

Sept. 28, 1954

M. O. TEETOR
MAGNETIC DOOR CATCH

2,690,348

Filed Sept. 16, 1949

3 Sheets-Sheet 1

Fig. 1.

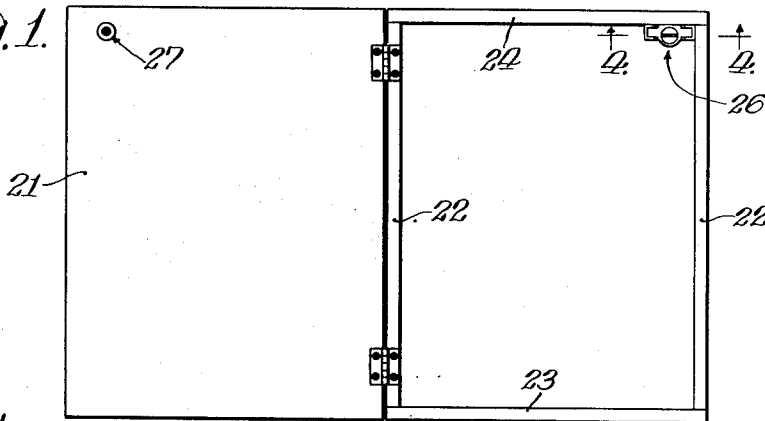


Fig. 2.

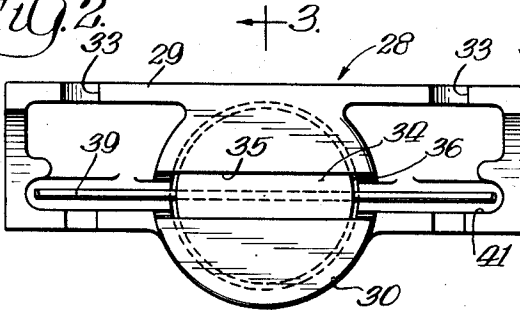


Fig. 6.

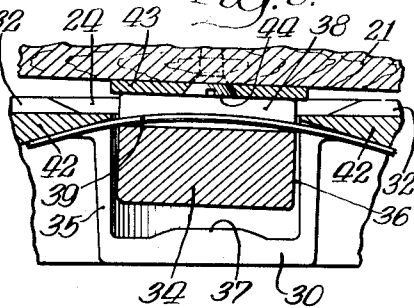


Fig. 4.

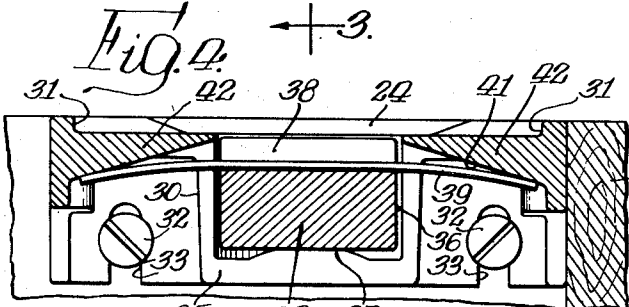


Fig. 3.

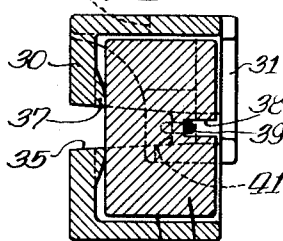
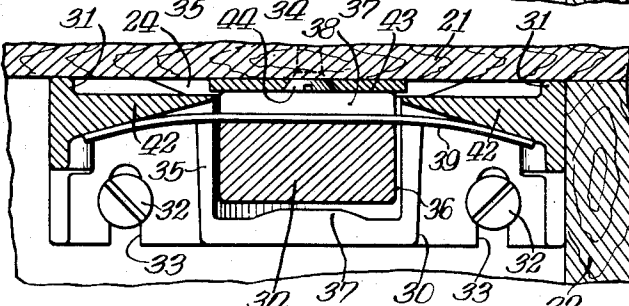


Fig. 5.

