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LATCHES AND LOCKS

Filed March 15, 1961

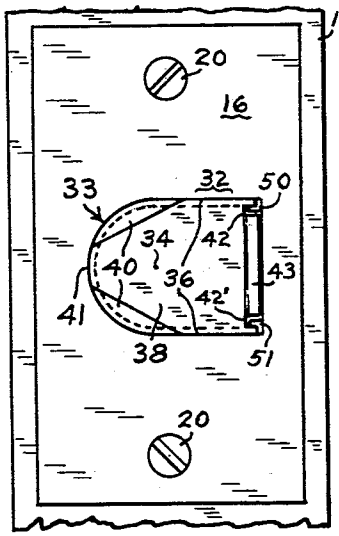

Fig. 3

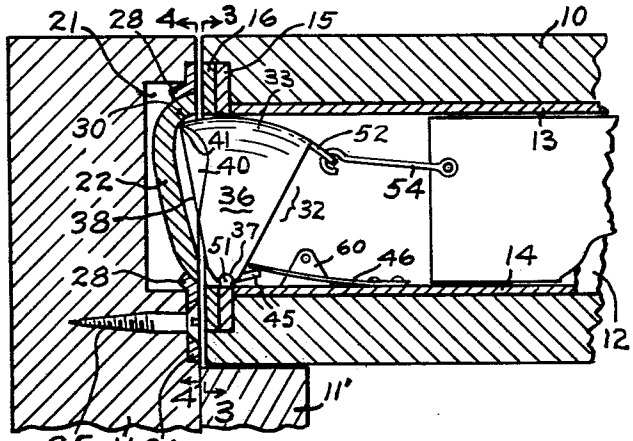

Fig. 1

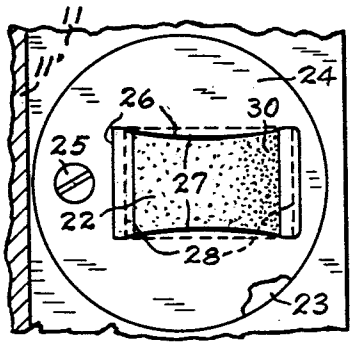

Fig. 4

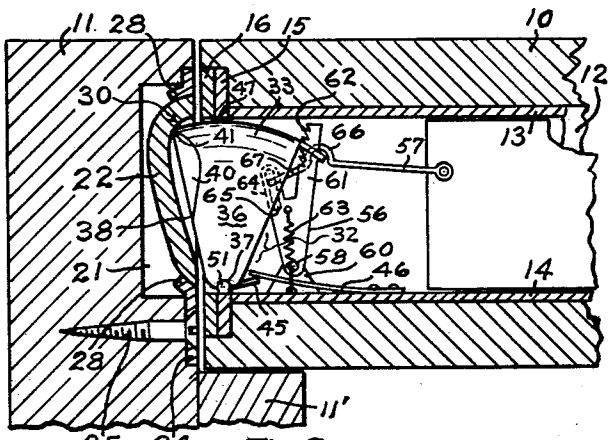

Fig. 2

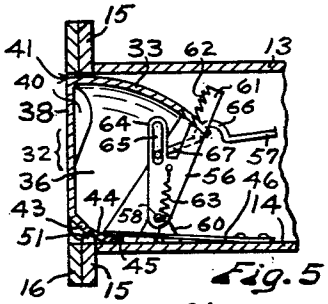

Fig. 5

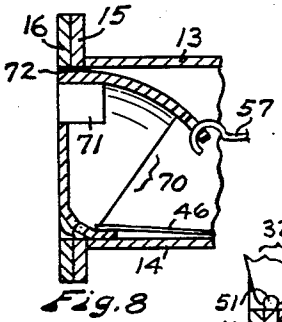

Fig. 8

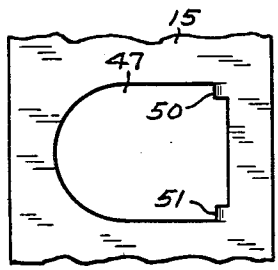

Fig. 7

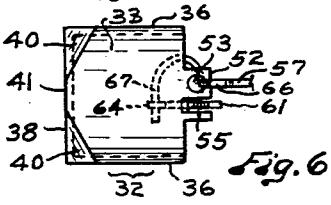

Fig. 6

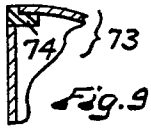

Fig. 9

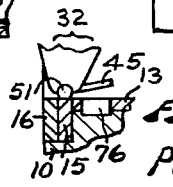

Fig. 10

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LATCHES AND LOCKS

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My invention relates to improvements in latches and locks and an object of my invention is to provide a combined latch and lock for use on doors in which a latch bolt is moved to and held in a latched position by magnetic means when the door is fully closed and the latch bolt is in registration with a strike member and is held retracted for all other positions of the door by devices which exert a holding force capable of being overcome by the pull of the magnetic means when the latch bolt is aligned with the magnetic means.

Other objects of my invention are to provide a magnetic door latch which is neat in appearance, easy to operate, silent in operation because it minimizes latch noises and permits the door to be closed softly and without slamming, and one which will efficiently hold the door closed and will effectively prevent play and rattle in the closed door.

Further objects are to provide a magnetic latch and lock in which both the latch and lock mechanism and the strike mechanism are easy to install and do not require highly accurate positioning relative to each other, and in which the latch bolt is always fully retracted and out of the way and does not protrude when the door is in any open position, and one in which the latch plate does not have any protruding parts on which articles of clothing and the like can catch.

Other objects of my invention will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings FIGURE 1 is a longitudinal sectional view, taken on a horizontal plane and with parts in elevation, showing a magnetic latch set constructed in accordance with my invention as it may appear when installed in a door.

