

June 23, 1970

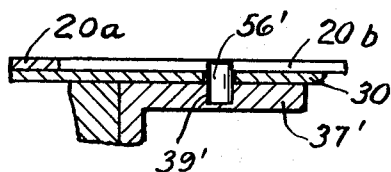
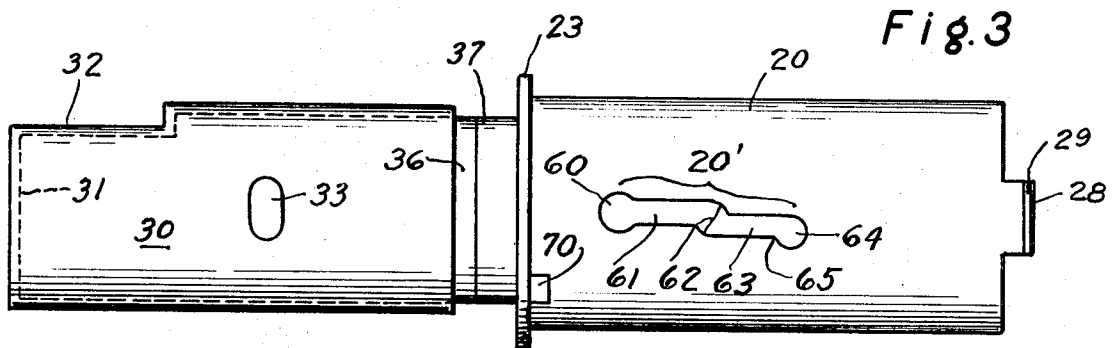
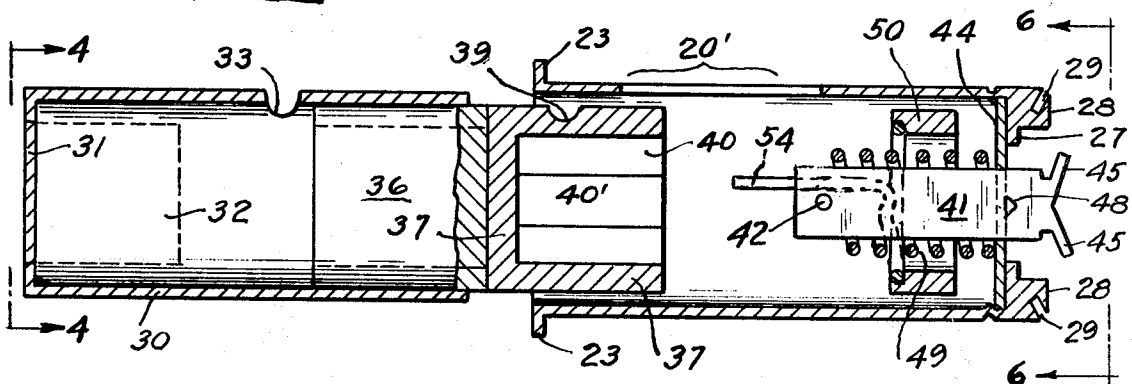
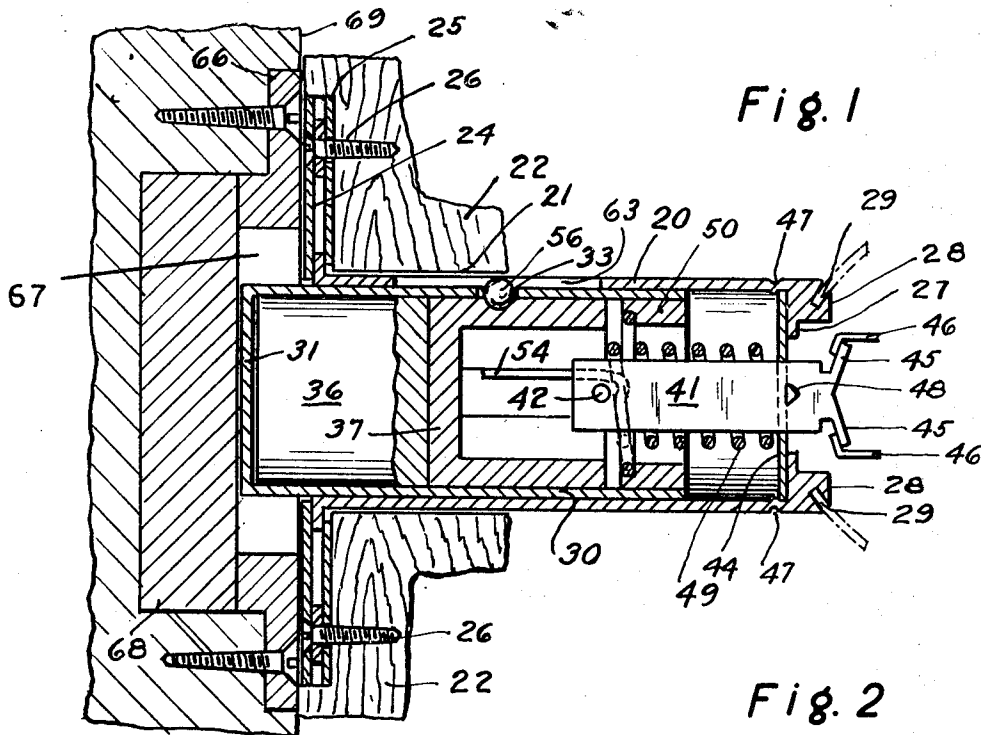
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3,516,701

