May 29, 1956 A. H. GOLDEN ET AL 2,747,907

LOCKING MECHANISM FOR TUBULAR LOCK

Filed Oct. 14, 1952

4 Sheets-Sheet 1

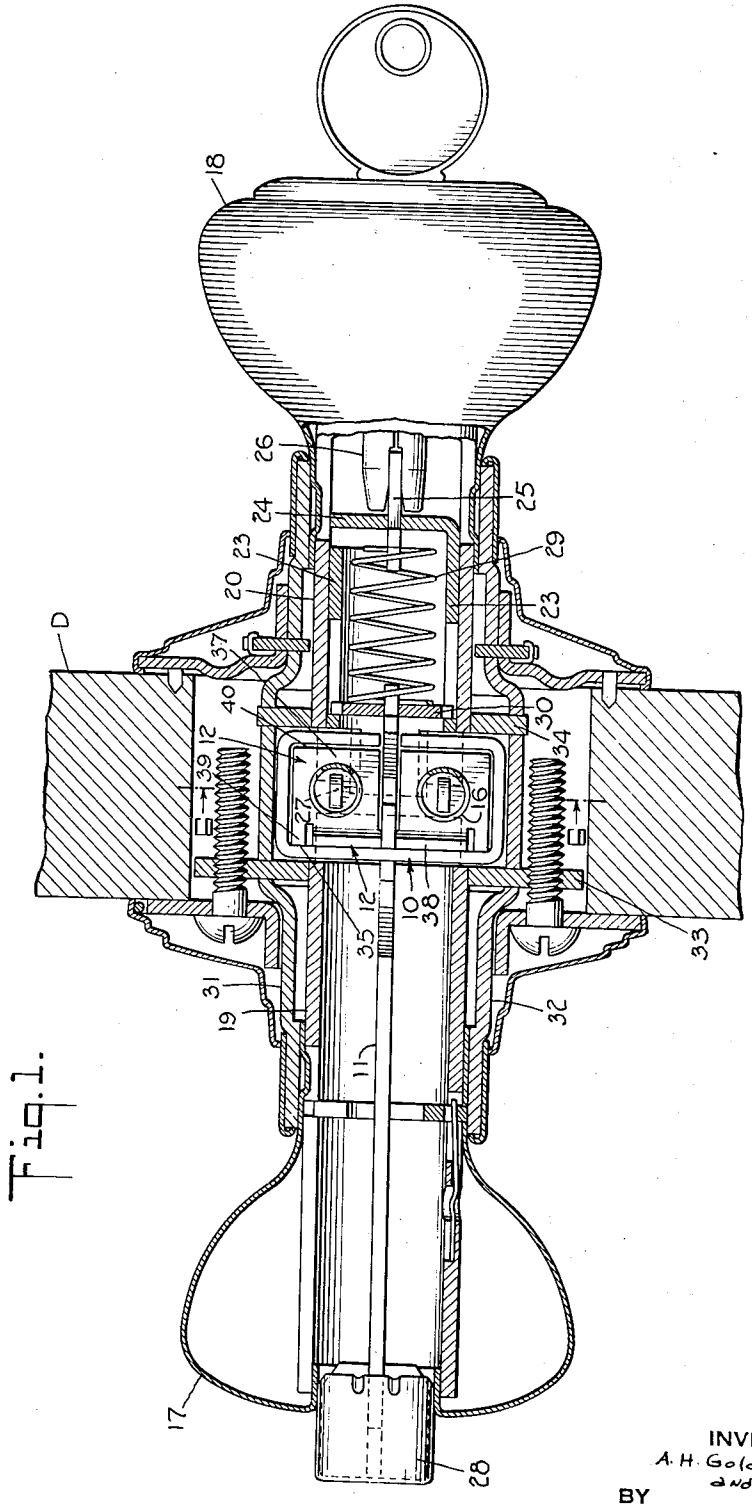


Fig. 1.

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Filed Oct. 14, 1952 4 Sheets-Sheet 2

