Jan. 10, 1956 A. G. RAYBURN 2,730,391

LATCH MECHANISM

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Fig. 3.

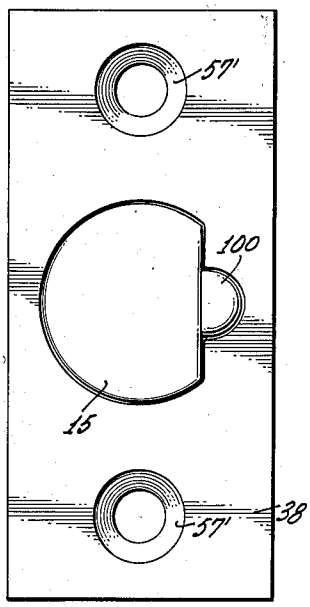


Fig. 1.

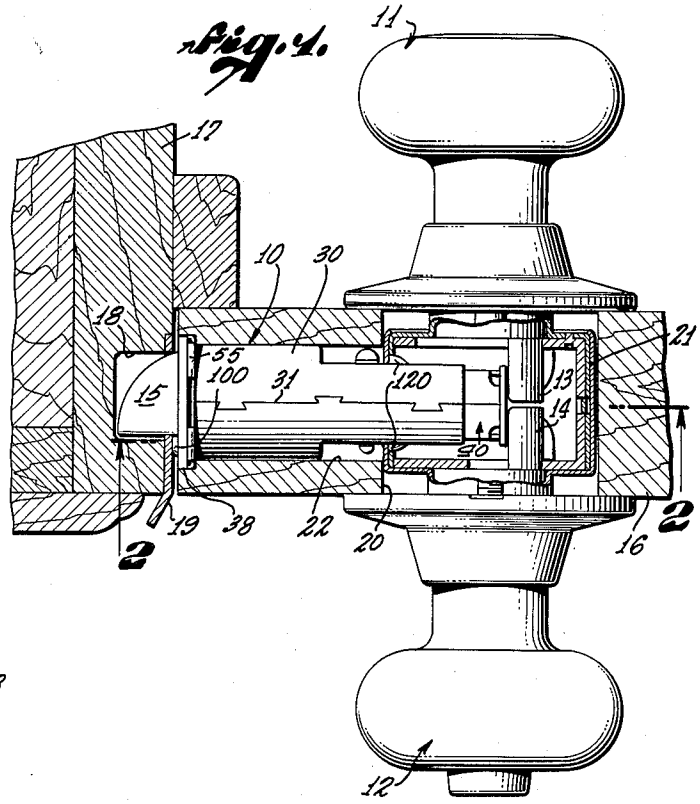


Fig. 4.

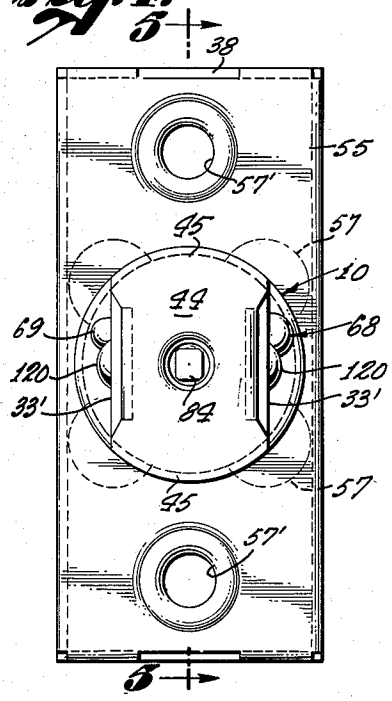
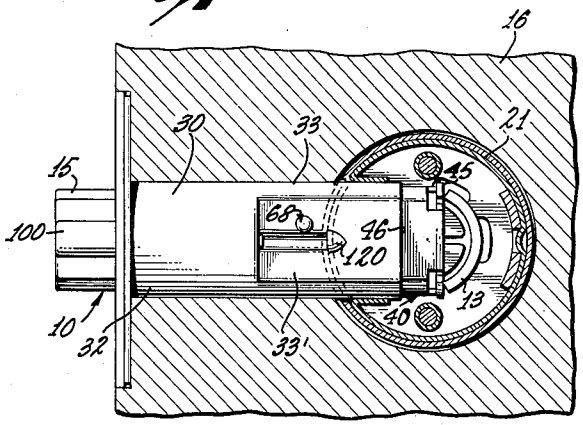


Fig. 2.



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LATCH MECHANISM

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Fig. 5.

