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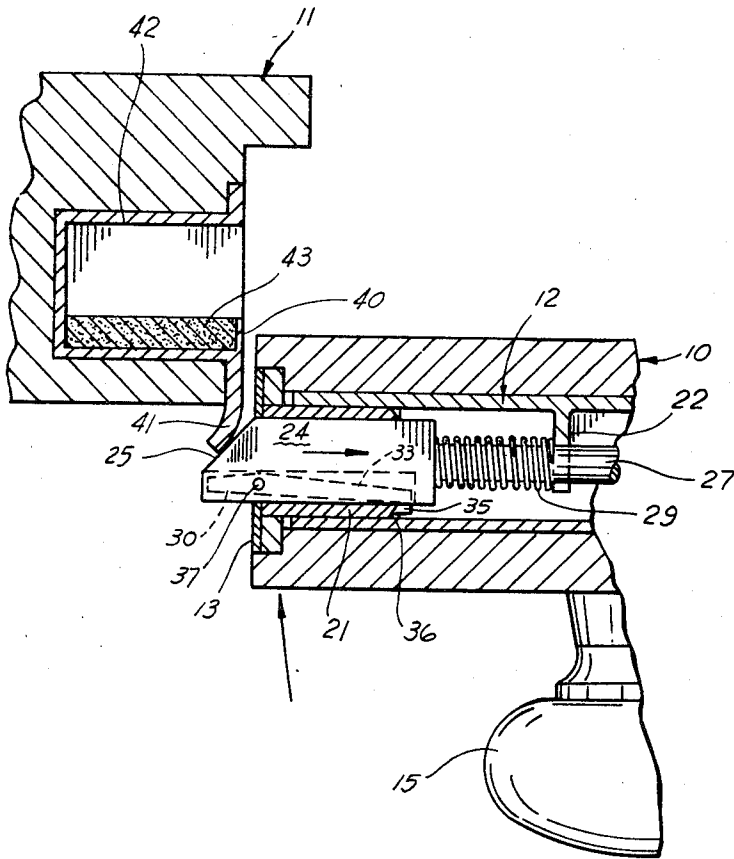
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[54] **LATCH MECHANISM INCLUDING A LATCH BOLT HAVING BOTH LONG AND SHORT EXTENDED POSITIONS**
6 Claims, 10 Drawing Figs.

[52] U.S. Cl. **292/169,**
292/153, 70/143, 292/340
[51] Int. Cl. **E05c 1/12,**
E05b 63/20, E05b 15/02
[50] Field of Search, **292/144,**
153, 335, 340; 70/143; 292/157, 169

ABSTRACT: There is provided a latch bolt spring urged in a direction to be extended and capable of retraction by conventional retractor means, which has both long and short extended positions for cooperation with a strike. The bolt is releasably retained in the short position by a movable catch member operative to engage and hold the bolt in the last-mentioned position. A magnet is employed in association with the strike to release the catch member so that the bolt may assume its fully extended or long position in the strike.