FIG. 2 is a view similar to FIG. 1, showing in addition, a locking member not shown in FIG. 1, which locking member is capable of holding the bolt in locked position, thereby converting the latch set into a lock set.

FIG. 3 is a view in elevation looking in the direction of line 3—3 of FIG. 1 showing the face plate and edge of the door and showing the face of the latch bolt as it would appear when retracted.

FIG. 4 is a view in elevation, with part of a door jamb in section, taken substantially on line 4—4 of FIG. 1 and showing a fragment of the door jamb with the magnetic strike member therein.

FIG. 5 is a detached sectional view of a fragment of the lock housing and the latch bolt and bolt locking means, showing the latch bolt in a retracted position.

FIG. 6 is a detached elevational view showing an end of the latch bolt and showing parts of the bolt locking and bolt operating means.

FIG. 7 is a detached fragmentary view in end elevation of the lock housing with the face plate omitted and showing bearing lugs used in pivotally mounting a latch bolt in said housing.

FIG. 8 is a sectional view showing a latch bolt of modified form made from sound-deadening non-magnetic material, such as nylon, and having therein a metal insert which may be a magnet or may be made of magnetic material capable of being attracted by a magnet.

FIG. 9 is a fragmentary sectional view showing a latch member having a strike engaging part in the form of an insert of durable sound-deadening material, such as nylon.

FIG. 10 is a fragmentary sectional view, with parts in elevation, showing means for holding a latch bolt retracted by magnetic force which is weaker than the magnetic force which holds it in a locked position.

Like reference numerals refer to like parts throughout the several views.

In the drawings 10 indicates a door and 11 a door jamb, both of conventional construction. A stop member 11', which may be a separate piece from the jamb 11 is rigidly secured to said jamb. The door 10 has a bored recess 12 for the reception of a tubular lock housing, which preferably is formed of two parts 13 and 14 divided along longitudinal lines in accordance with conventional construction. A flange 15 is rigid with the front end of one part of the lock housing and a face plate 16 overlies the flange 15 and can be secured thereto.