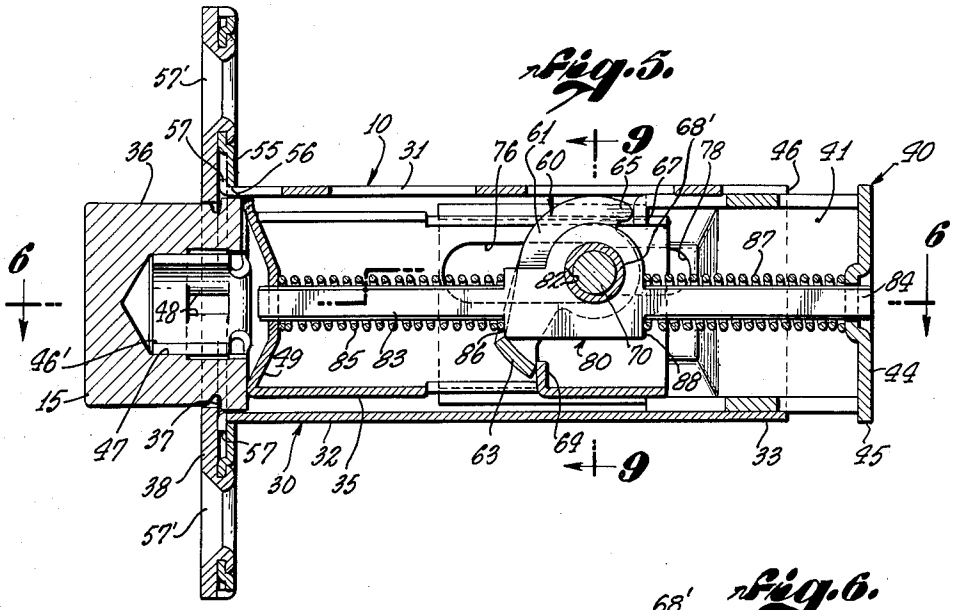


Fig. 6.

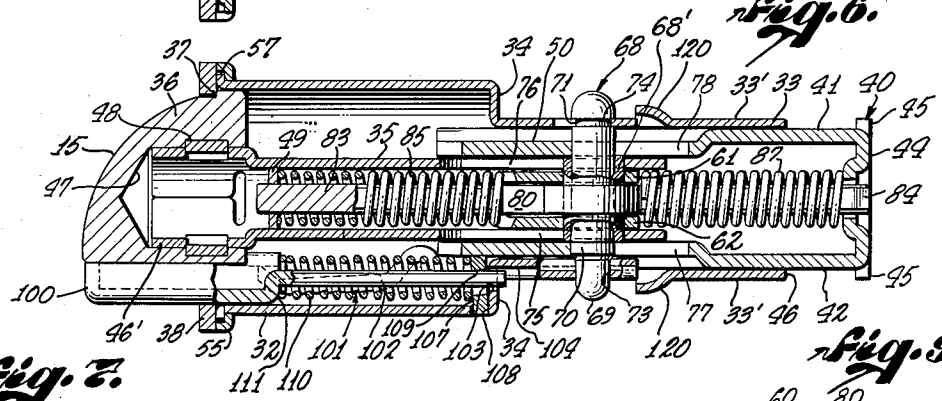


Fig. 7.

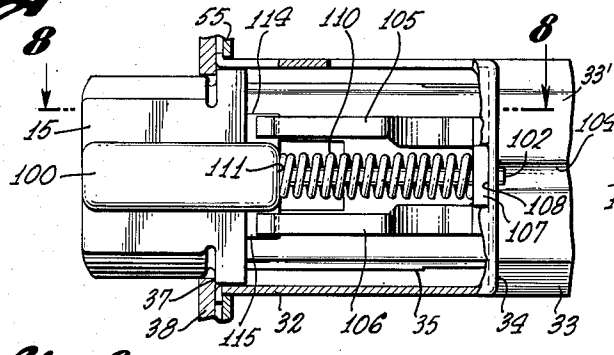


Fig. 9.

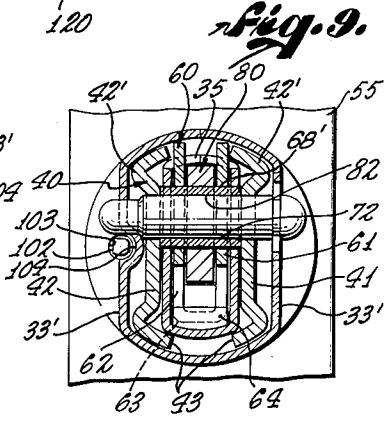
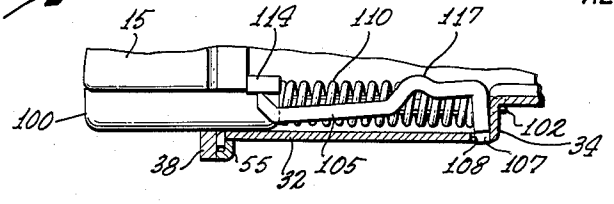


Fig. 8.