INVENTOR.
Macy O. Teetor,
BY
Davis Lindsey Hildner Meyer
Attys

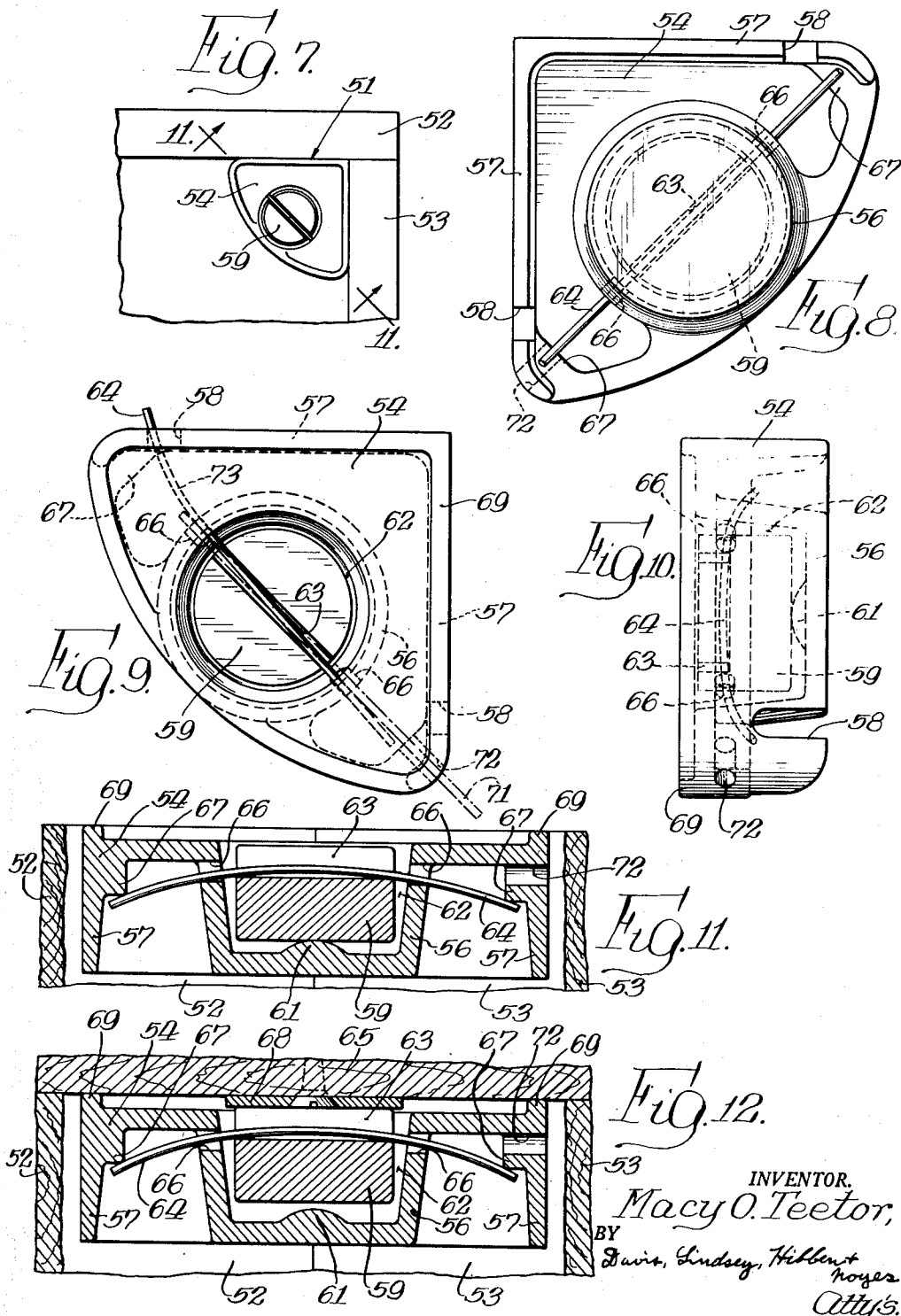
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3 Sheets-Sheet 2



INVENTOR,
Macy O. Teetor,
BY *Davis, Lindsey, Hibben +*
Hooper
Attys.

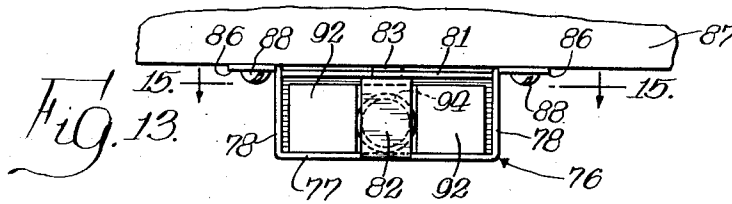
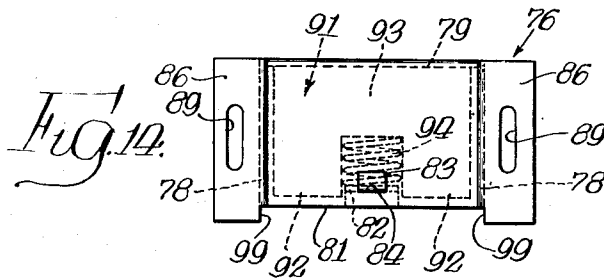
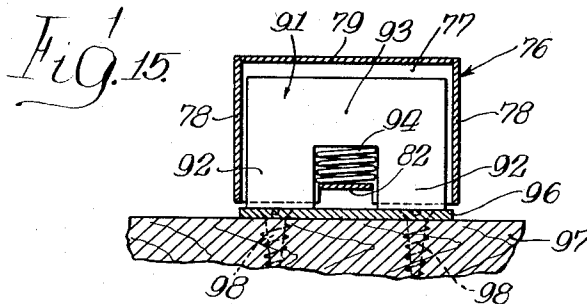
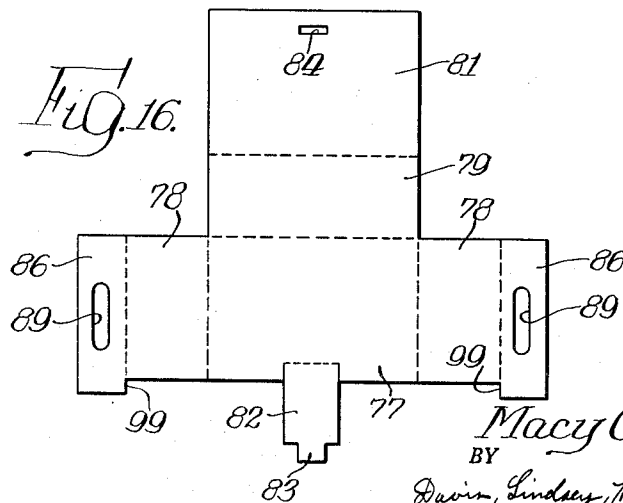
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3 Sheets-Sheet 3



INVENTOR.
Macy O. Teetor,
BY
Davis, Lindsey, Hibben + Hayes
Attys.