The edge of the door 10 is suitably mortised to receive the flange 15 and face plate 16 and screws 20, FIG. 3, can be used to secure these parts to the door. The edge of the door jamb 11 is provided with a recess 21 to receive a magnetic strike member 22 and with a cylindrical mortise 23 around the recess 21 to receive a cylindrical strike plate 24 within which the strike member 22 is secured. A single screw 25 is sufficient to secure the strike plate 24 to the door jamb 11. All of the recesses and mortises in the door 10 and jamb 11, except the mortise for the flange 15 and face plate 16 can be made by boring, thus minimizing time and labor required for installation. The outline of the flange 15 and face plate 16 can vary in accordance with conventional design.

The strike member 22 is a strong permanent magnet of substantial thickness having a concave front or outer side. The external shape of this magnetic strike member 22 can be varied but the member 22 herein disclosed is of generally rectangular shape or outline. The strike plate 24 has a generally rectangular opening 26 therein to receive the magnet 22. Said strike plate 24 is depressed to form ledges 28 at the ends of the opening 26. These ledges 28 are disposed back of the magnet member 22 and the member 22 rests against them. Parts 27 of the plate 24 along the lateral edges of the opening 26 overlie and are swaged against the adjacent lateral edge portions of the magnetic member 22 and cooperate in firmly securing the magnetic member 22 and plate 24 together.

The outer side of the magnetic strike member 22 is concave and is preferably roughened, as indicated by stippling in FIG. 4. This concave surface is of cam shape. Its curvature adjacent the forward edge, shown uppermost in FIGS. 1 and 2, recedes sharply to provide a shoulder part 30 for bolt engaging purposes and the curvature of the cam surface then flattens out toward the rear edge of the strike member 22.

A locking member of magnetic material, herein referred to as a latch bolt and indicated generally by numeral 32, is pivotally mounted in the lock housing 13, 14 for locking engagement with the strike member 22. The latch bolt 32 is in the form of a hollow shell comprising an outer wall 33, which in cross section, is generally semi-cylindrical, with a center of curvature at point 34, FIG. 3, and in side elevation is arcuate, as shown in FIGS. 1, 2 and 5, with a center of curvature at the location of a pivotal axis formed by pivot members 50 and 51 hereinafter described. The curved outer wall 33 terminates in two tapered, spaced apart, parallel, flat side wall portions 36, each of which has an arcuate notch 37 in its narrower inner extremity for pivotal purposes.

The rear side of the latch bolt 32, shown at the right in FIGS. 1, 2 and 5, is open. The front side 38 of said latch bolt is flat but the outermost part thereof, that is the part which merges with the outer curved wall 33 is provided with symmetrically beveled corner portions 40 which cooperate to form between them a strike member engaging part 41 of narrow width for contact with the

concave outer face of the strike member 22. Said part 41, which makes contact with the strike member 32 is much narrower than said strike member so that part 41 can engage with the strike member 22 at any location between the top and bottom edge of said strike member. This affords a substantial amount of tolerence in the relative vertical positioning of the strike member 22 and the bolt 32, in installation, and it compensates for a reasonable amount of sagging of a door, which may occur after installation.

The inner edge portion of the front wall 38, shown lowermost in FIGS. 1, 2 and 5, and at the right in FIG. 3, has two notches 42 and 42' therein which are respectively flush with the inside surfaces of the side walls 36. An extension of the front wall 38 between the notches 42 and 42' is bent inwardly to provide three parts at different angles namely a first part 43 disposed at an angle of approximately forty-five degrees relative to the front wall 38 a second part 44 disposed at a greater angle to said front wall 38 and a third or terminal part 45 bent at a still greater angle and adapted to have the end portion of a spring 46 rest thereon. The spring 46 is secured within the lock housing 13 14 and its downward pressure on the terminal part 45 of the latch bolt 32 holds said latch bolt retracted within the lock housing at all times when said latch bolt is not in substantially full registration with the magnetic strike member 22 and subjected to the maximum pull of said strike member 22.

