May 16, 1950 M. O. TEETOR 2,508,305

MAGNETIC DOOR CATCH

Filed Feb. 5, 1948

Fig. 1.

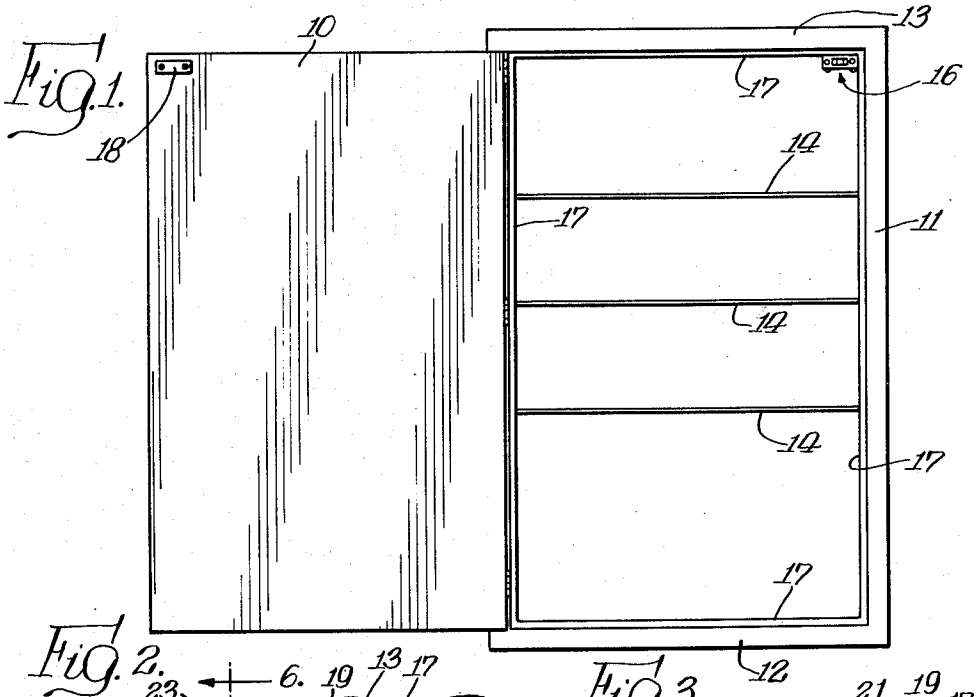


Fig. 2.

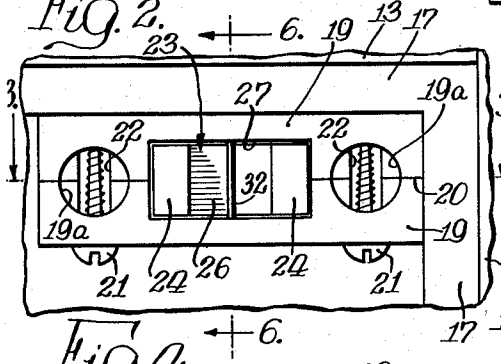


Fig. 3.

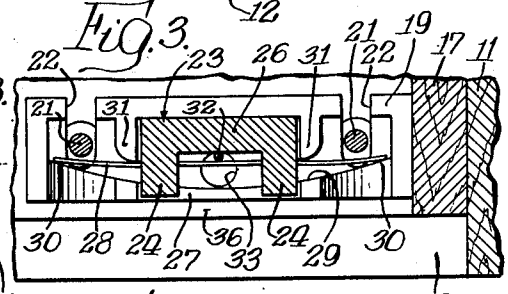


Fig. 4.

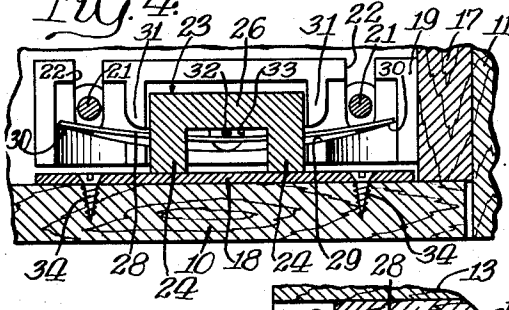


Fig. 5.