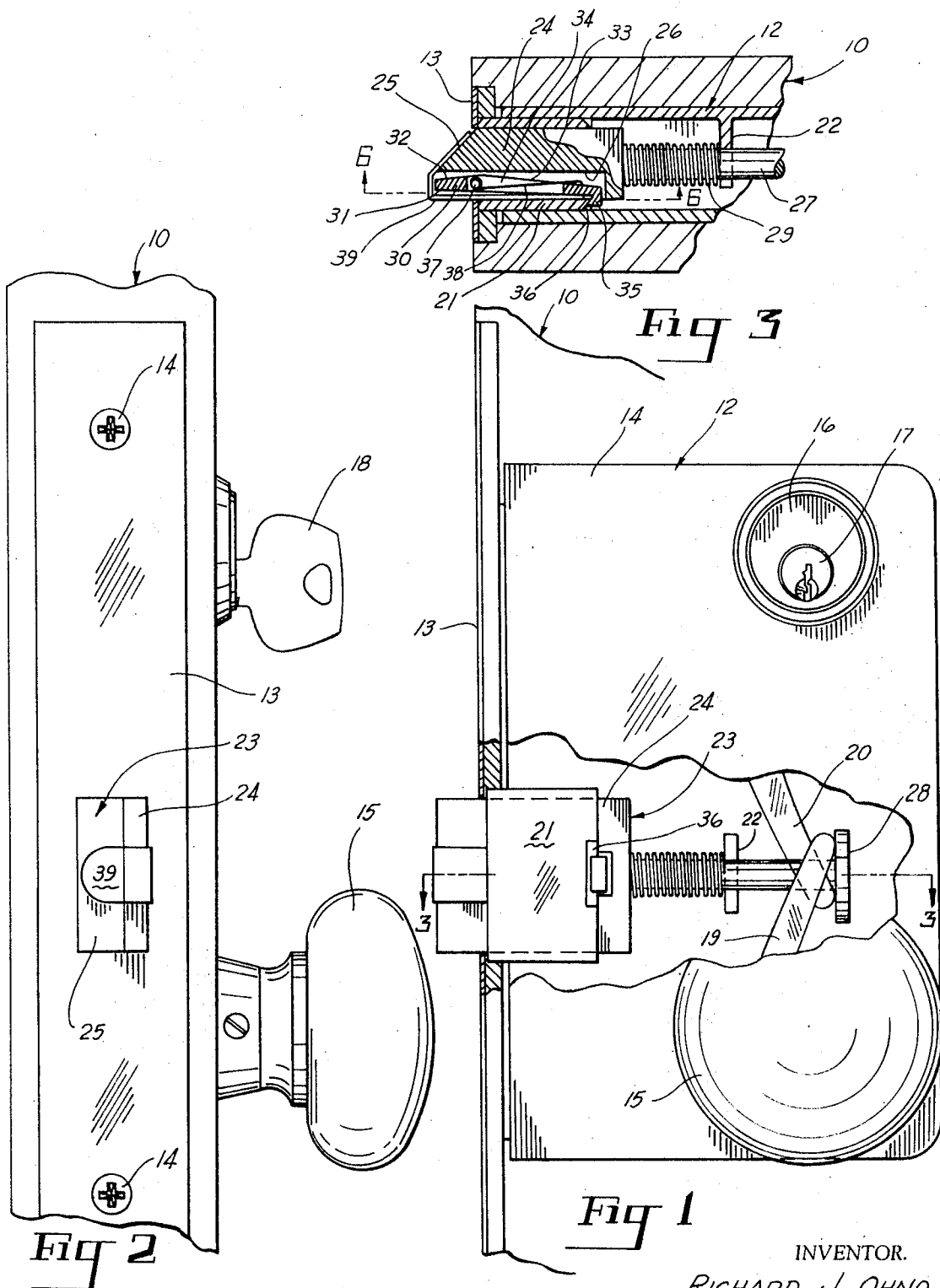


Fig 3

Fig 1

Fig 2

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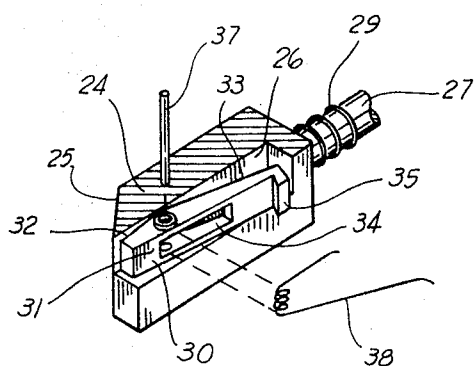


