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(54) **Magnetic latch assembly**

(57) A magnetic latch assembly includes a latch member (18, 82, 118) movably mounted to a first object (10, 68, 108) such as a door and a container, and a retainer (34, 94, 132) arranged in a second, opposing object (12, 70) such as a door frame and a lid. The latch member (18, 82, 118) includes a latch arm (20, 84, 124), a hook (24, 86, 126) formed on the distal end of the latch arm (20, 84, 124), and a first magnet (26, 92, 130) mounted in the hook (24, 86, 126). The retainer (34, 50, 94, 132) includes a housing (36, 52, 94, 134) with a cavity (40, 54, 96, 138) and a second magnet (42, 64, 100, 142). The cavity (40, 54, 96, 138) includes a first horizontal passage (40a, 54a, 96a, 138a) and a second vertical passage (40b, 54b, 96b, 138b) communicated with the horizontal passage (40a, 54a, 96a, 138a). The second

magnet (42, 64, 100, 142) has a magnetic pole of opposite polarity from the magnetic pole of the first magnet (26, 92, 130). When the first and second objects are relatively moved toward each other, the latch member (18, 82, 118) is moved into the first passage (40a, 54a, 96a, 138a) of the cavity (40, 54, 96, 138). When the latch head (24, 86, 126) is completely received in the first passage (40a, 54a, 96a, 138a), the two magnets (26, 42, 64, 92, 100, 130, 142) are operatively associated to cause the latch member (18, 82, 118) to be moved from the horizontal passage (40a, 54a, 96a, 138a) to the vertical passage (40b, 54b, 96b, 138b) and urge the latch member (18, 82, 118) or the latch head (24, 86, 126) into latching engagement with one end of the housing (36, 52, 94, 134) which serves as a retainer.

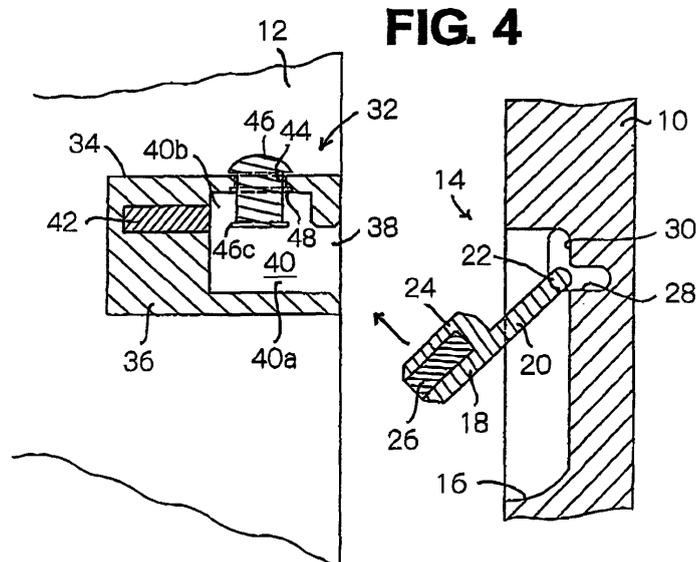


FIG. 4

Description

[0001] The present invention relates to a magnetic latch assembly and more particularly to a locking device for selectively locking and unlocking doors, lids or other similar closures.

[0002] Various magnetic latches have heretofore been proposed and implemented to secure doors, container lids, cabinets in a closed position. For example, United States Patent No. 2,673,111 discloses a magnetic door catch adapted for use on cabinet doors of the blind panel type. The magnetic door catch includes a magnetically permeable metal or armature plate secured to the inner surface of a door and a magnet unit pivotably mounted to a door jamb opposing the door. The magnet unit has an elongated frame in which a magnet is mounted. When the door is in its open position, the magnet unit hangs on a straight slant with the bottom end of the housing disposed inwardly from the front face of the door jamb. When the door is moved to its closed position, the magnetic attraction between the armature plate and the magnet causes the entire magnet unit to pivot to a substantially vertical position. In that position, the armature plate and the magnet are attracted to one another to hold the door in its closed position. To open the door, the door is pushed inwardly until the armature plate comes into contact with the door jamb. This causes the magnet to be dislodged from the armature plate. A spring is disposed in the magnet unit and is adapted to be deflected or compressed rearwardly when the armature plate is positioned in contact with the door jamb. When the pressure on the door is abruptly released, the spring urges the door toward its open position.

[0003] United States Patent No. 5,035,451 discloses a magnetic latch which includes a latch arm pivotably mounted to a door and having a hook at its one end and a spring leg at its other end. A flat magnet and a retainer in the form of a hook are attached to a cabinet. In the event of a disturbance such as an earthquake, the latch arm is pivotably moved in an upward direction and attracted to the magnet. If the door is moved further in an outward direction, the latch arm is brought into latching engagement with the retainer to prevent the slippage of the contents of the cabinet.

[0004] Many of conventional latch assemblies are complicate in structure and have various moving parts.

[0005] Accordingly, it is an object of the present invention to provide a magnetic latch having advantages over known such latches.

[0006] According to the present invention there is provided a magnetic latch assembly which includes a first latch means and a second latch means operatively associated with the first latch means to selectively latch and unlatch two relatively movable first and second objects such as a combination of a door and a door frame or a combination of a container and a closure lid.

[0007] The first latch means is arranged in the first object, and the second latch means is in the form of a re-

tainer arranged in the second object. The first latch means includes a latch member movably mounted to the first object, and a first magnet arranged in the latch member. The retainer has a housing within which a cavity is defined to receive at least part of the latch member when the first and second objects are moved toward one another. The cavity has a first passage and a second passage extending in a direction substantially perpendicular to the first passage. A second magnet is mounted in the housing and has a magnetic pole of opposite polarity from the first magnetic pole of the first magnet. The latch member is moved into the first passage of the cavity when the first and second objects are relatively moved toward each other. The first magnet and the second magnet are then operatively associated to cause the latch member to be moved from the first passage to the second passage. Advantageously, when the latch member reaches the second passage, the attractive force between the first and second magnets urges the latch member into latching engagement with one end of the housing which serves as a hook or retainer.

[0008] The invention can advantageously provide for a latch assembly that is simple in structure and can smoothly and effectively latch two relatively movable objects.

[0009] In a preferred embodiment, the latch member includes an elongated latch arm with a hook formed at its distal end. The first magnet is mounted in the hook.

[0010] In a preferred embodiment, the housing has a through aperture communicated with the cavity so that the latch member is accessible through the aperture. When the first and second objects are held in their latched position, the latch member is manually pressed down with sufficient force to disengage the first magnet from the second magnet. As a result, the latch member is moved toward the first passage of the cavity to allow removal of the latch member from the cavity or housing. As an alternative, a discrete release member may be inserted through the aperture. The release member may be engaged with the latch member when the first and second objects are held in their latched position. The release member may be manually pushed down with sufficient force to disengage the first magnet from the second magnet.

[0011] In a preferred embodiment, the housing has a bore communicated with the cavity. A release member is inserted into the bore. The second magnet is mounted in the release member. When the two objects are held in their latched position, one end of the release member extends out of the housing and the other end of the release member is substantially flush with the cavity. When the release member is pulled in a direction away from the cavity, the second magnet is disengaged from the first magnet. As a result, the latch member is moved from the second passage to the first passage of the cavity. This allows removal of the latch member from the housing.

[0012] The above and other objects, features and ad-

vantages of the present invention will be apparent from the following description of preferred embodiments when taken in conjunction with the accompanying drawings;

Fig. 1 is a perspective view of a magnetic latch assembly according to a first embodiment of the present invention, with a door in its open or unlatched position;

Fig. 2 is a view similar to that of Fig. 1, but with the door in its closed or latched position;

Fig. 3 is a sectional view, on an enlarged scale, of the magnetic latch assembly wherein a latch member is contained within the door;

Fig. 4 is a sectional view, on an enlarged scale, of the magnetic latch assembly wherein the latch member is pivotably moved out of the door;

Fig. 5 is a sectional view, on an enlarged scale, of the magnetic latch assembly wherein the latch member is partly inserted into a retainer as the door is moved toward a door frame;

Fig. 6 is a sectional view, on an enlarged scale, of the magnetic latch assembly wherein the latch member is fully engaged with the retainer to lock the door;

Fig. 7 is a perspective view of a magnetic latch assembly according to a second embodiment of the present invention, with a door in its closed or latched position;

Fig. 8 is a view similar to that of Fig. 7, but with the door in its open or unlatched position;

Fig. 9 is a sectional view of the magnetic latch assembly shown in Fig. 7;

Fig. 10 is sectional view of the magnetic latch assembly shown in Fig. 8;

Fig. 11 is a perspective view of a magnetic latch assembly according to a third embodiment of the present invention, with a container lid in its unlatched position;

Fig. 12 is a view similar to Fig. 11, but with the lid in its latched position;

Fig. 13 is a sectional view, on an enlarged scale, of the magnetic latch assembly shown in Fig. 11;

Fig. 14 is a sectional view, on an enlarged scale, of the magnetic latch assembly shown in Fig. 12;

Fig. 15 is a perspective view of a magnetic latch assembly according to a fourth embodiment of the present invention, with an attaché case in its open or unlatched position;

Fig. 16 is a view similar to that of Fig. 15, but with the attaché case in its closed or latched position;

Fig. 17 is a sectional view of the magnetic latch assembly shown in Fig. 15; and

Fig. 18 is a sectional view of the magnetic latch assembly shown in Fig. 16.