UNITED STATES PATENT OFFICE

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MAGNETIC DOOR CATCH

Macy O. Teetor, New Orleans, La.

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18 Claims. (Cl. 292—251.5)

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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

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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.

A primary object of the present invention is to provide a novel 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 novel 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 novel 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 a cabinet door and the like in which a permanent disk-type 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 novel magnetic catch for a cabinet door 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.

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

Fig. 1 is a front elevational view of a cabinet provided with a magnetic door catch comprising one embodiment of my invention;

Fig. 2 is an enlarged rear elevational view of the magnet unit of the magnetic catch shown in Fig. 1;

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

Fig. 4 is a horizontal sectional view taken along the line 4—4 of Fig. 1 looking upwardly in the direction of the arrows;

Fig. 5 is a horizontal sectional view through the magnetic catch illustrated in Fig. 1 and showing the cabinet door in closed position with the elements of the catch in coacting engagement;

Fig. 6 is a fragmentary horizontal sectional view similar to Fig. 5 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;

Fig. 7 is a fragmentary front elevational view of a cabinet corner showing a magnet unit comprising a modified form of the magnetic catch of my invention;

Fig. 8 is an enlarged rear elevational view of the magnet unit shown in Fig. 7;

Fig. 9 is an enlarged front elevational view of the magnet unit illustrated in Fig. 7 and showing the manner of assembling the parts of the unit;

Fig. 10 is an end view of the magnet unit as viewed from the right in Fig. 9;

Fig. 11 is a sectional view taken along the line 11—11 of Fig. 7 looking in the direction of the arrows;

Fig. 12 is a sectional view similar to Fig. 11 but showing the cabinet door in closed position with the elements of the catch in coacting engagement;

Fig. 13 is a fragmentary front elevational view of the upper portion of a cabinet frame having mounted thereon a magnet unit comprising still another modification of the magnetic catch of my invention;

Fig. 14 is a top plan view of the magnet unit shown in Fig. 13;

Fig. 15 is a horizontal sectional view taken along the line 15—15 of Fig. 13 looking downwardly in the direction of the arrows and showing a fragmentary portion of a cabinet door in closed position with the elements of the catch in coacting engagement; and

Fig. 16 is a plan view of a sheet metal blank adapted to be folded to form the magnet housing of the magnet unit shown in Figs. 13 to 15.

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

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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 first to Fig. 1 of the drawing, a storage cabinet is shown comprising a door 21 hingedly secured at one edge thereof to a cabinet frame having upright stiles or side portions 22, a sill or base 23, and a top portion 24. The cabinet is provided with a magnetic catch embodying the features of my invention and consisting of a magnet unit 26 mounted in the upper right-hand corner of the cabinet frame and a cooperating armature unit 27 affixed adjacent the upper outside corner of the inner face of the door 21. The armature and magnet units are thus mounted in coacting positions on the door and cabinet frame, respectively, so that the armature unit 27 engages the magnet unit 26 when the door 21 is in closed position against the cabinet frame.

Although as shown in the drawing, the magnet unit is secured to the cabinet frame and the armature unit is secured to the cabinet door, it is within the scope of my invention to reverse the positions of the two units, i. e., to mount the armature unit on the cabinet structure and the magnet unit on the door. Also, it is to be understood that the two cooperating units may be mounted in any desired coacting positions on the door and the cabinet structure and may also be put to related uses. For example, the magnet unit 26 could be mounted adjacent the outer stile 22, or the sill 23, or on a shelf extending horizontally between the stiles 22, with the armature unit 27 being mounted at any appropriate coacting location on the inner vertical face of the door 21. In this connection, 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 Figs. 2 to 6, inclusive, the magnet unit 26 of the device is shown as comprising an elongated magnet housing or body portion, indicated generally at 28, having a mounting flange 29 along one edge thereof, a centrally located aperture or socket portion 30 extending inwardly from the front face of the housing for receiving a magnet element, and a peripheral protecting rim 31 for preventing direct striking impact against the magnet element of the device, as hereinafter described in detail. The housing 28 is rigidly affixed to the lower face of the top portion 24 of the cabinet frame by means of a pair of screws 32 extending upwardly through a pair of edgewise slots or openings 33 in the flange 29. The openings 33 extend inwardly a substantial distance from the rear edge of the flange 29 to permit the magnet unit 26 to be adjusted to proper position adjacent the edge of the cabinet frame when being mounted.

