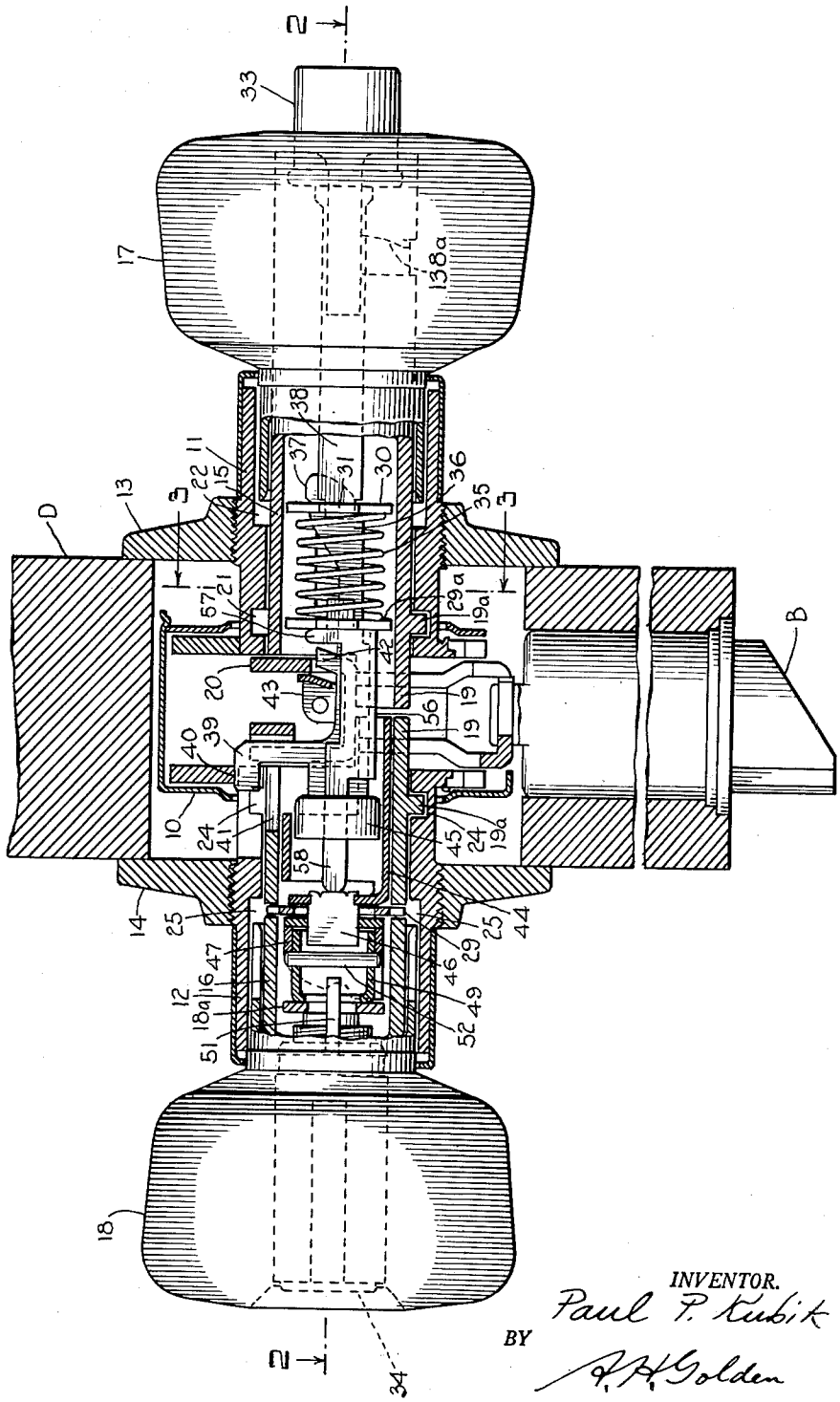
May 9, 1961 P. P. KUBIK 2,983,537

CYLINDRICAL LOCK

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Fig. 1.



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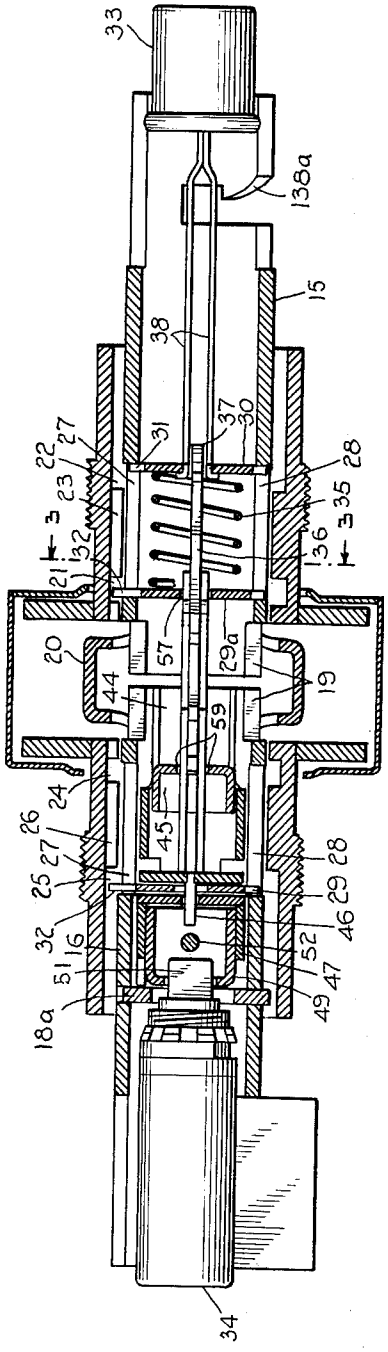
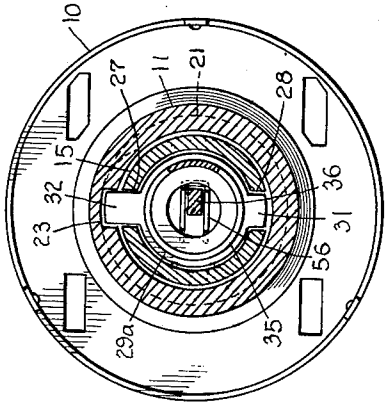


Fig. 2.

Fig. 3.