The housing flange 15 and face plate 16 are provided with registering openings through which the latch bolt operates and which preferably conform to the shape and size of said latch bolt. The opening 47 in the flange 15 is shown in FIG. 7 and a similar opening 48 in the face plate 16 is occupied by the latch bolt 32 in FIG. 3. The flange 15 is provided in the corners of the opening 47 with two bearing members 50 and 51 over which the pivot notches 37 in the narrower ends of the latch bolt side walls 36 fit.

An inwardly extending tab 52 FIGS. 1 and 6 on the innermost edge of the curved outer wall 33 of the latch bolt 32 has a perforation 53 therein within which one end of a retractor link 54 in the latch set shown in FIG. 1 is pivotally engaged. The other end of the retractor link 54 is connected with any suitable means in the lock housing 13, 14 by which a pull can be exerted on the link 54 to retract the latch bolt 32. The inner edge of the tab 52 has a notch 55 alongside of the hole 53 for the reception of a locking member 56 of the form shown in FIGS. 2, 5 and 6 and hereinafter described.

The structure shown in FIG. 1 and hereinbefore described provides an efficient door latch which operates as follows: When the door is fully closed the latch bolt 32 is in full registration with the magnetic strike member 22 and the magnetic pull of the strike member 22 overcomes the force of the spring 46 and holds the latch bolt 32 in the latched position. Any conventional means such as turn knobs can be used to make it possible to exert enough pull on the link 54 to overcome the magnetic force of the strike member 22 and retract the latch bolt 32. As soon as the door is moved away from a completely or fully closed position moving the latch bolt 32 out of registration with the strike member 22 the force of the spring 46 will hold the latch bolt 32 fully retracted. In its fully retracted position the face 38 of the latch bolt 32 will be substantially flush with the outer surface of the face plate 16 and the part 45 of said latch bolt whereon the spring 46 rests, will be in contact with an adjacent part of the lock housing and will thus function as a stop member limiting retractile movement of the latch member. If the face 38 of the latch bolt is flush with the face plate 16 when said latch bolt 32 is fully retracted said latch bolt will always be fully shielded when retracted and will be as close as possible to the magnetic member 22, for maximum magnetic pull thereon, when the door is fully closed. Because the latch bolt 32 is always held retracted except when the door 10 is fully closed it is not necessary, in closing the door, to push said latch bolt against any strike member to retract it. Thus a door equipped with my magnetic latch means may be very softly and easily closed and does not need to be slammed. Also the need for projecting strike pieces, whereon articles can become caught, is eliminated.

When the door 10 is in a closed position the strike engaging edge 41 of the latch bolt 32 is being drawn by the pull of the magnetic member 22 against the more sharply curved part 30 of said member 22 and exerts a wedging action which holds the door completely and tightly closed against the stop member 11' and prevents said door from rattling. The depth of the concave side of the strike member 22 does not need to be great because the tip 41 of the latch bolt 32 is always magnetically held in contact with the more sharply curved part 30 of this concave side of member 22 when the door is closed. Also the latch bolt will hold efficiently if the part 41 thereof engages with the less sharply curved portions of the cammed face of the strike member 22.

FIGS. 2, 5 and 6 show a lock set in which the locking member 56 is used in combination with all of the lock and latch mechanisms hereinbefore described, except that the retractor link 54, shown in FIG. 1, is replaced by a different retractor link 57. In this connection it will be understood that the retractor link 57 can be used in the latch set of FIG. 1, if desired.

The locking member 56 is supported by a pivot pin 58 from a bracket 60, which is rigidly attached to the interior of the latch housing 13, 14 near the pivoted end of the latch bolt 32. An arm 61 having ratchet type teeth 62 is rigid with the end portion of the lock member 56 remote from the pivot 58 and is positioned so that, by pivotal movement of said lock member 56, the teeth 62 can be caused to engage with the tab part 52 of the latch member 32 and lock said latch member 32 in engagement with the magnetic strike member 22, or said teeth can be retracted clear of said tab 52. A spring 63 is connected with the locking member 56 in such a manner that angular movement of the locking member will cause the line along which the force of said spring 63 is applied to said locking member to cross center by passing from one side to the other of the axis of the pivot 58. In this way the spring 63 is caused to yieldingly hold the locking member 56 either in a locking position or in a retracted position.