The magnet housing 28 is formed from a non-magnetic material such as brass, zinc, aluminum, or a suitable plastic. A magnet element in the form of a relatively thick, round disk-type permanent magnet 34 is disposed loosely within the socket 30 which is open and unobstructed at the front face of the housing 28. The socket 30 is also provided with a diametric slot 35 extending axially from the bottom thereof to the front face of the housing 28. The magnet 34 is formed from a magnetic metal or alloy, such as the alloy of iron, aluminum, cobalt, and nickel commercially available under the trade-mark "Alnico." I pre-

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fer that the magnetization of the disk-type magnet 34 be crosswise or in other words parallel to a diameter of the magnet so that the north polarity will be concentrated at one point on the periphery of the magnet and the south polarity at a diametrically opposite point on the periphery. This form of magnetization combines maximum magnetic strength with magnetic permanency for a given disk. However, it is within the scope of the invention to employ a disk-type magnet having its magnetization differently oriented with respect to the periphery of the magnet. For example, it is possible to so magnetize a disk-type magnet that one polarity is substantially at the axial center of the magnet with the other polarity being concentrated around the periphery of the magnet.

In addition, the diameter of the magnet 34 is slightly less than the internal diameter of the socket 30 whereby to provide an annular clearance 36 between the periphery of the magnet and the interior of the socket of sufficient extent to permit the magnet 34 to assume a cocked or angular position therein, as shown in Fig. 6 and hereinafter described in greater detail. The bottom of the socket 30 is provided with a dome-shaped projection 37 upon which the magnet 34 rests when in retracted position, and the depth of the socket 30 is such as to permit the full axial height of the magnet 34 to be fully enclosed by the socket 30 and to be protected thereby when in normal retracted position, as shown for example in Fig. 4.

The outer end face of the magnet 34 is provided with a diametric groove or slot 38 which is preferably so oriented with respect to the magnetization of the magnet that the groove or slot in effect divides the magnet into pole pieces or legs of opposite polarity thereby approximating a horseshoe-type magnet. An elongated bar spring 39, formed from a suitable resilient and non-magnetic material such as phosphorus-bronze spring wire, is disposed lengthwise within a longitudinal channel 41 in the housing 28 and extends through the slot 35 in the socket 30 and through the groove 38 in the magnet 34. The ends of the bar spring 39 are received within the interior of the housing 28 in abutment with a pair of shoulder portions 42 formed therein, and the intermediate portion of the spring 39 directly engages the magnet 34 within the groove 38 whereby the magnet is normally retained in a retracted position in contact with the projection 37 at the bottom of the socket 30. Thus, it will be seen that the intermediate portion of the spring 39 is free to move transversely within the channel 41 from a normal retracted position, as shown in Fig. 4, to an outwardly bowed or extended position, as shown in Figs. 5 and 6, thereby permitting outward resilient movement of the magnet 34 in the direction of and through the open end of the socket 30.

The armature unit 27 comprises a flat centrally apertured circular washer 43 formed from a magnetic metal such as iron or steel and having approximately the same or a slightly larger diameter than the disk-type magnet 34. The washer 43 is secured to the inner face of the door 21 by means of a screw 44 having its head portion recessed within the washer 43 whereby to present a smooth armature surface for flatwise engagement with the magnet 34 upon outward movement of the latter under the influence of the magnetic attractive forces therebetween. The force of the magnetic attraction between the

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magnet 34 and the washer 43 is greater than the tension exerted by the spring 39 thus permitting outward movement of the magnet 34 and its engagement with the washer 43 when the door 21 is closed. However, when the door 21 is in open position away from the cabinet frame, the magnetic forces between the magnet 34 and the washer 43 are broken and the spring 39 retracts the magnet 34 into the socket portion 30 of the housing 28.

In its normal retracted position, the magnet 34 is thus retained within the socket portion 30 of the housing 28 in abutment with the bottom projection 37 by means of the resilient action of the bar spring 39, as shown in Fig. 4. However, as the cabinet door 21 approaches a closed position when being moved at a normal rate of closure, the magnet 34 is caused by magnetic attraction to move outwardly from the housing 28 with the grooved front end of the magnet projecting through the front opening of the socket portion 30 into flatwise engagement with the armature element or washer 43. This engagement between the magnet 34 and the washer 43 occurs an instant before the door 21 reaches its finally closed position against the cabinet frame, and continued movement of the door 21 thereafter to finally closed position is accomplished solely by the action of the bar spring 39 which is placed under tension as a result of outward movement of the magnet 34. As shown in Fig. 5, when the door 21 is in fully closed position, the spring 39 is still bowed outwardly thereby urging the magnet 34 inwardly of the housing 28 and thereby resiliently retaining the door 21 in closed position adjacent the cabinet frame. When the door 21 is opened the spring 39, having its ends retained by the shoulders 42 and being in direct contact with the grooved portion 38 of the magnet 34, serves to break the contact between the magnet 34 and the washer 43 thereby disrupting the magnetic bond holding the door in closed position.

Although the armature element 43 is illustrated in the drawing as a flat washer, 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. 6 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. 6, the door 21 is warped or bulged outwardly to a slight extent at its central portion and fails to engage the horizontal top portion 24 of the cabinet frame along a substantial portion of its normal contact edge. However, because the magnet 34 is loosely and resiliently mounted within the socket portion 30 of the housing 28, angular or twisting movement of the magnet 34 occurs within the annular clearance space 36 whereby to permit flatwise engagement between the outer end of the magnet 34 and the armature 43. Moreover, if the cabinet door structure should become misaligned in a vertical plane (not illustrated in the drawing), a corresponding angular or cocked movement of the magnet 34 will likewise occur as a result of the annular clearance 36 whereby to compensate

for the misalignment. Hence, the magnetic forces in my device are utilized to their fullest extent at all times, the self-adjusting feature of the magnet element compensating for all types of misalignment between the door 21 and the cooperating cabinet frame work. It is apparent that if the magnet element were rigidly mounted and such misalignment should occur, the strength of the magnetic attraction between the magnet and armature elements would be seriously diminished as a result of the space or gap therebetween.