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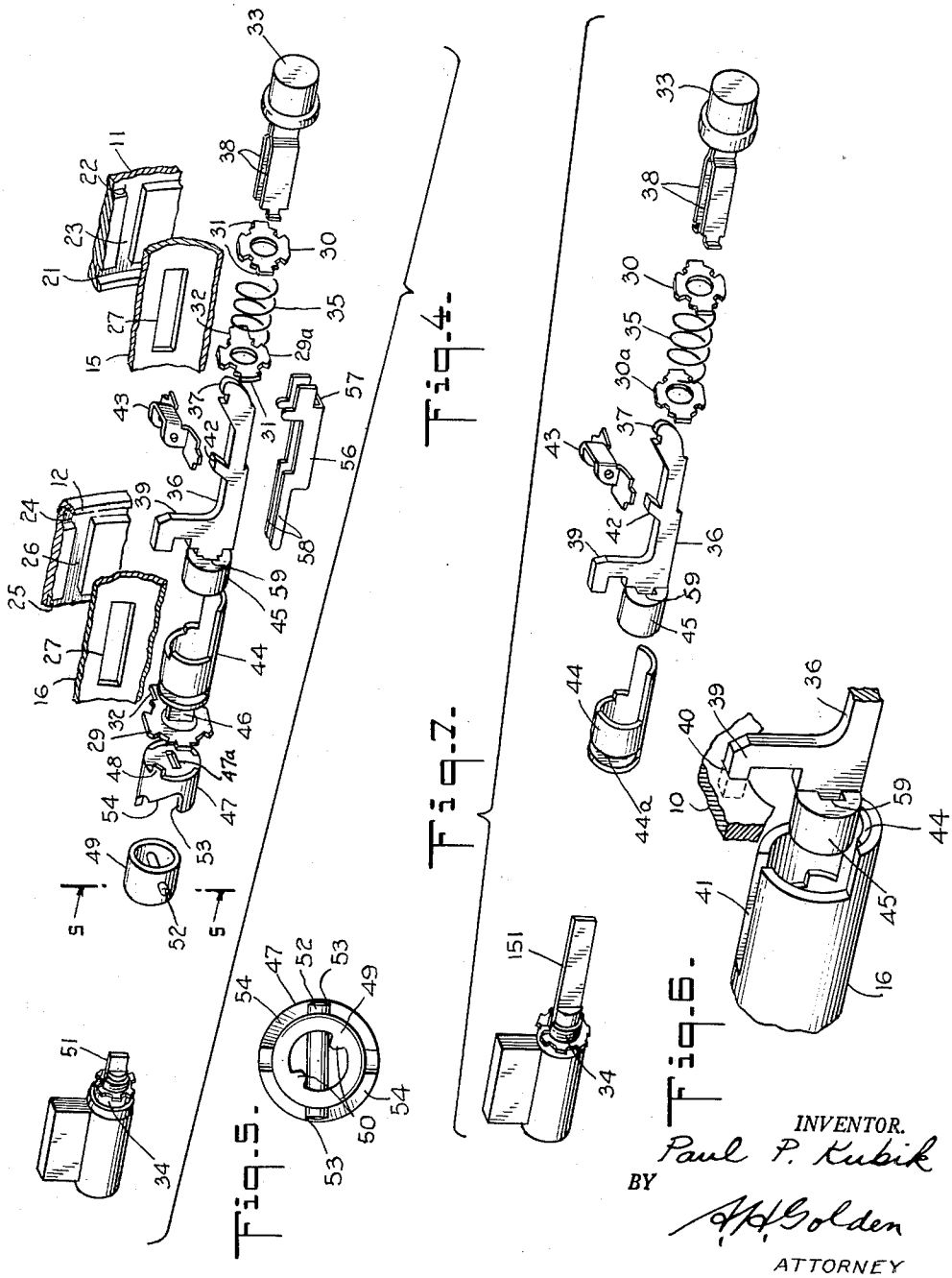


Fig. 5.

Fig. 4.

Fig. 7.

Fig. 6.

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Fig. 8.

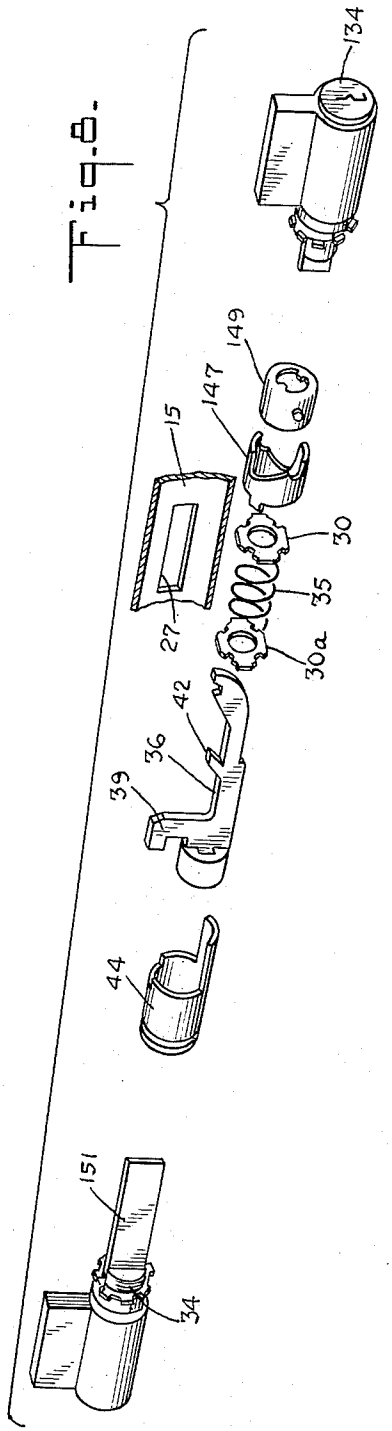
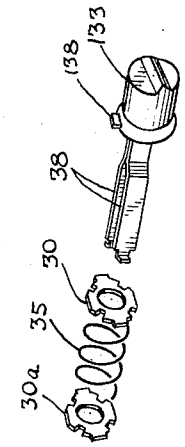


Fig. 9.



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Fig. 10.

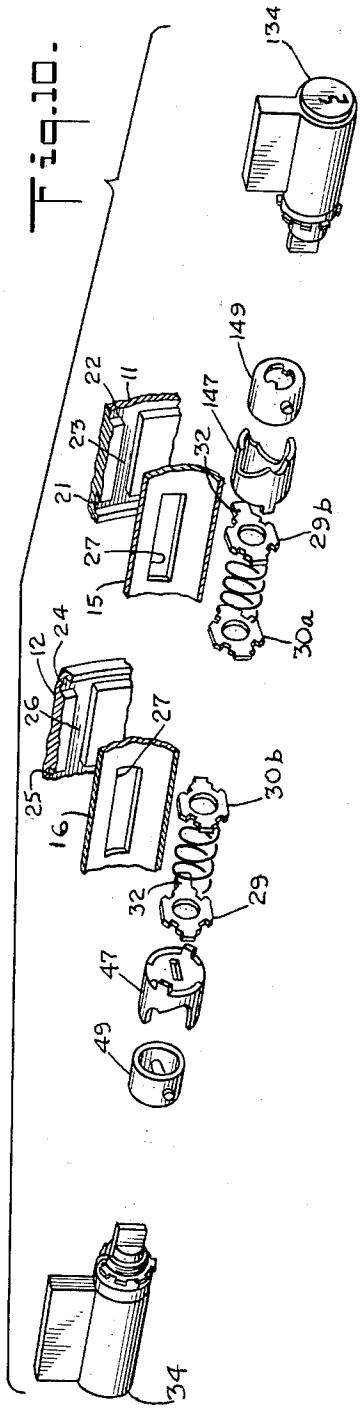


Fig. 12.