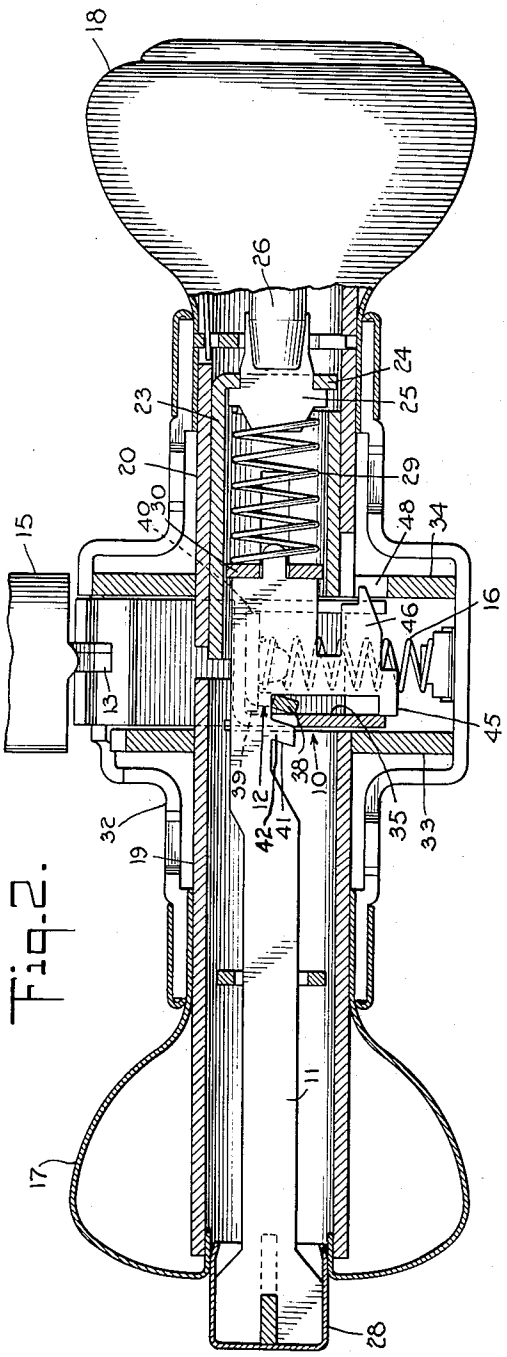


Fig. 2.

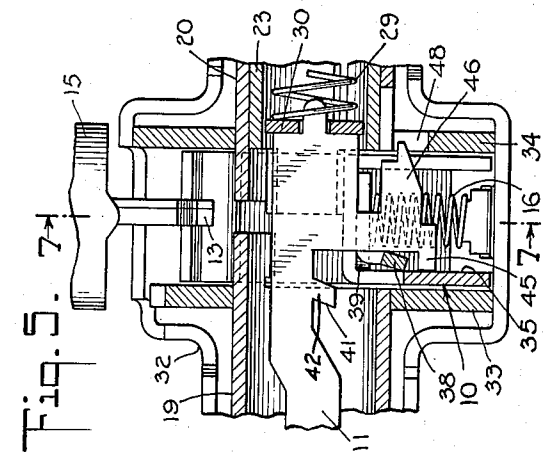


Fig. 5.

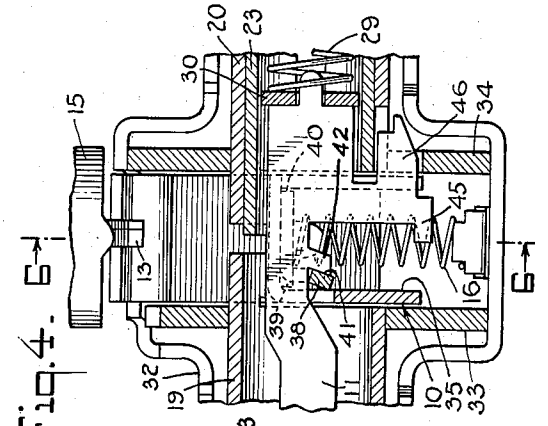


Fig. 4.

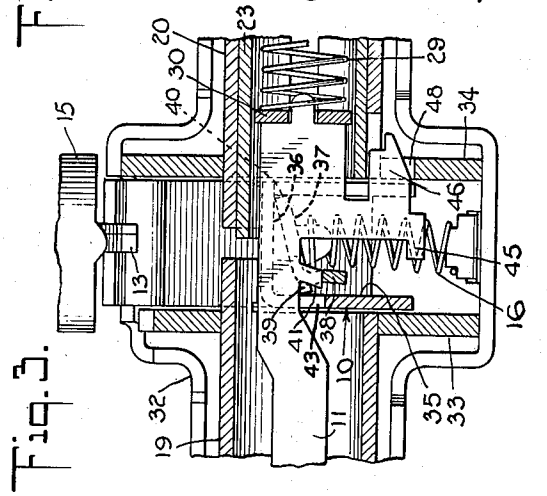


Fig. 3.

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LOCKING MECHANISM FOR TUBULAR LOCK

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4 Sheets-Sheet 3

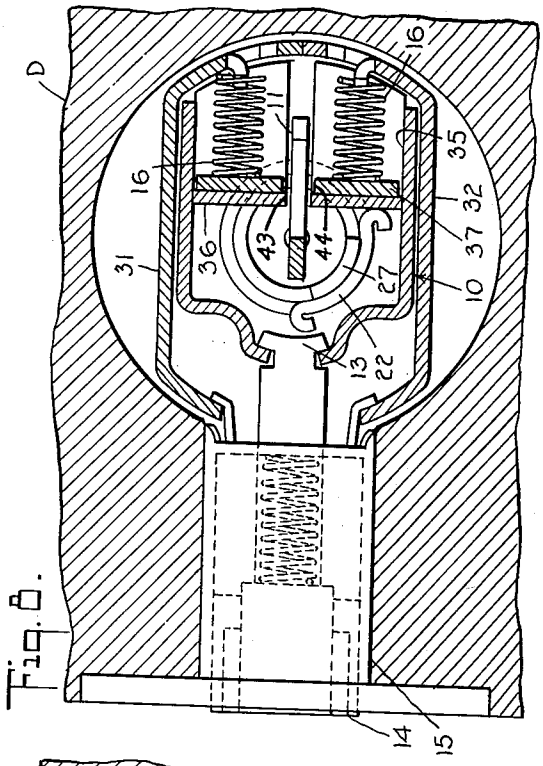


Fig. 8.