Fig 5

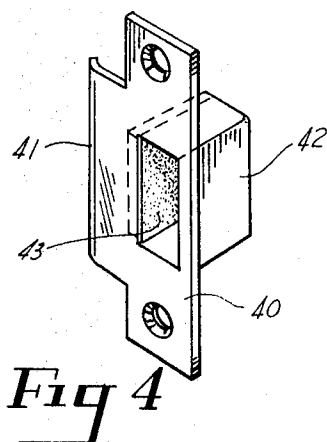


Fig 4

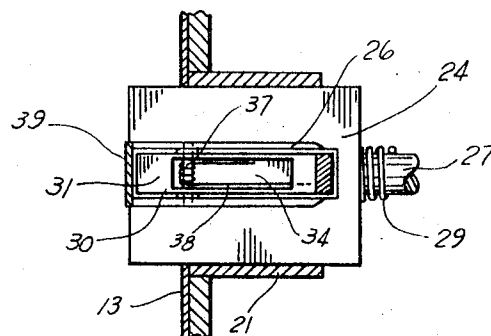


Fig 6

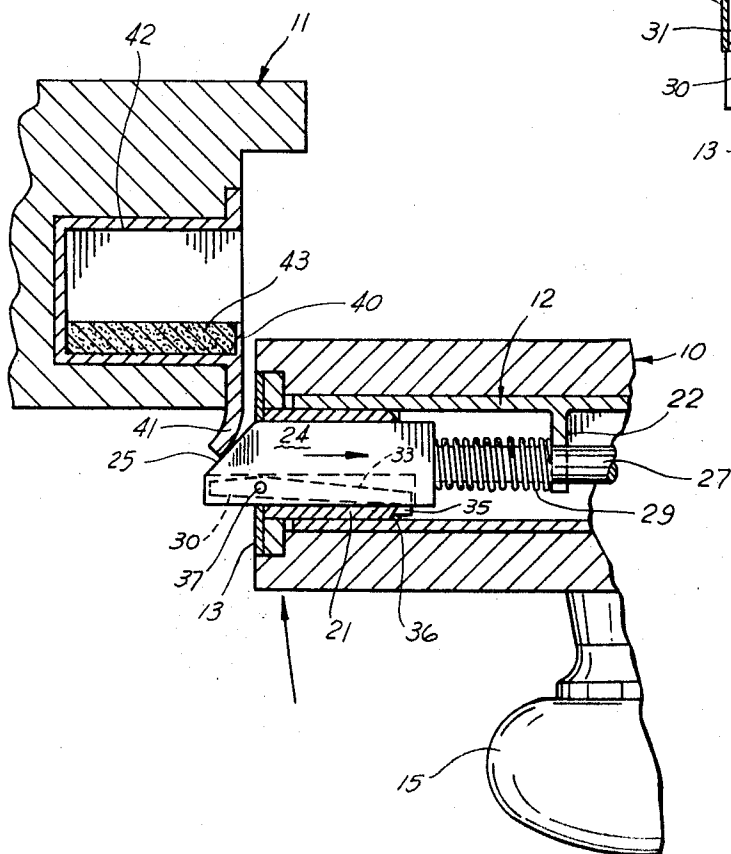


Fig 7

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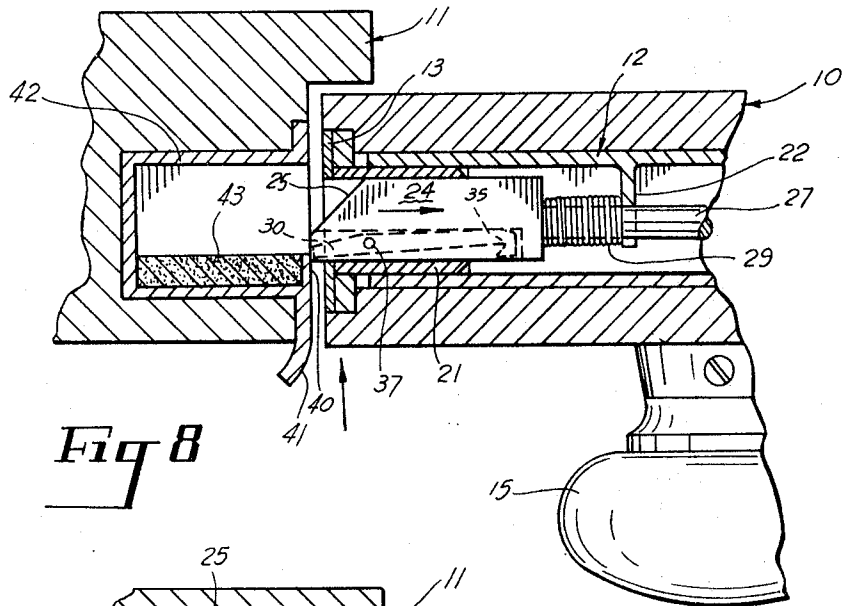