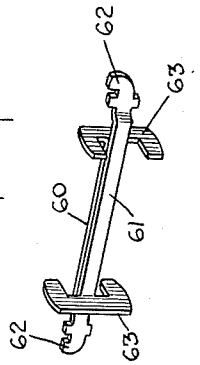
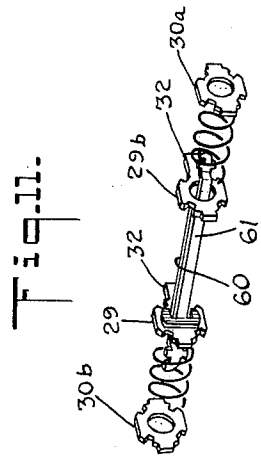


Fig. 11.



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Fig. 15.

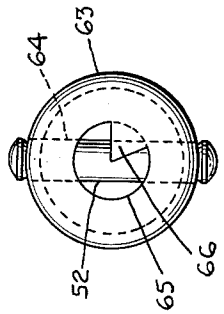


Fig. 14.

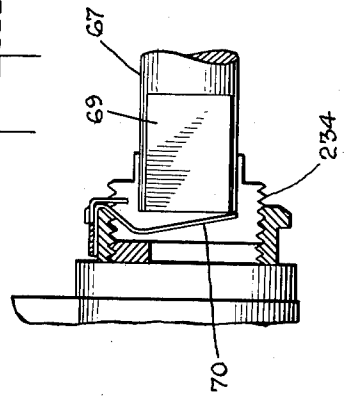
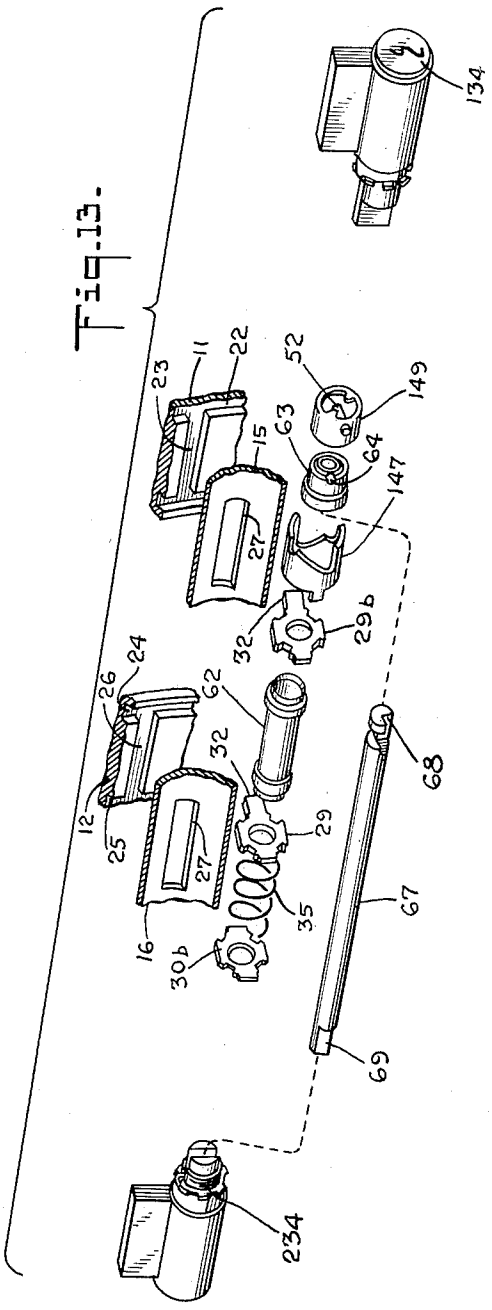


Fig. 13.



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2,983,537

CYLINDRICAL LOCK

Paul P. Kubik, Philadelphia, Pa., assignor to The Yale & Towne Manufacturing Company, Stamford, Conn., a corporation of Connecticut

Filed Sept. 14, 1956, Ser. No. 609,845

9 Claims. (Cl. 292—169)

This invention relates to a cylindrical lock of the type in which a housing is utilized for mounting separate inside and outside knobs, the two knobs in turn operating spindles that are preferably in the form of sleeves. In the lock casing there is provided a bolt retractor that is adapted to be moved to retracted position by rotation of either of the spindle sleeves by its corresponding knob.

In locks of the particular class, it is important to provide numerous operating functions. Thus, in some locks it is necessary that the inside knob carry a push button which when depressed locks the outside knob against rotation, the rotation of the inside knob thereafter releasing the outside knob for free rotation. This may be varied by using a turn button which will not be released. Further, in the locks that so utilize a push button or turn button, it very frequently is necessary to equip the outside knob with a key actuated cylinder for retracting the bolt retractor when that knob is locked by the button. Somewhat like those locks are others that will have emergency release means on the outside knob in place of the key actuated cylinder.

In another type of lock operation, the inside or outside knob, or both knobs, will be equipped with locking mechanism that will effect both the locking and the unlocking of a knob. That knob in some instances will be the same knob on which the locking mechanism is mounted, and in other instances will be the opposed knob. In another type lock it may be necessary so to arrange the locking mechanism that when the mechanism on one knob is operated both knobs will be locked against rotation.

As a matter of fact, in commercial locks of the particular class there are actually more than twenty different types of operation involving the locking or unlocking of the inside and outside knobs and the release of the knobs in all sorts of combinations. This is all very necessary because locks of the particular class are adapted for use on store doors, communicating doors, classroom doors, service station rest rooms, and on various other doors found in commercial buildings, institutional buildings, homes and the like. In other words, it is extremely important to provide a lock of the particular class in which the inside and outside knobs may be variously equipped with push buttons, turn buttons, pin tumbler cylinders or the like for contributing extremely varied types of controls and interlocks, all as those skilled in the art will fully appreciate.

It is obvious that in commercial practice, it is not feasible to manufacture a particular lock for each type of operation. Rather, it is important to manufacture a lock in such fashion that it may lend itself to varying operations as the situation may demand, and with little change of parts. Naturally, to provide the numerous operating combinations is a task of great magnitude, and much ingenuity and effort has been devoted to the development of a lock that will operate to give the different controls that are necessary for all the particular and varied operations that are required, while yet maintaining the parts simple and few in number.

I believe that I have contributed at this time a novel locking mechanism of the particular class described in which there is utilized an extremely effective concept that enables me to obtain numerous locking and operating combinations with very simple mechanism. This mechanism by its arrangement is adapted to yield every type of operation required in locks of the class here discussed.