[0013] A preferred embodiment of the present invention will now be described with reference to the figures, where like reference numerals indicate identical or functionally similar elements.

[0014] Referring first to Figs. 1 and 2, a door 10 is hingedly connected at its one lateral edge (not shown) to a door jamb or frame 12 to swing about a vertical axis. The door 10 is provided with a first latch means as generally designed by reference numeral 14. The first latch means 14 includes an elongated vertical recess 16 defined in the upper left corner of the inside surface of the door 10 and a movable latch member 18 contained within the recess 16 when the door 10 is in an open or unlatched position as shown in Fig. 3.

[0015] Referring to Figs. 3 to 6, the latch member 18 has an elongated latch arm 20, a pair of lateral pivot pins 22 (only one is shown in Figs. 3 to 6) extending outwardly from opposite sides of the proximal end of the latch arm 20, and a generally rectangular hook 24 formed on the distal end of the latch arm 20. A rectangular magnet 26 is embedded in the hook 24 and has, for example, a north magnetic pole. The outer end of the magnet 26 is substantially flush with or slightly outwardly extends from the outer end of the hook 24. As shown, the hook 24 has taper outer edges. A horizontal guide groove 28 is defined in the door 10 behind the recess 16 and communicated with the recess 16. The proximal end of the latch arm 20 is received in the horizontal guide groove 28 when the latch arm 20 is in its horizontal orientation as shown best in Fig. 5. Also, a pair of vertical guide grooves 30 (only one is shown in Figs. 3 to 6) are defined within the door 10 and located at opposite sides of the recess 16.

[0016] Referring back to Figs. 1 and 2, the door frame 12 is provided with a second latch means 32 in the form of a retainer 34. The retainer 34 includes a substantially rectangular housing 36 secured to the door frame 12 by any securing means such as screws and adhesives (not shown). Specifically, the housing 36 has a vertical front wall 36a (see Figs. 3 to 6), a horizontal top and bottom walls, 36b, 36c, a vertical inner wall (not shown) fixedly mounted onto the inside surface of the door frame 12, and an outer wall 36d, and a rear wall 36e. As shown, the outer wall 36d and the rear wall 36e of the housing 36 collectively form a curved corner therebetween. A rectangular front opening or open mouth 38 is defined in the front wall 36a of the housing 36 to receive the latch member 18. To facilitate insertion of the latch member 18 into the housing 36, the open mouth 38 has a taper peripheral edge. As shown in Figs. 3 to 6, the housing 36 has a L-shaped cavity 40 communicated with the opening 38. The cavity 40 has a first, horizontal passage 40a and a second, vertical passage 40b connected to the horizontal passage 40a and extending in a direction substantially perpendicular to the horizontal passage 40a. A rectangular magnet 42 is horizontally embedded in the housing 36 and opens to the cavity 40. The magnet 42 has, for example, a south magnetic pole. To allow the passage of the hook 24 of the latch member 18 into cavity 40, the horizontal passage 40a has a cross sectional area slightly greater than that of the hook 24 of the latch member 18. Also, the vertical passage 40b has a cross sectional area slightly greater than that of the hook 24 so as to

receive the hook 24 when the door 10 is in its latched position as shown in Fig. 6. The top wall 36b of the housing 36 is formed with a through aperture 44. A release member 46 is partly inserted into the cavity 40 through the circular aperture 44 and supported by the top wall 36b of the housing 36. More specifically, the release member 46 has a cylindrical shank 46a extending through the aperture 44, a semispherical head 46b secured to the upper end of the shank 46a and adapted to rest on the top wall 36b of the housing 36 when the door 10 is in its unlatch position as shown in Figs. 3 to 5, and an annular flange 46c extending around the lower end of the shank 46a. The top wall 36b of the housing 36 is formed at its bottom surface with an annular recess 48. The annular recess 48 has a diameter greater than that of the through aperture 44 and also, slightly greater than that of the annular flange 46c. The depth of the annular recess 48 is substantially equal to the thickness of the annular flange 46c of the release member 46. The annular flange 46c and the semispherical head 46b collectively prevent removal of the release member 46 from the top wall 36b of the housing 36.

[0017] To lock the door 10 from the position shown in Fig. 3, the latch member 18 is pulled out of the recess 16 manually by the index or other fingers of a user. Then, the latch member 18 is upwardly pivoted about the pivot pins 22 as shown in Fig. 4. At this time, the pivot pins 22 are located in the lower end of the vertical guide grooves 30. The latch member 18 is rotated in a clockwise direction in Fig. 4 until the latch arm 18 is horizontally aligned with the horizontal guide groove 28. The latch arm 18 is inserted into the horizontal guide groove 28 until the proximal end of the latch arm 20 makes contact with the rear or bottom end of the horizontal guide groove 28. With the latch member 18 in its horizontal orientation, the door 10 is moved toward the door frame 12, as shown in Fig. 5. This causes the latch member 18 to be inserted into the retainer housing 36 through the opening or open mouth 38. The latch member 18 is slidably moved on the bottom of the cavity 40 until the outer end of the hook 24 makes contact with the rear wall of the cavity 40 or the horizontal passage 40a. As mentioned earlier, the magnet 42 has a magnetic pole of opposite polarity from the magnetic pole of the magnet 26. The resulting attractive force between the magnets 26, 42 causes upward movement of the latch member 18 within the cavity 40. At this time, the pivot pins 22 are moved along the respective vertical guide grooves 30. When the hook 24 of the latch member 18 is fully received within the vertical passage 40b of the cavity 40 as shown in Fig. 6, the magnets 26, 42 are attracted to one another to aid in holding the latch member 18 in that position. The hook 24 is hingedly engaged with the upper or retaining end of the front wall 36a of the housing 36 so as to securely latch or lock the door 10. At this time, the annular flange 46c of the release member 46 is retracted or received within the recess 48 of the top wall 36b of the housing 36, and the semispherical head 44b is upwardly moved and disengaged from

the top wall 36a of the housing 36.

[0018] To unlatch the door 10 from the position shown in Fig. 6, the released member 46 is manually pressed down with sufficient force to overcome the attractive force between the magnets 26, 42. As a result, the magnet 26 is separated from the magnet 42 to allow downward movement of the latch member 18 within the cavity 40 while the pivot pins 22 of the latch member 18 are moved downwardly along the respective vertical guide grooves 30. With the latch arm 20 in contact with the bottom of the cavity 40, the door 10 is pivoted toward its open position. This causes the latch member 18 to be moved out of the cavity 40. As soon as the latch member 18 is separated from the retainer housing 36, the latch member 18 is downwardly pivoted about the pivot pins 22. The latch member 18 is thereafter received within the elongated recess 16.

[0019] In the illustrated embodiment, the magnetic latch assembly, preferably as an auxiliary security lock, is mounted on near the upper end of the door. As an alternative, the magnetic latch assembly may be mounted on near the bottom end of the door. Still alternatively, two magnetic latch assemblies may be mounted on both the upper and bottom ends of the door for improved security. Also, it is to be understood that the engagement formation such as the hook of any embodiment of the invention may be made of a magnetically permeable or ferromagnetic metal such as iron and steel. This arrangement eliminates the use of the magnet.

[0020] Referring next to Figs. 7 and 8, there is shown a magnetic latch assembly according to a second embodiment of the present invention. The latch member of this embodiment is identical in structure to that of the previous embodiment and therefore, will not be described herein. As in the previous embodiment, a retainer 50 as a second latch means is mounted on the door frame 12. The retainer 50 includes a rectangular housing 52 with vertical front and rear walls 52a, 52b, horizontal top and bottom walls 52c, 52d, a vertical inner wall (not shown) secured on the inside surface of the door frame 12, and an outer side wall 52e.