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Jan. 10, 1956 A. G. RAYBURN 2,730,391

LATCH MECHANISM

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Fig. 10.

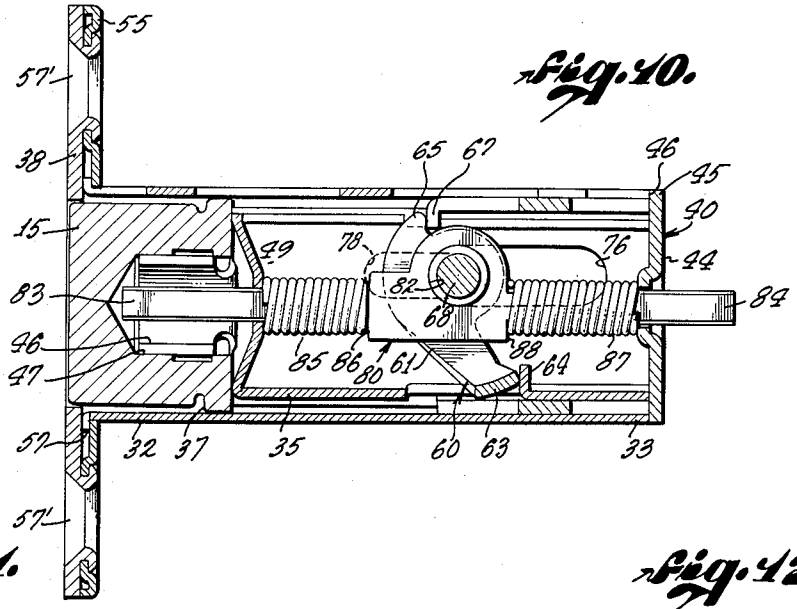


Fig. 11.

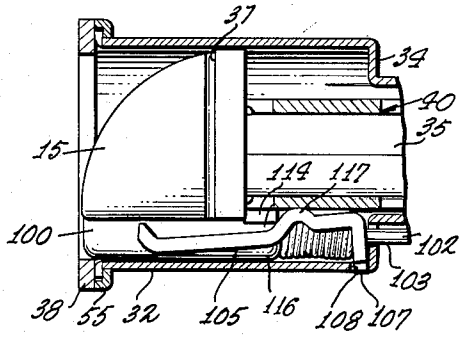


Fig. 12.

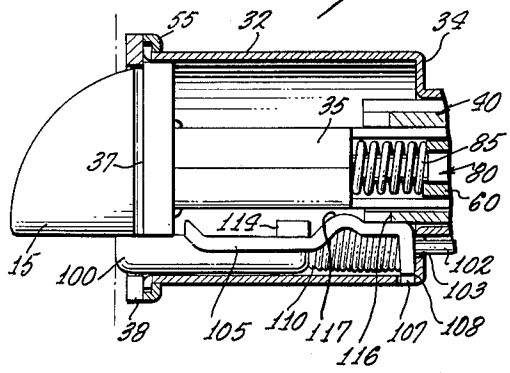


Fig. 13.

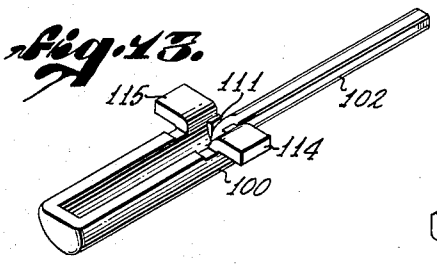


Fig. 15.

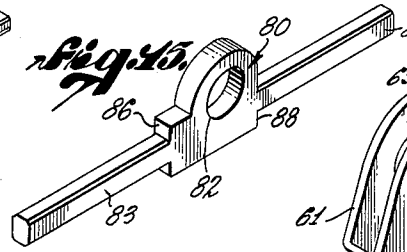


Fig. 16.

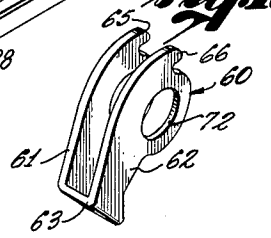
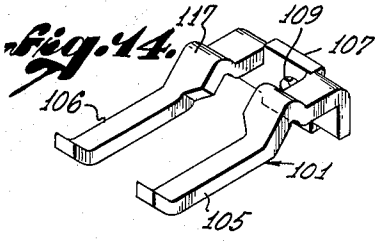


Fig. 14.



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United States Patent Office 2,730,391 Patented Jan. 10, 1956

2,730,391

LATCH MECHANISM

Alden Granville Rayburn, West Los Angeles, Calif., assignor to Victor M. Carter, Van Nuys, Calif.