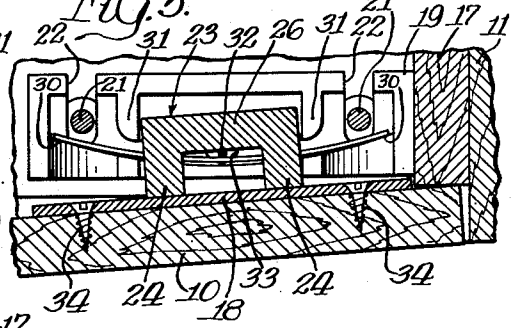
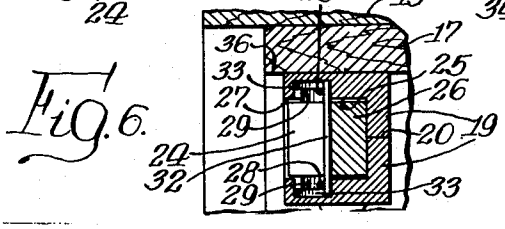


Fig. 6.



INVENTOR.
Macy O. Teetor,
BY
Davis, Lindsey, Hibben & Royce
Atty's.

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MAGNETIC DOOR CATCH

Macy O. Teetor, New Orleans, La.

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6 Claims. (Cl. 292—70)

1

This invention relates to a device for retaining a closure member in closed position by magnetic attraction and more particularly to a magnetic catch adapted for use on a cabinet door.

It is common experience that after a period of use the various component parts of a cabinet, such as the cabinet frame, shelves, walls, and doors, tend to become misaligned as a result of sagging or warping even though the cabinet parts were in perfect alignment and adjustment when originally installed. Such relative misalignment interferes seriously with the satisfactory operation of the usual type of cabinet latch in which one latch element is secured to the door and is adapted to engage mechanically a companion latch element secured to the cabinet frame or shelf. The resultant sticking of the door in closed position or the inability of the door to close due to improper contact between the latch elements can usually be corrected only by removing one or both latch elements and remounting them in properly aligned positions.

Various attempts have previously been made to incorporate magnets in cabinet door latches in order to utilize magnetic attractive forces as a means of retaining a door in closed position. However, in most of the prior magnetic latches the several latch elements have been rigidly mounted, and in no case has any provision been made to compensate for misalignment of the cabinet parts resulting from sagging or warping. In the case of a magnetic latch or catch, improper relative alignment of the cabinet parts results in faulty registry between the coacting surfaces of the latch magnet and its cooperating armature or companion magnet element, and consequently little or none of the available magnetic force is utilized in retaining the door in closed position. The magnetic latches and catches heretofore proposed are, therefore, subject to the same defects and disadvantages in this respect as the conventional non-magnetic latches.

Another difficulty encountered in the development of a satisfactory magnetic latch is the problem of protecting the magnet element from severe impact upon slamming of the cabinet door or other closure member. The most satisfactory materials for use in permanent magnets are the magnetic metals or alloys thereof comprising primarily iron, nickel, and cobalt in various combinations and proportions well known to the art. However, many of these alloys are exceedingly brittle and have low impact resistance. Thus, certain of the magnetic latches previously suggested cannot readily utilize magnets formed from these desirable alloys because the magnet element or elements of the latch are adapted to undergo direct striking contact with another element which contact would be likely to shatter or chip the magnet. In other cases, relatively elaborate and complex provisions have been made to cushion or lessen the shock of impact when the magnetic latch is operated by closing of the cabinet door. Obviously, it would be desirable to employ alloy magnets in a magnetic latch without the necessity for additional expensive cushioning devices for protecting the magnets from the shock of impact.

2

A primary object of the present invention is to provide a magnetic catch which is easily manufactured and installed and which is not subject to the above-mentioned objections.

Another object of the invention is to provide a magnetic door catch that will operate efficiently at all times to retain a cabinet door in closed position and to permit easy opening thereof even though the various parts of the cabinet structure, such as the frame, walls, door or shelves, should become warped or otherwise misaligned relative to each other.

A further object of the invention is to provide a magnetic catch for cabinet doors and the like in which a permanent magnet and a cooperating armature are mounted in self-adjusting coacting positions on a door and its adjacent structure so as to be capable of flatwise engagement with each other even though the door and the adjacent structure become misaligned or out of adjustment.