Fig 8

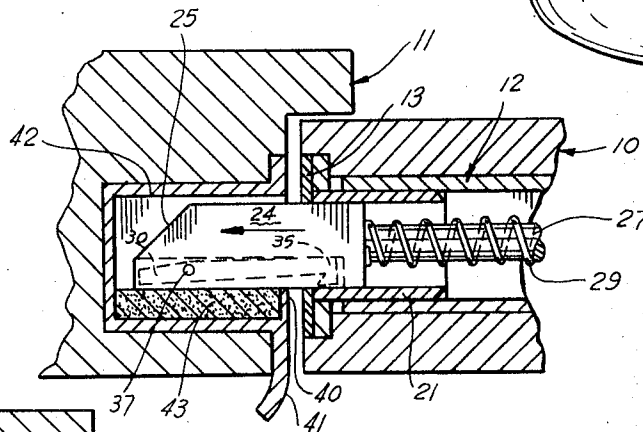


Fig 9

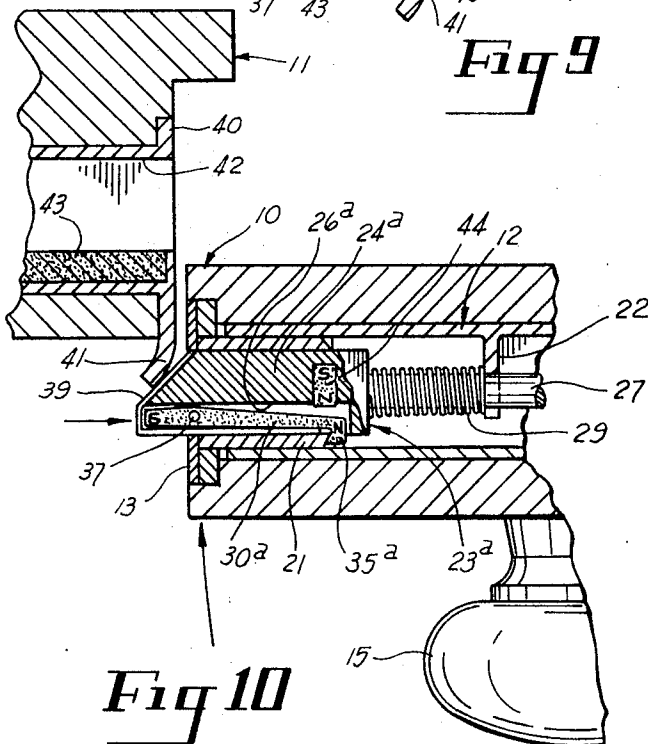


Fig 10

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LATCH MECHANISM INCLUDING A LATCH BOLT HAVING BOTH LONG AND SHORT EXTENDED POSITIONS

BACKGROUND OF THE INVENTION

It has been found desirable heretofore to provide in a latch mechanism a latching bolt which is spring urged to a short extended position and beyond to a long position for cooperation with a strike to provide extra security against such risks as jimmying of the door with which the latch is associated or "carding" of the latch bolt to retract it a distance sufficient to open the door. Also it has been recognized that when the door is open the bolt should not extend therefrom to its fullest extent, so as not to catch on clothing and other foreign objects carried past the door and also not present a problem with respect to camming of the bolt by the strike to retract it when the door is closed, as set forth in U.S. Pat. No. 3,353,858, dated Nov. 21, 1967. That patent also explains the desirability of providing a long-throw bolt which may be retracted by conventional retracting means and a bolt adaptable to conventional or standard lock sets.

In the latch mechanism of U.S. Pat. No. 3,353,858 the spring-biased latch bolt is released from the short extended position to assume the long position by mechanical means and the release mechanism requires a relatively large number of parts. It is relatively complex and expensive to produce. Furthermore, when the door is open, an exposed movable part of the latch mechanism may be engaged either accidentally or deliberately as by tampering and moved to a position to release the latch bolt to its fully extended position. In the last-mentioned bolt position, if the door is swung toward the closed position, the latch bolt may strike a conventional strike lip with jarring impact because the bolt in this position cannot be retracted by such a lip. In order to close the door in this situation, the latch bolt must first be retracted by the retractor mechanism associated with, say, the door knob.