A part 64 of the locking member 56, adjacent the arm 61, is provided with a longitudinal slot 65. The retractor link 57 has an arched portion 66 which engages within the perforation 53 in tab 52 and has lost motion relative to said tab 52. A continuation of the arched portion 66 is shaped in such a manner as to prevent displacement of the arched portion 66 from the perforation 53 in the tab 52 and this continuation of arched part 66 terminates in a reversely bent part 67 which extends through the slot 65 in the locking member 56. The perforation 53 is large and it receives the arched part 66 of link 57 and provides for some lost motion of the link 57 relative to the latch bolt 32. If the locking member 56 is in a locked position, as shown in FIG. 2, and the retractor link 57 is moved to the right it will first pivotally move the locking member 56 clockwise into an unlocked position and will then retract the latch bolt 32. As the latch bolt 32 is retracted the locking member 56 moves with it until both of said members are in a position such as shown in FIG. 5. As the latch bolt 32 and locking member 56 move toward this retracted position the line of pull of the spring 63 will cross center and hold the locking member 56 clear of the tab 52 until the latch bolt 32 is again moved back into a locked position. As the latch bolt 32 is moved by magnetic strike member 22 from an unlocked to a locked position the locking member 56 will be moved therewith by the extension 67 of the retractor link 57, thus causing the line of pull of

the spring 63 to again cross center and insuring engagement of the teeth 62 of said locking member with the tab 52.

The locking member 56 thus locks the latch member 32 in engagement with the strike member 22 in such a manner as to prevent said latch member 32 from being tampered with, for instance, by pushing it back into an unlocked position by the insertion of a thin instrument between the door and the jamb. Frequently the stop member 11' is a separate piece secured to the jamb 11. In such instances it may be possible to reach the latch bolt by passing a thin instrument between the stop member 11' and the jamb 11.

FIG. 8 shows a modification of my inventoin in which a latch bolt 70 is constructed of non-magnetic material, such as nylon, and a metal insert 71 is embodied in said latch bolt 70. The latch bolt 70 is used with permanently magnetized strike means, such as the strike member 22 hereinbefore described. The insert 71 can be a permanent magnet of opposite polarity from the magnet 22 or it can be a magnetic material capable of being attracted by the magnet 22. The lock housing parts shown in FIG. 8 are the same as those shown in the preceeding figures and are similarly numbered. The part 72 of the latch member 70 which makes contact with the magnetic strike member 22 is non-metallic and is soft enough so that there will not be an objectionable noise or click when said part 72 contacts the member 22. Obviously the member 71 of FIG. 8 can be embedded in a latch bolt of magnetic material, in which instance the member 71 will preferably be a magnet of opposite polarity from the strike member 22. Also if the member 71 is a magnet it can be used in connection with a strike member which is not a magnet but is of magnetic material.

FIG. 9 shows a fragment of a latch bolt 73 of magnetic material which is similar to the latch bolt 32 except that it has an insert 74 of soft but wear resistant material, such as nylon, in the tip part thereof. The insert 74 is the part which makes contact with the magnetic strike member 22 in the operation of the device and it minimizes noise.

FIG. 10 is illustrative of a latch bolt construction in which the spring 46 of the previous figures is replaced by a magnet 76 which is adapted to exert a weaker force than the magnet 22 on the latch bolt 32 to hold said latch bolt 32 retracted when the door 10 is in any open position but to permit the latch bolt 32 to be closed by the predominant pull of the magnet 22 when said door is in a fully closed position. The magnet 76 is herein shown as being positioned so that it will exert its pull on the terminal part 45 of the latch bolt 32, said part 45 being of magnetic material. However, it will be understood that this disclosed arrangement of the magnet 76 is merely illustrative of the use of a weaker magnet capable of holding the latch bolt 32 retracted except when its applied force is overcome by the pull of the stronger magnet 22 and that said magnet 76 can be arranged in various different ways in connection with the latch bolt 32.