Application April 1, 1952, Serial No. 279,735

8 Claims. (Cl. 292—169)

The invention relates to lock hardware of a type currently identified as tubular locks. The particular phase of design to which the present invention relates is the latch mechanism which is operated by the spindle.

Among the objects of the present invention is to provide a new and improved latch mechanism adapted to be assembled in its entirety for ultimate combination with a latch opening device but wherein the form of the parts has been maintained such that it can be manufactured with relative ease and relatively inexpensively.

Another object of the invention is to provide a new and improved latch mechanism so designed that the parts can be successfully manufactured by simple and inexpensive manufacturing techniques as, for example, by stamping in contrast to machining and in this way taking advantage of the employment of raw materials of such form that they are relatively inexpensive and thereby pass on the low cost to the ultimate user.

Still further among the objects of the invention is to provide a new and improved latch mechanism for a tubular lock set which is so designed that various parts thereof perform a multiple function purely as a result of special configurations while at the same time being so interrelated and mutually cooperable that moving parts move freely one upon the other with a degree of effectiveness such that only a single pin is found necessary to hold a completely operative assembly in assembled condition.

Another object is to provide a latch construction which incorporates a central post attached to the housing by a single pin, the post acting as a guide for the springs which as a result can be kept smaller in diameter with a greater number of coils, resulting in more stabilized and snappier spring action for the latch and keeping all reaction forces in the center of the latch mechanism.

Still another object is to provide a sub-assembly of the bolt, shank, and lever which are held together by means of a tubular pin so that final assembly into the latch is completed more easily because the parts being held in position thereby effect a great saving in assembly time and a lowering of the cost of each unit.

Also included among the objects of the invention is to provide a new and improved latch mechanism which may if necessary be used together with a dead bolt device, the parts however being of simple design and guiding surfaces being made ample and rugged to the end that even though made of inexpensive materials and by employment of inexpensive manufacturing technique, the device nevertheless is rugged and long-wearing even when installed by persons of somewhat limited mechanical skill.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a longitudinal sectional view through a door showing the latch housing in elevation and in a position it would occupy with respect to the spindles and handles.

Figure 2 is a cross-sectional view taken on the line 2—2 of Figure 1 but showing the latch mechanism in elevation.

Figure 3 is an end view of a door in which the latch mechanism is installed.

Figure 4 is a right end elevational view of the latch housing at the end opposite from Figure 3.

Figure 5 is a longitudinal sectional view through the latch housing showing the latch mechanism taken on line 5—5 of Fig. 4.

Figure 6 is a longitudinal sectional view taken on the line 6—6 of Figure 5.

Figure 7 is a fragmentary elevational view showing the dead bolt location and with a portion of the casing removed.

Figure 8 is a fragmentary longitudinal sectional view taken on the line 8—8 of Figure 7.

Figure 9 is a cross-sectional view taken on the line 9—9 of Figure 5.

Figure 10 is a longitudinal sectional view similar to Figure 5 except that the latch bolt is shown in retracted position.

Figure 11 is a fragmentary longitudinal sectional view taken along a line 90° from the sectional view of Figure 10 and with the striking bolt withdrawn.

Figure 12 is a view similar to Figure 11 but with the striking bolt extended.

Figure 13 is a perspective view of the dead bolt.

Figure 14 is a perspective view of the dogging member or dead bolt retainer.

Figure 15 is a perspective view of a guide member employed within the latch casing.

Figure 16 is a perspective view of the reciprocator which is adapted to withdraw the striking head when the portion of the latch mechanism on the right-hand side as viewed in the drawings is pressed from right to left.

In the embodiment chosen to illustrate the invention there is shown in Figure 1 a tubular lock set wherein the latch mechanism is illustrated in general by the reference character **10** and is shown operatively associated with a pair of respectively outside and inside knobs **11** and **12** mounted so as to rotate respectively spindles **13** and **14** in a manner such that a striking head **15** is withdrawn. The lock set is shown mounted in a door **16** wherein a door frame **17** is provided with a suitable recess **18** and suitable striking plate **19**. To accommodate the lock set the door has provided therein a transverse cylindrical aperture **20** adapted to receive the spindles held in a suitable spindle cage **21**, the door also being provided with a chamber **22** extending from the aperture **20** from right to left to accommodate the latch mechanism.