DOOR LATCH AND LOCK OF MAGNETIC TYPE

Filed Sept. 3, 1968

2 Sheets-Sheet 1



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DOOR LATCH AND LOCK OF MAGNETIC TYPE

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2 Sheets-Sheet 2

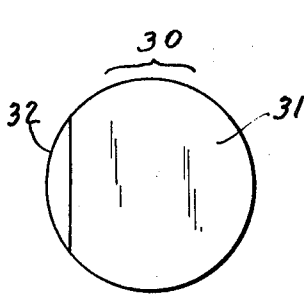


Fig. 4

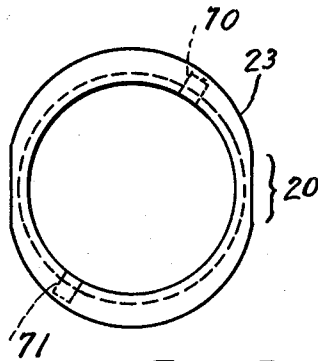


Fig. 5

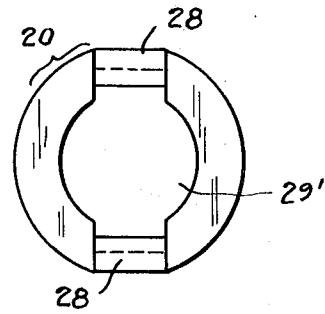


Fig. 6

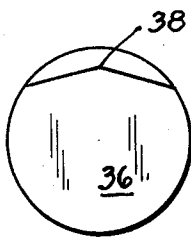


Fig. 8

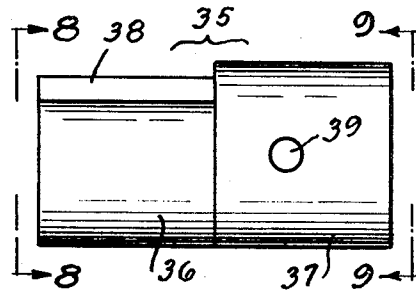


Fig. 7

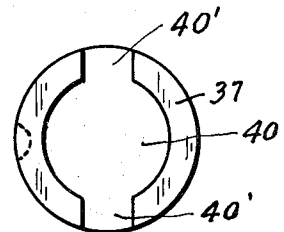


Fig. 9

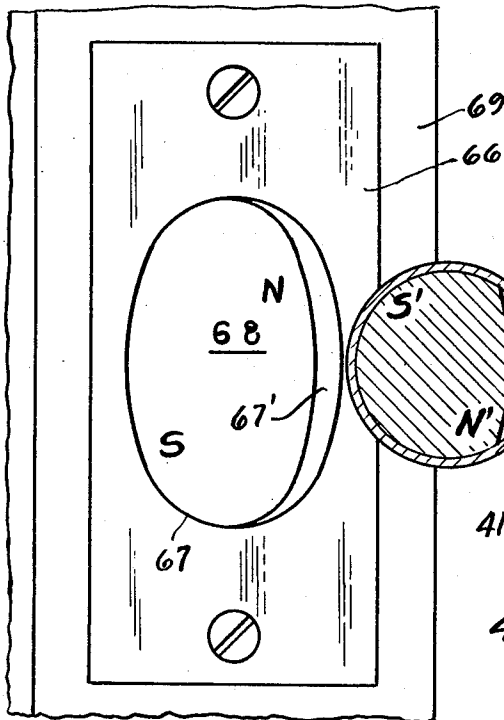


Fig. 14

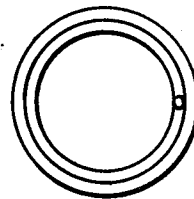


Fig. 11

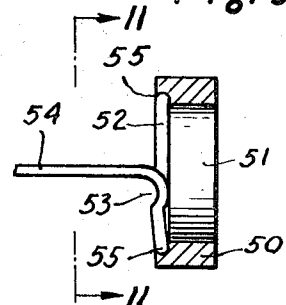


Fig. 10

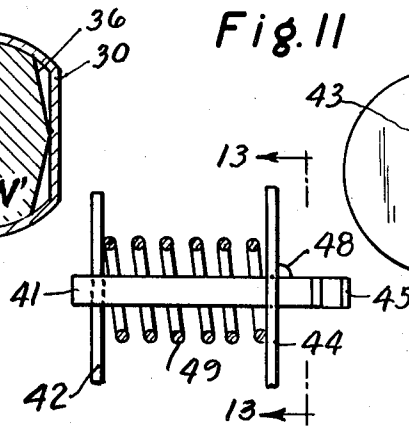


Fig. 12

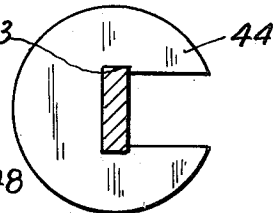


Fig. 13

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DOOR LATCH AND LOCK OF MAGNETIC TYPE

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U.S. Cl. 292—144

8 Claims

ABSTRACT OF THE DISCLOSURE

A bolt containing a magnetized rotor member is longitudinally movable within a housing between a retracted position in which it is locked whenever the door is open and a door locking position in which it is within a magnetized strike member. A ball or pin locks the bolt in both its retracted and outwardly projected positions. The rotor and strike member are magnetized so that, as the door is moved to a closed position, their flux will first rotatively move the rotor and unlock the retracted bolt, then move the rotor and bolt endwise into the strike member locking the door closed, then lock the bolt in the strike member by further rotatively moving the rotor. A pull back link unlocks the bolt, retracts it and leaves it locked in the retracted position when the door is open.

BACKGROUND OF THE INVENTION

Field of the invention

My invention relates to a latch and lock of a type in which a bolt is magnetically moved to a locked position when the door by which it is carried is closed and this lock and latch is in the nature of an improvement on the latches and locks disclosed in my two prior Pats. No. 3,129,968, issued Apr. 21, 1964, and No. 3,273,925, issued Sept. 20, 1966.

SUMMARY OF THE INVENTION

General objects of my present invention are to improve latches and locks of the type having magnetically operated bolts, to reduce to a minimum the number of parts in said latches and locks, to make them more tamper proof and to make them neater in appearance and less expensive to manufacture.

Another object is to provide a latch and lock in which a longitudinally movable magnetically operated bolt is locked in an outwardly projected position in a strike member when the door by which it is carried is closed and is locked in a retracted position when said door is open.

