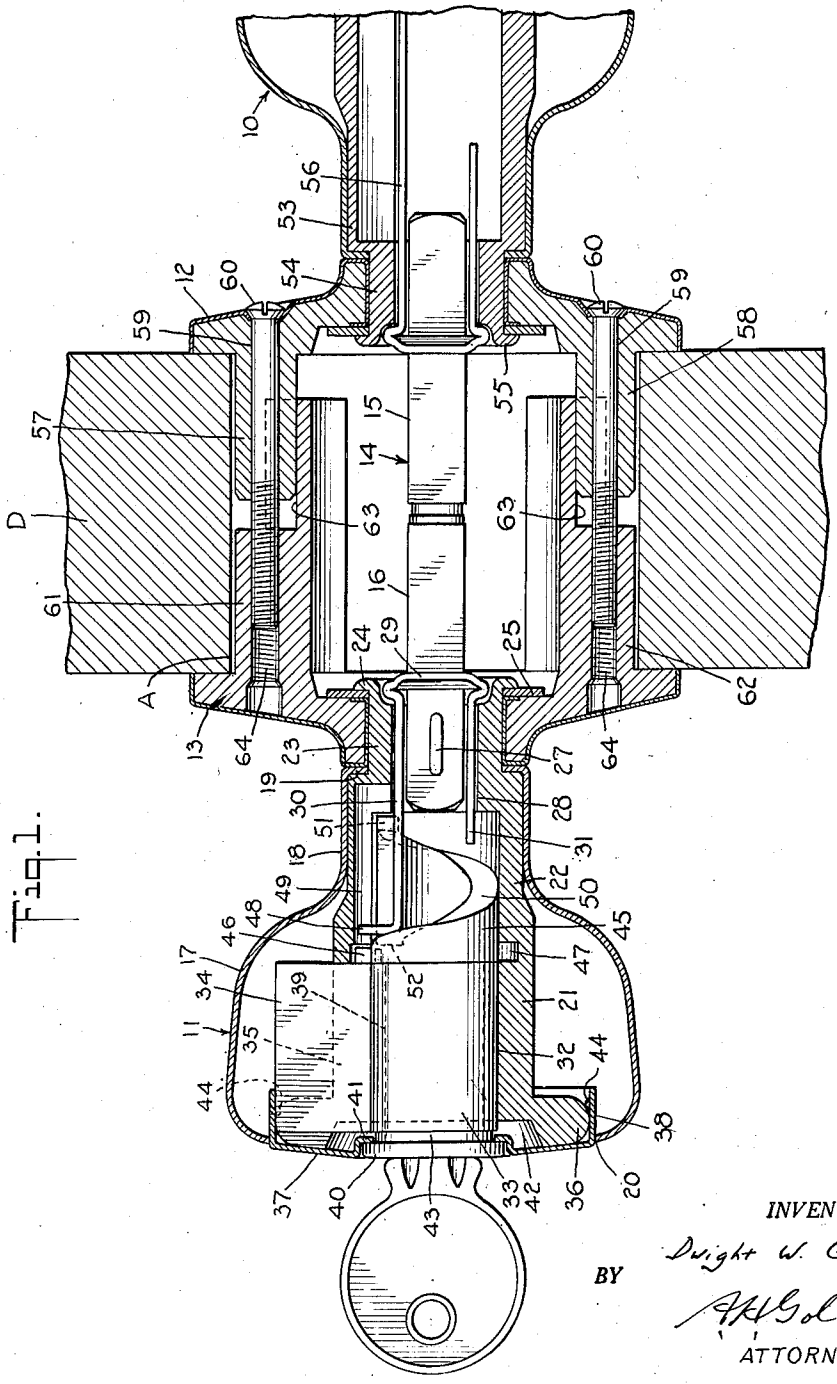


Fig. 1.

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Fig. 3.

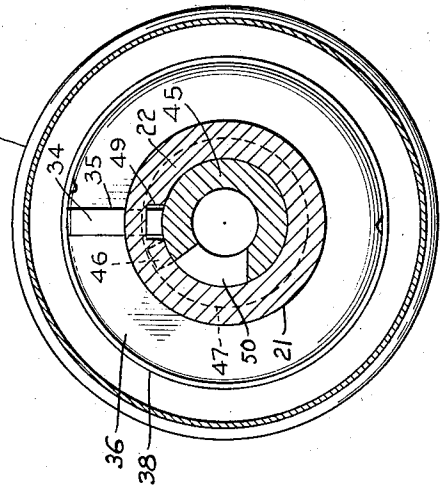


Fig. 4.