Specifically the latch mechanism is contained within a casing **30** illustrated as stamped from sheet metal in two halves adapted to interlock along the line **31** of Figure 1. The casing, as viewed in greater detail in Figures 5, 6 and 9, for example, has a substantially cylindrical end portion **32** which is at what may be described as the outer end, and an inner end portion **33** which may be described as a hollow end portion having flat sides **33'** forming a shoulder **34** at the junction of each flattened side with the substantially cylindrical portion **32**. Both ends of the casing as illustrated are open. The bolt **15** or striking head, as it may be designated, is shown mounted upon a hollow sheet metal shaft **35**. As indicated particularly in Figures 5, 6 and 7, the bolt has a substantially cylindrical portion **36** which is adapted to reciprocate back and forth within the inside wall of

the substantially cylindrical outer end portion 32 of the casing. The cylindrical portion 36 is slightly smaller in diameter than the adjacent portion of the striking head so as to provide a shoulder 37 which is adapted to abut a plate 38 in outermost position, thereby limiting movement of the striking head or bolt from right to left as viewed in Figures 5, 6 and 7. The substantially rectangular shape of the shaft of the latch bolt is best illustrated in Figure 9.

Also reciprocatable within the casing 30 is a latch actuator 40. The latch actuator is preferably provided with flat side elements 41 and 42 which have a smooth sliding fit within the flattened portions 33' of the casing. The flat sides 41, however, are also in sliding relation to the flat side walls 33' of the hollow sheet metal shaft which is attached to the bolt. The sliding relationship of the flat sides 41 and the flat-sided sheet metal shaft is clearly illustrated in Figure 9.

To enhance the ruggedness of the latch actuator, edges are deformed as at 42' so as to give added strength and also so as to make provision for an edge 43 along which the sheet metal shaft 35 may be free to reciprocate. It should be noted in passing that the sheet metal latch actuator has a closed end 44 formed by bending over the flat sides 41, as illustrated in Figures 5 through 9, inclusive, thereby providing a closed end. Outwardly extending ears or lugs 45 may be stamped from the same latch actuator in order to provide a stop against an adjacent edge 46 of the casing. This stop limits movement of the striking head from right to left.

The sheet metal shaft 35 has a deformed outer end portion 46' which is designed to be received in a hole 47 in the striking head of the latch bolt and there to be secured in place by extension laterally of configurations 48 in suitable recesses in the striking head. A dished flanged portion 49 may be bent inwardly from the adjacent end, as best seen in Figures 5 and 6, in such manner as to provide a transverse partition within the shaft. The upper end of the flange, as viewed in Figure 5, may fall within a slot in the cylindrical portion to prevent the cylindrical portion 36 from turning relative to the shaft 35 once the parts are assembled together.

Constructed as they are and as has been described, the shaft is designed to reciprocate freely endwise with respect to the casing within the actuator 40, the actuator being provided with inwardly depressed flat areas 50 to make the reciprocating association a relatively close though free sliding fit. At the same time the actuator is designed to slide with relation to the adjacent inside surfaces of the flat inner end portion 33 of the casing 30.

As has been previously noted the casing 30 is relatively stationarily mounted relative to an assembly of plates comprising the finish plate 38 and a backing plate 53 secured thereto by conventional means but providing a space therebetween immediately surrounding an aperture 56 for reception of the cylindrical outer end portion of the casing and a flange 57 thereon which is adapted to be hooked between the finish plate and the backing plate. Countersunk screw recesses 57' are provided by means of which the latch mechanism may be secured in the door in the position illustrated in Figures 1 and 2. Thus mounted the casing provides a slide-way for the reciprocating parts, namely, the latch bolt and its hollow sheet metal shaft and the sheet metal latch actuator. These are so designed with respect to the mechanism that as the actuator moves from right to left, the latch bolt is withdrawn in a direction from left to right, and becomes a reverse acting latch bolt, relative to movement of the actuator. Movement of the latch bolt by the actuator is therefore indirect in that the reciprocator is interposed between them.

To accomplish this relative reciprocating movement there is provided a reciprocator indicated generally by the reference character 60 and shown in perspective in Figure 16. The location of the reciprocator in the

casing 30 may be discerned in Figures 5, 6 and 10. The reciprocator may also be made from a stamped sheet metal part having opposite sides 61 and 62 joined along an end edge 63. The end edge 63 is so shaped that it is adapted to bear against an inwardly directed flange 64 which is actually an inwardly bent portion of the wall of the hollow sheet metal shaft on the latch bolt. At its opposite end the reciprocator is constructed with figures 65 and 66 constructed and located so as to bear against an inwardly bent flange 67 on the actuator.

The reciprocator 60 is fixed in its position relative to the casing 30 by means of a pin 68. The pin has a relatively small end 69, a cylindrical mid-portion 70 of somewhat greater circumference and a shallow annular recess 71 adjacent the larger end. The reciprocator is provided with a hole 72 adapted to receive the mid-portion of the pin with a free rotating fit. The pin, however, is designed to fit frictionally within the casing 30 and for that purpose one side of the casing is provided with a snug aperture 73 into which the small end of the pin may be pressed and the other side is provided with an aperture 74 which will receive the annular recess 71 in the pin with a snap fit.