Another object is to provide a latch and lock embodying a tubular housing having in it a trackway shaped so as to provide two spaced apart shoulders with which a track follower, herein disclosed as a ball or pin, and which is movable in the trackway, can engage to lock a tubular bolt in either a retracted or an outwardly projected position, the bolt having within it a magnetized rotor member and said bolt being longitudinally movable into and out of a recess in a magnetized strike member, the track follower being connected with and moving with the rotor member and operating through a transverse slot in the bolt, the bolt normally being locked retracted when the door is in an open position and the rotor and strike member being magnetized in such a manner that when the door is moved from an open to a closed position, their magnetic flux will unlock and release the bolt from its retracted position by rotatively moving the rotor, then draw the bolt into the recess in the strike member and then lock the bolt against unauthorized retraction from the strike member, such as by tampering or picking methods, by further imparting rotation to the rotor member.

Other objects of the invention will be apparent from the following description and accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view of my lock and the strike member with which it cooperates showing fragments of a door and door jamb in which they are installed and showing the bolt of the lock in engagement with the strike member.

FIG. 2 is a partly exploded view, partly in section and partly in elevation, of this latch and lock mechanism.

FIG. 3 is a top plan view looking down at the exploded parts as they are shown in FIG. 2.

FIG. 3A is a fragmentary sectional view showing a track follower in the form of a pin instead of a ball and which functions as a bolt locking means.

FIG. 4 is a detached outer end view, taken on line 4—4 of FIG. 2, and showing the strike engaging outer end of a tubular bolt.

FIG. 5 is a detached view showing the outer end of a lock housing as it appears before face plates are attached to it.

FIG. 6 is a detached elevational view, taken on line 6—6 of FIG. 2 and with parts omitted, showing the inner end of a housing.

FIG. 7 is a detached plan view of a magnetized rotor member.

FIG. 8 is an outer end view of said rotor member looking in the direction indicated by line 8—8 of FIG. 7.

FIG. 9 is an inner end view of said rotor member looking in the direction indicated by line 9—9 of FIG. 7.

FIG. 10 is a view, partly in elevation and partly in section, of a torque member supporting ring and torque member supported by it.

FIG. 11 is an elevational view of said ring and torque member looking in the direction indicated by broken line 11—11 of FIG. 10.

FIG. 12 is a detached assembly view showing the top edge of a bolt retracting or pull back link having on it a guide washer and a compression spring and having a cross pin in one end thereof.

FIG. 13 is a view partly in section and partly in elevation looking in the direction of line 13—13 of FIG. 12.

FIG. 14 is a somewhat schematic view showing in elevation a magnetized strike assembly and in section a magnetized rotor and a bolt and illustrating the operation of the magnets in rotatively moving the rotor and longitudinally moving the rotor and bolt when the door is moved from an open to a closed position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

This lock comprises an outer cylindrical metal housing or casing 20 adapted to be installed in a bored hole 21 in the edge portion of a door 22. The housing 20 has a narrow outwardly extending flange 23 on its outer end, FIGS. 1, 2, 3 and 5, and said flange 23 is trapped and held between two face plates 24 and 25 when the lock is fully assembled and ready for installation in the door 22. The face plates 24 and 25 can be secured together in any suitable manner and can be attached to the door by screws 26. The inner end of the housing 20, see also FIG. 6, has an inwardly extending flange 27 which is notched at two diametrically opposite locations so as to leave an opening of the shape shown on FIG. 6 and is provided at the notched locations with two anchor lugs 28 which protrude from the end of said housing 20. A transverse groove 29 is provided in the outer side of each anchor lug 28.

A longitudinally extending trackway, indicated in a general way by 20' in FIG. 3 and more fully hereinafter described, is provided in the wall of housing 20. For purpose of illustration this trackway is shown as a slot but it will be understood that the major portion of said track-

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way is preferably in the form of a groove in the inside of the housing wall.