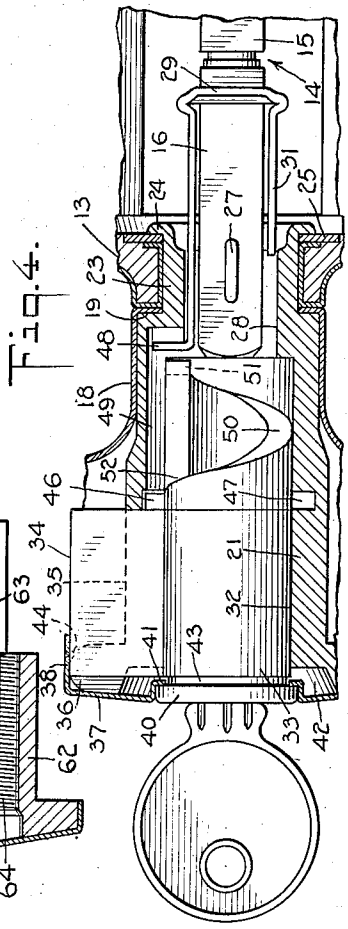
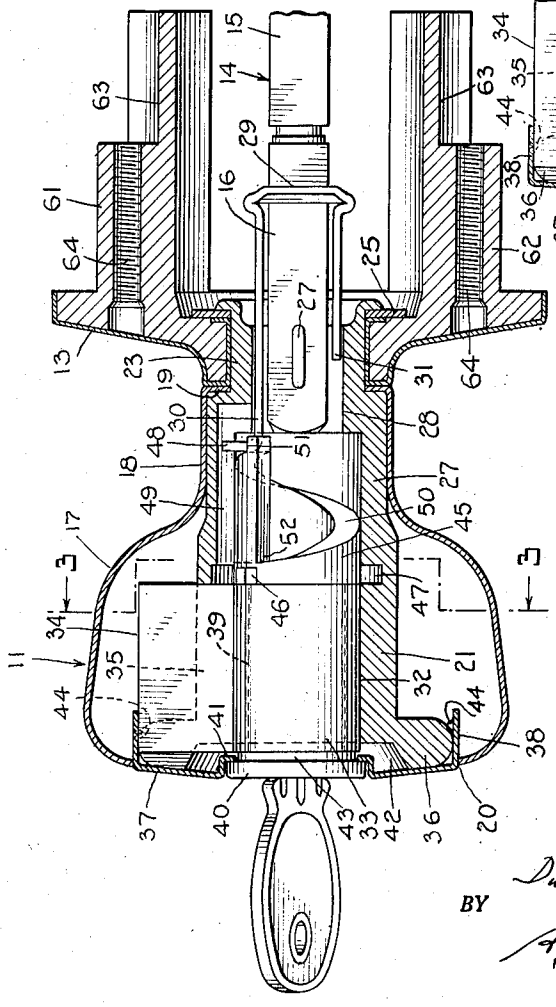


Fig. 2.



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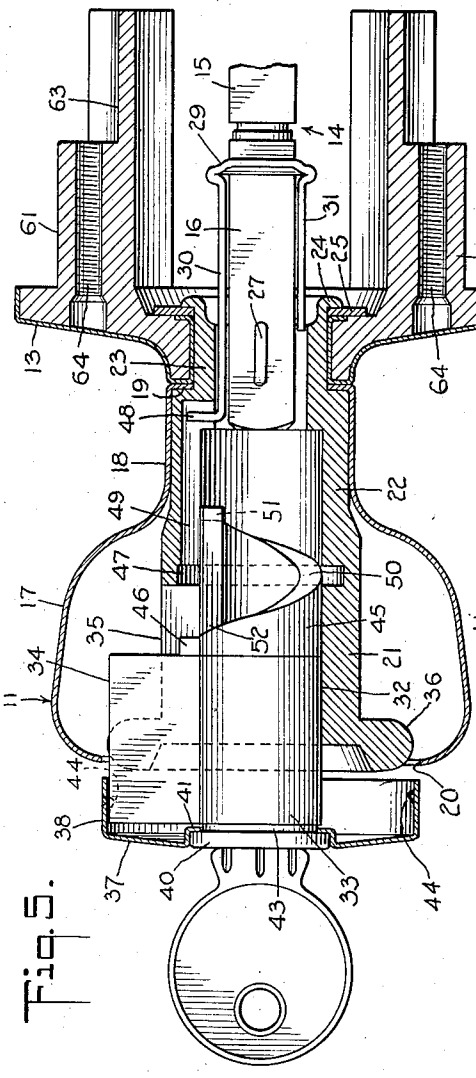


Fig. 5.