So that the sheet metal shaft of the latch bolt and the actuator can move, the sheet metal shaft is provided at its opposite sides with slots 75 and 76. These slots are somewhat wider than the diameter of the mid-portion of the pin so as to slide freely over the pin. The actuator is provided with somewhat similar slots 77 and 78 to permit the actuator to slide with relation to the pin.

To facilitate and improve the smoothness and positiveness of operation of the reciprocating parts, a guide member 80 is employed. The form of the guide member is clearly illustrated in Figure 15. The location of the guide member in the latch housing is clearly apparent in Figures 5, 6, 9 and 10.

The guide member comprises a mid-portion 81 adapted to fit between the opposite sides of the reciprocator 60, the mid-portion being provided with a central pivot hole 82 adapted to receive the cylindrical mid-portion 70 of the pin 68. Extensions 83 and 84 on the guide member are in axial alignment and extend respectively toward the outer and inner ends of the casing. The extensions are preferably non-circular in cross-section, here being illustrated as essentially square in cross-section having bevelled corners. The extension 83, as illustrated in Figures 5, 6 and 10, is adapted to be slidably received in an opening in the flanged portion 49. The guide member is sufficiently short, however, to permit retraction of the striking head while the extension 83 is received within the opening in the striking head. The extension 84 is made of such length that it is slidably received in an opening of corresponding shape in the end 44 of the actuator.

To facilitate assembly there may be employed a tubular pin 68' surrounding the solid pin 68. The tubular pin is adapted to carry the shaft 35 and striking head 15, the reciprocator 60, the guide member and the spring 85 in a sub-assembly. These parts can then be applied as a unit when the latch is assembled and the pin 68 put in place.

The coiled compression spring 85 surrounds the extension 83 and is kept between the flanged portion 49 and a shoulder 86 on the guide member. Another coiled compression spring 87 surrounds the extension 84 bearing against the inside of the end 44 of the actuator and a shoulder 88 on the guide member at the central portion. The coiled spring 85 serves to return the striking head 15 to its initial extended position after retraction whereas the coiled spring 87 serves to return the actuator to its initial position. However, inasmuch as the actuator and latch bolt are interconnected through the reciprocator, both springs act together to return their respective parts simultaneously to initial positions. By reason of the fact that both reciprocating parts are accurately guided along a centrally located guide member and the extensions thereof, they are assured accurate movement in alignment with

each other at all times so that the reciprocation is always a smooth operation.

The latch mechanism is furthermore provided with a dead latch plunger **100** shown in perspective in Figure 13. A forked dog or lever **101** operable with the dead latch plunger is shown in perspective in Figure 14. The location of these parts with respect to the latch mechanism is clearly illustrated in Figures 6, 7 and 8. The dead latch plunger is employed for the conventional purpose of preventing manipulation of the striking head out of its secure position in the strike plate by some instrument when the door is closed, this being accomplished by depression of the dead latch plunger to the position shown in Figure 1 in which adjustment the forked lever or dog drops behind the latch bolt to prevent its inadvertent withdrawal by means of an instrument.

It is significant to note that the dead latch plunger may likewise be formed from sheet metal stock pressed into the form of a dead latch plunger and a shank **102** thereon, as illustrated in Figure 13. Interior portions of the dead latch plunger and shank are shown to be hollow but in being hollow they in nowise detract from the ruggedness and efficiency of operation of the dead latch plunger. At the same time, however, they permit of inexpensive fabrication.

The dead latch plunger **100** is mounted within the cylindrical outer end portion **32** of the casing, the shank **102** being extended through an aperture **103** in the shoulder **34** intermediate the outer and inner end portions of the casing. The casing is furthermore deformed with a longitudinal recess **104** at the outer surface of the flattened portion **33** thereof so as to provide a slideway for the shank **102** of the dead latch plunger.

The forked lever **101** has arms **105** and **106** which are adapted to lie alongside the dead latch plunger. The arms are joined by a base portion **107**, the location of which with respect to the dead latch plunger is clearly visible in Figures 7 and 8. The base portion is adapted to extend outwardly through an aperture **108** in the casing, thereby to correctly position the forked lever. The base portion is provided with a hole **109** adapted to receive the shank **102** in a free sliding fit. A coiled spring **110** is located so as to surround the shank bearing at one end against an end wall **111** of the dead latch plunger and at the other end against the base plate **107**.