Still another object of the invention is to provide a magnetic door catch for use on cabinet doors and the like in which a permanent horseshoe magnet is resiliently and loosely mounted for limited lateral and angular movement with respect to its support whereby to permit coacting engagement between the magnet and a cooperating armature even though the door and the adjacent structure to which the catch elements are secured may occupy non-parallel and misaligned positions.

A still further object of the invention is to provide a magnetic catch for cabinet doors and the like in which a permanent magnet retains the door in closed position by engagement with a cooperating armature and in which the magnet is so mounted with respect to its supporting structure that direct striking contact between the armature and the magnet is avoided when the door is moved into a closed position with great speed and force.

Other objects and advantages of my invention will become apparent from the subsequent description thereof and from the accompanying drawing, in which:

Figure 1 is a front elevational view of a cabinet provided with a magnetic door catch embodying the features of the present invention;

Fig. 2 is an enlarged fragmentary front elevational view of one unit of the magnetic door catch

as mounted in the upper right hand corner of the cabinet frame shown in Fig. 1;

Fig. 3 is a horizontal sectional view taken along the line 3—3 of Fig. 2 looking downwardly in the direction of the arrows;

Fig. 4 is a horizontal sectional view taken through the magnetic catch of Fig. 1 and showing the cabinet door in closed position with the elements of the catch in coacting engagement;

Fig. 5 is a horizontal sectional view similar to Fig. 4 but showing the cabinet door in warped or misaligned position with respect to the cabinet frame and showing the manner in which the magnet element adjusts itself to permit flatwise engagement of the catch elements in spite of misalignment of the supporting structure; and

Fig. 6 is a vertical sectional view taken along the line 6—6 in Fig. 2 looking in the direction of the arrows.

The magnetic catch of my invention comprises generally a magnet element and a cooperating armature element, one of which is adapted to be secured to a closure member such as a cabinet door and the other of which is adapted to be secured in coacting position on an adjacent structure such as a door frame, cabinet wall, or cabinet shelf. One or the other of the catch elements is resiliently mounted for limited lateral movement towards its companion element and also for limited angular or twisting movement relative to its support thereby permitting the movably mounted element to adjust its position automatically for flatwise coacting engagement with the other element when the closure member and adjacent structure are in non-parallel misaligned positions relative to each other.

Referring to Fig. 1 of the drawing, a storage cabinet is shown comprising a door 10 hingedly secured at one edge thereof to a cabinet frame having upright stiles or side portions 11, a sill or base 12, a top portion 13, and a plurality of shelves 14. The cabinet is provided with a magnetic catch embodying the features of my invention and consisting of a magnet unit 16 mounted in the upper righthand corner of the cabinet frame on a recessed strip or door stop 17 which extends peripherally around all four sides of the interior of the cabinet, and a cooperating armature unit comprising an armature element or plate 18 affixed adjacent the upper outside corner of the inner face of the door 10. The armature and magnet units are mounted in coacting positions on the door and cabinet frame, respectively, so that the armature element 18 engages the magnet unit 16 when the door 10 is in closed position adjacent the stop 17. As shown in Figs. 3 to 6, the magnet unit 16 is secured on the stop member 17 a slight distance inwardly from the front edge thereof in order to allow the slamming force of the door 10 to be expended on the stop 17 and to provide space to accommodate the armature element 18 when the door 10 is in closed position.

The term "frame member" is used broadly in the specification and claims to include any cooperating portion of the cabinet structure such as the walls or shelves as distinguished from the cabinet door.

Referring now to Figures 2 to 6, inclusive, the magnet unit of the catch is shown as comprising an elongated magnet housing or body formed from a pair of complementary halves 19 secured together, as by a suitable cement, along a longitudinal plane, as shown at 20, and rigidly affixed to the upper peripheral strip 17 by means of a pair of screws 21 extending upwardly through a pair of vertical slotted openings 22. The openings 22 extend from the center portions of the halves 19 to their rear faces and permit the magnet unit to be adjusted to proper position when being mounted. The halves 19 of the housing are also cut away at their abutting portions to provide a pair of circular openings 19a extending horizontally and transversely thereof and through which the screws 21 may be inserted for mounting the magnet unit on a vertical surface when desired.