There has been a need for a more simple construction, one less expensive, easier to produce, and one in which there is no exposed movable part of the latch mechanism to be engaged either accidentally or deliberately as by tampering and moved to a position to release the latch bolt to its fully extended position when the door is open. There has also been a need for a latch mechanism having fewer moving parts and employing a magnet to release the bolt from a short extended position of, say, approximately three eighths of an inch from the remainder of the latch mechanism on the door to assume a long position of approximately one and five sixteenths of an inch. This longer throw of the bolt from the short extended position to the long position may not be achieved easily, if at all, by practical mechanical means but is capable of simple achievement through the aforementioned use of a magnet to release the bolt from its short extended position to its fully extended position.

SUMMARY OF THE INVENTION

In accordance with the invention there is provided a latch mechanism of the above-described type which embodies the aforementioned desirable features, eliminating undesirable ones, a latch mechanism which is comprised of few and inexpensive parts and a latch mechanism which is economical to produce. It will be noted from the foregoing that the invention contemplates the provision of a latch mechanism such as characterized above which is of an improved construction.

More specifically, the invention provides a latch bolt spring urged in a direction to be extended and retractable by conventional retractor means, which has both long and short extended positions for cooperation with the strike and which bolt is releasably retained in the short position by a movable catch member operative to engage and hold the bolt in the last-mentioned position, and a magnet in association with the strike to release the catch member so that the bolt may assume its fully extended or long position in the strike.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a fragmentary, side elevational view of a door broken away and illustrating the latch bolt mechanism of the invention mounted thereon, the case or housing of the mechanism also being broken away to show parts therein;

FIG. 2 is a fragmentary view in front elevation further illustrating the latch bolt mechanism;

FIG. 3 is a sectional view taken on line 3-3 of FIG. 1;

FIG. 4 is a perspective view of the strike unit with which the latch bolt mechanism cooperates;

FIG. 5 is a perspective view illustrating the bolt head of the latch mechanism, omitting a partial cover, partially in section and illustrating certain parts thereof in exploded form;

FIG. 6 is a sectional view taken on line 6-6 of FIG. 3;

FIG. 7 is a fragmentary view illustrating in cross section on a horizontal plane through the door and a door frame one position of the bolt head with reference to the strike unit, omitting a partial cover for the bolt;

FIG. 8 is a similar view illustrating the parts in different positions;

FIG. 9 is a similar view illustrating the parts in different positions; and

FIG. 10 is a view similar to FIG. 7, illustrating a modification of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The latch mechanism of the invention may be employed in various types of lock sets though illustrated in a lock set of the mortise type. In the drawings the door on which the latch unit is mounted is indicated generally at 10. It is hinged vertically to swing within a door frame indicated generally at 11. The latch unit comprises a conventional case or housing indicated generally at 12, mounted on the door 10 in the usual manner and provided with a nonmagnetic face plate 13 having the customary attaching fasteners 14 (FIG. 2) securing the face plate to the edge of the door in flush relation thereto.

The case or housing of the latch unit is adapted for support for one or more latch actuators. In the drawings only one of a pair of door knobs is shown for simplicity of illustration and indicated at 15, forming one latch actuator. Another is illustrated in the form of a cylinder lock 16 having the usual rotatable key plug 17 (FIG. 1) receiving a key in the usual manner (FIG. 2) which key is indicated at 18. Associated with the knob 15 and the rotatable key plug 17 through conventional connections, not shown, are bolt-retracting arm linkages (FIG. 1) indicated at 19 and 20 respectively.