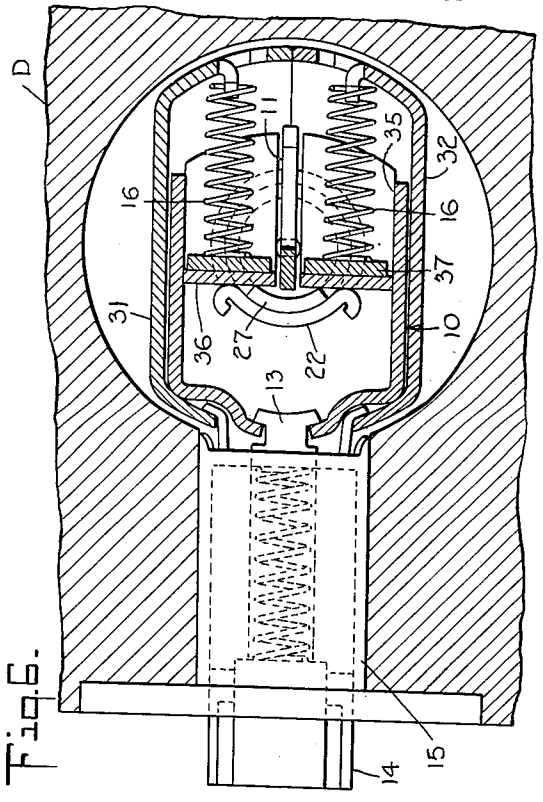


Fig. 6.

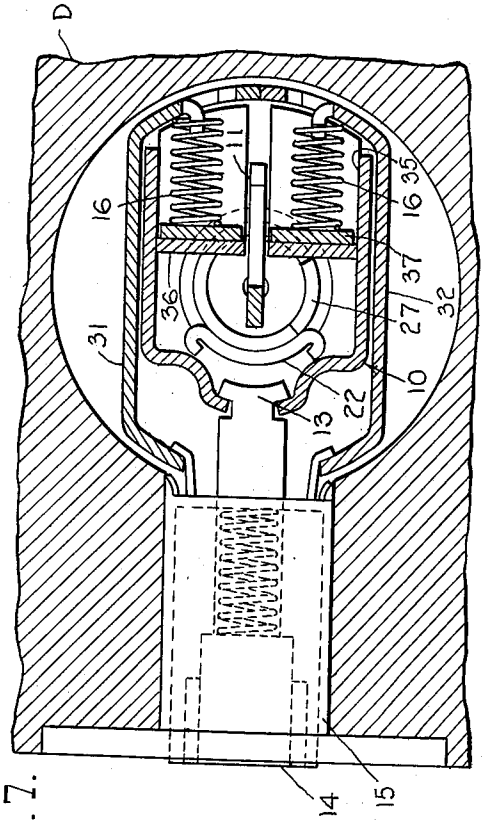


Fig. 7.