The dead latch plunger is provided with upper and lower wings **114** and **115**, these being clearly shown in Figures 7 and 8, against which the ends of the arms **105** and **106** are adapted to press. The wings normally keep the arms out of locking engagement with the striking head. When, however, the dead latch plunger is depressed as the latch strikes against the strike plate so that the dead latch plunger occupies the position illustrated in Figure 1, the wings will be removed from the ends of the arms, in which event the compression spring **110** will tend to tip the arms in a general clockwise direction as viewed in Figures 6 and 8 and also as viewed in Figure 12 wherein the dead latch plunger is likewise shown depressed. In that position the arms fall behind the rear of the striking head **15** in which position they prevent manipulation of the striking head to an unlatched position. Operation of the dead latch plunger, however, does not interfere with normal operation of the latch and latch bolt by the spindles. When the latch is manipulated in the normal fashion, namely, by the driving of the actuator **40** in a direction from right to left, an outer end **116** of the actuator strikes against an elevated portion **117** of each of the arms **105** and **106**, thereby shifting the fingers from the position shown in Figure 12 to the position shown in Figure 11 but in advance of retraction of the striking head far enough to strike the ends of the arms. By this action the arms are removed from a blocking position before the striking head is withdrawn sufficiently far and the dead latch plunger action will thus be made temporarily inoperative. When the latch is released, the wings **114** and **115** hold the arms out as the dead latch plunger is sprung outwardly to initial position.

The latch casing **30** may also be provided with outwardly extending configurations **120** so as to engage within the cage **21** thereby to hold the latch mechanism in operative relationship with the spindles **13** and **14** as illustrated in Figure 1. Details of the connection are illustrated in co-pending application Serial No. 276,774, filed March 15, 1952.

There has thus been described a latch mechanism featuring particularly a latch casing and appropriate moving parts which can be constructed in the manner described from sheet metal material of relatively thin wall section. The cross-sectional areas of the various parts are maintained relatively large so as to provide adequate strength and ruggedness and also so as to promote smoothness in operation of one part as it slides with relation to another. The material forming the moving parts has been so formed that the various stops and slideways can be formed directly from the sheet metal itself by stamping operations without the necessity of special machining of parts. Substantially all essential parts of the device with the exception of the striking head can be made in this fashion, thereby greatly improving the overall adaptability of the parts to their job and at the same time minimizing the expense both of material going into the fabrication of the parts and the actual manufacturing and assembly technique required.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

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

1. In a tubular lock set a latch mechanism comprising a casing and an indirect acting latch bolt means reciprocably mounted in the casing, said casing comprising a tubular element having an open cylindrical outer portion and an open flat-sided inner portion, said latch bolt comprising a striking head in the cylindrical outer portion and a hollow shaft affixed thereto slidably mounted in the casing, a latch actuator slidable axially over the shaft and within the casing, a centrally pivoted reciprocator bearing at one end thereof against the actuator and at the other end thereof against the shaft and a pivot pin extending between opposite sides of the casing and through the reciprocator for mounting said reciprocator, a guide member including a mid-portion laterally adjacent the reciprocator and longitudinal shaft extensions having a sliding fit in said head and said actuator, and spring means between the head and the actuator adapted to return the head and actuator to initial positions.

2. In a tubular lock set a latch mechanism comprising a tubular casing having an outer end portion and a flat-sided inner end portion, a latch bolt having a striking head and a flat-sided shaft affixed thereto, a hollow flat-sided actuator slidably mounted in said inner end of the casing and having a guiding relationship with the shaft, said inner end of the casing having a transverse pin mounted therein, said shaft and said actuator having longitudinal slots at opposite sides slidably surrounding the pin, an elongated guide member having one end reciprocatably mounted in the latch bolt, an opposite end reciprocatably mounted in the actuator and mid-portion having a transverse aperture therein mounted on the pin, spring means engaging the guide means and biased against the latch bolt and actuator, and a reciprocator pivotally mounted on the pin having one end thereof engaging the actuator and the other end engaging the shaft.

3. In a tubular dead lock set a latch mechanism comprising a tubular casing having an outer end portion and an inner end portion having side walls forming a shoulder at the junction of the inner end portion with the outer end

portion, a latch bolt member having a striking head slidably mounted in the outer end and a shaft attached thereto, a latch actuator fitting slidably relative to the shaft, said actuator having one portion forming a slideway with the shaft and another portion forming a slideway within the inner end of the casing, said actuator having an outwardly extending flanged stop adapted to engage the inner end of the casing, a dead latch plunger at one side of said striking head having a guide shaft extending slidably through said casing at the shoulder, said casing adjacent the inner end having an outwardly bent limit stop for the dead latch plunger guide shaft, a dog and a portion of the casing forming a dog retainer adjacent the dead latch plunger, and a transversely disposed pin adapted to secure the casing, the actuator and the latch bolt shaft in assembled relationship.