[0021] As shown in Figs. 9 and 10, the housing 52 has a L-shaped cavity 54 composed of a relatively long horizontal passage 54a and a relatively short vertical passage 54b extending upwardly from the inner end of the horizontal passage 54a, as in the first embodiment. A front opening 56 is defined in the front wall 52a of the housing 52 and communicated with the horizontal passage 54a of the cavity 54. A horizontal through bore 58 is defined in the rear wall 52b of the housing 52 to receive a release member 60. The horizontal bore 58 has a rectangular cross section and is composed of a large diameter section 58a communicated directly with the cavity 54 and a small diameter section 58b communicated with the large diameter section 58a. A shoulder or step 62 is formed between the large and small diameter sections 58a, 58b. The release member 60 includes a rectangular shank 60a with an enlarged front end 60b. The enlarged

end 60b of the shank 60a has a cross sectional area slightly less than that of the large diameter section 58a of the bore 58, and the remaining part of the shank 60a has a cross sectional area slightly less than that of the small diameter section 58b of the horizontal bore 58. An apertured tab or knob 60c is secured to the rear end of the shank 60a and has a rectangular flange 60d. A magnet 64 is contained in the shank 60a and opens to the cavity 54. The shank 60a of the release member 60 is completely contained within the through bore 58 during latching of the door 10. As shown in Fig. 9, the flange 60d is held in contact with the rear wall 52b of the housing 52 so that the front end of the shank 60a is substantially flush with the front end of the through bore 58 in order not to prevent vertical movement of the latch member 18 within the cavity 54.

[0022] In use, the latch member 18 is operated in a manner identical to that of the first embodiment during latching of the door 10. To unlatch the door 10, with the knob 60c grabbed by the user, the release member 60 is pulled toward the user with sufficient force to overcome the attractive force between the magnets 26, 64, as shown in Fig. 10. This causes immediate drop of the latch member 18 within the cavity 54. As in the previous embodiment, the latch member 18 is slid out of the cavity 54 while the door 10 is pivoted toward its open position. As soon as the latch member 18 is separated from the retainer 50, the latch member 18 is downwardly pivoted about the pivot pins 22. As a result, the latch member 18 is received within the recess 16.

[0023] Referring to Figs. 11 and 12, there is shown a magnetic latch assembly according to a third embodiment of the present invention, as applied to a container 66. The container 66 includes a rectangular container body 68 and an associated closure lid 70 slidably movable on the container body 68 to selectively open and close the container. Specifically, the container body 68 has opposite longitudinal side walls 68a, opposite lateral side walls 68b (only one is shown), a bottom wall 68c connected to the four side walls, and an open top 68d. As shown better in Fig. 11, a pair of semicircular guide grooves 72 (only one is shown) are defined in the longitudinal side walls 68a of the container body 68 adjacent to the open top 68d. The closure lid 70 is formed on its longitudinal side edges with a corresponding pair of semicircular projections 74. The opposite projections 74 are slidably received within the respective guide grooves 72 so that the closure lid 70 is selectively moved between an open or unlatched position (see Fig. 11) and a closed or latched position (see Fig. 12). One of the lateral side walls 68b is lower than the other side wall so that the closure lid 70 is inserted from the lower side wall of the container body 68. The difference in height between the two lateral side walls 68b is substantially equal to the thickness of the closure lid 70.

[0024] As shown better in Figs. 13 and 14, a first latch means 76 is arranged in one of the side walls 68b of the container body 68, and a second latch means 78 is ar-

ranged in the closure lid 70. It is to be understood that the first latch means may be arranged in the closure lid, whereas the second latch means may be arranged in the container body. In the illustrated embodiment, the first latch means 76 includes a vertical recess 80 defined in the inner surface of the side wall 68b of the container body 68, and a movable latch member 82 mounted to the side wall 68b of the container body 68 and vertically movable along the vertical recess 80. The latch member 82 includes an elongated latch arm 84, a hook 86 formed on the distal end of the latch arm 84, and a pair of opposite ellipsoidal elements or holders 88 extending downwardly from the proximal end of the latch arm 84. A pair of ellipsoidal guide grooves 90 are defined within the side wall 68b of the container body 68 and located at opposite sides of the recess 80. The ellipsoidal elements 88 are received within the respective guide grooves 90 so that the latch member 82 is constantly held in a horizontal orientation. As in the previous embodiments, a rectangular magnet 92 is embedded in the hook 86 of the latch member 82 and has an outer end substantially flush with or slightly extending outwardly from the distal end of the latch arm 84. As shown, the hook 86 has taper outer edges.

[0025] The second latch means 78 is in the form of a housing or retainer 94 arranged in one of the lateral sides of the closure lid 70 adjacent to the latch member 82. As shown in Figs. 13 and 14, the second latch means 78 is substantially identical in structure to that used in the first embodiment. However, the second latch means used in this embodiment is slidably moved toward the first latch means, whereas in the first embodiment, the first latch means is pivotably moved toward the second latch means. More specifically, the retainer 94 includes a L-shaped cavity 96 defined in the lateral end of the lid 70 and composed of a horizontal passage 96a and a vertical passage 96b extending upwardly from the inner end of the horizontal passage 96a. The front edge of the closure lid 70 is formed with a front opening or mouth 98 to receive the latch member 82 and is communicated with the cavity 96. A magnet 100 is embedded in the closure lid 70 behind the cavity 96. The outer end of the magnet 100 is substantially flush with the rear wall of the cavity 96. A circular through aperture 102 is defined in the lid 70 above the cavity 96 and communicated with the cavity 96. A release member 104 is inserted through the circular aperture 102 and includes a cylindrical shank 104a, a semispherical head 104b secured to the upper end of the shank 104a, and an annular flange 104c extending around the lower end of the shank 104a.

[0026] To close or latch the closure lid 70, the lid 70 is slidably moved toward the latch member 82 as shown in Fig. 11. Further movement causes the latch member 82 to be inserted into the cavity 96 through the front opening 98 of the lid 70. Once the latch member 82 makes contact with the rear wall of the cavity 96, the attractive force between the magnets 92, 100 causes upward movement of the latch member 82 along the vertical passage 96b

of the cavity 96. As a result, the hook 86 of the latch member 82 is brought into contact with the top wall of the cavity 96. At this time, the magnets 92, 100 are attracted to one another, and the hook 86 is engaged with the front or retaining edge of the closure lid 70. Also, the head 104b of the release member 104 is disengaged from the upper surface of the closure lid 70, as shown in Fig. 14.

[0027] To open or unlatch the closure lid 70 from the position shown in Fig. 14, the release member 104 is manually pressed down with sufficient force to overcome the attractive force between the magnets 92, 100. As a result, the magnet 92 is disengaged from the magnet 100, and the latch member 82 is downwardly moved until the latch member 82 makes contact with the bottom wall of the cavity 96. This allows the closure lid 70 to be slidably moved away from the latch member 82.

[0028] Referring now to Figs. 15 and 16, there is shown a magnetic latch assembly according to a fourth embodiment of the present invention, as applied to an attaché case 106. The attaché case 106 has a rectangular shape and includes a lid shell 108 and a base shell 110 connected to the lid shell 108 by conventional hinges (not shown). In the illustrated embodiment, the lid shell 108 is provided with a first latch means 112, and the base shell 110 is provided with a second latch means 114. The base shell 110 is provided with a handle (not shown) between the first and second latch means.

[0029] The first latch means 112 includes a latch mount 116 secured to the top surface of the lid shell 108, and a movable latch member 118 partly extending out of the latch mount 116. The latch mount 116 includes a vertical front wall 116a, a bottom wall 116b secured to the top surface of the lid shell 108, upstanding opposite side walls 116c (only one is shown in Figs. 15 and 16), and a top wall 116d, and a round rear wall 116e. A front recess 120 is defined in the front wall 116a of the latch mount 116. A pair of vertical guide grooves 122 are defined in the latch mount 116 and located at opposite sides of the front recess 120. The latch member 118 includes an elongated latch arm 124, a rectangular hook 126 arranged on the distal end of the latch arm 124, and opposite ellipsoidal elements or holders 128 extending upwardly from the proximal end of the latch member 118 and movably disposed within the respective guide grooves 122. The ellipsoidal elements 128 serve to constantly hold the latch member 118 in a horizontal orientation and prevent removal of the latch member 118 from the latch mount 116. A rectangular magnet 130 is embedded in the hook 126.

[0030] The second latch means 114 is in the form of a retainer 132. The retainer 132 includes a housing 134 secured to the top surface of the base shell 110 and partly extending outwardly from the front edge of the base shell 110. The retainer 132 is formed at its front end with a front opening 136 which is shaped to receive the latch member 118. The retainer 132 also includes a L-shaped cavity 138 composed of a horizontal passage 138a com-

municated with the opening 136 and a vertical passage 138b extending vertically upwardly from the inner end of the horizontal passage 138a. An access aperture 140 is defined in the top surface of the housing 134 and communicated with the vertical passage 138b. The top aperture 140 allows the user to gain access to the hook 126 of the latch member 118 when the attaché case is in its latched position as shown in Figs. 16 and 18. A rectangular magnet 142 is horizontally embedded in the retainer 132 behind the cavity 138 and has a magnetic pole of opposite polarity from the magnetic pole of the magnet 130.