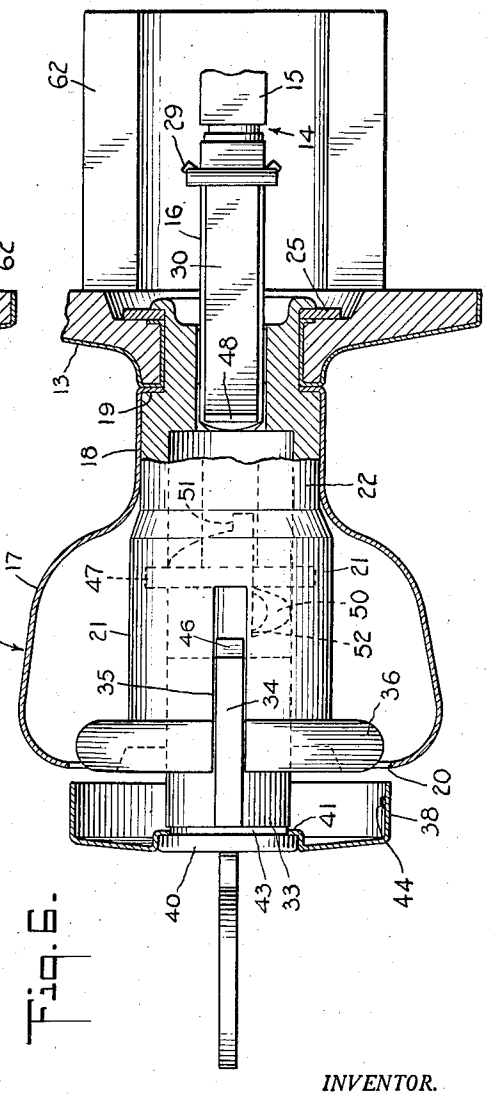


Fig. 6.

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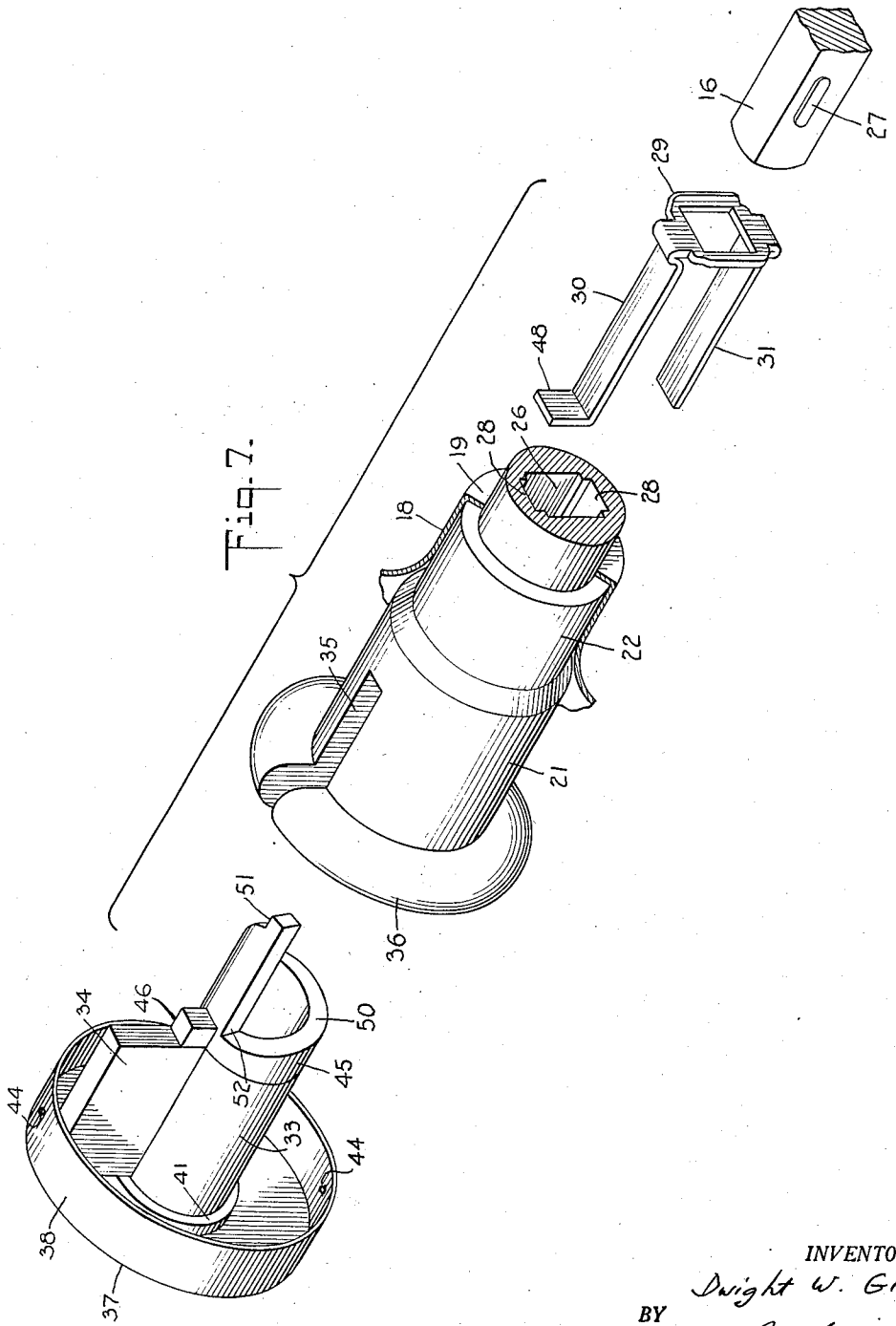