Thus, as a feature of my invention I contribute a mechanism requiring but few operating parts, with those parts very simple in form and adapted easily to be assembled in a wide number of combinations to yield all of the intricate operations that are required.

In essence, my invention resides in the utilization of a lock housing having opposed bearing portions in the form preferably of sleeves in which rotate the outside knob and its sleeve-like rotating spindle and the inside knob and its sleeve-like rotating spindle. I equip one or both spindles with sliding members, which may be in the form of washers, pins, or the like. I can arrange these washers or equivalent members to perform several different functions, whereby to control the spindles against rotation in varying combinations. As a part of this control, I provide each housing sleeve with a locking portion, preferably a groove. These grooves may be quite short, although the length is not critical. I can then form one or more of the washers as a locking washer, with a part for coacting with the grooves. By providing means for sliding these washers or equivalent members relatively to the spindles, I can bring the locking washers into a position in the locking grooves of the housing sleeves, or outwardly of the locking grooves of the housing sleeves. When a washer is in a groove, the spindle carrying the washer is obviously locked against rotation. In this way, it is possible for me to obtain many combinations and permutations for varying operations.

Thus, if I provide means carried by the inside knob for moving the washer carried by the inside spindle sleeve into locking position or out of locking position, I control merely the inside knob. If I provide means extending from the inside knob through to the washer carried by the outside knob spindle sleeve, then I can from the inside knob control the locking or unlocking of the outside knob. It is possible to reverse the operation by providing means carried by the outside knob for controlling either the outside knob spindle washer or the inside knob spindle washer. Naturally, it is possible to operate the washers from the inside knob either by the key plug of a pin tumbler cylinder, a turn button, push button, or the like, and it is similarly possible to operate the locking washers from the outside knob by a key plug, push button, turn button or the like. It is also possible to couple the washers of the inside and outside knobs so that the two may be operated together to lock both knobs simultaneously or to release both knobs simultaneously, again through turn button, push button or pin tumbler cylinder.

My invention enables me not only to utilize the locking washers or their equivalent in the manner described, but also to assemble in the lock a push button actuated locking stem that will contribute to the operation of the conventional stems of that type. Thus, the locking stem when used as a part of the lock assembly can be actuated from the inside knob to lock the outside knob, and while so locking the outside knob will permit a pin tumbler cylinder on that knob to be utilized for imparting bolt retracting movement to the retractor. Also, through the use of the locking stem, it is possible so to arrange the lock that the closing of the door will automatically release the outside knob for rotation, as will be appreciated by those skilled in the art. My invention enables me actually to utilize the locking stem without the locking washers, so that I can assemble a lock having any of those types of

operation that are usually effected through the use of a push button actuated locking stem. In addition, by utilizing the locking washers with the locking stem, I am able through my invention to achieve the locking and unlocking of one or both knobs in various combinations, as well as the action that is contributed through the use of the stem.

In other words, through the simple concept that I have contributed to the art, I am able very effectively and very simply to lock either or both of the knobs of my lock from the inside or from the outside, and to do this in any number of combinations and permutations that may be necessary to achieve effective operations such as are required in modern commercial buildings, schools, institutions, homes and the like.

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 disclosure 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.

Referring now to the drawings:

Fig. 1 is a longitudinal section showing my novel locking mechanism assembled to provide push button locking, and also key locking for both knobs.

Fig. 2 is a longitudinal section on the line 2—2 of Fig. 1.

Fig. 3 is a cross section on the line 3—3 of Figs. 1 and 2.

Fig. 4 is an exploded view showing in more detail parts of the assembly shown in Figs. 1 to 3.

Fig. 5 is a view on the line 5—5 of Fig. 4.

Fig. 6 is a detailed view illustrating the coaction between the locking stem and the outside spindle.

Fig. 7 shows parts of my locking mechanism that will be assembled to provide push button locking without key locking.

Fig. 8 shows parts of my mechanism that will provide an action like Fig. 7, but with the locking stem actuated through an inside lock cylinder.

Fig. 9 shows the manner in which I can substitute a turn button in the arrangement shown in Fig. 4 or Fig. 8.

Fig. 10 shows how parts of my locking mechanism may be assembled to enable a key on each knob to lock that knob.

Fig. 11 indicates how my mechanism can be assembled so that each key controls the opposed knob.

Fig. 12 shows in detail the links utilized in Fig. 11.

Fig. 13 shows parts of my locking mechanism that I utilize to control both knobs through a key on either knob.

Figs. 14 and 15 show the means that coact with opposed ends of the connecting bar shown in Fig. 13.

Referring now more particularly to Figs. 1, 2, and 3 of the drawings, I utilize in my invention a cylindrical lock housing **10** having on opposed ends thereof an inside spindle bearing sleeve **11** and an outside spindle bearing sleeve **12**. The details of the cylindrical housing **10** and its mounting are not important to an understanding of my invention, and it is necessary to know merely that the bearing sleeves **11, 12** are integrally assembled to opposed ends of the housing **10**. Simply for purposes of illustration, I show the housing **10** mounted upon a door D in Fig. 1 through knob roses **13, 14** that are

threaded upon the bearing sleeves **11, 12** to clamp opposed sides of the door D.

I further utilize a sleeve-like inside knob spindle **15** and a similar outside knob spindle **16**, Figs. 1 and 2, that rotate on the corresponding bearing sleeves **11, 12**, and that have knobs **17, 18**. A lug **19***a* on each spindle **15, 16** interlocks with its bearing sleeve to hold the spindle assembled. The inside and outside spindles **15, 16** are formed at their inner ends with cam portions **19**, that coact with a bolt retractor **20** in the cylindrical housing **10**, Fig. 1, whereby either spindle **15, 16** when rotated by its knob will retract a latchbolt B. Those skilled in the art will recognize that the arrangement I have thus far described is rather typical of cylindrical locks, regardless of the particular type of locking operation that is provided by the lock.

As a part of the extremely novel locking mechanism that I have now conceived, I form the inner surface of the inside spindle bearing sleeve **11** with a pair of circular grooves **21, 22**, Figs. 1 and 2, that are spaced relatively to one another in an axial direction on the sleeve. Between the grooves **21, 22**, the bearing sleeve **11** has a longitudinal groove **23**, Figs. 2 and 3. I form also the outside bearing sleeve **12** with inner grooves **24, 25** that are like the corresponding grooves **21, 22** on the inside sleeve, with a longitudinal groove **26** extending between those grooves **24, 25**. I then form opposed sides of each sleeve-like spindle **15, 16** with longitudinal windows or slots **27, 28**, Figs. 2 and 3, that are so arranged as to lie in aligned relation to the longitudinal grooves **23, 26** on bearing sleeves **11, 12** when the spindles **15, 16** are in normal position corresponding to the projected position of the latchbolt B.