[0031] To latch the attaché case from the position shown in Figs. 15 and 17, the lid shell 108 is moved toward the base shell 110. Further movement of the lid shell 108 causes the latch member 118 to be inserted into the cavity 138 through the front opening 136 of the retainer 132. Once the distal end of the latch member 118 makes contact with the rear wall of the cavity 138, the attractive force between the magnets 130, 142 causes upward movement of the latch member 118 within the cavity 138. With the attaché case in its latched position shown in Figs. 16 and 18, the magnets 130, 142 are attracted to each other, and the hook 126 of the latch member 118 is engaged with the front wall or retaining end of the retainer. In this position, the top surface of the hook 126 is substantially flush with the top surface of the retainer housing 134.

[0032] To unlatch the attaché case, the top surface of the hook 126 is manually pushed down with sufficient force to disengage the magnet 130 from the magnet 142. This causes downward movement of the latch member 118 within the cavity 138 until the bottom of the latch arm 124 is brought into contact with the bottom surface of the cavity 138. This allows the latch member 118 to be moved away from the cavity 138. As the lid shell 108 is pivoted away from the base shell 110, the latch member 118 is slid out of the cavity 138 through the front opening 136.

[0033] Although the present invention has been described with respect its preferred embodiments, it is to be understood that various changes and modifications may be made without departing from the scope of the invention as defined by the appended claims.

Claims

1. A magnetic latch assembly for selectively latching and unlatching first and second relatively movable objects, comprising a first latch means (14, 76, 112) associated with said first object (10, 68, 108); and a second latch means (32, 78, 114) associated with said second object (12, 70, 110) and operatively associated with said first latch means (14, 76, 112), **characterized in that** said first latch means (14, 76, 112) includes a latch member (18, 82, 118) movably mounted to said first object (10, 68, 108) and having a first magnetic member, and said second latch

- means (32, 50, 78, 114) includes a housing (36, 52, 94, 134) having a retaining region, said housing (36, 52, 94, 134) including a cavity (40, 54, 96, 138) adapted to receive at least part of said latch member (18, 82, 118) and having a first passage (40a, 54a, 96a, 138a) and a second passage (40b, 54b, 96b, 138b) extending in a direction substantially perpendicular to said first passage (40a, 54a, 96a, 138a), and a second magnetic member (42, 64, 100, 142) arranged to be magnetically attracted to said first magnetic member (26, 92, 130), and **in that** said latch member (18, 82, 118) is moved into said first passage (40a, 54a, 96a, 138a) of said cavity (40, 54, 96, 138) when said first and second objects are relatively moved towards each other, and said first magnetic member (26, 92, 130) and said second magnetic member (42, 64, 100, 142) are operatively associated to cause said latch member (18, 82, 118) to move to said second passage (40b, 54b, 96b, 138b) and to urge said latch member (18, 82, 118) into latching engagement with said retaining region of said housing (36, 52, 94, 134).
2. The assembly of Claim 1, **characterized in that** said latch member (18, 82, 118) includes an elongated latch arm (20, 84, 124) having a proximal end supported by said first object (10, 68, 108, 116) and a distal end, and an engagement formation (24, 86, 126) arranged at said distal end of said latch arm (20, 84, 124) and arranged to receive said first magnetic member (26, 92, 130).
3. The assembly of claim 2, **characterized in that** said first latch means (14, 76, 112) comprises a recess (16, 80, 120) defined in said first object (10, 68, 108, 116), and a first guide groove (30, 90, 122) defined in said first object (10, 68, 108, 116) and adapted to guide said latch member (18, 82, 118) during movement of said latch member (18, 82, 118) within said recess (16, 80, 120), said first guide groove (30, 90, 122) extending in a direction substantially parallel to said second passage (40b, 54b, 96b, 138b) of said cavity (40, 54, 96, 138) when said latch member (18, 82, 118) is latching engaged with said retaining end of said housing (36, 52, 94, 116).
4. The assembly of claim 3, **characterized in that** said first latch means (14) further comprises a second guide groove (28) defined in said first object (10) and extending in a direction substantially perpendicular to said first guide groove (30).
5. The assembly of Claim 1, 2, 3 or 4, **characterized in that** said first latch means (14) comprises a recess (16) defined in said first object (10), and said latch member (18) is pivotably moved between a first position wherein said latch member (18) is contained within said recess (16) and a second position where-
- in said latch member (18) is aligned with said first passage (40a, 54a) of said cavity (40, 54).
6. The assembly of Claim 1, 2, 3, 4 or 5, **characterized in that** said second magnetic member (42, 100, 142) is contained in said housing (36, 94, 134) adjacent to said cavity (40, 96, 138).
7. The assembly of claim 6, **characterized in that** said housing (134) has a through aperture (140) communicated with said cavity (138) so that said latch member (118) is accessible through said aperture (140).
8. The assembly of claim 6, **characterized in that** said housing (36, 94) has a through aperture (44, 102), further comprising a release member (46, 104) extending through said aperture (44, 102) and engaged with said latch member (18, 82) when said latch member (18, 82) is latching engaged with said retaining end of said housing (36, 94).
9. The assembly of Claim 1, 2, 3, 4 or 5, **characterized in that** said housing (52) has a through bore (58) communicated with said cavity (54), further comprising a release member (60) shaped to receive said second magnet (64) and movably received in said through bore (58) to allow selective engagement between said first and second magnets (26, 64).
10. The assembly of any one or more of the preceding claims wherein at least one of said first and second magnetic members comprises a magnet having a first magnetic pole.