Within the housing 12 there is secured by any suitable means a nonmagnetic sleeve-like bolt support and guide open at its ends and having the cross section indicated in the drawings, the bolt sleeve being indicated at 21. This sleeve extends through the front portion of the housing 12 in communication with a bolt opening in the face plate 13 and also in communication with the interior of the housing 12. As shown in FIG. 3, the housing 12 is also provided with an inwardly extending flange 22 for supporting and guiding the tail portion of the bolt to be described in detail hereinafter. The flange also provides an abutment serving as a stop engageable by a portion of the bolt to limit the outward extension of the bolt.

In the form of FIGS. 1 through 9, the bolt is indicated generally at 23. It is of composite form having a head portion 24, the outline of which is generally conventional and shown in the drawings. It is of nonmagnetic metal and provided with the usual tapering leading surface 25. The bolt head 24 is slidably received in the sleeve part 21 of the housing. Midway between its upper and lower extremities the bolt head is provided with a longitudinal groove 26 best shown in FIGS. 3 and 6 extending from the tapering surface 25 rearwardly to a point approaching the rear end of the bolt head. The groove 26 is formed in one side face of the bolt head. There is provided in fixed relation to the bolt head as by any suitable means a shaft 27 extending rearwardly from the bolt head forming the tail portion of the bolt and having at the rear extremity thereof a

rectangular flange 28. The shaft 27 has the aforementioned sliding and guided relation with the flange 22 of the housing. Intermediate the flange 22 and the bolt head 24 there is provided on the shaft 27 a coiled compression spring 29 urging the bolt in a direction to be extended from the housing, one end of the spring being engaged with the bolt head and the other being engaged with the flange 22. The aforementioned flange 22 of the housing which provides the aforesaid abutment is engageable by the flange 28 of the tail portion of the bolt to limit outward travel of the bolt. Retraction of the bolt through rotation of either the knob 15 or the key plug 17 is effected through the linkages 19 or 20 respectively acting on the flange 28 of the bolt.

A catch member 30 is provided in the groove 26 of the bolt head, which catch member is of elongated form having a substantially flat face portion 31 facing outwardly from the groove 26 extending from the forward end of the catch member to a point approaching the rear end thereof. The forward face portion of the catch member opposing the bottom of the groove 26 is tapered at 32 as shown in FIG. 3, and the longer rear portion 33 of the last-mentioned face of the catch member is inclined also as shown in the last-mentioned view. Intermediate its ends the catch member 30 is provided with a longitudinal opening 34 therethrough. At its rear end the catch member 30 is provided with a hooklike tail part 35 for cooperation with a beveled edge portion 36 of the bolt sleeve 21. In this form of the invention the catch member is of ferrous metal and may be formed of mild steel. Pivoting the catch member 30 through a hole therein at a point not far removed from the forward end thereof is a pivot pin 37 extending into the bolt head 24 into and through the groove 26 therein with washers on either side of the member 30. The catch member pivoted in this manner may be considered a lever stop as will be apparent hereinafter. The construction and mounting of the catch member within the groove 26 of the bolt head by the pivot pin is such that in the angular position of the catch member shown in FIGS. 8 and 9 of the drawings, the catch member is entirely recessed with the bolt head.

A hair spring 38 biases the tail portion of the catch member in a direction outwardly from the bottom of the groove 26 in the bolt head. The intermediate portion of this spring is supported about the pivot pin 37 within the apertured portion 34 of the catch member through which the pin extends, as shown in the drawings. One end of the hair spring bears against the bottom of the groove 26 while the other end extends out of the aperture 34 in the catch member and over the tail portion of the catch member.

A cover 39 of plastic material, as shown in FIG. 3, is provided to cover that portion of the bolt head which is grooved and which would otherwise be visible in the operation of the latch mechanism, to inhibit tampering with the catch member and also to tend to prevent dirt or other foreign material from accumulating in the aforementioned recessed part of the bolt head containing the catch member. The cover 39 may have a press fit in the groove 26 and may extend over the inclined surface 25 of the bolt head as shown to protrude therefrom (FIG. 3) for engagement with the strike, tending to reduce the noise of closing of the door in a manner common to plastic inserts provided in modern-day latch bolts. For simplicity of the drawings the cover 39 has been omitted from FIGS. 5, 7, 8 and 9. The cover 39 terminates short of the tail portion of the catch member 30, and the last-mentioned tail portion may extend outwardly from the groove 26 in the bolt head as shown in FIG. 3, for example.