I provide several washers for assembly to the spindle slots **27, 28**, three of those washers, that I utilize in Figs. 1 and 2, being numbered **29, 29***a*, and **30**. As shown in more detail in Fig. 4, the washer **30** has opposed lugs **31** that will engage in the spindle slots **27, 28** whereby that washer **30**, while able to slide in an axial direction on its spindle, will nevertheless rotate integrally with the spindle. The washers **29, 29***a* are similar to washer **30**, but have one lug extended to form a relatively long locking part **32**. Thus, each washer **29, 29***a* by its axial movement can engage the longitudinal groove **23** or **26** in the corresponding bearing sleeve. This naturally will lock a spindle against rotation, and I therefore term the washers **29, 29***a* locking washers. When the washer **29** or **29***a* moves to aligned relation with one of the circular bearing sleeve grooves **21, 22, 24, 25**, its locking part **32** will be positioned in that groove so that the washer can rotate.

Actually, I assemble washers like the washers **29, 29***a*, and **30** in different numbers and in different arrangements to achieve different types of locking operation, as I shall describe in due course. In order that my invention may more readily be understood, I shall for the present confine my description to the particular assembly that I show in Figs. 1 to 4.

Thus, in Figs. 1 to 4, I show my mechanism assembled to form what I term a communicating suite lock, with an inside push button **33** adapted to lock the outside knob **18**, and a key plug **34** on the outside knob adapted to lock both knobs. In that assembly, I utilize between the locking washer **29***a* and the washer **30** a coil spring **35** that acts to hold those washers normally against opposed ends of the spindle slots **27, 28**. Thereby the washers **29***a* and **30** are normally in aligned relation to the grooves or free portions **21, 22** in bearing sleeve **11**. It will be understood that the locking part **32** on washer **29***a* can then rotate in groove **21**, and the inside spindle **15** will not be locked.

I further utilize in the assembly shown in Figs. 1 to 4 a locking stem **36** having a hooked outer end **37** that is adapted to be inserted through the locking washer **29***a* and coil spring **35** into interlocking relation to the washer

30. I equip the push button 33 with opposed arms 38 having hooked ends that will interlock with the washer 30. Thus, washer 30 will connect the push button 33 and locking stem 36 so that they will move together.

The particular action of the locking stem 36 is rather usual, and I need observe merely that stem 36 has a locking portion 39 that moves in a slot 40 in lock housing 10, Figs. 1 and 6, and that will enter a slot 41 in outside spindle sleeve 16 when push button 33 is depressed, whereby to lock that sleeve. On the stem 36 is a lug 42 that will move behind a catch 43 on bolt retractor 20, whereby to dog the stem in locking position. The operation of the catch 43 is similar to that described in the patent to A. H. Golden et al., No. 2,747,907, and need not be described in further detail, it being understood that a retracting movement of the retractor 20 when moved by the inside knob 17 will move the catch 43 out of dogging relation to the stem 36. It should be noted at this point, however, that in my invention I utilize the coil spring 35, acting through the connecting washer 30, to press the locking stem 36 toward release position.

In the assembly that I show in Figs. 1 to 4, I utilize a sleeve-like rollback 44 that can be rotated by the key plug 34, and that can act in a usual way against the bolt retractor 20 for retracting the bolt. The rollback 44 supports the inner end of locking stem 36, and for that purpose I equip the stem 36 with a circular part 45 that rests on the inner surface of rollback 44. In the particular assembly, I mount on the outer end of rollback 44 a short bar 46, Figs. 1, 2, and 4. I then utilize a cam tube 47 having a slot 47*a*, best seen in Fig. 4, that is adapted to accept the bar 46 so that rollback 44 will rotate integrally with tube 47. Actually, I have shown tube 47 and slot 47*a* rotated ninety degrees in Fig. 4 in order to show further parts of tube 47, and it is to be understood that bar 46 when assembled will be engaged in slot 47*a*. The inner end of the cam tube 47 has lugs 48, shown in Fig. 4, that extend at opposed sides of locking washer 29 to limit rotation of the tube.

Between the cam tube 47 and the key plug 34 I utilize a cam driver 49 that is assembled to rotate within the cam tube. That cam driver 49 is formed at its outer end with an opening having lugs 50, Fig. 5, whereby a connecting bar 51 on the key plug can rotate the driver 49. On the cam driver 49 is a pin 52 having end portions that are adapted to coact with the outer edge of cam tube 47. I form the outer edge of cam tube 47 with stop surfaces 53, Figs. 4 and 5, whereby cam driver 49 when rotating in one direction will act through pin 52 to rotate also cam tube 47. Thus, key plug 34, by rotating in one direction, will rotate the rollback 44 to effect rather conventional key actuation of the bolt retractor 20.

In addition, I form the cam tube 47 with cam surfaces 54, Figs. 4 and 5, against which the pin 52 will act, when key plug 34 rotates in the opposed direction, to move cam tube 47 axially. Pin 52 can act in that way because the lugs 48, Fig. 4, then lie against the sides of the lugs 31, 32 on the locking washer 29 whereby to hold the cam tube 47 against rotation. Also, the cam driver 49 is held against axial movement by its engagement with knob retainer 18*a*, Figs. 1 and 2. By moving axially, the cam tube 47 will move the locking washer 29 to place its locking part 32 in the longitudinal locking groove 26 on the outside bearing sleeve 12. It will be understood, therefore, that by particular rotation of key plug 34, the outside spindle 16 will be locked against rotation.

I shall now call attention to the fact that I utilize in the assembly shown in Figs. 1 to 4 a slider 56 that extends between the outer end of the key actuated rollback 44, and the locking washer 29*a* on the inside spindle 15. As is best shown in Fig. 4, the slider 56 is U-shaped so that it can be assembled to slide relatively to the locking stem 36. The slider 56 is formed at one end with a portion 57 that will rest against locking washer 29*a* and at its opposed end with parts 58 that will extend slidably through openings 59, Figs. 2 and 4, in the stem part 45, to bear against the end of the rollback 44, as in Figs. 1 and 2.

To understand the action of the slider 56, it is necessary to realize that the cam tube 47, when moving the locking washer 29 axially, will act also through that washer 29 to move rollback 44 in an axial direction. Therefore, the cam tube 47 will be effective through the rollback 44 and slider 56 to move the locking washer 29*a* in unison with the locking washer 29. Also, the slider 56 thereby is effective to transfer the pressure of spring 35 on the right hand side of the lock, as viewed in Fig. 1, to the cam tube 47 on the left, enabling the spring to hold that tube and the cam driver 49 in camming relation to one another. Through the particular arrangement, the key plug 34, when rotating in one direction away from a neutral position, will move the locking washers 29, 29*a* into locking engagement with the corresponding locking grooves 23, 26 on the spindle bearing sleeves. When rotating in the opposed direction away from neutral position, key plug 34 will simply rotate rollback 44 to retract latchbolt B.