The magnet housing is formed from a non-magnetic material such as brass, aluminum, or a suitable plastic. A permanent horseshoe magnet or magnet element 23 formed from a magnetic metal or alloy, such as the alloy of iron, aluminum, cobalt, and nickel commercially available under the trade name "Alnico," and having a pair of spaced projecting pole pieces or legs 24 and a connecting portion 26, is disposed loosely within the housing with the legs 24 extending transversely in the direction of a generally rectangular opening 27 provided in the front side of the housing. The magnet 23 is of lesser longitudinal length than the length of the opening 27 thereby providing sufficient clearance between the respective ends of the magnet and the housing to permit the magnet 23 to assume an angular position therein as shown in Fig. 5. In addition, the transverse height of the magnet 23 is less than the height of the opening 27 thereby providing a slight clearance 25, as seen in Fig. 6, to permit angular or cocking movement of the magnet in a vertical plane. The opening 27 is also of such depth as to permit the legs 24 of the magnet 23 to be fully enclosed by the housing and to be protected thereby when in normal retracted position as shown in Fig. 3.

Two elongated bar springs 28 formed from a suitable resilient and non-magnetic material, such as phosphorus-bronze spring wire, are disposed lengthwise within wide longitudinal channels 29 in the housing above and below the magnet 23, the springs 28 extending at right angles to the leg portions 24 of the magnet 23 and generally parallel to the connecting portion 26. The ends of each of the springs 28 are adapted to abut a pair of shoulder portions 30 formed on the interior of the housing, the intermediate portions of the springs 28 being free to move transversely within the wide channels 29 from a normal retracted position adjacent a pair of projecting abutments 31, as shown in Fig. 3, to a bowed or extended position as shown in Figures 4 and 5. A retaining pin 32 is disposed vertically in the housing intermediate the bar springs 28 and the connecting portion 26 of the magnet 23, the pin 32 projecting above and below the magnet 23 and being adapted to engage the central portions of the springs 28 with its respective ends and to engage the connecting portion 26 of the magnet 23 at its central portion. The ends of the retaining pin 32 are loosely disposed for limited transverse movement in enlarged and opposed circular recesses or cavities 33 formed in the halves 19 of the housing. By the foregoing arrangement of parts, outward resilient movement of the magnet element 23 in the direction of and through the opening 27 is permitted.

The armature unit comprises a flat armature element or plate 18 formed from a magnetic metal such as iron and secured to the inner face of the door 10 by means of a pair of screws 34. Upon outward movement of the magnet element

23, the pole faces of the legs 24 engage flatwise with the armature element or plate 18 under the influence of the magnetic attractive forces therebetween. The force of the magnetic attraction between the magnet 23 and the armature plate 18 is greater than the tension exerted by the springs 28 thus permitting outward movement of the magnet 23 and its engagement with the plate 18 when the door 10 is closed. However, when the door 10 is in open position away from the cabinet, the magnetic forces between the magnet 23 and the armature 18 are broken and the springs 28 retract the magnet 23 back into the housing.

In its normal retracted position the magnet 23 is retained within the magnet housing against the back wall of the recess 27 by means of the movable retaining pin 32 which engages the connecting portion 26 of the magnet 23 and which is in turn held inwardly by the springs 28 as shown in Fig. 3. However, as the cabinet door 10 approaches a closed position when being moved at a normal rate of closure, the magnet 23 is caused by magnetic attraction to move outwardly from the housing, with the legs 24 projecting through the opening 27 into flatwise engagement with the armature plate 18. This engagement between the magnet legs 24 and the armature plate 18 occurs an instant before the door 10 reaches its finally closed position against the stop portion 17 and continued movement of the door 10 thereafter to finally closed position is accomplished by the springs 28 which are placed under tension as a result of outward movement of the magnet 23. As shown in Fig. 4, when the door 10 is in fully closed position the springs 28 are still bowed outwardly, thus urging the magnet 23 inwardly of the housing and thereby resiliently retaining the door 10 in a closed position adjacent the peripheral strip or door stop 17.