Another important feature of my invention is the provision of the protective rim 31 at the front face of the housing 28 adjacent the end portions thereof. As best seen in Figs. 4 and 5, the magnet housing 28 is secured to the top portion 24 of the cabinet frame with the protective rim 31 at each end of the housing substantially in flush alignment with the outer edge of the cabinet frame. The depth of the rim 31 is slightly greater than the thickness of the washer 43 so that when the door 21 is in closed position, as seen in Fig. 5, the necessary space will be provided for receiving the washer 43 and the spring 39 will always be under tension thereby insuring proper functioning of the catch and avoiding looseness and rattling of the closed door. In addition, the depth of the rim 31 is such that the armature element 43 cannot strike against the outer face of the housing 28 when the door 21 is slammed to closed position. Moreover, the magnet 34 is further protected by the fact that the depth of the socket 39 is greater than the axial height of the magnet 34 so that when the magnet is in normally retracted position adjacent the projection 37, the outer end of the magnet is slightly recessed below the front face of the housing 28, as seen in Fig. 4. It is apparent that when the door 21 is closed rapidly and with considerable force, the door will reach a fully closed position before the magnet 34 can move outwardly. As previously explained, the magnetic alloys are in most cases quite 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 providing a protective rim 31 around portions of the magnet housing 28 and by recessing the magnet 34 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 at the same time without sacrificing efficiency, self-adjustment, or ease of operation of the catch.

When the cabinet door 21 is moved at a normal rate of closure to a shut position, the magnet 34 must first move outwardly in order to engage the armature element 43 as the door approaches shut position, and then the bar spring 39 which is thus placed under tension restores the magnet 34 to its normal inward or retracted position within the housing whereby to complete the closing of the door and whereby to retain the same in closed 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 34 and the armature 43 inasmuch as the magnet 34 is normally retained in its inward position by the spring 39 and the door 21 will first forcibly engage the protective rim 31, the outer contact edge of which is spaced forwardly from the front face of the magnet housing. Thereafter, the magnet 34 must move outwardly to engage the armature 43 but only

after the force of the slamming movement of the door has been expended against the rim 31.

In Figs. 7 to 12, inclusive, I have shown a slightly different embodiment of the magnetic catch of my invention which is particularly adapted for corner installations. Thus, the magnet unit, indicated generally at 51 in Fig. 7, has a generally triangular configuration and may be mounted, for example, at the upper outer corner of a cabinet frame such as defined by a top member 52 and an upright stile or side portion 53. It will be understood that a cooperating armature element (Fig. 12) is mounted in co-acting position on the cabinet door in the same manner as described in connection with Figs. 1 to 6.

The magnet unit 51 comprises a generally triangular housing or body portion 54 having a cylindrical socket portion 56 extending inwardly from the front face thereof and also having rearwardly extending peripheral flanges or side walls 57 along two sides thereof. The side walls 57 are provided with a pair of edgewise openings or slots 58 for rigidly affixing the housing 54 to the cabinet frame by means of screws or the like. As in the first embodiment of the invention, the slots 58 extend a substantial distance into the side walls 57 in order to permit the magnet unit to be adjusted to the proper position when being mounted adjacent the front edge of the cabinet frame. Also, the housing 54 is formed from a non-magnetic material such as brass, zinc, aluminum, or a suitable plastic.

A disk-type magnet 59 is loosely disposed in the socket 56 and is rockably supported on a dome-shaped projection 61 at the bottom of the socket 56 when the magnet 59 is in normally retracted position, as seen in Fig. 11. The side walls of the socket 56 are sloped outwardly toward the front face of the housing 54 (Figs. 11 and 12), and the internal diameter of the socket 56 is slightly greater than the diameter of the magnet 59 whereby to provide an annular clearance 62 around the magnet of sufficient extent to permit the magnet to assume an angular or cocked position within the socket 56. Moreover, the socket 56 is of sufficient depth with respect to the axial height of the magnet 59 to permit the magnet to be fully enclosed by the housing 54 when in normal retracted position abutting the projection 61, as seen in Fig. 11.

The forward face of the magnet 59 is grooved diametrically, as at 63, and an elongated bar spring 64 is disposed lengthwise within the housing 54 and extends through a pair of enlarged apertures 66 disposed diametrically in the side walls of the socket 56 adjacent the front face of the housing 54 and also through the groove 63 in the front face of the magnet 59. The ends of the spring 64 are retained in coacting engagement with a pair of shoulder portions 67 formed on the interior of the housing 54, the intermediate portion of the spring 64 extending through the enlarged apertures 66 and the magnet groove 63 thereby being free to move transversely from a normal retracted position of the magnet 59 (Fig. 11) to an outwardly extended position of the magnet, as seen in Fig. 12. The apertures 66 are of sufficient size to permit transverse movement of the bar spring 64 therein as the magnet 59 moves back and forth between retracted and extended positions. As in the first described form of the invention, the bar spring 64 is formed from a suitable resilient and non-magnetic material such as phosphorus-bronze spring wire.