The foregoing description and accompanying drawings clearly disclose preferred embodiments of my invention but it will be understood that this disclosure is merely illustrative and that changes may be made within the scope of the following claims.

I claim:

1. Lock means for use with a door which is swingingly movable relative to a door jamb having a stop member, comprising a latch housing disposed within the door and having a bolt accommodation opening flush with an edge of the door; a latch bolt composed at least partly of magnetic material having one end portion thereof pivotally supported by said housing adjacent said bolt accommodation opening for swinging movement of at least part of the other end portion of said latch bolt into and out of said housing through said bolt accommodation opening; a permanently magnetized strike member embedded in the door jamb and registering with the latch bolt when the door is fully closed, said strike member having a concave outer side the curvature of which recedes sharply adjacent its forward edge forming a concave shoulder positioned for engagement by the swingingly movable forward end of the latch bolt, the wedging pressure exerted by said latch bolt when it is urged against said shoulder by the magnetic pull of said strike member holding the door in tightly closed rattle free engagement with the stop member of said door jamb; latch bolt holding means capable of yieldingly holding said latch bolt in a retracted position, the magnetic pull of said strike member being capable of overcoming the force of said latch bolt holding means and holding said latch bolt in engagement with said strike member when said strike member and said latch bolt are aligned with each other; releasable bolt locking devices capable of locking said latch bolt in engagement with said strike member; and latch bolt retracting means connected with said latch bolt and locking devices operable in first unlocking said locking devices and then retracting said latch bolt.

2. The apparatus as claimed in claim 1 in which the latch bolt holding means comprises a holding magnet yieldingly holding said bolt in a retracted position when the door is open and said bolt is dis-aligned relative to said strike member, the magnetic pull of the strike member being greater than the magnetic pull of the holding magnet, whereby the bolt is drawn into engagement with the strike member when it is aligned therewith.

3. The apparatus as claimed in claim 1 in which an insert of sound deadening material is provided in the strike-contacting tip portion of said bolt.

4. In lock means for a door which is swingingly movable relative to a door jamb, a housing adapted to be installed in the door and having a bolt accommodation opening flush with the front edge of the door; a permanently magnetized strike member adapted to be embedded in the door jamb flush with the outer surface of the jamb, said strike member having a concave cam shaped outer bolt receiving recess which recedes sharply at its forward end forming a curved shoulder; a bolt composed at least partly of magnetic material pivoted at its rear end in said housing whereby its forward end portion is swingingly movable in said bolt accommodation opening for engagement with and retraction from the sharply receding curved shoulder at the forward end of said strike member, yieldable means normally retracting said bolt into said housing when said housing is moved away from said magnetic strike member, the magnetic pull of said strike member overcoming the force of said yieldable means and holding the forward end of said bolt in engagement with said strike member when the latch housing is close to and in registration with said strike member; a locking member in said housing pivotally mounted on an axis inwardly from and parallel with and close to the pivotal axis of said bolt for swinging movement with said bolt and toward and away from said bolt; spring means yieldingly holding said locking member in locking engagement with said bolt when said bolt is in engagement with said strike member; manually operated bolt retracting means in said housing; and lost motion devices operatively connecting said bolt retracting means with said bolt locking member and said bolt, whereby retractile movement of said bolt retracting means will first disengage said bolt locking member from said bolt and then retract said bolt from said magnetic strike member.

5. The apparatus as claimed in claim 4 in which ratchet teeth are provided on said locking member for locking engagement with said bolt; and in which a spring is connected between the locking member and the housing and exerts a yielding force on the locking member along a line which crosses the pivotal center of said locking member when pivotal locking and unlocking movement is im-

parted to said locking member, said spring yieldingly holding said locking member in a locked position relative to said bolt when said bolt is in engagement with said strike member and in a retracted position relative to said bolt when said bolt is retracted.

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