Fig. 7.

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2,825,220

REMOVABLE CYLINDER LOCK AND KNOB

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Application October 25, 1954, Serial No. 464,346

15 Claims. (Cl. 70—224)

This invention relates to locks of the class having an outside knob that is equipped with a key-actuated lock cylinder for operating a lock mechanism. I contribute by my invention a novel knob and rose construction for a lock of this class, including extremely novel means for assembling the lock cylinder to the outside knob.

In locks of the particular class, the key plug in the lock cylinder acts upon locking mechanism for the outside knob through the intermediary of an actuating member. As a feature of my invention, I utilize this actuating member to control the assembly of the lock cylinder to the outer knob. This actuating member normally prevents removal of the cylinder from the knob, but can be manipulated under proper circumstances to enable the cylinder and the key plug to be disassembled relatively to the knob. I prefer so to arrange the actuating member as to limit the rotating movement of the key plug. When its rotation is thus limited, the key plug holds the cylinder assembled to the knob. The actuating member can be moved out of limiting relation to the key plug if the knob is first removed from the lock. It is then possible to rotate the key plug to a position that allows the plug, together with the cylinder, to be removed from the knob.

As a further feature, I utilize for the outer knob a one-piece shell, and also an insert for that shell that may take the form of a sleeve. This insert or sleeve is used for supporting the lock cylinder within the shell. I form the front end of the shell with an opening through which the lock cylinder and its bible are inserted into the sleeve, and I utilize a cap to cover the cylinder and bible when in assembled position. As a particular feature of this part of the invention, I arrange the key plug to retain the cap relatively to the knob.

Another feature resides in the novel construction whereby I facilitate the assembly of the lock parts in properly aligned position. I mount the knob roses on opposed sides of the door through screws extending between the roses. I form the inner rose with relatively long bores for the screws, whereby the inner rose supports the screws in aligned relation to threaded bores in the outer rose to facilitate assembly of the lock. I prefer to form the roses with parts that slide relatively to each other, these parts actually aligning the bores for the screws, and acting together with the screws to align the roses when assembled. Each knob has relatively long bearing surfaces in its rose, and the spindle is assembled with a force fit to the outer knob, thereby holding the spindle in rather precisely aligned relation to each knob and rose.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the

conception on which my dislosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

In the drawings:

Fig. 1 is a longitudinal section showing my novel lock construction.

Fig. 2 is similar to a portion of Fig. 1, but shows the key plug rotated to depress the actuator for the locking mechanism.

Fig. 3 is a cross section on the line 3—3 in Fig. 2.

Fig. 4 is similar to Fig. 2, but with the key plug further rotated to a position that enables the lock cylinder to be removed from the knob.

Fig. 5 shows the cylinder partly removed from the knob.

Fig. 6 is a plan view of Fig. 5.

Fig. 7 shows parts of the lock in exploded relation.

Referring now more particularly to Fig. 1 of the drawings, I show at 10 and 11 the inside and outside knobs of my extremely novel lock construction. Knobs 10 and 11 are mounted to rotate at opposed sides of the door D on roses 12, 13 that are in themselves novel, and that I shall describe fully in due course. In the particular form of my invention that I have chosen to illustrate, I utilize between the inside and outside knobs 10 and 11 a sectional spindle 14 of the type shown in the Heyer application, Serial No. 154,319, filed April 6, 1950, now Patent No. 2,743,600, having square spindle sections 15, 16, that rotate relatively to each other in aligned relation. Each knob, 10 and 11, acts through its corresponding spindle section 15 or 16, as in Heyer, to retract a latch bolt, not shown.