A tubular bolt 30 fits snugly within the housing 20 and is longitudinally movable in said housing. The bolt 30 is approximately cup shape, is cylindrical throughout the major portion of its length, has a closed outer end 31 and has a flat portion 32 on one side thereof extending from its closed outer end toward its inner end for about one half of its length. A short transverse slot 33 is provided in the wall of the bolt 30 about mid way of its length for registration with the trackway 20' in housing 20, as hereinafter explained. The inner end of bolt is open to receive other parts of the latch and lock mechanism. Preferably tubular bolt 30 is formed of strong durable material, such as nylon plastic or a non-magnetic metal.

A rotatively movable member, indicated generally by numeral 35 in FIG. 7, is disposed within the tubular bolt 30 and is herein termed a magnetized rotor. Said rotor 35 is formed of an outer end part 36 and an inner end part 37 rigidly attached together by suitable adhesive or by mechanical means, such as screws. The inner end part 37 of rotor 35 can be either metal or plastic. The outer end part 36 is a magnet more fully hereinafter described. Said outer end part 36 has a flattened side 38 which operates within the flattened end part 32 of the bolt 30. The two flattened end parts 32 and 38 are suitably shaped to provide for limited rotary movement of the rotor member 35 within the bolt member 30. The inner end of the inner rotor part 37 has within it a recess or cavity composed of an axial bore 40 and two diametrically opposite notches or grooves 40', FIG. 9. A longitudinally movable bolt operating pull back link 41 extends into the bore 40 and is provided with a cross pin 42. The cross pin 42 is not attached to the rotor part 37 but moves freely in the grooves 40'. The end of the link 41 remote from the cross pin 42 extends through a suitable opening 43, FIG. 13, in a washer 44 and terminates in two divergent arms 45. Any suitable pull back means, such for instance as member 46, shown fragmentarily in FIG. 1, and which can be operated by a knob or key can be connected with arms 45 for retracting link 41.

The washer 44 rests against the inner end flange 27 of housing 20 and is rigidly staked to said housing 20 by preferably two or more inwardly displaced parts 47. A stop member 48, FIGS. 1, 2 and 12, is rigid with link 41 near the arms 45 and outwardly from washer 44 and will engage with said washer 44 and limit inward movement of the link 41 relative to the housing 20. A helical compression spring 49 on link 41 between washer 44 and cross pin 42 yieldingly urges link 41 to the left, FIG. 1.

A torque member supporting sleeve or disc 50 is disposed within and yieldingly connected with the inner end portion of the tubular bolt 30 and has an open center 51 which provides working clearance for link 41 and spring 49. The disc 50 carries a torque member which is formed of spring material and comprises an arcuate base part 52, a spring arm 53 inclined away from the base part 52 and a torque arm 54 which is approximately perpendicular to the base part 52. Preferably the disc 50 is shaped to provide a marginal flange 55 on its inner side and the base 52 of the torque member fits like a snap ring within this flange 55 and is rigidly attached to the disc 50 to hold it in proper adjustment at all times. The torque arm 54 extends generally parallel to the link 41 alongside of the coil spring 49 and past the cross pin 41 into one of the notches 40' in the rotor part 37 and is positioned so it can be pressed against a side wall of said notch to exert an off center torque on the rotor and rotatively move said rotor.

When the rotor 35 and bolt 30 are in the outwardly projected position, FIG. 1, the cross pin 42 will be close to the spring arm 53 and if the pull back link 41 is retracted it will first deflect the spring arm toward the disc 50 and in so doing will cause the torque arm 54 to impart rotary movement to the rotor 35 and release the rotor 35 and

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bolt 30 for retractile movement. Further retraction of link 41 will then move the rotor and bolt to a fully retracted position. Preferably spring arm 53 is indented at 53' to receive cross pin 42. Also preferably the face of disc 50 is suitably shaped so spring arm 53 will be deflected flush with disc 50 and both arms of cross pin 42 will press against disc 50 in retracting bolt 30.