I believe it will now be understood that my novel locking mechanism, when assembled in the manner shown in Figs. 1 to 4, will enable both inside and outside knobs 17, 18 to be locked through rotation of the key plug 34. The particular assembly further provides push button locking of the outside knob, with key plug 34 adapted to retract the latchbolt B.

I shall now describe the manner in which I can assemble my mechanism to contribute further types of locking operation. It will first be observed that I can assemble in place of the locking washer 29*a*, in Figs. 1 to 4, a plain washer like the washer 30. Thus by a very simple substitution I can achieve push button locking, as in Figs. 1 to 4, together with key locking of the outside knob through washer 29, but without locking the inside knob.

I can assemble my mechanism also to provide what I term an office lock, with merely push button locking of the outside knob, and key retraction of the bolt when that knob is locked. This assembly will be understood through reference to Fig. 7 of the drawings. To assemble my mechanism in that way I prefer to eliminate the cam tube 47 and cam driver 49 from the assembly shown in Figs. 1 to 4, since the key plug need not then effect longitudinal movements. I then utilize in place of the end bar 46 on rollback 44 and bar 51 on key plug 34 a relatively long connecting bar 151 that will engage in a slot in the end of rollback 44. Further, I utilize simply two plain washers 30, 30*a* on the inside knob spindle, as shown in Fig. 7. In this arrangement, the spring 35 will act between washers 30, 30*a*, and will be utilized simply to press the locking stem 36 and push button 33 toward release position. Therefore, I can omit slider 56 that I show in Fig. 4. To hold the rollback 44 against movement out of assembled position in an axial direction, I can utilize a lug struck inwardly on the knob spindle, and engaged in a slot 44*a* in the rollback 44. Thus, by assembling my mechanism in the manner shown in Fig. 7, I can achieve what is actually a conventional locking stem action. It is important to realize, however, that I do this through features that enable me to achieve many other types of action.

In Fig. 8 I indicate how my mechanism can be assembled to contribute an entrance lock, with the outside knob locked through a key plug on the inside knob, and a key plug on the outside knob that is adapted to retract the bolt. Actually, the assembly that I utilize for this purpose is in some respects like that shown in Fig. 7. However, I utilize on the inside knob a key actuation that is like that utilized in Figs. 1 to 4 on the outside knob. Thus, in place of the push button 33 in Fig. 7, I substitute in Fig. 8 a key plug 134, a cam tube 147 and cam driver 149. I believe it will not be necessary to describe

the action of the key plug **134** in detail, since this plug will act through cam driver **149** to move the washer **30** in the same manner as the key plug **34** in Fig. 4 moves the washer **29**. It will be understood that by moving the washer **30** the key plug **134** in Fig. 8 will move the locking stem **36** to locking position. In the assembly shown in Fig. 8, I can eliminate the locking stem catch **43** utilized in Fig. 7, since the key plug action will be effective to hold the stem in locking position.

I show in Fig. 9 a turn button **133** that I can utilize as a part of my novel locking mechanism. That turn button **133** is somewhat like the push button **33** in Figs. 1 to 4, but has a lug **138** for dogging the turn button in locking position. That dogging lug **138** is adapted to coact in a rather usual way with a camming slot **138***a* that I form on the knob spindle **15**, as shown in Fig. 2. Because the turn button **133** shown in Fig. 9 has arms **38** that will interlock with a washer **30**, I can utilize that button **133** in many different types of assembly to change the action of that assembly. Thus, when utilized in place of the button **33** in Fig. 4, for example, turn button **133** can hold the locking stem **36** in locking position, so that the stem will not be released when catch **43** moves away from detent **42** on stem **36**. When utilized in Fig. 8, turn button **133** will replace key plug **134** and its cams, and the locking action will not require the use of a key.

I have thus far described my locking mechanism assembled with the locking stem **36**, and I shall now describe types of operation that do not involve a locking stem. Thus, in Fig. 10 I show my mechanism assembled to form a communicating lock that contributes simply locking of each knob through a key plug on that knob. In that assembly, I utilize a locking washer **29** that is mounted on the outside spindle in normally aligned relation to the free portion or groove **25** on the outside bearing sleeve, and a locking washer **29***b* on the inside spindle **15** in normally aligned relation to the groove **22**. Juxtaposed to the sleeve grooves **21**, **24** I utilize plain washers **30***a*, **30***b*. The outside knob and spindle have the same key plug and cam arrangement that I have described in connection with Figs. 1 to 4, but in Fig. 10 I duplicate that arrangement on the inside knob and spindle. In other words, the assembly shown in Fig. 10 has the inside keep plug **134** and cams **147**, **149** that I have already described in connection with Fig. 8. Thus, in Fig. 10, the key plug **34** on the outside knob can move the locking washer **29** in an axial direction for locking that knob, and the key plug **134** on the inside knob can act similarly on the washer **29***b* for locking that knob.

In Fig. 11, I indicate how the arrangement in Fig. 10 can very easily be adapted so that each key plug will lock merely the opposed knob. To accomplish this, I simply reverse the positions of the washers relatively to the positions shown in Fig. 10. That is, instead of arranging the washers as in Fig. 10, I assemble the locking washers **29**, **29***b* in aligned relation to the free grooves **21**, **24** on the inner ends of the bearing sleeves, and I assemble the plain washers **30***a*, **30***b* in aligned relation to the sleeve grooves **22**, **25**. When so assembled, it will be appreciated that the plain washers **30***a* and **30***b* will be in coacting relation to the cam tubes **47**, **147**, Fig. 10. I then utilize a pair of links **60**, **61** that are shown in detail in Fig. 12. Each link **60**, **61** has an end portion **62** that I assemble in interlocked relation to a plain washer **30***a* or **30***b*, Fig. 11, and an opposed end portion **63** in bearing relation to the locking washer **29** or **29***b* for the opposed spindle. When the washer **30***a* moves axially through rotation of the inside key plug **134**, the link **61** that is interlocked with that washer will move the locking washer **29** on the outside spindle into locking relation to the locking groove **26** on the corresponding bearing sleeve. The link **60** will act similarly to enable outside key plug **34**, by moving washer **30***b* to move washer **29***b* to position locking the inside spindle. Thereby, a key on either knob will lock the opposed knob. Of course, it will be understood from the description that I have already made that I do not particularly need to utilize key actuation for the washers **30***a*, **30***b* when arranged as shown in Fig. 11. I can very well utilize for that purpose the turn button arrangement that I have described in connection with Fig. 9. Further, it is to be understood that my invention enables me to utilize the assembly shown in Fig. 11 with the turn button or key plug merely on one knob, the opposed knob being equipped with a different form of actuation, or even being a plain knob when it is not desired to effect locking of a particular side of the door.