In the extremely novel lock construction that I have now conceived, I utilize for the outside knob 11, a one-piece hollow shell 17 that has at its inner end a sleeve portion 18 with an inwardly directed flange 19, and at its front end a relatively large opening 20. I assemble a die cast insert sleeve 21 to the shell 17 through its front opening 20. This sleeve 21 has an intermediate portion 22 positioned against the flange 19 and integrally secured, preferably through a force fit, within the knob sleeve 18. The inner end portion 23 of the insert sleeve is of somewhat smaller diameter than the portion 22, and extends a considerable distance past the flange 19 to provide a rather long bearing surface for mounting the knob 11 on the outside rose 13. To retain the knob relatively to the rose, the inner end portion 23 of the insert sleeve is formed initially with a lip 24, and this lip is pressed outwardly to overlie a washer 25 at the inner side of the rose after the knob is assembled to the rose.

The inner end portion 23 of the insert sleeve 21 is formed with an axial opening 26, best seen in Fig. 7, to receive the square spindle section 16. I secure the spindle section 16 in opening 26 with a force fit, so that the spindle remains permanently assembled to the outside knob in axially aligned relation thereto. For the particular purpose, I form splines 27 on two opposed sides of the spindle section 16. It may be observed at this point that the opening 26 in the insert sleeve is formed with longitudinal grooves 28, Fig. 7, that are intermediate those sides of opening 26 that coact with the splines 27. I utilize these grooves 28 to hold the opposed arms 30, 31 of an actuator or push piece 29 that slides on the spindle section 16. It will be sufficient here to state merely that the push piece 29 enables a key plug in the outside knob 11 to actuate locking mechanism for the knob, as in the Heyer application to which I have already re-

ferred. I shall presently describe in detail the extremely novel structure through which the push piece 29 and key plug coact with each other.

Referring again to Fig. 1, it will be seen that I form the insert sleeve 21 with a large bore 32 extending inwardly from its outer end. A lock cylinder 33, having the usual laterally extending bible 34, is adapted to be inserted into the bore 32 through the opening 20 in the front end of the knob shell 17, with the bible 34 moving in a slot 35 in one side of the insert sleeve 21. I further form sleeve 21 with a head 36 that is in approximately flush relation to the front end of the knob, the slot 35 being extended through this head to receive the bible 34. I utilize the head 36 on insert sleeve 21 to support a cap 37 for closing the front end opening 20 of the knob. This cap 37 is formed with a circular flange 38 that encircles the head 36, and that fits rather closely within the knob opening 20. I prefer to form the circular flange 38 with small inward projections 44, Figs. 1 and 7, that are adapted to snap over the head 36 on insert 21 whereby the cap 37 fits snugly upon the head 36.

The cap 37 has also a central opening for the key plug 39, and I arrange a particular coaction between the cap and key plug to retain the cap in assembled position. For the particular purpose, I form the key plug 39 at its outer end with a flange 40 that overlies a part 41 of the cap 37 around its central opening. I prefer to offset the part 41 of the knob cap 37 inwardly to be positioned in a recess 42 in sleeve 21, as clearly shown in Fig. 1, whereby to enable the outer end of the key plug 39 with its flange 40 to be substantially flush with the outer surface of the cap 37. I prefer also to make the key plug flange 40 relatively small, with a groove 43 formed on the outer end of the lock cylinder 33 to enable the part 41 to extend behind the flange 40. Through the arrangement that I have described, the knob cap 37 is assembled actually to the key plug 39, and is held by the key plug in assembled position on the knob when the key plug and its cylinder are assembled to the knob.

I shall now proceed to describe the extremely novel means whereby I prevent the removal of the key plug 39 and lock cylinder 33 from the outer knob 11, while enabling the removal of the plug and cylinder under certain conditions. I equip the key plug 39 at its inner end with a portion 45 that extends axially beyond lock cylinder 33. Upon this portion 45 at the inner end of cylinder 33 is a lug 46 that projects beyond the periphery of cylinder 33. I form the interior of the insert sleeve 21 with a circular groove 47 in which the lug 46 moves, and the lug is adapted by its position in this groove to hold the key plug 39, and therefore the lock cylinder 33 in assembled position in the knob. The groove 47 does, however, communicate with the longitudinal slot 35 in the sleeve 21, and if by rotation of the key plug the lug 46 is permitted to align with the bible 34, as in Fig. 4, this lug can move outwardly through slot 35 in the manner shown in Figs. 5 and 6. I particularly arrange a novel coaction between the key plug 39 and push piece 29 that holds the lug 46 normally out of aligned relation to the bible 34, so that the key plug 39 and lock cylinder 33 cannot be removed from the knob.