FIG. 1

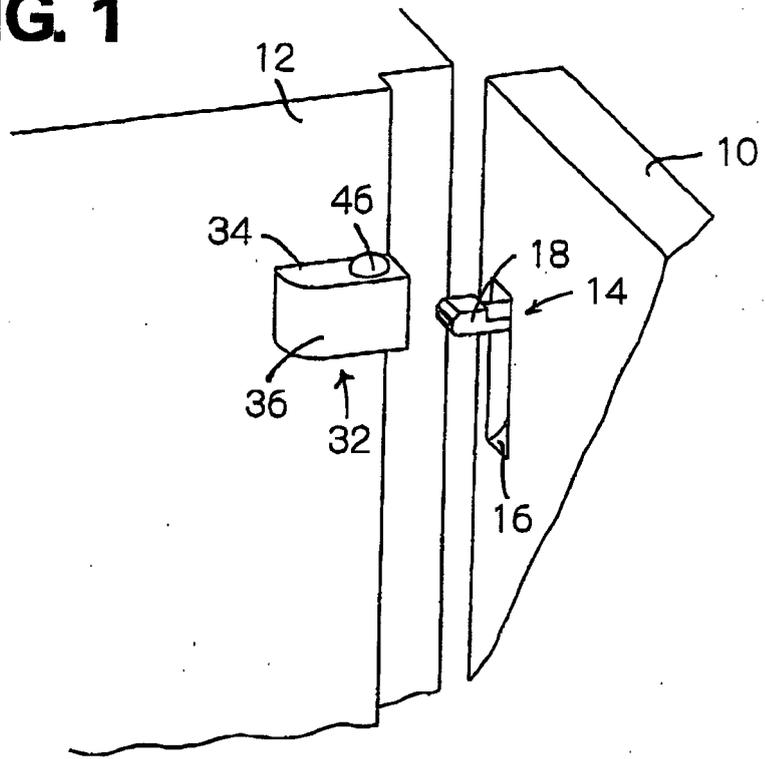


FIG. 2

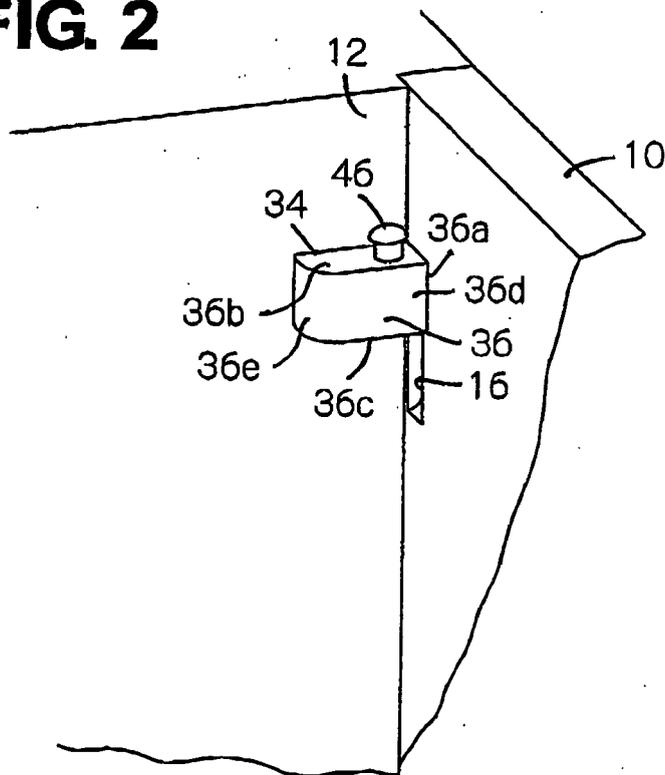


FIG. 3

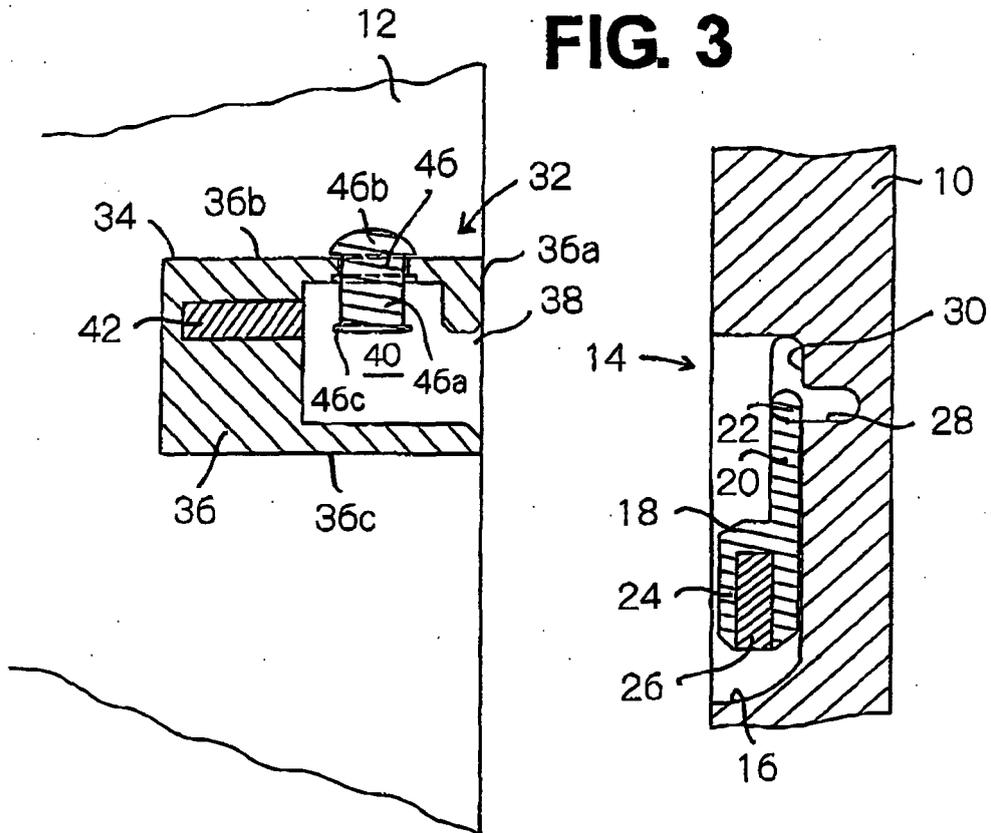


FIG. 4

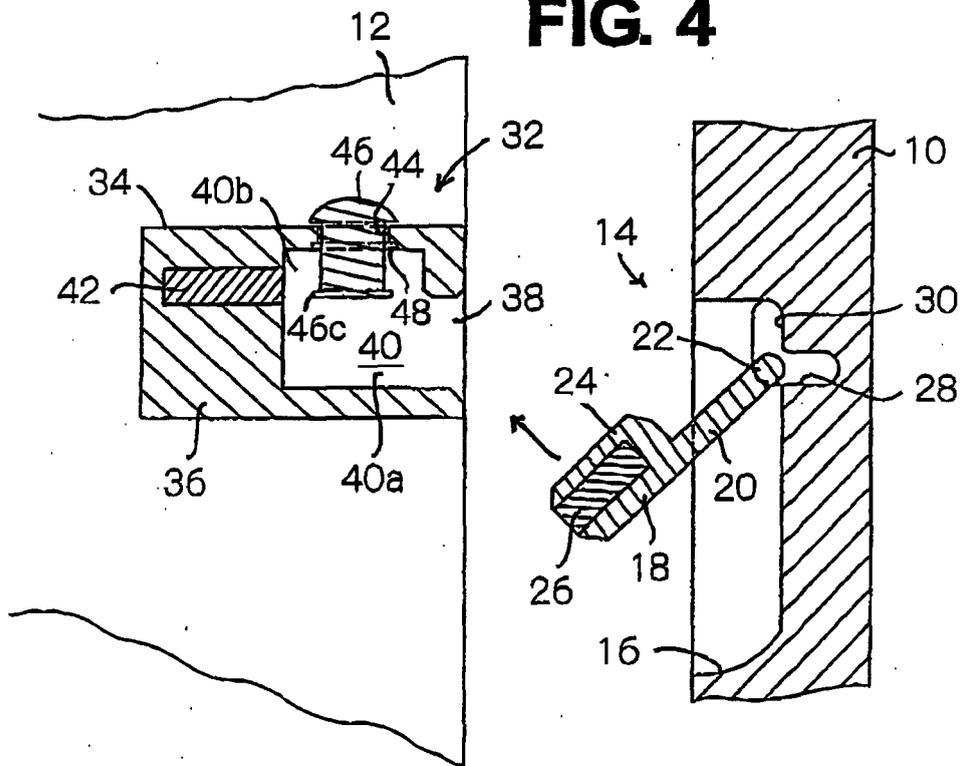