Although the armature element 18 is illustrated in the drawing as a flat plate, it is apparent that other suitable forms could be employed with equal success. The terms "armature element" "armature unit," or "armature" as used herein and in the appended claims are also intended to include the use of a companion magnet element as well as merely a non-magnetized but magnetically permeable member.

Fig. 5 of the drawing illustrates the self-adjusting feature of my invention whereby perfect alignment between the catch elements is obtained even though the cabinet door and its adjacent structure may have become misaligned as a result of warping or other causes. As shown in Fig. 5, the door 10 is warped or bulged outwardly at its central portion and fails to engage the strip 17 horizontally along a substantial portion of its normal contact edge. However, because the magnet 23 is loosely and resiliently mounted within the housing, angular or twisting movement of the magnet 23 occurs relative thereto and relative to the outer edge of the strip 17 to permit flatwise engagement between the outer ends of the magnet legs 24 and the armature 18. Moreover, if the door and cabinet structure should become misaligned in a substantially vertical plane (not illustrated in the drawing), angular movement or cocking of the magnet 23 will occur in a vertical plane as a result of the clearance space 25 to permit flatwise engagement of the magnet and armature. Hence, the magnetic forces are utilized to their fullest extent at all times, the self-adjusting feature of the magnetic element compensating for all misalignment between the door 10 and the cabinet framework

including misalignment in a substantially horizontal plane or a substantially vertical plane or both. It is apparent that if the magnet element were rigidly mounted and misalignment occurred, the strength of the magnetic attraction between the elements would be seriously diminished as a result of the space or gap between the magnet element and the armature.

Another important feature of my invention is the location of the magnet 23 with respect to the front face of the housing and the location of the entire magnet unit 16 with respect to the portion of the cabinet structure upon which it is mounted. As best seen in Figs. 3 and 6, the magnet housing is secured to the strip 17 inwardly from the outer edge thereof to provide a ledge or clearance space 36. The space 36 is sufficient so that the armature plate 18 cannot strike against the outer face of the housing when it is slammed to closed position. The magnet 23 is further protected by making the recess 27 in which it is mounted of greater depth than the width of the magnet so that the legs 24 thereof are slightly recessed from the front face of the housing when the magnet is in its normal retracted position. Thus, in the event that the space 36 is not made sufficiently wide when the magnet unit is mounted on the strip 17, the plate 18 will strike only against the front face of the housing when the door is slammed and not against the pole faces at the ends of the magnet legs 24. It is apparent that when the door 10 is closed rapidly and with great force, the door will attain closed position before the magnet 23 can move outwardly. As previously explained, the magnetic alloys are in many cases brittle and low in impact resistance, and as a result of these properties precautions must be taken to avoid forceful contact between the permanent magnet and its armature element. By recessing or insetting the magnet housing a sufficient distance from the outer edge of the cabinet structure and by insetting the magnet 23 from the front face of the housing, I have been able to eliminate this source of difficulty without the need for expensive and complicated cushioning mechanisms and yet without sacrificing efficiency, self-adjustment, or ease of operation of the catch.

When the cabinet door 10 is moved at a normal rate of closure into shut position, the magnet 23 must first move outwardly in order to engage the armature 18 as the door approaches shut position, and then the bar springs 28, which are thus placed under tension, restores the magnet 23 to its normal inward or retracted position in the housing and thereby complete the closing of the door and retain the same in shut position. On the other hand, if the cabinet door is closed with a hard slamming action, there is no danger of severe impact between the magnet 23 and the armature 18 inasmuch as the magnet 23 is normally retained in its inward position by the springs 28 and the door will first forcibly engage the peripheral strip or door stop 17, the outer edge of which is spaced by the ledge 36 from the magnet housing. Thereafter, the magnet 23 must move outwardly to engage the armature 18 but only after the force of the slamming movement of the door has been expended.

Although the invention has been described herein in connection with a certain specific embodiment, it will be understood that various equivalent structures and modifications of the specific form of the invention herein described may also be resorted to without departing from

the scope of the invention as defined in the appended claims.