The trackway 20' in the housing 20 is adapted to receive a track follower and locking member, shown in FIG. 1 as a ball 56 seated in a spherical depression 39 in rotor part 37. Ball 56 extends through the transverse slot 33 in bolt 30 and into trackway 20'. Said trackway 20' is herein disclosed as being in the form of a slot in the wall of housing 20 but preferably all parts of said trackway except an opening 60 at the end thereof shown at the left in FIG. 3 will be in the form of a groove in the inside wall of the housing 20. A locking pin 56', FIG. 3A, can be used instead of the ball 56 by suitably modifying the shape of a recess 39' in a rotor part 37' and if necessary modifying the shape of a trackway 20b in a housing 20a. The purpose of the opening 60 at one end of trackway 20' is to permit insertion of the track follower, such as ball 56 or pin 56' in assembly.

In addition to the opening 60 the trackway 20' comprises a straight track portion 61 extending from the opening 60 longitudinally of housing 20 and terminating in a locking shoulder 62 and another straight track portion 63 transversely offset relative to track portion 61 and which terminates in an enlarged portion 64 shaped to form a locking shoulder 65. The locking ball 56 normally operates in the track portion 63, secures the bolt in locking position when it is engaged with shoulder 62 and secures the bolt in retracted position when it is engaged with shoulder 65, as will be more fully hereinafter explained.

Preferably one or more small magnets, such as magnets 70 and 71, FIGS. 3 and 5, are attached to the housing 20 near its outer end and positioned so the magnetic flux of their poles will react with the magnetic flux of the poles of magnetized rotor part 36 in exerting a light torque on rotor 35 urging and tending to hold the track follower, such as locking ball 56 or pin 56', against the shoulder 65. Obviously one only of the magnets 70 or 71 can be used but the use of two or more magnets spaced around the rotor provides a better balance of forces. These small magnets lessen the danger of the bolt 30 being released accidentally or as a result of tampering and moving to an outwardly projected position while the door is open. The holding force of small magnets 70 and 71 is overcome by a stronger magnetic force, as hereinafter described, when the door is moved to a closed position.

The strike means used in connection with this lock, FIGS. 1 and 14, comprises a strike plate 66, preferably of non-magnetic material, such as nylon plastic, aluminum or the like, having in it a bolt receiving opening 67 and having back of it a strike magnet 68 forming a bottom for the opening 67. The strike magnet 68 and strike plate 66 are installed in a suitably mortised recess in the door jamb 69. Preferably the wall 67', FIG. 14, which forms the bolt engaging side of the strike plate opening 67 is convergently beveled from its outer edge toward its bottom so the bolt 30 will wedge against said inclined wall 67' when the door is closed thereby providing a tighter fit and helping to prevent rattling of the door.

A preferred method of assembling this lock is as follows: Insert the rotor 35 in the tubular bolt 30, insert the disc 50 with attached torque member 52, 53, 54 into the open end of bolt 30 and fixedly secure said disc 50 in the proper position in said bolt 30. Put washer 44 and coil spring 49 on pull back link 46 and insert cross pin 42 in link 46. Insert the cross pin carrying end of link 46 through the opening in the disc 50. This is done by holding spring 49 retracted, and with link 46 held at an angle to bolt 30, inserting one end of the cross pin 42 through opening 51 in disc 50 and then manipulating the other end of cross pin 42 through said opening 51 as the

link 41 is moved into alignment with the bolt 30. The assembled parts are then inserted into the housing 20 and manipulated so as to align the recess 39 in rotor member 37, the slot 33 in bolt 30 and the opening 60 at the end of trackway 20' in housing 20 and the ball 56 is inserted. The bolt 30 and housing 20 are then further telescoped together until the washer 44 rests against the end flange 27 of the housing where it is rigidly staked in place by the indentations 47 in the housing wall. The ball 56 follows the part 61 of trackway 20' until it rests against the shoulder 62, after which said ball 56 operates between the shoulders 62 and 65 along part 63 of trackway 20'. The face plate assembly is applied to and made fast to the outer end of the housing 20 after the bolt 30 with rotor 35 therein has been inserted in said housing 20.