FIG. 5

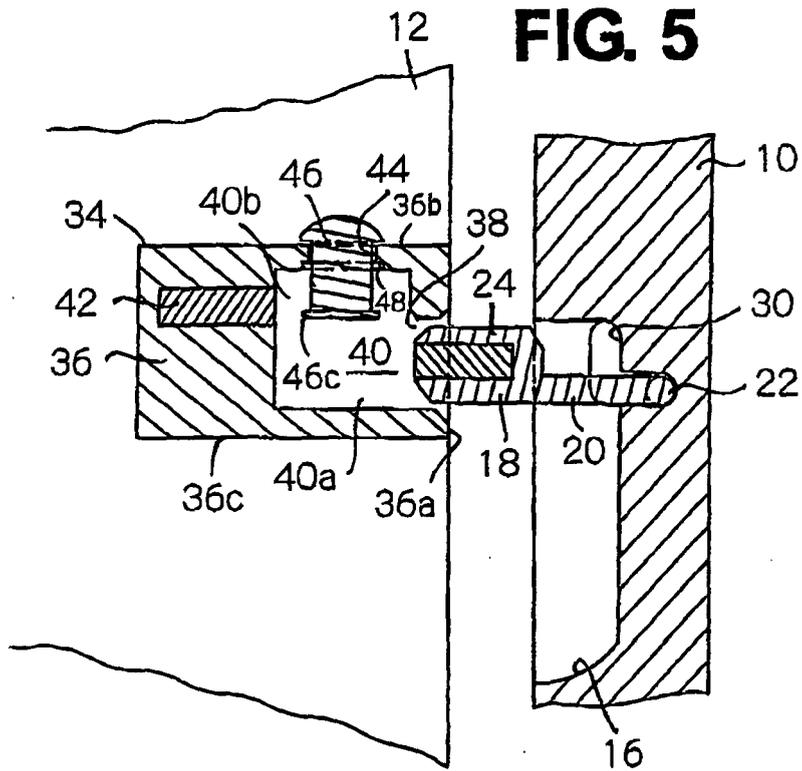
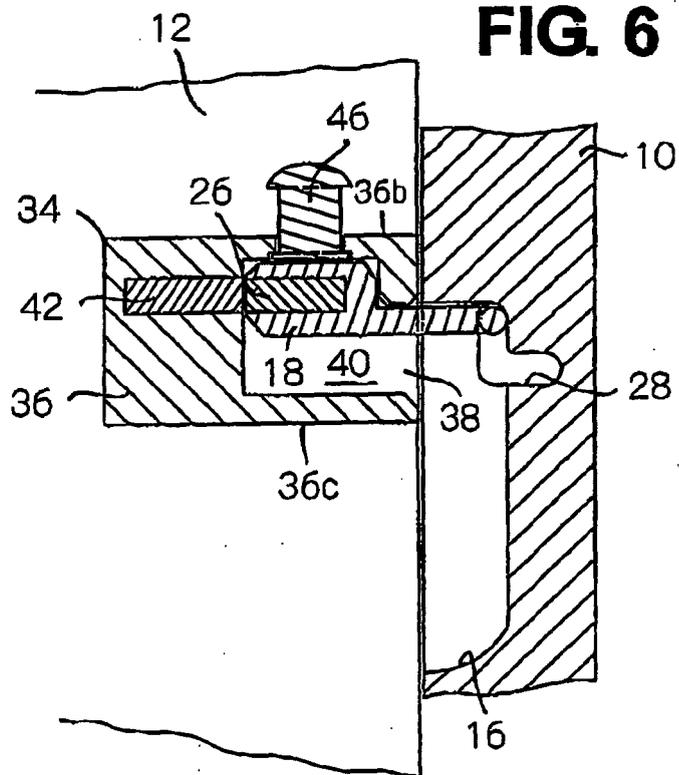
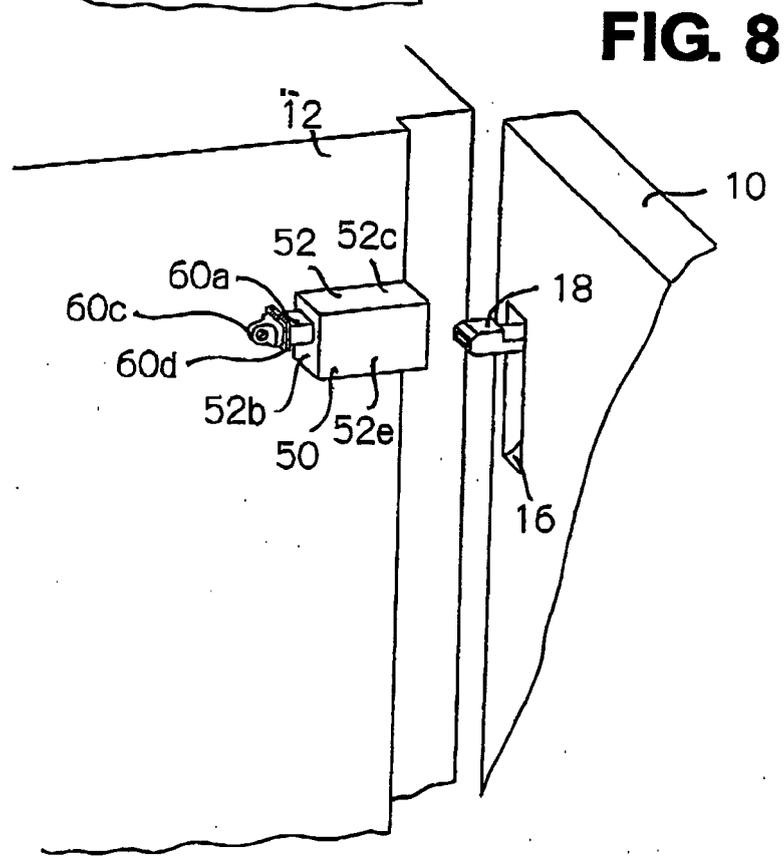
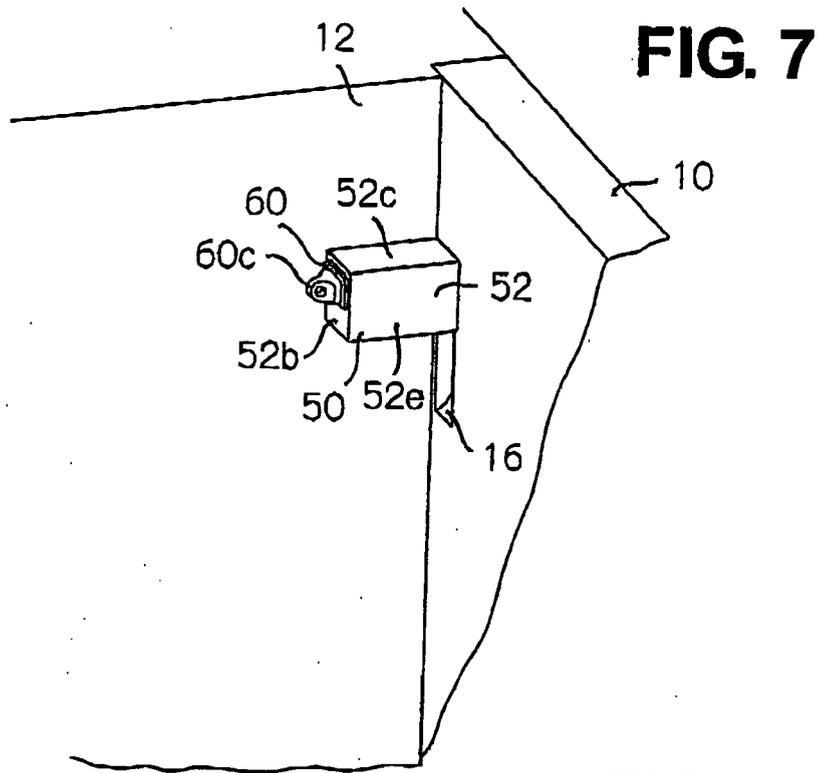