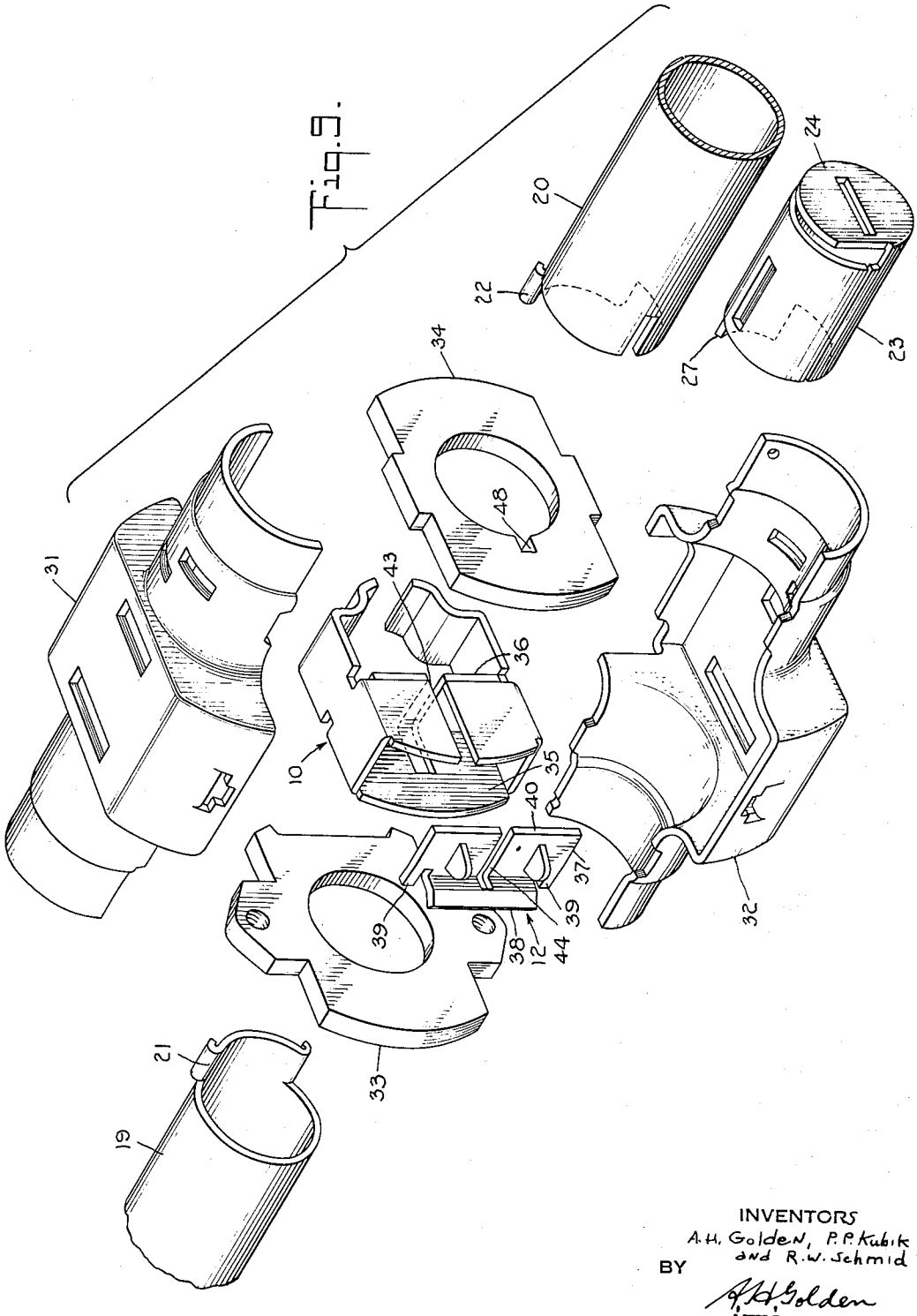
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LOCKING MECHANISM FOR TUBULAR LOCK

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Fig. 5.



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United States Patent Office 2,747,907
Patented May 29, 1956

2,747,907

LOCKING MECHANISM FOR TUBULAR LOCK

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Application October 14, 1952, Serial No. 314,644

7 Claims. (Cl. 292—169)

This invention relates to tubular locks. More particularly, our invention relates to tubular locks of the class in which a push piece moves to a locking position and is held in that position by a dog, the dog being in turn preferably mounted on a bolt retractor. We have now developed, in a lock of this class, an extremely novel push piece and dog construction that does not yield to release the lock when the lock is subjected to vibration. Further, by our novel construction we prevent the lock from being locked unintentionally by the movement of the push piece relatively to the dog upon the slamming of the door in which the lock is mounted.

It will be appreciated by those skilled in the art that the push piece in locks of the particular class moves between locking and unlocking positions in a direction that is at right angles to the door, a spring always pressing it to its unlocking position. When the push piece is moved to locking position, it is then dogged thereafter by the dog in this locking position, the dog accepting the thrust of the spring that presses the push piece toward unlocking position at all times. The dog moves with the retractor as the retractor moves to retract the bolt, and this carries the dog out of dogging relation to the push piece, thereby allowing the push piece to move to unlocking position. Spring means hold the dog yieldingly against the reactor, and as the push piece is pushed manually inwardly toward locking position the dog is first cammed by the push piece relatively to the retractor against the pressure of said spring means. Thereafter, the dog is released by the push piece and moves to dog the push piece in locking position.

Prior art locks of this class cannot be relied upon to remain in locked condition when subjected to vibration because the dog is readily vibrated relatively to the retractor and push piece to release the push piece for movement by its spring to unlocking position. Also, locks of this class have a tendency to lock inadvertently because the push piece by its momentum is thrown to locking position when the door slams, simulating the action of a manually inward push. The spring that holds the push piece in unlocking position does, of course, tend to prevent inadvertent locking, but there is a practical limit to the strength of this spring because a spring that is strong enough to prevent accidental locking also makes the push piece difficult to operate, and in addition facilitates the release of the push piece from the dog when the lock vibrates. It is not desirable to strengthen the spring holding the dog because this yields a hard action.

In other locks of this class, the dog is not cammed by the push piece as the push piece moves to locking position. Instead, the dog enters into dogging relation with the push piece merely by entering notches in the push piece as the push piece moves to locking position. In locks of this class, the dog cannot be vibrated to release the push piece. However, the push piece can, in these structures, be moved easily by its momentum to locking position when the door slams. To prevent this, a momentum piece is provided, this momentum piece moving inwardly

with the push piece when the door slams and blocking the dog against moving into dogging relation to the push piece.