It will be apparent that the operation of this form of the invention is similar to the operation of the form shown in Figs. 1 to 6. Thus, the magnet 59 is normally retained by the bar spring 64, which is in direct coacting engagement therewith, in retracted position adjacent the abutment 61 at the bottom of the socket 56. When the cabinet door, indicated at 65 in Fig. 12 and having a suitable armature element such as a washer 68 affixed thereto, approaches closed position, the magnet 59 moves outwardly from the housing 54 by magnetic attraction into flatwise engagement with the armature element, as seen in Fig. 12. Thereafter, final closing movement of the cabinet door is effected by means of the resilient action of the bar spring 64 which engages the bottom of the groove 63 in the magnet 59 and urges the latter inwardly of the housing 54. Thus, the cabinet door is resiliently retained in closed position adjacent the cabinet frame work by means of the tension of the bar spring 64. Upon opening of the door 65, the direct engagement of the spring 64 intermediate its retained ends with the grooved portion 63 of the magnet 59 functions to break the magnetic contact between the magnet and the armature elements.

Although not shown in the drawing, it will be apparent that the provision of the annular clearance space 62 between the magnet 59 and the socket 56, together with the outwardly sloping side walls of the socket 56, results in the same self-adjusting features of the device as described in connection with the first form of the invention whereby the magnet 59 can assume a cocked or angular position in any plane to compensate for misalignment of the cabinet door or its adjacent structure due to warping or other causes.

In this form of the invention also, the housing 54 is provided with a protective rim 69 extending along the walls 57 at the front face of the housing in order to avoid direct striking contact between the magnet and the armature upon forceful closing of the cabinet door. The depth of the rim 69 is slightly greater than the thickness of the washer 68 whereby to provide space for the latter and to insure tensioning of the spring when the door is closed. In addition, the depth of the rim 69 is sufficient so that the armature element 68 on the cabinet door cannot strike against the outer face of the housing 54 when the door is slammed to closed position. The magnet 59 is further protected by the arrangement, hereinbefore described, of the socket 56 which is of greater depth than the axial dimension of the magnet 59 so that the magnet is slightly recessed from the front face of the housing when in normal retracted position.

In Fig. 9 I have illustrated the method of assembling the component parts of the magnet unit 51. First, the magnet 59 is dropped into the socket 56 of the housing 54 with the grooved end of the magnet facing outwardly. The bar spring is then inserted lengthwise, as shown in broken lines at 71, through an aperture 72 provided at one corner of the triangular housing 54. The spring is pushed inwardly through the groove 63 in the magnet 59 and through the aligned apertures 66 in the walls of the socket 56 and finally through the screw slot 58 at the opposite side of the housing 54 to the position shown in dotted lines at 73 in Fig. 9. The end of the spring 64 which projects outwardly from the screw slot 58 is then pushed backwardly until the end of the spring drops within the hous-

ing and is received on the internal shoulder portion 67.

In Figs. 13 to 16, inclusive, there is illustrated still another modification of the magnetic catch of my invention. This form of the invention differs primarily from the forms shown in Figs. 1 to 12 in that a helical or coil spring is employed instead of an elongated bar spring and a horseshoe magnet is utilized instead of a disk-type magnet. Furthermore, whereas the magnet housings 28 and 54 in the previously described forms are particularly adapted to be fabricated by casting or injection molding techniques, the magnet housing of the form of the invention shown in Figs. 13 to 16 is formed integrally from a sheet metal blank by suitable cutting, stamping, and folding operations.

To this end, the magnet housing of the device, indicated generally at 76, is formed from an integral one-piece blank of non-magnetic sheet metal by folding the latter along the dotted lines indicated in Fig. 16 whereby to provide a bottom portion 77, upright side portions 78, a rear wall 79, and a top portion 81. A rigid retaining member in the form of an upstanding tongue 82 is bent upwardly adjacent the front edge of the bottom 77, and the outer end portion thereof, indicated at 83, extends through an aperture 84 in the top 81 and is bent over for holding the latter in place when the magnet unit is completely assembled. In addition, a pair of laterally projecting ears 86 are provided adjacent the side portions 78 for mounting the housing 76. In Fig. 13 the housing 76 is illustrated as mounted on a horizontal top portion 87 of a cabinet frame by means of a pair of screws 88 extending upwardly through a pair of elongated apertures 89 provided in the ears 86.

A horseshoe-type magnet, indicated generally at 91, comprising a pair of spaced pole pieces or legs 92 and a transverse connecting portion 93 is loosely disposed within the housing 76 with the legs 92 thereof extending toward the open front portion of the housing on either side of the tongue 82. A coil or helical spring 94 is disposed between the legs 92 of the magnet 91 in operative engagement with the tongue 82 and the connecting portion 93 of the magnet whereby the magnet 91 is normally urged inwardly of the housing 76 to retracted position, as shown in Fig. 14. In Fig. 15 the magnet 91 is shown in extended position, the spring 94 being compressed and the legs 92 projecting beyond the front of the housing 76 into flatwise engagement with an armature plate 96 fastened to a closure member or door 97 by means of a pair of screws 98. Upon opening of the door 97, the collapsed spring 94 serves to break the magnetic contact between the magnet 91 and the armature plate 96.