It will be observed that the leg 30 on the push piece 29 is considerably longer than the leg 31, and can therefore extend a considerable distance into the bore 32 of the insert sleeve 21. The leg 30 of the push piece 29 has at its end an angular portion 48 that moves in a longitudinal slot 49 in the interior of the sleeve 21 as the push piece 29 slides on the spindle 14. This slot 49, together with the grooves 28 on the inner end portion 23 of the insert sleeve, hold the push piece 29 in an axially aligned position in the knob. The key plug portion 45 has a cam surface 50 adapted to rotate in contact with the angular end 48 on push piece 29, whereby the key plug 39 when rotating in one direction slides the push piece 29 inwardly on the spindle section 16 for operating lock mechanism within the lock. Referring particularly to Fig. 2, it will be observed further that I form at one end of the cam surface 50 a stop surface 51. I form also a stop surface 52 at the opposed end of the cam surface 50. Through rotation of the key plug 39 to either locking or unlocking position, one or the other of the stop surfaces 51, 52 is brought into engagement with the angular end 48 on the push piece 29, and the push piece thereby limits further rotation of the key plug.

It is extremely important to note that the retaining lug 46 is so positioned, relatively to the surface 51 and surface 52, that the lug 46 cannot move into aligned relation to the bible 34. In other words, through coaction with stop surfaces 51, 52, the push piece 29 holds lug 46 out of aligned relation to release slot 35 in the insert sleeve 21. Through this arrangement, therefore, the push piece 29 prevents removal of the lock cylinder 33 from the outside knob 11. Upon removal of the outside knob 11 and rose 13 from the door D, however, the push piece 29 is accessible and can be slid inwardly on the spindle section 16 to the position shown in Fig. 4. In this position of push piece 29, its angular end 48 no longer limits the rotation of the key plug 39, thus enabling the lug 46 to be aligned with slot 35 so that the lock cylinder 33, together with the plug 39 and knob cap 37, can be removed from the knob, as shown in Figs. 5 and 6.

The inside knob 10, as I have illustrated this knob in Fig. 1, has a construction that is somewhat similar to that of the outside knob 11, with an insert 53 that has a relatively long bearing portion 54 in the inside rose 12, and a lip 55 that holds the knob permanently assembled to this rose. I show also a push piece 56 on inside knob 10, but this push piece merely acts as in the Heyer application referred to above, and is not important to an understanding of my invention.

I shall now describe the extremely novel means through which I assemble the inside and outside knobs 10 and 11, together with their roses 12, 13, in rather precisely aligned relation to one another upon the door D. I form the inside rose 12 with a pair of arms 57, 58 to extend within the transverse opening A in the door. I utilize a pair of screws 60 for assembling the roses 12, 13 against the opposed sides of the door, and I particularly form the arms 57, 58 on the inner rose 12 with relatively long plain bores 59 for these screws 60. Due to their length, bores 59 hold the screws 60 in predetermined aligned positions on the rose 12. Upon the outside rose 13 I form a pair of inwardly extending portions 61, 62 corresponding to the arms 57, 58 on the inside rose 12. I construct the outside rose portions 61, 62 with guide surfaces 63 for overlapping the arms 57, 58. The outside rose portions 61, 62 in addition have threaded bores 64 for the screws 60.

Through this arrangement, the inside and outside roses 12, 13 are held in aligned relation to each other when being assembled upon the door, with the threaded bores 64 aligned relatively to the bores 59 in the inside rose. Because the bores 59 are constructed to hold the screws 60 in predetermined aligned positions, these screws are piloted relatively to the threaded bores 64 and can very readily be driven into position to assemble the inside and outside roses 12, 13 to the door. The roses are then in aligned relation to each other, and through the relatively long bearing portions 23, 54 on the knobs, the knobs are also in aligned relation to each other. Moreover, because the knob spindle 14 is assembled with a force fit to the outside knob 11, this spindle is aligned relatively to the inside knob 10.

I believe that those skilled in the art will now understand that I contribute by my invention a novel lock construction in which the lock cylinder is retained very

securely in the outside knob of the lock, but that enables the lock cylinder nevertheless to be easily removed under the proper circumstances. Moreover, I am able to utilize for the outside knob a one piece knob shell. In the particular construction, a lock cylinder is assembled and disassembled relatively to the outer knob through a rather simple operation, with the particular assembly of the knob cap to the lock cylinder facilitating this operation. In addition, my extremely novel construction actually facilitates the mounting of the knobs and roses on the door, with these knobs and roses in predetermined aligned relation to one another. I believe, therefore, that the very considerable advantages of my invention will be fully appreciated.

I now claim:

1. In a combination of the class described, a knob, a cylinder within said knob, a key plug rotatable relatively to said cylinder, a push piece mounted for movement in an axial direction relatively to the knob, means through which said key plug is effective upon rotation thereof relatively to said cylinder to move the push piece axially, means whereby said push piece limits the rotation of said key plug, means for releasing the key plug and cylinder for movement outwardly of the knob when said key plug is rotated beyond the position to which it is limited by said push piece, and said push piece movable out of limiting relation to the key plug when the knob and cylinder together with the push piece are out of assembled relation to a locking mechanism operated by the push piece.