We shall now described the novel features of our invention whereby, through the inherent construction and mounting of our push piece and dog, we contribute a lock in which the push piece can while camming the dog, cannot be moved to locked position by slamming of the door. Thereby, we omit the need for a momentum piece. At the same time, our dog cannot be vibrated to release the push piece. Because of this, we contribute all the advantages of each of the two types of prior art mechanisms we have described above, while omitting the undesirable features thereof.

As one very important feature of our invention, we so mount the dog upon the bolt retractor as to prevent the dog from shifting or moving in a release direction relatively to the push piece when the lock is vibrated as by rapping upon the door. By our arrangement, the bolt retractor supports the dog in dogging relation to the push piece when the lock vibrates.

In the preferred form of our invention, the dog is provided with what we term a base, and this base is held seated in a transverse position upon the bolt retractor by the springs that press the retractor to a position corresponding to the projected position of the latchbolt. As is usual in locks of this class, the push piece moves transversely to the retractor and is pressed outwardly toward unlocking position by a spring. When the push piece is pressed inwardly to locking position against the force of this spring, a detent portion that we form upon the dog accepts the outward spring thrust of the push piece and holds the push piece in locking position. In our invention, we provide upon the retractor a surface that in turn accepts this thrust directly from the detent portion of the dog.

We prefer to mount the dog in a pocket in the retractor, and we so form the detent portion as to extend angularly from the base of the dog into a position in which it is juxtaposed to an inner surface of the pocket. This inner surface then supports the detent portion against the forces applied to it when it is in dogging relation to the push piece. As a further feature of this part of the invention, the edges of the base of the dog are juxtaposed to the inner surfaces of the retractor so as to prevent the dog from shifting transversely of the retractor. One of these edges coacts with the detent portion to provide the end of the dog with a relatively extensive lateral base, and this arrangement prevents the dog from tilting out of dogging relation to the push piece when the lock vibrates.

As a further feature of our invention, we utilize the spring thrust of the push piece for holding the dog in dogging relation to the push piece. In other words, the push piece must be moved by the dog beyond its locking position against the pressure of its spring, in order to be released from the dog. We accomplish this by forming, upon either the push piece or the dog, an inclined cam surface that cams the detent portion against the push piece. The inclination of this cam surface is such that the dog in moving away from the push piece to release the push piece effects inward movement of the push piece beyond locking position before it is released from locking position. This inward movement of the push piece is resisted by the push piece spring so that this spring therefore resists any disengagement of the dog from the push piece. However, because the retractor springs also press the dog to dogging position, all of these springs therefore coact to prevent release movement of the dog. Moreover, we so arrange the detent portion on the dog as to enable the push piece actually to oppose tilting of the dog. This we do by forming the detent portion at that side of the dog that is opposed to the side seated on the retractor. Thereby, the spring thrust of the push

piece when acting against the detent does not tend to tilt the dog, but acts together with the retractor springs to rotate the dog more firmly against its seat. The particular arrangement not only opposes tilting of the dog, but requires that the push piece move still further inwardly before it would be possible for the dog, by a theoretical tilting movement, to release the push piece.

As still another features of the invention, our novel construction is arranged to prevent the push piece from being dogged accidentally in locking position. We form upon the push piece a surface that engages the detent portion of the dog as the push piece moves toward locking position. Preferably, this surface is formed upon a lug that carries also the inclined cam surface that cams the detent portion of the dog against the push piece. Through this arrangement the push piece when moving to locking position must move the dog against the pressure of the retractor springs. The push pin must move a very considerable distance against the retractor spring pressure, because of the position of the detent portion at its particular side of the dog. The retractor springs therefore coact very effectively with the push piece spring to prevent accidental dogging of the push piece.

We have thus outlined rather broadly the more important features of our invention in order that the detailed description thereof that follows may be better understood, and in order that our contribution to the art may be better appreciated. There are, of course additional features of our 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 our disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of our 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 our invention, in order to prevent the appropriation of our invention by those skilled in the art.

Referring now to the drawings:

Fig. 1 is a sectional view taken on a vertical plane showing a preferred form of our novel lock; Fig. 2 is a view similar to Fig. 1 but taken on a horizontal plane; Figs. 3, 4 and 5 are partial views showing with Fig. 2 the parts in successive stages of the locking and unlocking cycle; Figs. 6 and 7 are views on the correspondingly numbered lines in Figs. 1, 4 and 5; Fig. 8 is similar to Figs. 6 and 7 but shows a retraction of the bolt retractor by the outer knob, and Fig. 9 is a view showing parts of the lock in exploded relation.

To appreciate fully the novel features of our invention in the form shown in the drawings, it is necessary first to realize that the bolt retractor **10**, the push piece **11**, and the dog **12** do fulfil the usual function of corresponding parts in locks of the particular class. Thus, the bolt retractor **10** is interlocked with the tail **13** of the bolt **14** and retracts this bolt in the latch tube **15** through a horizontal movement in the plane of the door D in which the lock is mounted, as may be best seen in Fig. 8. Yielding means that in our invention is in the form of a pair of springs **16** returns the retractor **10** to a position corresponding to the projected position of the bolt **14**. Inner and outer knobs **17**, **18** are fixed upon retractor tubes **19**, **20**, and these tubes have at their inner ends cams **21**, **22** that impart retracting movement to the bolt retractor **10**. The outer retractor tube **20** is adapted to be locked in the usual way by the push piece **11**, as will be described later in detail.