I shall now refer to Fig. 13 of the drawings to describe my extremely novel locking mechanism when arranged to provide a store door lock, with the locking of both inside and outside knobs effected simultaneously through a key plug on either knob. In describing the store door lock, it will be helpful to state first that I utilize on the inside spindle a key plug and cam arrangement like that I have already described in detail in connection with Fig. 4. Since that arrangement is utilized on the inside spindle **15**, and will actuate a locking washer **29***b*, it is used actually as I have described in connection with Fig. 10, with a key plug **134** that acts through a cam driver **149** and cam tube **147** to move a locking washer **29***b* in an axial direction. More particularly, I assemble the locking washer **29***b* in Fig. 13 in normally aligned relation to the free groove **22** on the inside bearing sleeve **11**. The inside key plug **134** by its rotation can then move washer **29***b* to place its locking part **32** in the longitudinal groove **23** in the inside bearing sleeve **11** whereby to lock the inside knob. I further utilize in Fig. 13 the locking washer **29**, that I assemble in normally aligned relation to the free groove **24** in the outside bearing sleeve. I further assemble a plain washer **30***b* in aligned relation to the free groove **25** in the outside bearing sleeve **12**, with the coil spring **35** between the washers **29**, **30***b*, I then utilize a tubular connecting bar guide **62** between the locking washers **29** and **29***b* on the opposed inside and outside spindles **15**, **16**. The arrangement is such that the spring **35**, by pressing the locking washer **29**, will act through the tubular guide **62** to press also the locking washer **29***b*. Washer **29***b* in turn will press the cam tube **147** whereby to hold that tube and the cam driver **149** in camming relation to one another. Thus, spring **35** will press both locking washers **29**, **29***b* toward the inside knob, with those washers normally in aligned relation to their corresponding grooves **24**, **22**, on the bearing sleeves, so that both knobs of the lock will be free to rotate. Also, the inside key plug **134**, when actuating the locking washer **29***b* to locking position will simultaneously move the washer **29** to locking position. Thereby, inside key plug **134** is effective to lock both knobs.

As an important part of the arrangement shown in Fig. 13, I assemble to the cam driver **149** an insert **63**, Figs. 13 and 15. That insert **63** has a transverse opening **64** for the cross pin **52** that I have already described, whereby to assemble insert **63** integrally to cam driver **149**. Insert **63** further has an axial opening **65**, Fig. 15, having therein a projection **66** that extends through a relatively small angle. In the particular assembly, shown in Fig. 13, I so form the cam tube **147** as to be open along its axis, and I provide a long connecting bar **67** that I insert through washers **30***b*, **29**, guide **62**, washer **29***b*, and the tube **147**. The inner end of connecting bar **67** I form with slots whereby to leave a relatively narrow portion **68**, Fig. 13. Thereby, the connecting bar **67**, when inserted as I have described, is adapted to interlock with the cam insert **63**, with the narrow portion **68** of the bar in position to rotate the projection **66** on the insert. However, since both the narrow bar portion **68** and the projection **66** have a small angular width, a considerable amount of lost motion can take place between the con-

necting bar 67 and cam insert 63, for a purpose that will appear. I form the opposed end of connecting bar 67 with a flat portion 69 whereby bar 67 will be keyed to the outside key plug 234. On that key plug I mount a spring 70, Fig. 14, that acts when the key plug is in assembled position to press the bar 67 relatively to the cam insert 63. Through the particular arrangement, the outside key plug 234 by rotating the cam driver 149 will move both locking washers 29, 29*b*. Since the inside key plug 134, also, can rotate the cam driver 149, my mechanism when so assembled enables me to provide simultaneous locking of both knobs through a key on either knob. The lost motion that I have described between the connecting bar 67 and cam insert 63 will enable either key plug 134 or 234 to actuate cam driver 149 without requiring the opposed key plug to rotate. In addition, that lost motion will enable each inside and outside knob spindle to rotate independently, without acting through cam insert 63 to place a strain on the locking mechanism.

I believe that those skilled in the art will now understand that I have contributed a locking mechanism that is exceedingly novel and that can be assembled to provide a very large number of different types of locking operation. This I do through the utilization of free grooves and a locking groove on each inside and outside bearing sleeve, together with washers that can be assembled to the knob spindles in different arrangements relatively to the grooves on the bearing sleeves. Through my novel inventive concept, I am able to utilize those washers not only as locking elements, but also to perform further functions in the lock. Thus, through the washers I can, when I so desire, assemble in the lock a locking stem that can be actuated by push button, turn button, or key. When assembling the locking stem in that way, I am still able to utilize the locking function of one or more washers, with the washers actuated through key or button. The washers in addition enable me to utilize a single spring to perform several different spring functions in the lock. Actually, it is conceivable that the locking elements need not be washers, and I have referred to washers merely for the purpose of facilitating a description of my invention. It is important to realize merely that I utilize elements that move axially on the knob spindles, and that will perform several functions so that I can assemble my novel locking mechanism to achieve any desired type of locking operation in a cylindrical lock. Not only do I achieve the types of operation that I have particularly described, but by further substituting or interchanging the locking washers and plain washers I can effect still other types of operation. I accomplish these things while utilizing parts that are relatively simple and few in number, with a minimum number of parts that need be formed especially for use in a particular assembly. Thus, through the manufacture of a relatively small number of parts, I am able to assemble many different cylindrical locks. In short, I contribute a novel locking mechanism that is of extreme value to the industry, and I believe that the very considerable merits of my invention will be readily appreciated.

I now claim:

1. In a lock assembly of the class described, a housing, a bearing sleeve on one end of said housing, a spindle sleeve mounted to rotate within said bearing sleeve, said spindle sleeve having a portion extending from said bearing sleeve and formed with a bolt retracting cam rotating in said housing, groove means extending axially on the inner surface of said bearing sleeve, two washers assembled in said spindle sleeve, each washer formed with lugs engaged in slots in said spindle sleeve to mount said washers for sliding movement independently of one another and with said lugs moving in aligned relation to said groove means, so that there can be used as either of said washers a washer having a lug that will coact with said groove means to lock the spindle sleeve, a spring acting between the said washers to press said washers on their mounting to predetermined normal positions that are beyond opposed ends of said groove means, surfaces formed on each of said washers for coaction with a lock operating part, and at least one lock operating part engaging the said surfaces on a particular washer to accept the spring pressure of the washer while adapted to move axially with that washer as it slides relatively to its normal position, so that either washer is effective by its yielding spring pressure to move and to be moved by a lock operating part engaged therewith.