2. In a combination of the class described, a knob, a key plug rotatable in said knob, a push piece mounted for movement in an axial direction relatively to the knob, means through which said key plug is effective upon rotation thereof relatively to said knob to move the push piece axially, means whereby said push piece limits the rotation of said key plug, means for releasing the key plug for movement outwardly of the knob when said key plug is rotated beyond the position in which it is limited by said push piece, and said push piece movable out of limiting relation to the key plug when the knob and push piece are out of assembled relation to a locking mechanism operated by the push piece.

3. In a combination of the class described, a housing portion, a knob mounted to rotate relatively to said housing portion, a cylinder within said knob, a key plug rotatable in said cylinder, a lock actuating member rotating with the knob relatively to said housing portion and movable relatively to the knob, means through which said key plug moves the lock actuating member relatively to the knob upon rotation of the plug relatively to said cylinder, means whereby said member limits the rotation of said key plug, means for releasing the key plug and cylinder for movement outwardly of the knob when said key plug is rotated beyond the position to which it is limited by said lock actuating member, said member movable out of limiting relation to the key plug when the knob and cylinder together with the said member are out of assembled relation to a locking mechanism operated by the member.

4. In a combination of the class described, a rose, a knob mounted to rotate relatively to said rose, a cylinder within said knob, a key plug rotatable relatively to said cylinder, a push piece rotating with the knob relatively to said rose and movable relatively to the knob, means through which said key plug moves the push piece relatively to the knob upon rotation by the plug relatively to said cylinder, means whereby said push piece limits the rotation of said key plug, means for releasing the key plug and cylinder for movement outwardly of the knob when said key plug is rotated beyond the position to which it is limited by said push piece, and said push piece movable out of limiting relation to the key plug when the knob and cylinder together with the push piece are out of assembled relation to a locking mechanism operated by the push piece.

5. In a combination of the class described, a knob, a cylinder within said knob, a key plug rotatable relatively to said cylinder, a push piece mounted for movement in an axial direction relatively to the knob, means through which said key plug is effective upon rotation thereof relatively to said cylinder to move the push piece axially, means whereby said push piece limits the rotation of said key plug, a lug on said key plug, said knob having therein a slot with which said lug is aligned when said key plug is rotated beyond the position to which it is limited by said push piece whereby to release the key plug and cylinder for movement outwardly of the knob, and said push piece movable out of limiting relation to the key plug when the knob and cylinder together with the push piece are out of assembled relation to a locking mechanism operated by the push piece.

6. In a combination of the class described, a knob, a cylinder within said knob, a key plug rotatable relatively to said cylinder, a lock actuating member, cam means through which said key plug moves the lock actuating member in an axial direction relatively to the knob upon rotation of the key plug relatively to said cylinder, coacting surfaces on said key plug and actuating member limiting the rotation of said key plug, means for releasing the key plug and cylinder for movement outwardly of the knob when said key plug is rotated beyond the position to which it is limited by said coacting surfaces, and said lock actuating member movable to place said surfaces out of limiting relation to each other when the knob and cylinder together with the actuating member are out of assembled relation to a lock mechanism operated by the actuating member.

7. In a combination of the class described, a knob, a cylinder within said knob, a key plug rotatable relatively to said cylinder, a lock actuating member, means through which said key plug acts upon rotation thereof relatively to said cylinder to move the lock actuating member in an axial direction relatively to the knob, a stop surface on said key plug through which the plug engages the lock actuating member to limit the rotation of the key plug in one direction, a stop surface through which the key plug engages the lock actuating member to limit the rotation of the key plug in the opposed direction, means for releasing the key plug and cylinder for movement outwardly of the knob when said key plug is rotated in a particular direction beyond the position at which it is limited by the corresponding stop surface, and said lock actuating member movable out of coacting relation to at least one of said stop surfaces when the knob and cylinder together with the lock actuating member are out of assembled relation to a lock mechanism operated by the lock actuating member.

8. In a combination of the class described, a knob, a lock cylinder, a key plug rotating in said cylinder, support means for said cylinder and key plug in the knob, said knob having an open front end through which the cylinder and key plug move into supported position in the knob, a cap for closing said knob opening, and overlying all of the cylinder with the exception of said key plug, a portion on said cylinder support means shaped to coact with said cap, and a part of said key plug overlying the cap to retain the cap relatively to said cylinder with the cap supported on said portion of the support means.