I claim:

1. A magnetic door catch comprising a magnet unit and a cooperating armature adapted to be mounted in opposing coacting positions on a door member and an adjacent frame member, said magnet unit comprising a body portion rigidly securable to its supporting member, a permanent magnet loosely disposed in said body portion for limited transverse and angular movements relative thereto, said magnet having spaced leg portions extending transversely in said body portion and movable outwardly therefrom for contact with said armature, a pair of spaced bar springs disposed lengthwise in said body portion on opposite sides of said magnet for normally urging said magnet into retracted position in said body portion but permitting outward movement thereof by magnetic attraction, and a retaining pin extending transversely between and engaging said springs and said magnet, said body portion having enlarged recesses of greater size than the ends of said pin in which the pin ends are loosely disposed for limited movement therein.

2. In combination with coacting door and frame members having faces adapted to engage when the door member is in closed position, a magnet element on one of said members, an armature element on the other of said members, and a body structure movably supporting one of said elements on its associated member, said body structure being mounted inwardly in recessed relation from the face of its associated member and thereby retaining said one element inwardly from said face for preventing direct striking contact of said elements during slamming of said door member, and said one element being resiliently movable into contact with the other of said elements by magnetic attraction.

3. A magnetic catch for holding a closure member in closed position adjacent a frame member, said catch comprising a pair of cooperating magnet and armature elements adapted to be supported in opposed coacting positions on said members, one of said elements being provided with a pair of spaced legs, a housing for said one element having the latter loosely and rockably disposed therein, the other of said elements and the legs of said one element being provided with flat coacting contact faces and said one element being movable outwardly from said housing by magnetic attraction into engagement with said other element, and resilient means operatively engaging said one element intermediate the legs thereof for normally urging said one element inwardly of said housing but permitting simultaneous outward and rocking movement of said one element for effecting parallel alignment of the contact faces of said legs with the contact face of said other element whereby to permit flatwise engagement between said coacting contact faces when said closure and frame members are in misaligned, non-parallel positions.

4. A magnetic catch for holding a closure member in closed position adjacent a frame member, said catch comprising a permanent magnet element having a pair of spaced legs, a cooperating armature element adapted to be secured to one of said members, a housing for said magnet element adapted to be secured to the other of said members and having said magnet element loosely and rockably disposed therein, said armature element and the legs of said magnet element being provided with flat coacting contact faces and said magnet element being movable outwardly from said housing by magnetic attraction into engagement with said armature element, and resilient means operatively engaging said magnet element intermediate the legs thereof for normally urging said magnet element inwardly of said housing but permitting simultaneous outward and rocking movement of said magnet element for effecting parallel alignment of the contact faces of said legs with the contact face of said armature element whereby to permit flatwise engagement between said coacting contact faces when said closure and frame members are in misaligned, non-parallel positions.

5. A magnetic catch for holding a closure member in closed position adjacent a frame member, said catch comprising a permanent magnet element having a pair of spaced legs, a cooperating armature element adapted to be secured to one of said members, a housing for said magnet element adapted to be secured to the other of said members and having a recess extending inwardly from the front of said housing, said recess being of greater depth than said magnet element and said magnet element being loosely and movably disposed within said recess with said legs extending outwardly for movement outwardly from said housing by magnetic attraction into engagement with said armature element, and resilient means operatively engaging said magnet element intermediate the legs thereof for normally urging said magnet element inwardly of said housing and for normally holding said legs in recessed relation inwardly from the front of said housing whereby to prevent direct striking contact between said elements when said closure member is slammed to closed position.

6. A magnetic catch for holding a closure member in closed position adjacent a frame member, said catch comprising a permanent magnet element having a pair of spaced legs, a cooperating armature element adapted to be secured to one of said members, a housing for said magnet element adapted to be secured to the other of said members and having said magnet element loosely and rockably disposed therein, said magnet element being movable outwardly from said housing by magnetic attraction into engagement with said armature element, and elongated bar spring means having its end portions retained in said housing and its intermediate portion operatively engaging said magnet element between the legs of the latter for normally urging said magnet element inwardly of said housing but permitting simultaneous outward and rocking movement of said magnet element whereby to effect parallel engagement between said elements when said closure and frame members are in misaligned, non-parallel positions.

MACY O. TEETOR.

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