We have shown an arrangement that is quite usual in locks of this class whereby the bolt **14** may be retracted by a key from the outside of the door when the outer tube **20** is locked. In the particular form shown in Figs. 1 and 2, a relatively short retractor tube **23** is mounted within the outer retractor tube **20**, and in the end **24** of the tube **23** is an operating member **25** through which

this tube is rotated by a key plug **26** mounted in the outer knob **18**. As will be understood by those skilled in the art, the key actuated retractor tube **23** acts through a cam portion **27** on its inner end to move the bolt retractor **10**, as shown in Figs. 5 and 7.

The push piece **11** extends at one end through the inner knob **17** in the usual way, and preferably is provided at this end with a push button **28**. Also, at its inner end the push piece **11** is pressed away from locking position by a coil spring **29**. Actually, as we have shown it, the spring **29** is engaged between the operating member **25** and a disc **30** that supports one end of the push piece **11**.

For the purpose of disclosure, we have shown a pair of complementary housing parts **31**, **32** that are assembled to form the spindle housing. Transverse plates **33**, **34** guide the bolt retractor **10** for sliding movement on flat surfaces in this housing. Actually, the particular details of the spindle housing are not important to an understanding of our invention, and it is merely necessary to know that the spindle housing supports the bolt retractor **10** and the retractor tubes **19**, **20** in the usual relation in locks of the particular class. We do prefer, however, that the spindle housing should present four flat surfaces for guiding the bolt retractor **10** at its four sides, as may be clearly seen in Fig. 1.

It will be readily understood that the operation of the lock as we have thus far described it is rather conventional. We shall now describe particularly the novel features through which we greatly improve the control that is provided over the lock by the push piece **11**.

In the rear end of the bolt retractor **10**, and opening in the direction of the retracted movement, we form a relatively deep pocket **35**, well shown in Fig. 9. At the inner end of this pocket is a vertical wall **36**, and the dog **12** is normally held seated against this wall by the retractor springs **16**. When dogging the push piece **11**, as in Fig. 4, the dog **12** remains seated in this position, but we do not rely solely upon the retractor springs **16** to hold the dog **12** in seated position, as will appear. The dog **12**, best shown in Fig. 9, has what we term a base **37**, this being the part of the dog that actually seats on the wall **36**, and extending angularly relatively to this base is a detent portion **38** through which the dog coacts with the push piece **11**. The detent portion **38** accepts the thrust of the spring **29** when dogging the push piece **11** in locking position, as seen in Fig. 4. It is important to note that the detent portion **38** is located on that side of the base **37** that faces away from the end wall **36** of the retractor pocket **35**, in a position juxtaposed to the side wall of this pocket. By this novel arrangement, the spring thrust of the push piece **11** is transferred through the detent portion **38** directly to this side wall and therefore to the retractor **10**, and does not tend to tilt the dog **12** out of seated position on the inner wall **36** of the retractor. In fact, by the position of the detent portion on the dog, we enable the thrust of the push piece to press the dog to seated position, as will presently be explained.

We impart further stability to the dog **12** by so forming its base **37** that vibration of the lock cannot tilt the dog out of dogging relation to the push piece **11**. Referring particularly to Fig. 4, it will be quite apparent that the detent portion **38** of the dog **12**, in moving out of dogging relation to the push piece **11**, must move in a direction toward the open end of the pocket **35**. Vibration of the lock may tend to move the detent portion **38** in this way through tilting of the dog **12** in a counterclockwise direction accompanied by shifting of the base of the dog toward the push button end of the push piece **11**. In our invention, we so form the edge **39** of the base of the dog **12** as to be juxtaposed to the side wall of the pocket **35**, and this edge by engaging the side of the pocket prevents shifting of the dog and thereby prevents it from tilting due to vibration such as would be caused by rapping upon the door. In the particuar form

of dog that we illustrate, the detent portion **38** and the edge **39** of the base **37** together provide what is in effect a relatively broad side on the dog **12**, and this side by its juxtaposition to the side wall of the retractor pocket **35** enables the dog to withstand vibration without shifting its position. Also, the opposed edge **40** of the base **37** by engaging the opposed side wall of the pocket **35** prevents the detent portion **38** from shifting away from the side of the pocket.