As in the two previous forms of the invention, the magnet unit 91 is arranged for angular or twisting movement within the housing 76 in order to compensate for warping or misalignment of the cabinet frame or door. Thus, the length of the housing 76 is greater than the width of the magnet 91 (Figs. 13 to 15) whereby to permit twisting or cocking of the magnet in a horizontal plane, and also the vertical height of the housing 76 is greater than the thickness of the magnet 91 in order to permit cocking movement in a vertical plane.

In the present form of the invention, protection of the magnet 91 against direct striking contact with the armature element 96 is provided by making the housing 76 of greater depth than the

short dimension of the magnet 91 so that when the magnet is in normal retracted position, as shown in Fig. 14, the pole pieces 92 are completely recessed within the housing 76 and protected thereby. In addition, the transverse ears 86 extend forwardly beyond the front edge of the housing 76, as seen most clearly at 99 in Fig. 14, in order to provide a guide for mounting the housing in recessed relation with respect to the edge of the cabinet frame. It will be apparent that if the front edges of the extended portions 99 of the ears 86 are substantially aligned with the outer edge of the cabinet frame during mounting of the device, the front of the housing 76 will then be recessed a slight distance inwardly from the front of the cabinet frame and thereby provide further protection for the magnet in a manner somewhat similar to the peripheral protective rims described hereinbefore in connection with Figs. 1 to 12.

Although the invention has been described in detail herein in connection with certain specific embodiments, it will be understood that various modifications and equivalent structures may be resorted to without departing from the scope of the invention as defined in the appended claims.

I claim:

1. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a permanent magnet element loosely disposed in said housing for outward movement therefrom, said magnet element having an elongated groove adjacent its outer end, and an elongated one-piece bar spring extending through said groove in said magnet element in direct contact with the latter, said spring having its end portions received within the interior of said housing in coacting engagement therewith whereby said magnet element is normally retained in retracted position within said housing by the resilient action of said spring.

2. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a permanent magnet loosely disposed in said housing for outward movement therefrom, said magnet having an elongated narrow groove extending across its outer face, and an elongated one-piece bar spring having a diameter only slightly less than said groove and extending through the latter in close-fitting relation therein and in direct contact with the magnet, said spring having its end portions received in coacting engagement within said housing for normally urging the magnet inwardly of said housing but permitting said outward movement thereof, and said groove permitting the magnet to rock about the spring as a pivot.

3. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a disk-type permanent magnet loosely disposed in said housing for outward movement therefrom, said magnet having a diametric groove at its front face thereby dividing the front end of the magnet into pole pieces of opposite polarity, and an elongated

one-piece bar spring extending through said groove in said magnet in direct contact with the latter, said spring having its end portions received within the interior of said housing in coacting engagement therewith whereby said magnet is normally retained in retracted position within said housing by the resilient action of said spring.

4. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing having a socket portion extending inwardly from the front face thereof for receiving a magnet element, a permanent magnet element loosely disposed in said socket portion for outward movement therefrom, and elongated one-piece bar spring means extending through said socket portion in direct coacting engagement with said magnet element and with the interior of said housing for normally urging said magnet element inwardly of said socket portion but permitting resilient outward movement thereof.

5. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing having a socket portion extending inwardly from the front face thereof for receiving a magnet element, an upstanding projection at the bottom of said socket portion for supporting a magnet element, a permanent magnet element loosely disposed in said socket portion for outward movement therefrom, and an elongated one-piece bar spring in direct coacting engagement with said magnet element and with the interior of said housing for normally retaining said magnet element inwardly of said socket portion in abutment with said projection but permitting resilient outward movement of said magnet element.

6. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing having a socket portion of circular cross-section extending inwardly from the front face of said housing for receiving a magnet element, a disk-type permanent magnet loosely disposed in said socket portion for outward movement therefrom, said magnet having a smaller diameter than the internal diameter of said socket portion whereby to provide an annular clearance between said magnet and the wall of said socket portion for permitting limited twisting movement of the magnet therein, and an elongated one-piece bar spring in direct coacting engagement with the interior of said housing and with said magnet for normally urging the latter inwardly of said socket portion but permitting resilient outward movement thereof.

7. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of an elongated magnet housing having a central socket portion extending inwardly from the front face of said housing for receiving a magnet element, a disk-type permanent magnet loosely disposed in said socket portion for outward movement therefrom, and an

elongated one-piece bar spring extending longitudinally within said housing and having its end portions in engagement with the interior of said housing and its central portion in direct engagement with said magnet for normally urging said magnet inwardly of said socket portion but permitting resilient outward movement thereof.

8. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of an elongated magnet housing of non-magnetic material having a central opening extending inwardly from the front face of the housing for receiving a magnet element, a disk-type permanent magnet loosely disposed within said opening for outward movement therefrom, said magnet having a diametric groove extending across its front face, retaining means integral with said housing for supporting said magnet in retracted position in said opening, and an elongated one-piece bar spring of non-magnetic material disposed longitudinally within said housing and extending through said groove in the front face of the magnet, said spring having its end portions in coacting engagement with the interior of said housing whereby said magnet is normally urged inwardly of said opening against said retaining means by the resilient action of said spring in engagement with the grooved portion of the magnet.

9. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a permanent magnet element loosely disposed in said housing for outward movement therefrom, a unitary one-piece spring member in direct coacting engagement with said housing and said magnet element for normally urging the latter inwardly of said housing but permitting said outward movement thereof, and a protective rim adjacent at least a portion of the periphery of said housing at the front face thereof for preventing direct striking contact between said magnet element and a cooperating armature element.

10. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a generally triangular magnet housing adapted to be rigidly affixed at a corner portion of a frame member, said housing having a socket portion extending inwardly from the front face thereof for receiving a magnet element, a permanent magnet element loosely disposed in said socket portion for outward movement therefrom, and an elongated one-piece bar spring in direct coacting engagement with said magnet element and with the interior of said housing for normally urging said magnet element inwardly of said socket portion but permitting resilient outward movement thereof.

11. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a generally triangular magnet housing adapted to be rigidly affixed at a corner portion of a frame member, said housing having

a centrally located socket portion of circular cross-section extending inwardly from the front face thereof for receiving a magnet element, said socket portion having a pair of enlarged apertures diametrically disposed in the side walls thereof and adjacent the front face of said housing, a disk-type permanent magnet loosely disposed in said socket portion for outward movement therefrom, said magnet having a diametric groove extending across the front face thereof, and an elongated one-piece bar spring disposed lengthwise within said housing and extending through said apertures and through said groove in said magnet, the end portions of said spring being retained by engagement with the interior of said housing for normally urging said magnet inwardly of said socket portion by the resilient action of said spring in engagement with the grooved portion of said magnet.

12. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a generally triangular magnet housing adapted to be rigidly affixed at a corner portion of a frame member, said housing having a centrally disposed socket portion of circular cross-section extending inwardly from the front face of the housing for receiving a magnet element, said socket portion having its side walls sloping outwardly toward the front face of the housing, a disk-type permanent magnet loosely disposed within said socket portion for outward movement therefrom, the internal diameter of said socket portion being greater than the diameter of said magnet whereby to provide an annular clearance between said magnet and said socket portion, and an elongated one-piece bar spring in direct coacting engagement with said magnet and with the interior of said housing for normally retaining said magnet inwardly of said socket portion but permitting outward resilient movement thereof, said annular clearance and the outwardly sloping side walls of said socket portion permitting said magnet to assume an angular position relative to said socket portion.

13. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a generally triangular magnet housing adapted to be rigidly affixed at a corner portion of a frame member, said housing having a centrally located socket portion of circular cross-section extending inwardly from the front face thereof for receiving a magnet element, said socket portion having a pair of enlarged apertures diametrically disposed in the side walls thereof and adjacent the front face of said housing, a disk-type permanent magnet loosely disposed in said socket portion for outward movement therefrom, said magnet having a diametric groove extending across the front face thereof, and an elongated one-piece bar spring disposed lengthwise within said housing and extending through said apertures and through said groove in said magnet, the end portions of said spring being retained by engagement with the interior of said housing for normally urging said magnet inwardly of said socket portion by the resilient action of said spring in engagement with the grooved portion of said magnet, and said housing being provided with aperture means adjacent one

corner thereof for inserting said bar spring into said housing and through said enlarged apertures in said socket portion during assembly of the device.

14. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a permanent magnet element having a pair of spaced poles and being loosely disposed in said housing for outward movement therefrom, and a unitary one-piece spring member in direct coacting engagement with said housing and with said magnet element between the poles of the latter for normally urging the magnet element inwardly of said housing but permitting said outward movement thereof by magnetic attraction.

15. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a permanent magnet element loosely disposed in said housing for outward movement therefrom, and a coil spring in direct coacting engagement at its opposite ends with said housing and with said magnet element whereby said magnet element is normally retained in retracted position within said housing by the action of said spring.

16. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, said housing having an open front portion with an upright rigid retaining member disposed centrally thereof, a permanent horseshoe magnet loosely disposed in said housing for outward movement therefrom, said magnet having its leg portions disposed on opposite sides of said retaining member and extending toward the open front of said housing, and a coil spring in operative engagement with

said retaining member and with said magnet intermediate the leg portions of the latter for normally urging said magnet inwardly of said housing.

17. In a magnetic catch for holding a closure member in closed position adjacent a frame member and including a pair of cooperating magnet and armature elements one of which is movable under magnetic attraction toward the other, the combination of a magnet housing, a permanent horseshoe magnet loosely disposed in said housing for outward movement therefrom, and a coil spring in direct operative engagement with said housing and with said magnet for urging the latter inwardly of said housing but permitting outward movement thereof by magnetic attraction, said housing being of slightly greater internal dimensions than said magnet whereby to provide clearance between said magnet and the walls of said housing thereby permitting twisting movement of said magnet relative to said housing in both horizontal and vertical planes.

18. In a magnetic catch having a pair of cooperating magnet and armature elements adapted to hold a closure member in closed position adjacent a frame member with one of said elements being movable under magnetic attraction toward the other of said elements, the combination of a housing having said one element loosely disposed therein for outward movement therefrom, a pair of spaced leg portions on said one element, and a unitary one-piece spring member in direct coacting engagement with said housing and with said one element intermediate the leg portions thereof whereby said one element is normally urged inwardly of said housing but is adapted to move outwardly under magnetic attraction and simultaneously to rock about said spring member as a pivot.

References Cited in the file of this patent

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Number	Name	Date
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