The rotor magnet 36 and strike magnet 68 are selectively magnetized as illustrated in FIG. 14. When the door 22 is in an open position the tubular bolt 30 and rotor 35 will be held by the ball 56 in a retracted position. As the door 22 is moved to a closed position the flux of the two magnets 36 and 68 will first rotate the rotor 35 far enough to release the ball 56 from its engagement with the shoulder 65, will then draw the bolt 30 into the recess 67 in the strike member 66 and will further rotate the rotor 35 enough to move the ball 56 into engagement with the shoulder 62. This will hold the bolt 30 in engagement with the strike plate 66 until it is withdrawn therefrom by exerting a pull on link 46.

An arrangement of the poles of magnets 36 and 68 which will bring about rotary and longitudinal movement of the bolt 30 and rotor 35 as above set forth is diagrammatically shown in FIG. 14. This figure shows the strike magnet 68 as having on its front face a north pole at N and a south pole at S and shows the rotor magnet 36 as having on the face thereof which is closest to the strike magnet when the door is closed a north pole at N' and a south pole at S'. As the door 22 is moved toward a closed position the two poles S' and N, shown uppermost, will be closer to each other than the two lowermost poles N' and S. Since all of the poles are of about equal strength it is apparent that, as the door is being closed and is moved near to a closed position, the torque exerted on the rotor by the two uppermost poles S' and N will hold the ball 56 in locking engagement with the shoulder 65 until said two uppermost poles S' and N are substantially in alignment with each other. As soon as the uppermost pole S' passes a position of true alignment with the uppermost pole N the direction of the torque exerted by these two poles S' and N on the rotor 35 will be reversed and will be in the same direction as the torque that is then being exerted by the two lowermost poles N' and S and the rotor will be rotatively moved so as to release the ball 56 from engagement with the shoulder 65 and align it with the part 63 of trackway 20'. When this occurs the attraction between the two magnets 36 and 68 will move the bolt 30 endwise into a locked position within the strike plate opening 67. The torque being exerted on the rotor 35 by the magnet poles continues and when the ball 56 reaches the shoulder 62 it will be moved into engagement with said shoulder 62 where it will remain until it is moved clear of said shoulder by the retraction of the pull back link 41.

When the bolt 30 is retracted by pull back link 41 in the act of opening the door its retractile movement will be stopped by engagement of the ball 56 with the curved wall of the enlarged end part 64 of trackway 20' and the ball 56 will be deflected sidewise into engagement with the shoulder 65 where it will remain and hold the bolt 30 retracted until the next closing movement of the door.

Briefly summarized the operation of this lock is as follows: When the door is closed magnetic flux will always move and tend to hold the bolt in an outward position in engagement with the strike plate means and by rotatively moving the rotor member will engage the track follower with the shoulder 62 and lock the bolt 30 in engagement

with the strike plate means. Manual retraction of the pull back link 41 will first unlock the track follower from the shoulder 62, then retract the bolt and allow the door to be opened. The curved wall of the terminal end part 64 of track member 20' and the small magnets 70 and 71 will cause the track follower to be locked and held in engagement with shoulder 65 until such time as the rotor and strike members are moved into alignment with each other by closing of the door, whereupon the dominant flux of the rotor and strike magnets will unlock the track follower from the shoulder 65, snap the bolt 30 into the recess in the strike plate means and lock the track follower in engagement with the shoulder 62.

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

I claim:

1. In latch and lock means for use in a door which is swingingly movable relative to a door jamb, a tubular housing adapted to be installed in an edge portion of the door; a tubular bolt longitudinally movable in said housing between a retracted unlocked position and an outwardly projected locked position; manually operated bolt retracting means connected with said bolt; a magnetized strike member carried by the door jamb and having a bolt receiving recess positioned to receive said bolt; a magnetized rotor member disposed within and supported for limited rotary movement by and movable longitudinally with said bolt; and means operated by limited rotary movement of said rotor member in said bolt adapted to selectively lock said bolt either in a retracted or an outwardly projected position, said rotor member and strike member being magnetized selectively and being positioned so that when the door with the bolt in a retracted position is moved from an open to a closed door position in which the rotor member and strike member are in approximate alignment their magnetic flux will first rotatively move said rotor and unlock said bolt from its retracted position then longitudinally move said bolt into an outwardly projected position in engagement with said strike member and then further rotatively move said rotor and lock said bolt in said outwardly projected position.