A strike shown to advantage in FIG. 4 is provided for cooperation with the latch bolt mechanism. The strike consists of the usual plate portion indicated at 40 having the usual holes therein for receiving fasteners, not shown, to secure the strike to the door frame 11. The plate part 40 has integral therewith the usual inclined lip 41 to provide a cam surface for the latch bolt and the plate part 40 is also apertured in a conventional manner to receive the bolt. The strike also includes an integral box part 42, the sidewall structure of which defines

in part the opening in the strike for the latch bolt in the illustrated embodiment.

A magnet is provided in association with the strike for cooperation with the latch bolt and as illustrated may take the form of a permanent magnet. The magnet which is indicated at 43 may be of ceramic material or may be of iron or other suitable material for magnets. It is of platelike form and is offset in the strike box 42 toward the lip 41 of the strike plate. When assembled in the strike the magnet 43 defines one side of the bolt opening in the strike as indicated in FIGS. 4 and 7 though a portion of the plate part 40 extends over the near edge of the magnet in the manner shown. The magnet 43 may be secured in the box part 42 of the strike in any suitable manner.

When the door is open the catch member or lever stop 30 assumes the angular position shown in FIG. 3 under the influence of the spring 38 in which the hooklike tail 35 of the stop extends out of the recess 26 in the bolt head engaging the beveled edge portion 36 of the bolt sleeve thereby limiting outward movement of the spring-biased bolt and holding it in the short extended position of the last-mentioned view. In this position the bolt head protrudes from the face plate 13 to the extent indicated, say, approximately three eighths of an inch.

When the door is closed, it moves to the position of FIG. 7 in which the bolt head engages the cam surface 41 of the strike and is cammed inwardly thereby to the position of FIG. 8 so as to clear the strike. In so moving from the position of FIG. 7 to the position of FIG. 8 the catch member or lever stop 30 moves into the field of the magnet 43 associated with the strike. The forward end of the member 30 is attracted to the magnet 43 so that the stop 30 moves on its pivotal axis swinging the tail part 35 of the stop out of engagement with the bolt sleeve 21, thereby releasing the bolt head so that it may extend fully into the strike to its long position under the influence of the spring 29 as shown in FIG. 9. As previously indicated, outward movement of the bolt is limited by engagement of the bolt flange 28 with the flange 22 of the case.

It will be understood that if the door is closed while the bolt is retracted as by holding the actuating knob 15 in a bolt-retracting position, when the knob is thereafter released, the catch member or stop lever 30 has an action similar to that described above, clearing the bolt sleeve, so that the bolt extends into the strike to the extent shown in FIG. 9. In this position the bolt may be extended a distance of, say, one and five sixteenths of an inch. When the door is opened as upon actuation of either the linkage 19 or the linkage 20 as aforesaid, the bolt is retracted by the camming effect of the linkage on the flange 28 of the bolt tail and, as the bolt clears the strike during the opening of the door, the catch member or lever stop 30 moves out of the field of force of the magnet 43 associated with the strike, permitting the member or stop 30 to pivot on its axis to its operative position of FIG. 3 so that when the bolt is thereafter released, the tail portion 35 of the stop reengages the edge portion 36 of the bolt sleeve to retain the bolt in its short position shown in FIG. 3.

In the modified form shown in FIG. 10 the catch member or lever stop is formed as a magnet to cooperate with the magnet associated with the strike but in lieu of the catch spring there is substituted another permanent magnet to bias the catch member to its operative position shown in FIG. 10 in which it engages the bolt sleeve. In this form like reference numerals designate like parts.

The bolt indicated generally at 23^a is similar. It has a similar bolt head 24^a. However, the bolt head has formed in the bottom of the groove 26^a at the rear end thereof a blind hole for reception therein of a permanent magnet 44 of the bar type. The catch member or stop lever 30^a is similarly formed as aforesaid but is solid and constructed as a permanent magnet having at its rear end a pole of the same polarity as the exposed pole of the bar magnet 44. As illustrated in FIG. 10, both of these poles are north opposing one another. Hence when the bolt head is in the short position of FIG. 10, the hooklike tail part 35^a of the member or stop 30 is engaged

with the bolt sleeve. It will be understood that the hooklike tail portion 35^a of the stop is urged outwardly from the bottom of the groove 26^a by the opposing magnetic forces previously described so that it may be engaged as aforesaid.