FIG. 6





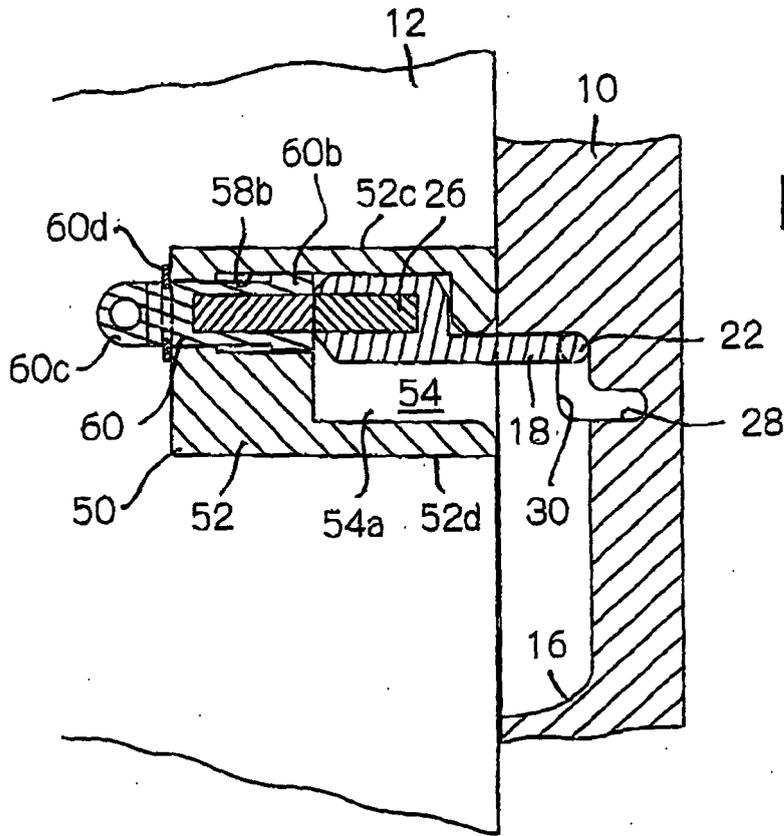


FIG. 9

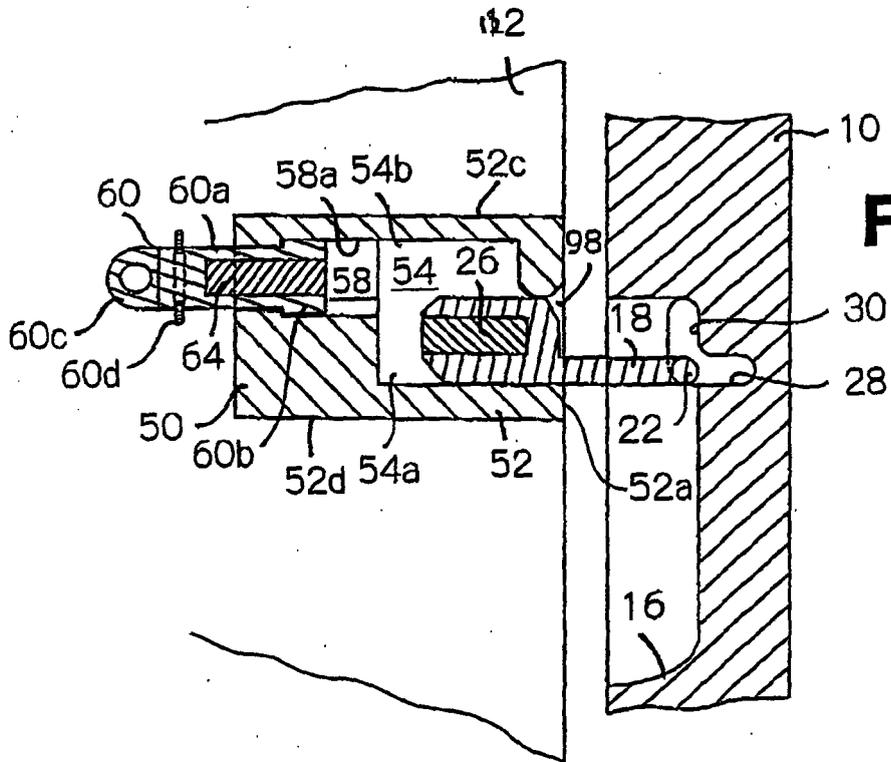


FIG. 10

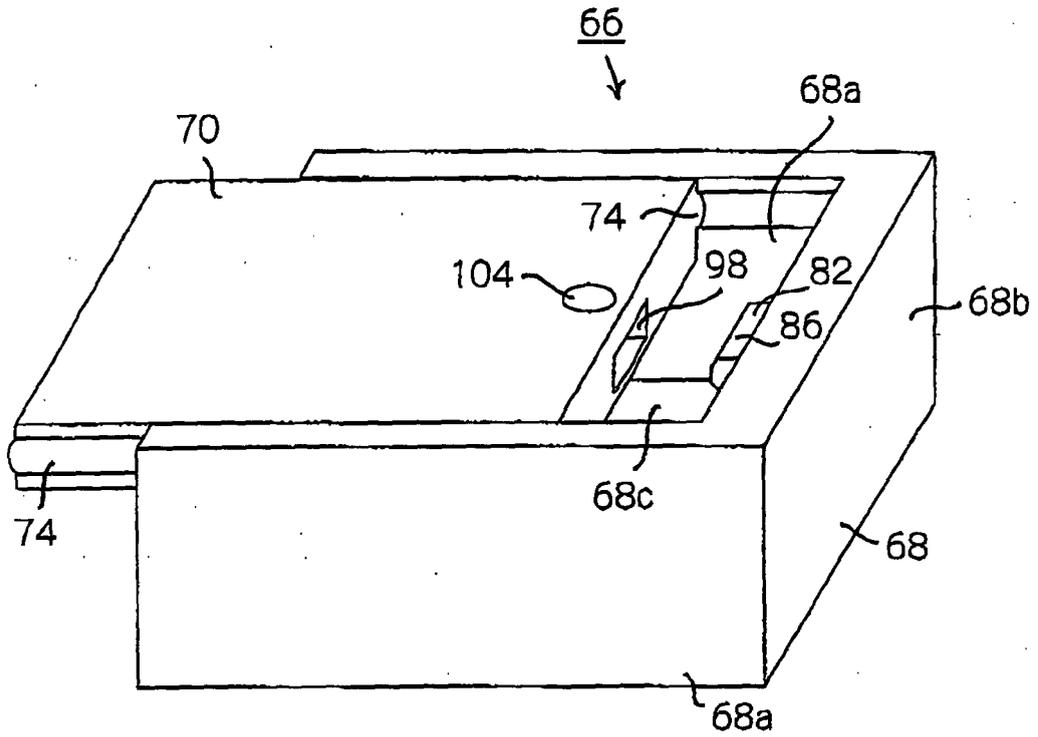


FIG. 11

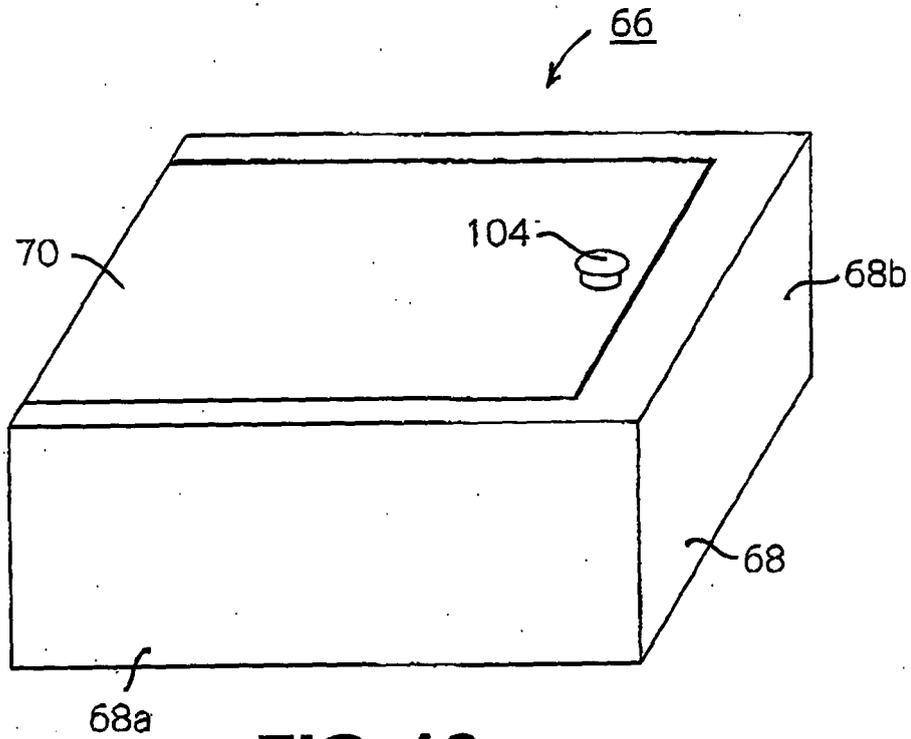


FIG. 12

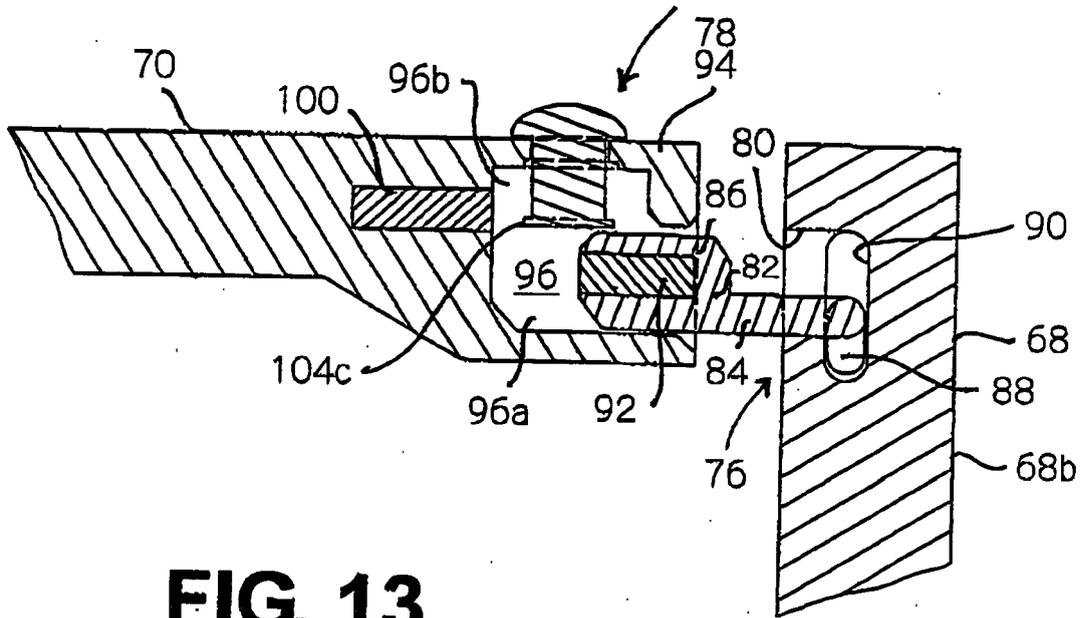


FIG. 13

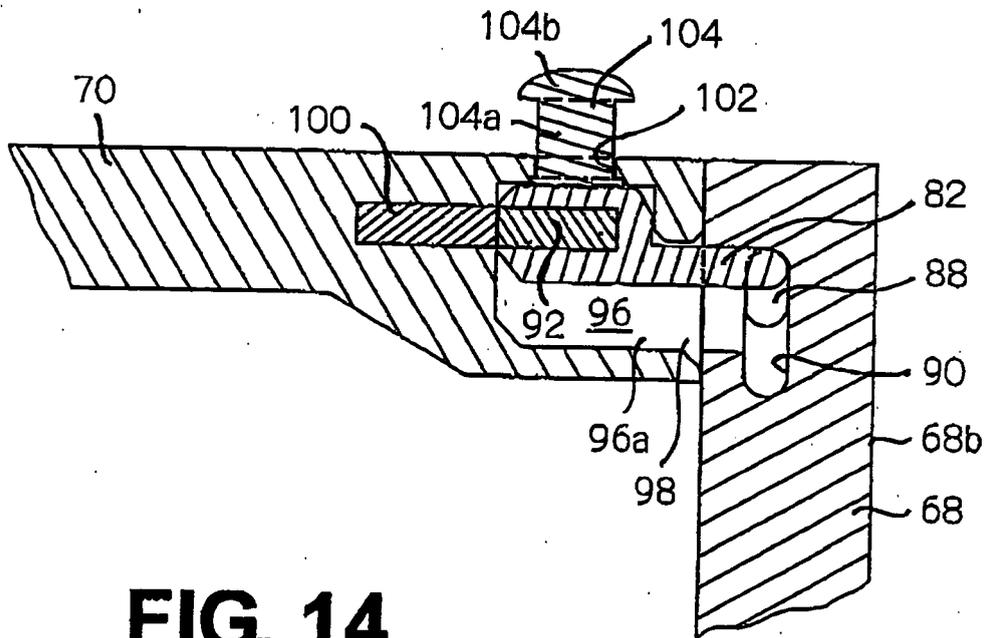


FIG. 14

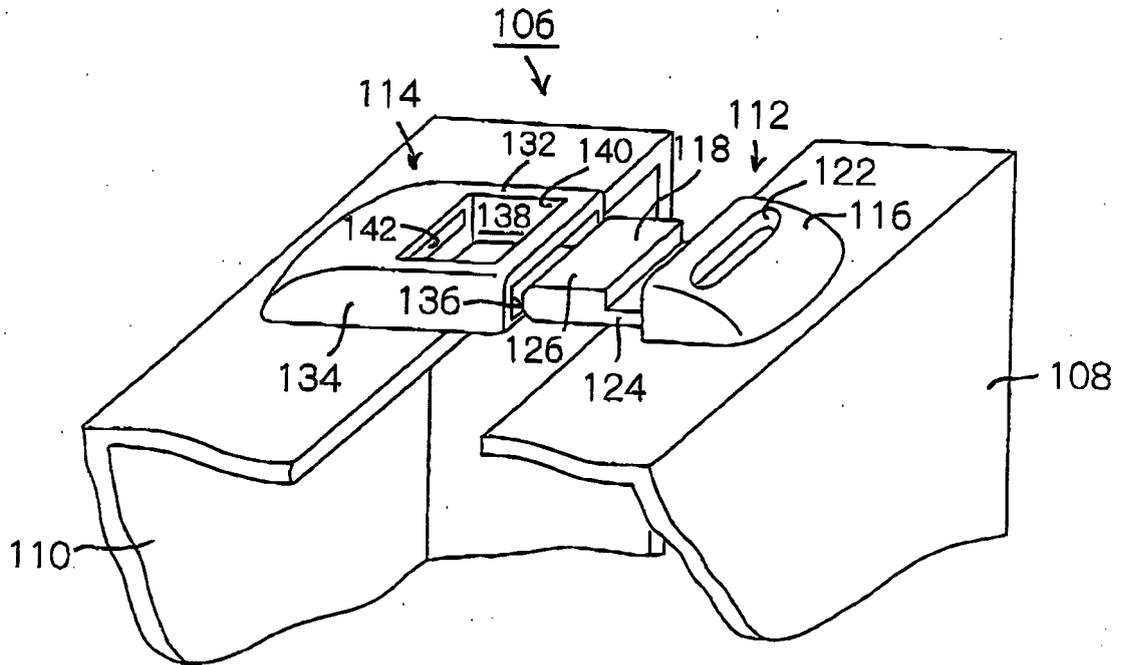


FIG. 15

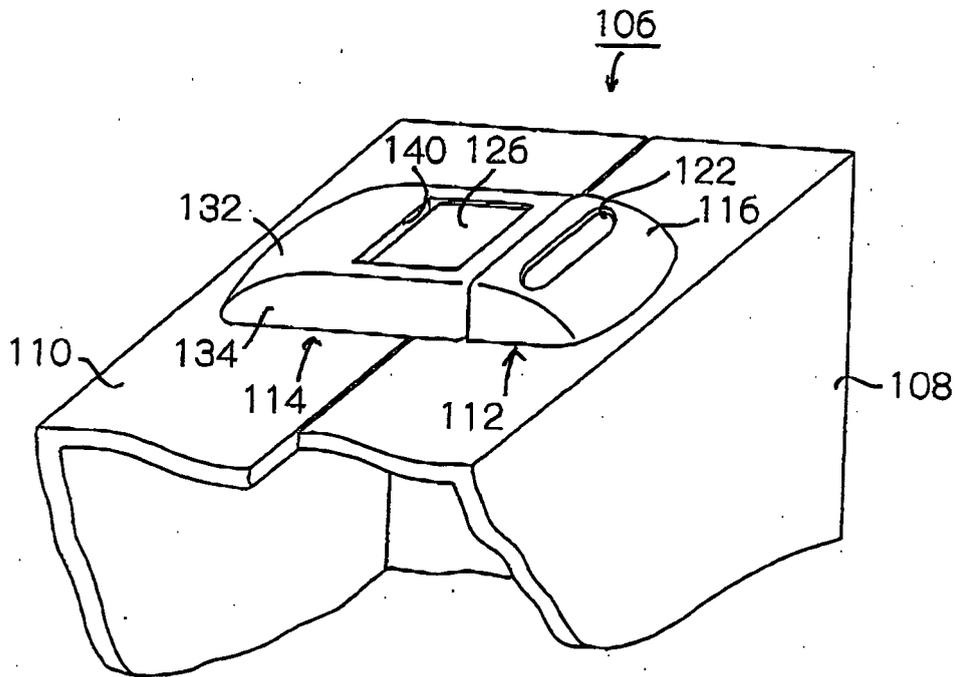