We shall now describe more particularly the coaction of the push piece **11** in our extremely novel construction. It will be observed first that the dog **12** when dogging the push piece **11** in locking position, as in Fig. 4, acts through an inclined cam surface that tends to hold the dog in dogging position. We prefer to form this inclined cam surface upon the push piece **11**, as shown at **41**, and this surface engages the detent portion **38** that we prefer to incline also. Because the detent portion **38** accepts the thrust of the push piece spring **29** through the cam surface **41**, this spring coacts with the retractor springs **16** to hold the dog **12** seated in dogging position upon the retractor. Actually, the cam surface **41** requires that the push piece **11** undergo a small inward movement beyond locking position, against the pressure of its spring **29** as a preliminary to its release from locking position. The push piece **11** holds the dog **12** in dogging position not only through the camming action that is contributed by the particular cam surface **41**, but also through the particular arrangement of the detent portion **38** on the dog. It will be remembered that the detent portion **38** is at the side of the dog opposed to its seated side. Further, if we consider Fig. 4, we see that the spring thrust of the push piece **11** is toward the left. This spring thrust therefore tends to rotate the dog **12** clockwise in Fig. 4. However, the dog **12** cannot rotate clockwise since it cannot shift in the retractor pocket, as has been explained. Actually therefore, the spring thrust of push piece **11** presses the dog against seating surface **36** on the bolt retractor. This arrangement very firmly opposes tilting of the dog **12** out of dogging position when the lock vibrates. The particular action will be appreciated even further when it is realized that a tilting movement of the dog **12**, if we were to assume that the dog tilts, could not release the push piece **11** unless the push piece were to move inwardly far beyond the position shown in Fig. 4, that being the locking position of the push piece. This is because we form the detent portion **38** at that side of the dog opposed to the seated side. Thus, the dog **12** cannot by tilting release the push piece **11** from locking position. This release can be accomplished only through a positive retracting movement of the bolt retractor **10** and dog **12** from the position of Fig. 4 to the position of Fig. 5.

As an important part of our invention, we form upon the push piece **11** a lug **42** that coacts with the detent portion **38** at its particular side of the dog whereby to prevent accidental movement of the push piece to locking position. Incidentally, we prefer to form the inclined cam surface **41** as one edge of the lug **42**. As the push piece **11** is pressed from the unlocking position, shown in Fig. 2, toward the locking position, shown in Fig. 4, the lug **42** first engages the detent portion **38**. Because of the position of the detent portion **38** on the base **37**, the lug **42** then tilts the dog **12** about its opposed edge **40**, as shown in Fig. 3. Moreover, the push piece moves inwardly a very considerable distance with lug **42** against the dog before the lug passes by the detent portion **38**. Therefore, when the push piece moves to the locking position of Fig. 4, a relatively large part of its movement is against the pressure of retractor springs **16**, as well as against the push piece spring **29**. We prefer to incline the surfaces through which the lug **42** engages the detent portion **38** as the push piece **11** moves to locking position, this being done to facilitate the tilting

of the dog. In any event the parts described prevent accidental locking movement of the push piece **11** when the door slams, and we do not rely entirely upon the push piece spring **29** for this purpose, as in prior art constructions.

To enable the push piece **11** to coact with the detent portion **38** of the dog, we arrange the push piece to extend through the base **37** of the dog. To accomplish this, we form the retractor **10** with a transverse slot **43** extending through the vertical wall **36** and the side walls of the pocket **35**, as may best be seen in Fig. 9. Also, we form in the dog **12** a transverse slot **44** that extends through the base **37** but not through the detent portion **38**. The slots **43** and **44** permit the push piece **11** to move freely, and the push piece by its position in these slots does not interfere in any way with the desired movements of the bolt retractor **10** and the dog **12**. The retractor springs **16** do of course press the base **37** of the dog symmetrically at opposed sides of the slot **44**.

We prefer to form upon the push piece **11** a stop lug **45** that engages an inner side wall of the pocket **35** of the retractor **10** so as to define the unlocking position of the push piece **11**, as shown in Fig. 2. This stop lug **45** accepts the thrust of the spring **29** when the push piece is in unlocking position so that this spring thrust is not then accepted by the detent portion **38** of the dog. The actual locking of the outer retractor tube **20** is accomplished by push piece **11** in the usual way, and will be well understood by those acquainted with the art. Thus, a part **46** on the push piece when in locking position enters a slot **47** in the retractor tube **20**, as shown in Fig. 4, and prevents rotation of the outer knob **18**. We do prefer however to utilize the transverse wall **34** for guiding and holding the locking part **46**, and for this purpose, we form the plate **34** with a groove **48**.

The bolt retractor **10** in our novel construction lends itself readily to one-piece sheet metal construction, as is clearly shown in Fig. 9, although this particular construction is not essential to our invention. We prefer to make the bolt retractor **10** rectangular in section so as to slide in the spindle housing between the rectangularly disposed parts **31**, **32** and the transverse plates **33**, **34**. The retractor pocket **35** then is rectangular, and the base **37** of the dog **12** is made rectangular to fit in the pocket. In the particular dog that we have illustrated, the edge **39** of the base **37** is provided by a pair of lugs that may be clearly seen in Figs. 1 and 9. This is merely to facilitate the formation of the dog from sheet metal, and of course the base **37** in effect is rectangular because of the arrangement of these lugs.

We believe that those skilled in the art will now understand the extremely novel construction that we have contributed in tubular locks, and that the operation and advantages of this construction will be fully appreciated.