9. In a combination of the class described, a knob, a lock cylinder, a key plug rotating in said cylinder, support means secured to said knob for supporting said cylinder and key plug in the knob, said knob having in its front end an opening through which the cylinder and key plug move into supported position in the knob, a cap for covering said knob opening and overlying said cylinder with the exception of said key plug, a

portion on said cylinder support means shaped to support said cap when the cap is assembled to the knob, a head on said key plug overlying a part of the cap, a lug on the key plug for fitting against a surface of said support means to hold the key plug, cylinder, and cap in assembled relation to the knob, an end slot for the lug in said support means to allow the key plug, cylinder, and cap to move into and out of assembled position, and means for holding said key plug against movement to bring said lug into register with said end slot during normal rotation of said key plug relatively to said knob.

10. In a combination of the class described, a knob having an insert, a lock cylinder, a key plug rotating in said cylinder, said knob having in its front end an opening through which the cylinder and key plug move into assembled position relatively to said insert, a lock actuating member, a cam on the key plug for moving the lock actuating member as the key plug rotates in assembled position, a lug on the key plug for engaging relatively to a retaining surface of said insert whereby to hold the key plug and cylinder assembled to the insert, an end slot for the lug in the insert to allow the key plug and cylinder to move into and out of assembled position in the knob, and means for coacting with the lock actuating member to limit the rotating movement of the key plug to positions in which the lug on the key plug is juxtaposed to the retaining surface of the insert and out of aligned relation to the end slot.

11. In a combination of the class described, a knob insert, a sheet metal knob secured about said knob insert, said sheet metal knob formed at its front end with an opening to allow a lock cylinder to be inserted into assembled relation to the insert, a lock cylinder for assembly to said knob and insert including a key plug, a cap formed to fit the knob opening and supported loosely on said cylinder, a portion on said knob insert shaped to accept said cap, and means acting when said cylinder and cap are inserted into said opening to secure the cap to the knob and said portion of the insert.

12. In a combination of the class described, inner and outer knob roses relatively long portions on said inner rose adapted to be positioned in an opening in a door to extend toward the outer rose when the roses are against the opposed surfaces of the door, a screw for each of said inner rose portions, a bore in each of the said relatively long rose portions formed to support the corresponding screw at opposed ends of the portion whereby to hold the screw in predetermined aligned relation to the inner rose, and threaded bores in the outer rose adapted to receive said screws for assembling the roses relatively to one another and to the door.

13. In a combination of the class described, inner and outer knob roses, relatively long portions on said inner rose adapted to be positioned in an opening in a door to extend toward the outer rose when the roses are against the opposed surfaces of the door, portions on the outer rose in guide relation to the said relatively long inner rose portions, screws for assembling the roses to each other, a bore for a screw formed through each of said inner rose portions, a threaded bore in each outer rose portion, the first bores supporting the screws at opposed ends of the relatively long inner rose portions whereby to hold the screws in predetermined aligned relation to the threaded bores, a knob for each rose, bearing surfaces of substantial length on which each knob rotates relatively to its rose, and said bearing surfaces together with the guide relation between said inner and outer rose portions holding each knob in predetermined alignment with the opposed knob.

14. In a combination of the class described, inner and outer knob roses, relatively long portions on said inner rose adapted to be positioned in an opening in a door to extend toward the outer rose when the roses are against the opposed surfaces of the door, portions on the outer rose in guide relation to the said relatively long inner rose portions, screws for assembling the roses to each other, a bore for a screw formed through each of said inner rose portions, a threaded bore in each outer rose portion, the first bores supporting the screws at opposed ends of the relatively long inner rose portions whereby to hold the screws in predetermined aligned relation to the threaded bores, a knob secured to each rose for rotation relatively thereto, a spindle having opposed ends rotating with the corresponding knobs, means whereby the spindle is secured with a force fit to one knob, bearing surfaces of substantial length through which each knob is supported on its rose, and said bearing surfaces together with the force fit of the spindle holding both knobs and the spindle in aligned relation to one another.

15. In a combination of the class described, a knob, a cylinder within said knob, a key plug rotatable relatively to said cylinder, a push piece, cam means through which said key plug moves the push piece upon rotation of the key plug relatively to said cylinder, coacting surfaces on said key plug and push piece limiting the rotation of said key plug, a lug on said key plug moving in a circular slot in said knob to hold the key plug and cylinder within the knob, a longitudinal slot in said knob communicating with said circular slot, said longitudinal slot formed to lie out of aligned relation to said lug when the lug is in any position to which it can move with the key plug rotation limited by said coacting surfaces, said push piece movable to place said surfaces out of limiting relation to each other when the knob and cylinder together with the push piece are out of assembled relation to a lock mechanism operated by the push piece, and said surfaces when so placed out of limiting relation enabling the key plug to align its lug with said longitudinal slot so that the lug can move in that slot to allow removal of the key plug and cylinder from the knob.

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