2. In a lock assembly of the class described, a housing, inside and outside spindles rotatable in portions of said housing, said spindles having cams extending from said housing portions and rotating in the housing to retract a bolt, a plurality of members mounted for sliding movement in an axial direction on said spindles, a spring acting on the said members on one spindle to press each of those members to a predetermined position relatively to the spindle and within the corresponding housing portion, surfaces formed on each of said members for coaction with a lock operating part, a lock operating part in the form of a locking stem assembled to the said surfaces on one of the spring pressed members to accept the spring pressure of the member while adapted to move axially with the member as the member moves relatively to its predetermined position relatively to said one spindle, said locking stem having a portion for locking the opposed spindle, and a slider assembled between the said surfaces on another of the spring pressed members on said one spindle and a member on said opposed spindle whereby to transfer the spring pressure to said member on the opposed spindle, so as to press also said last mentioned member to a predetermined position.

3. In a lock assembly of the class described, a housing having a pair of opposed bearing portions, a hollow sleeve rotating in each bearing portion, locking surfaces formed on the inner surfaces of said bearing portions and relatively to which said sleeves rotate, each of said locking surfaces being of relatively short length axially of said bearing portions as compared to each of said sleeves, a plurality of locking and non-locking washers, means whereby each sleeve is adapted to support thereon two of said washers for sliding motion independently of each other axially of said sleeve and within the bearing portion for that sleeve, said washers having like body portions whereby to be interchangeable in assembly to said sleeves, each locking washer being formed to extend sufficiently outwardly of its sleeve to coact with said locking surfaces, each non-locking washer being formed to lie sufficiently inwardly of its sleeve to escape said locking surfaces, means for moving at least one washer axially on its sleeve when supported thereon, said at least one washer by its axial movement adapted to impart axial movement to a lock operating member, and also effective when a locking washer to lock its sleeve through coaction with the locking surfaces.

4. In a lock assembly of the class described, a housing, a bearing sleeve extending from said housing, a spindle sleeve mounted to rotate within said bearing sleeve for actuating a bolt retracting cam in said housing, groove means extending axially on the inner surface of said bearing sleeve, two washers assembled in said spindle sleeve, said washers formed with lugs engaged in longitudinal slot means in said spindle sleeve to mount said washers for sliding movement independently of one another and with said lugs moving in aligned relation to said groove means, so that a lug on a washer when formed to coact with said groove means will lock the spindle sleeve, spring means pressing said washers in opposed directions on their mounting to predetermined normal positions that are beyond opposed ends of said groove means, a coacting surface formed on each of said washers for coaction with a lock operating part, and a lock operating part engaged with a coacting surface on a par-

ticular washer to accept the spring pressure of the particular washer while adapted to move axially with that washer as it slides relatively to its normal position, either washer being effective by its yielding spring pressure to move and to be moved by a lock operating part engaged therewith.

5. In a lock assembly of the class described, a housing, a bearing sleeve extending from said housing, a bolt retracting spindle sleeve mounted to rotate within said bearing sleeve, a locking surface extending axially on the inner surface of said bearing sleeve, said locking surface being positioned on a medial portion of said bearing sleeve and of relatively short length as compared to the length of said bearing sleeve, two members assembled on said spindle sleeve in axial relation thereto, said members having like body portions whereby to be interchangeable in assembly relatively to said spindle sleeve, means mounting said members for sliding movement independently of one another in a longitudinal direction on said spindle sleeve with said members moving in aligned relation to said locking surface on the bearing sleeve, so that a member when formed with a locking portion on its body portion will coact with said locking surface to lock the spindle sleeve, spring means acting against the said members to press said members on their mounting to predetermnied normal positions that are beyond opposed ends of said locking surface on the bearing sleeve, coacting surfaces formed on each of said members for coaction with a lock operating part, and a lock operating part engaged with a coacting surface on a particular member on said spindle sleeve to accept the spring pressure of the member while adapted to move axially with that member as said particular member slides relatively to its normal position, either member being effective by its yielding spring pressure to move and to be moved by a lock operating part engaged therewith.

6. In a lock assembly as set forth in claim 5, and including a further bolt retracting spindle sleeve mounted to rotate in a further bearing sleeve that extends from said housing, a stem having one end portion connected to a coacting surface on said particular member on the first spindle sleeve and an opposed end portion extending toward said further spindle sleeve, said stem being pressed toward a release position by the spring pressure of said particular member and moved to a locking position when the said lock operating part slides said particular member against its spring pressure, and means on said opposed end portion of the stem locking said further spindle sleeve when the stem is in locking position.

7. In a lock assembly as set forth in claim 5, and including a further bolt retracting spindle sleeve mounted to rotate in a further bearing sleeve that extends from said housing, a stem having one end portion connected to a coacting surface on said particular member on the first spindle sleeve and an opposed end portion extending toward said further spindle sleeve, said stem being pressed toward a release position by the spring pressure of said particular member and moved to a locking position when the said lock operating part slides said particular member away from its normal position against the spring pressure, means on said opposed end portion of the stem locking said further spindle sleeve when the stem is in locking position, a slider having one end portion connected to a coacting surface on the other of said sliding members on the first spindle sleeve, an opposed end portion of said slider extending toward said further spindle sleeve, and means connected to said opposed end portion of the slider and acting through the slider for moving said other sliding member away from its normal position on the first spindle sleeve, so that a locking portion on said other member will lock said first spindle sleeve.

8. In a lock assembly of the class described, a housing, inside and outside bearing sleeves extending from said housing, bolt retracting inside and outside spindle sleeves mounted to rotate within the corresponding bearing sleeves, a locking surface extending axially on the inner surface of each bearing sleeve, each locking surface being positioned on a medial portion of its bearing sleeve and of relatively short length as compared to the length of said bearing sleeve, two members assembled on each spindle sleeve in axial relation thereto, said members having like body portions whereby to be interchangeable in assembly relatively to said spindle sleeves, means mounting the two members on each sleeve for sliding movement independently of one another in a longitudinal direction relatively to the sleeve with said members moving in aligned relation to the corresponding locking surface, so that a member when formed with a locking portion on its body portion will coact with a locking surface to lock a corresponding spindle sleeve, spring means acting against the said members to press said members on their mounting to predetermined normal positions that are beyond opposed ends of the locking surface on the corresponding bearing sleeve, coacting surfaces formed on each of said members for coaction with a lock operating part, a lock operating part engaged with a coacting surface on a particular member on one spindle sleeve for sliding that member relatively to its normal position, and a link engaged with the coacting surfaces on said particular member and on a member on the other spindle sleeve, enabling said lock operating part to slide also the last named member against spring pressure relatively to normal position.

9. In a lock assembly as set forth in claim 5, and including a further bolt retracting spindle sleeve mounted to rotate in a further bearing sleeve that extends from said housing, the said lock operating part being in the form of a link and having one end portion connected to a coacting surface on said particular member on the first spindle sleeve and an opposed end portion extending toward said further spindle sleeve, a further member connected to said opposed end portion of the link and adapted to lock said further spindle sleeve, and means for moving said further member to a position locking the further spindle sleeve while accepting through said link the spring pressure of said particular member in the first spindle sleeve.

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