We now claim:

1. In a lock of the class described, a bolt retractor movable transversely of said lock, a dog having a base lying in a seating position with one side against said bolt retractor, a spring holding said dog with its base seated against the retractor and yielding to enable the dog to move relatively to the retractor away from seating position, a detent lug on said dog extending from that side of said base opposite the seated side of said base in an angular direction, a push piece moving transversely of said bolt retractor between locking and unlocking positions and spring pressed toward unlocking position, a part on said push piece moving in contact with said detent lug as the push piece moves against the thrust of its spring from unlocking to locking position whereby to cam said dog angularly away from its seat with said dog fulcrumming relatively to said retractor, said push piece part when thus coacting with the detent lug contributing considerable movement to said dog against the pressure of its spring to allow said push piece part to pass by said detent lug, and said detent lug thereafter moving with said dog

behind said push piece part to dog said push piece in locking position.

2. In a lock of the class described, a bolt retractor movable transversely of the lock, a dog lying in a seating position against said bolt retractor, a spring pressing said dog in a particular direction for holding the dog in said seating position whereby the dog moves with the retractor, said spring yielding to enable the dog to move relatively to the retractor away from seating position, a detent portion on said dog, a push piece moving transversely of said bolt retractor between locking and unlocking positions, a spring pressing said push piece to unlocking position, cam surfaces on the push piece and the detent portion of the dog through which the spring thrust of the push piece acts when the push piece is in locking position to exert a force in the direction of the spring pressure on the dog, the push piece thrust by exerting said force pressing the dog toward seating position and into dogging relation to the push piece with the dog then holding the push piece in locking position, and said dog acting through the said cam surfaces to move the push piece against the thrust of its spring beyond locking position as the dog moves out of dogging relation to the push piece.

3. In a lock of the class described, a bolt retractor movable transversely of the lock, a dog lying in a seating position with one side against said bolt retractor, a spring for holding the dog in said seating position and yielding to enable the dog to move relatively to said retractor away from said seating position, a detent portion on said dog extending from that side of the dog opposed to its seated side, a push piece moving transversely of said bolt retractor between locking and unlocking positions, a spring pressing said push piece to unlocking position, a part on said push piece applying the spring thrust of the push piece to said detent portion when said push piece is in locking position for pressing the dog toward its seating position, and said detent portion then acting through said push piece part to hold the push piece in locking position.

4. In a lock of the class described, a bolt retractor movable transversely of the lock, a dog having a base lying in a seating position against said bolt retractor, a spring for holding the dog with its base seated against the retractor and yielding to enable the dog to move relatively to the retractor away from said seating position, a detent portion on said dog, a push piece moving transversely of said bolt retractor between locking and unlocking positions, a spring pressing said push piece to unlocking position, said detent portion coacting with a part of said push piece for dogging said push piece in locking position when said push piece is pressed inwardly against its spring to said locking position, and a part of said retractor in supporting relation to the detent portion of the dog at one side of its base whereby to accept independently of the base at least a part of the spring thrust of the push piece.

5. In a lock of the class described, a bolt retractor movable transversely of the lock and having a pocket formed with an end surface and a side surface, a dog having a base lying in a seating position against said end surface with one end of its base juxtaposed to said side surface, a spring for holding the dog in its seating position, a detent portion on said dog also juxtaposed to said side surface of the pocket when the dog is in said seating position, a push piece moving transversely of said bolt retractor between locking and unlocking positions, a spring pressing said push piece to unlocking position, said detent portion of the dog acting against a part of said push piece for dogging said push piece in locking position when said push piece is pressed inwardly against its spring to said locking position, and the said side surface of the pocket by its juxtaposed relation to said detent accepting from the detent the spring thrust of the push piece and acting with said one end of the base to oppose tilting of the dog out of dogging relation to the push piece.

6. In a lock of the class described, a bolt retractor movable transversely of said lock, a push piece moving transversely of said bolt retractor between locking and unlocking positions, spring means yieldingly pressing said push piece to unlocking position, a dog, spring means pressing the dog in a particular direction for holding the dog in a dogging position, means for moving said dog from dogging position, a detent portion on said dog engaging a part of the push piece to dog said push piece in locking position once said push piece reaches locking position, said push piece part then applying to the detent portion of the dog the spring thrust of the push piece, said detent portion formed with a bearing surface through which the spring thrust of the push piece when so applied exerts a force in the same direction as do the spring means that press the dog whereby to press the dog toward dogging position, and said dog acting through said bearing surface to push said push piece beyond locking position when said dog moves away from dogging relation to said push piece.

7. In a lock of the class described, a push piece moving between an inward locking and an outward unlocking position, a spring yieldingly pressing said push piece to unlocking position, a bolt retractor having a pocket, a dog for said push piece in said retractor pocket, a spring pressing said dog in a particular direction to a seated position in the retractor pocket for dogging said push piece in locking position, said bolt retractor moving relatively to said push piece to move said dog to release said push piece, cam parts on said push piece and dog through which said push piece acts in turn when dogged in locking position by said dog to press the dog in the same direction as does the spring that presses the dog, and the push piece by so acting through the cam parts holding the dog seated in said pocket for preventing release of the push piece from locking position through vibration of the lock.

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