In operation the catch member or lever stop 30^a functions in much the same manner as the aforementioned catch member or lever stop 30 previously described. The forward end of the last-mentioned member is in the illustrated form a south pole of the magnet. The polarity of the magnet 43 in the strike is such as to attract the front end of the lever stop, overcoming the influence of the magnet 44, when the door is closed to a position similar to that shown in FIG. 8 so that the tail piece 35^a of the stop clears the bolt sleeve permitting the spring-biased bolt to assume a long position in the strike similar to that shown in FIG. 9. The bolt 23^a is retracted in the same manner and when retracted the lever stop 30^a reengages the bolt sleeve 21.

While only two forms of the invention have been illustrated in the drawings and described above, it will be apparent to those versed in the art that the latch mechanism may take other forms and is susceptible of various changes and modifications without departing from the principles of the invention. For example, the magnet associated with the strike may be an electromagnet instead of a permanent magnet.

It will be appreciated from the foregoing that in interpreting the appended claims both the catch member 30 and the catch member 30^a are formed of magnetic material which, of course, includes the use of a magnet for such a catch member as the member 30^a.

What I claim is:

1. Latch mechanism for use with a swinging door having an edge face with a recess extending into the door from the face and a jamb having an edge face and a recess entering the jamb from the face thereof, said latch mechanism comprising:

- a. a housing of nonmagnetic material in said door recess providing an opening at the door face, a bolt receiving space connecting with said opening, a member on said housing projecting into the space therein and formed with an opening in alignment with the opening at the door face, and a catch on said housing,
- b. a bolt comprising a head and a shank, said shank being slidable in said housing while said shank is slidable in the opening in said projecting member,
- c. an inclined end face on said bolt head,
- d. said bolt head having a catch receiving recess opening onto a side thereof opposite to the inclined face and opposed to the catch on the housing,

e. a catch lever of ferrous metal pivotally mounted in said catch receiving recess and having a portion coextensive with said inclined face and having a catch at its inner end cooperating with the housing catch,

f. means biasing said lever into a position in which the catch thereon engages the catch on the housing,

g. biasing means in said housing interposed between a portion of said bolt and a portion of said housing to urge said bolt head outwardly of said door face, said housing catch being positioned relative to the door face a distance whereby only the inclined face of the head projects from the door face when said catches are in engagement,

h. a strike in said jamb recess having a camming lip thereon engageable by said inclined face and providing a bolt head receiving recess,

i. a permanent magnet in said strike at one side of said bolt head receiving recess leaving space for the bolt head to enter the strike, and

j. means to retract said bolt against the influence of said bolt biasing means,

whereby said bolt is constantly urged outwardly of said housing with the engaging catches limiting outward movement of the bolt to position the head so that only the portion thereof with the inclined surface projects from the door face, said head being retracted by engagement of the inclined face thereof with the camming lip, thereafter partially projected into the strike recess when the head comes opposite thereto, whereupon the permanent magnet is effective to move the lever against the influence of its biasing means to disengage the catches and permit the bolt head to be further projected in the strike recess.

2. The latch mechanism of claim 1 in which the lever biasing means is a spring.

3. The latch mechanism of claim 2 in which the spring is a wire spring coiled about the pivotal mounting of the lever.

4. The latch mechanism of claim 1 in which the lever biasing means comprise a permanent magnet in said bolt head which cooperates with the lever which is magnetized to urge the catch thereon into position engaging the housing catch.

5. The latch mechanism of claim 1 together with a member on said shank on the side of said projecting member remote from the bolt head and adapted to cooperate with the projecting member to limit outward movement of the bolt.

6. The latch mechanism of claim 1 together with a plastic cover for the housing end, said cover being received in a recess provided in the edge face of the door and constituting an enlargement of the recess therein.