FIG. 16

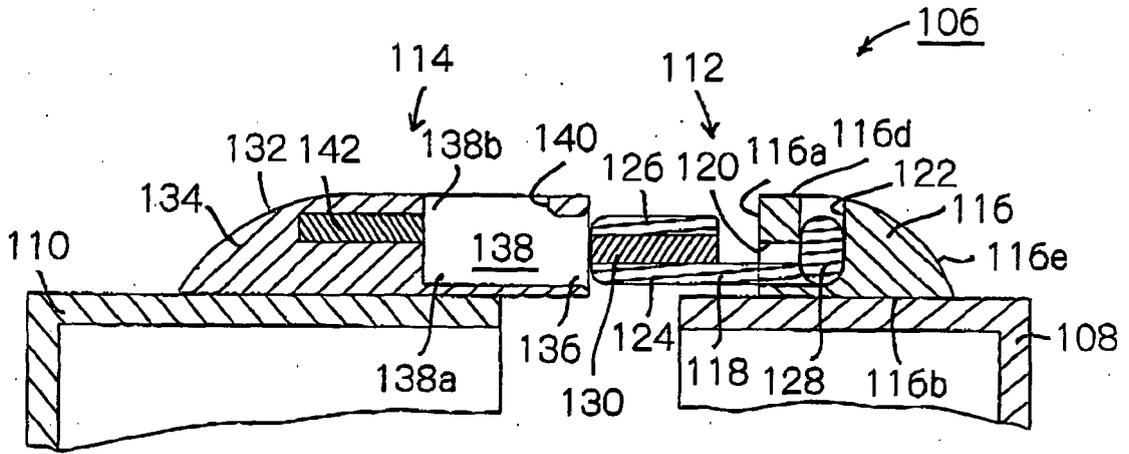


FIG. 17

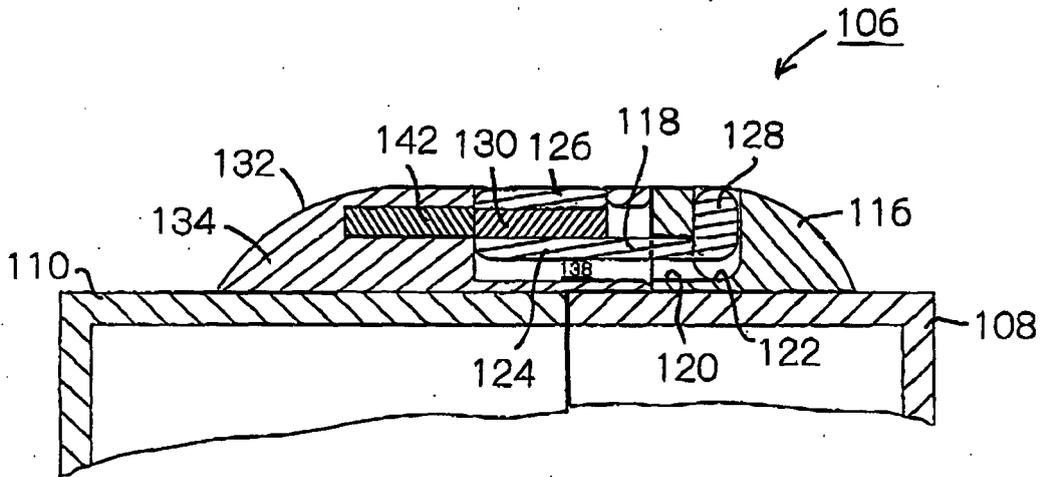


FIG. 18



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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			E05C E05B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 August 2005	Westin, K
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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