2. The lock and latch means as claimed in claim 1 in which the manually operated bolt retracting means includes devices operative to first rotatively move said rotor member and unlock the bolt from its outwardly projected position and to then longitudinally move said bolt to a retracted position.

3. The lock and latch means as claimed in claim 1 in which the means for selectively locking the bolt either in a retracted or in an outwardly projected position includes a longitudinally extending trackway in the housing; two longitudinally spaced apart locking shoulders provided in said trackway; and a track follower connected to and movable with said rotor member operating in said trackway and movable into locking engagement with each of said shoulders to selectively lock said bolt in either a retracted or an outwardly projected position.

4. The latch and lock means as claimed in claim 2 in which the manually operated bolt retracting means includes devices operable on initial bolt retracting movement of the bolt retracting means in rotatively moving the rotor member in the bolt and unlocking the track follower from engagement with one of said locking shoulders and operable on further retraction thereof in retracting the bolt.

5. The latch and lock means as claimed in claim 2 in which at least one holding magnet is attached to the housing adjacent the outer end thereof and positioned so its flux reacts with the flux of the magnetic rotor member in urging the track follower into engagement with the locking shoulder by which the bolt is held retracted, the force exerted by said magnetic strike member dominating the force exerted by said holding magnet and releas-

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ing said track follower from engagement with said shoulder when the rotor member is moved into approximate registration with the strike member.

6. Latch and lock means for use in a door which is movable relative to a door jamb comprising a tubular housing adapted to be installed in the edge portion of the door, said housing having in its wall a longitudinally extending trackway provided with two spaced apart locking shoulders, one of which is closer to the outer end of said housing than the other; a tubular bolt longitudinally movable in said housing between a retracted and an outwardly projected position; bolt retracting means connected with said bolt; a magnetized strike member in said jamb positioned to receive said bolt when said bolt is outwardly projected, said bolt having in its wall a transverse slot normally registering with the trackway in said housing; a magnetized rotor member supported for limited rotary movement in said tubular bolt, said rotor member having a peripheral wall portion close to the wall of said bolt and provided with a recess which normally registers with the transverse slot in said tubular bolt and the trackway in said housing; and a track follower disposed in the recess in said rotor member and extending through the transverse slot in said bolt and into the trackway in said housing, said track follower being movable along said trackway by longitudinal movement of said rotor and bolt and being movable by rotary movement of said rotor in said bolt into engaged and disengaged positions relative to said locking shoulders, said track follower holding said bolt retracted when it is engaged with the locking shoulder closest to the outer end of said housing and holding said bolt outwardly projected when it is engaged with the locking shoulder farthest from the outer end of said housing, said rotor and strike member being selectively magnetized so as to provide between them a magnetic flux which, when the bolt is retracted and they are moved into approxi-

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mate registration, with each other by closing of the door will first rotatively move said rotor and release the track follower from the shoulder nearest the outer end of the housing, then move the bolt endwise to an outwardly projected locking position, then further rotatively move the rotor and engage said track follower with the shoulder farthest from the outer end of said housing.

7. The latch and lock means as claimed in claim 6 in which an opening of substantial size through which the track follower can be passed is provided in the housing wall and a track extension along which the track follower can be moved connects said opening with the part of the trackway between the two locking shoulders.

8. The latch and lock means as claimed in claim 6 in which the bolt retracting means includes a manually operated pull back link and lost motion devices connecting said pull back link with the rotor and the bolt, said lost motion devices being adapted, when moved by retraction of the pull back link, to first rotatively move the rotor in the bolt and disengage the track follower from the locking shoulder nearest the outer end of the housing and then to move the bolt to a retracted position.

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U.S. Cl. X.R.

292—153, 251.5