4. In a tubular dead lock set a latch mechanism comprising a tubular casing having an outer end portion and an inner end portion having flattened side walls forming a shoulder at the junction of the inner end portion wtih the outer end portion, a latch bolt member having a striking head slidably mounted in the outer end portion and a hollow flat-sided shaft attached thereto, a latch actuator fitting slidably over the shaft, said actuator having a portion of narrower width forming a slideway with the shaft and a portion of greater width forming a slideway within the inner end portion of the casing, said actuator having an outwardly extending flanged stop adapted to engage the inner end portion of the casing, a dead latch plunger at one side of said striking head having a guide shaft extending slidably through said shoulder in the casing, said casing adjacent the inner end having an outwardly bent limit stop for the dead latch guide shaft, a dog and a portion of the casing forming a dog retainer adjacent the dead latch plunger, and a transversely disposed pin extending through the latch bolt shaft and the actuator and frictionally retained in one side of the casing thereby to secure the casing, the actuator and the latch bolt shaft in assembled relationship.

5. In a tubular lock set a latch bolt sub-assembly, an actuator and a casing adapted to operably mount and contain said assembly and said actuator, said latch bolt sub-assembly comprising a strike head, a hollow shaft attached to the strike head and having opposite flat sides, said sides having oppositely located longitudinally extending slots therein, a reciprocator having a pivot hole intermediate opposite ends, a tubular pivot pin in said hole and mounted slidably in said slots whereby to retain said reciprocator in the shaft, said shaft having a shoulder in contact with one end of the reciprocator, a hollow elongated actuator mounted around and in longitudinally sliding relationship with the shaft and having an engagement with the other end of the reciprocator, said actuator having slots coinciding with the slots of the shaft and having a sliding non-rotating fit within an inner portion of the casing, and a pin secured in said casing and extending through the slots in the actuator and shaft and through said tubular pin whereby to secure said latch bolt assembly, said actuator and said casing in assembled relationship, and spring means biased between the actuator and the sub-assembly adapted to maintain an initial position of said actuator and sub-assembly.

6. In a tubular lock set a latch bolt sub-assembly, an actuator and a casing adapted to operably mount and contain said assembly and said actuator, said latch bolt sub-assembly comprising a strike head, a hollow shaft attached to the strike head and having opposite flat sides, said sides having oppositely located longitudinally extending slots therein, a reciprocator having a pivot hole intermediate opposite ends, a tubular pivot pin in said hole and mounted slidably in said slots whereby to retain said reciprocator in the shaft, said shaft having a shoulder in contact with one end of the reciprocator, a guide rod having a central portion in pivotally retained relationship with said reciprocator and said tubular pin, an outside portion on said rod slidably engaging the shaft, a hollow elongated actuator mounted around and in longitudinally sliding relationship with the shaft and having an engagement with the other end of the reciprocator, said actuator having slots coinciding with the slots of the shaft, said actuator having a sliding non-rotating fit within the inner portion of the casing, an inside portion on said rod having a sliding fit in said actuator, and a pin secured in said casing and extending through the slots in the actuator and shaft and through said tubular pin whereby to secure said latch bolt assembly, said actuator and said casing in assembled relationship.

7. In a tubular lock set, a latch mechanism comprising a casing and an indirect acting latch bolt means reciprocably mounted in the casing, said casing comprising a cylindrical outer end portion and a flat sided inner end portion, a latch actuator comprising a hollow elongated element having at least one flat side, said actuator being slidably mounted at the inner end portion of the casing, and a latch bolt assembly comprising a striking head slidably mounted in the outer end portion of the casing and a hollow shaft attached to the striking head having at least one flat side, said shaft being slidably mounted within the actuator with respective flat sides in sliding engagement, said shaft being spaced from the casing by interposition of the actuator, a reciprocator within the shaft, and a pivot pin pivotally supporting the reciprocator on the casing intermediate opposite ends of the casing and the shaft with one end of the reciprocator bearing against the actuator in an axial direction and the other end bearing against the shaft in an axial direction.

8. In a tubular lock set a latch bolt sub-assembly, an actuator and a casing adapted to operably mount and contain said assembly and said actuator, said latch bolt sub-assembly comprising a strike head, a hollow shaft attached to the strike head and having opposite flat sides, said sides having oppositely located longitudinally extending slots therein, a reciprocator having a pivot hole intermediate opposite ends and a tubular pivot pin in said hole and mounted slidably in said slots whereby to retain said reciprocator in the shaft, said shaft having a shoulder in contact with one end of the reciprocator, and a hollow elongated actuator adapted to be slidably mounted around the shaft and in engagement with the other end of the reciprocator.

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