

[54] HINGE AND DOOR DETENT

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[51] Int. Cl.E05f 1/12, E05d 7/00

[58] Field of Search16/180, 150, 128 AB

[56] References Cited

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[57] ABSTRACT

A hinge for swingably mounting a door or similar member in a frame characterized by a pair of flexible hinged portions integrally interconnected by a portion of reduced thickness. The flexible hinged portions extend from a base which has side members terminating in action surfaces slidably engaging the door structure to provide a pivot point for the door. The coaction between the action surface, the door and the flexible hinged portions cause an elastic deformation of the flexible member which acts as an over-center spring for the movement of the door. The base member has means for being attached to a door frame.

7 Claims, 8 Drawing Figures

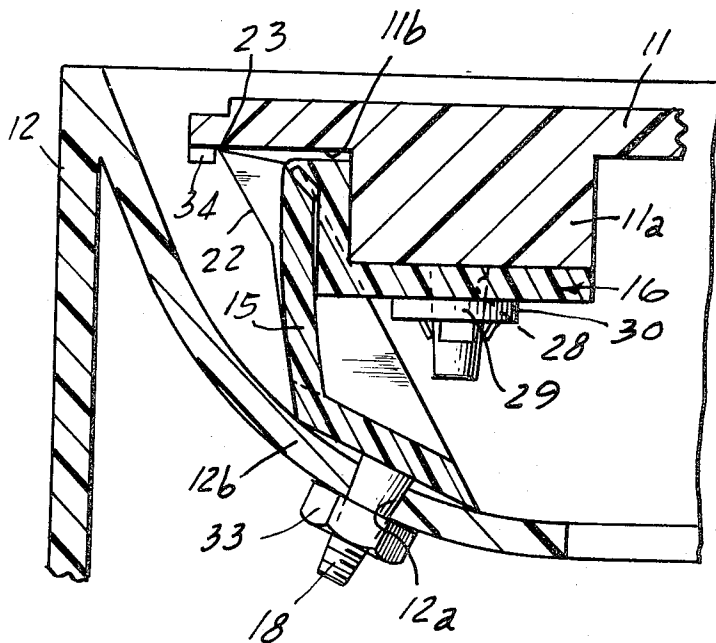


Fig. 1

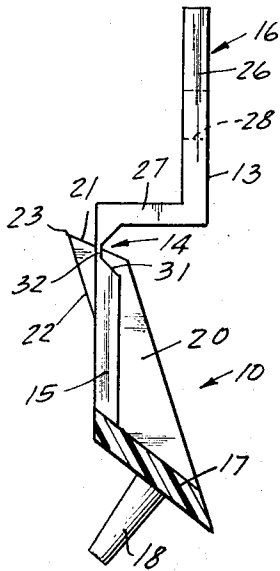


Fig. 2

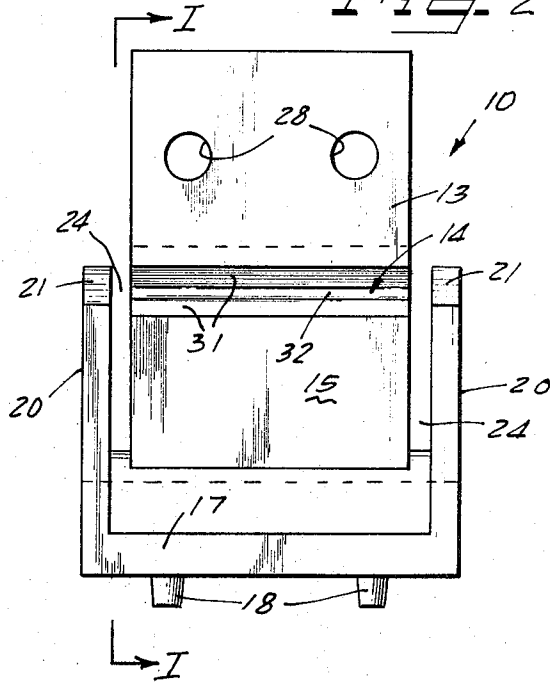


Fig. 3

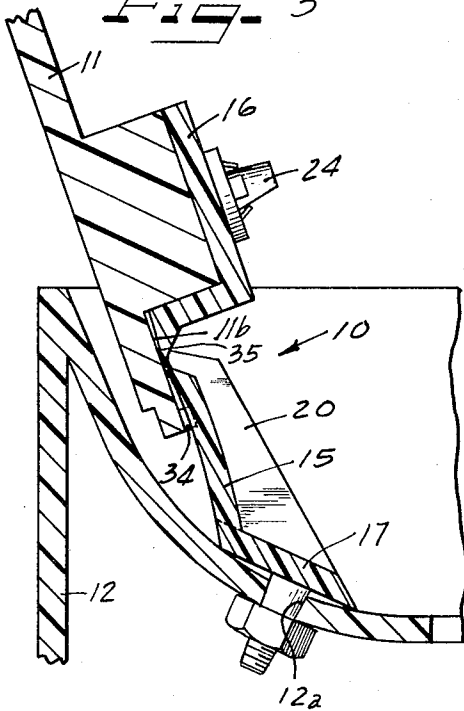
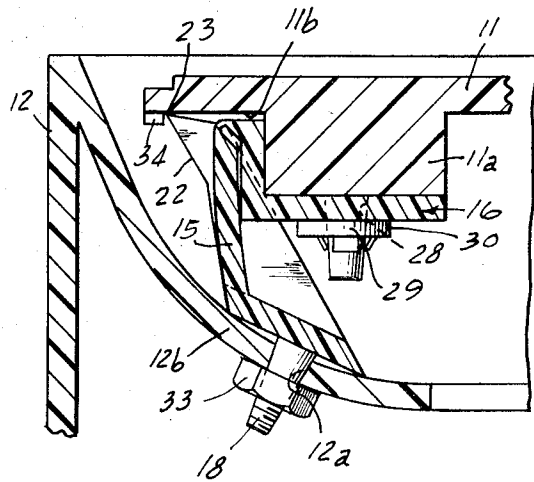


Fig. 4



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Fig. 5

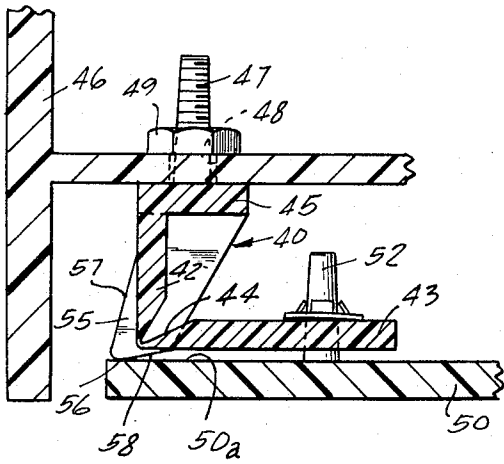


Fig. 6

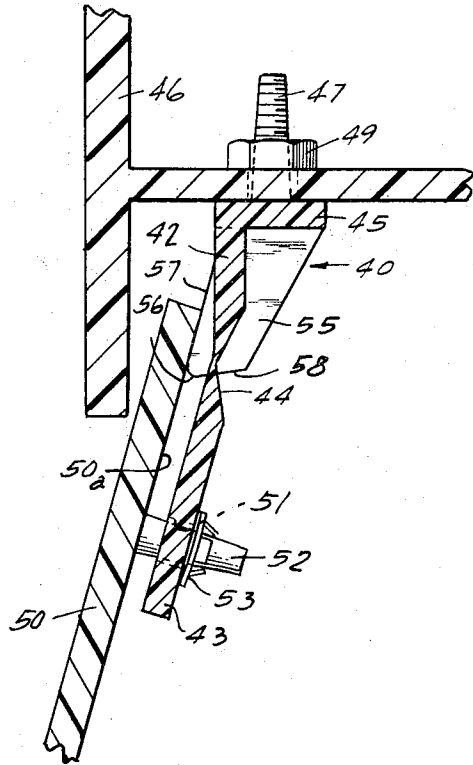


Fig. 7

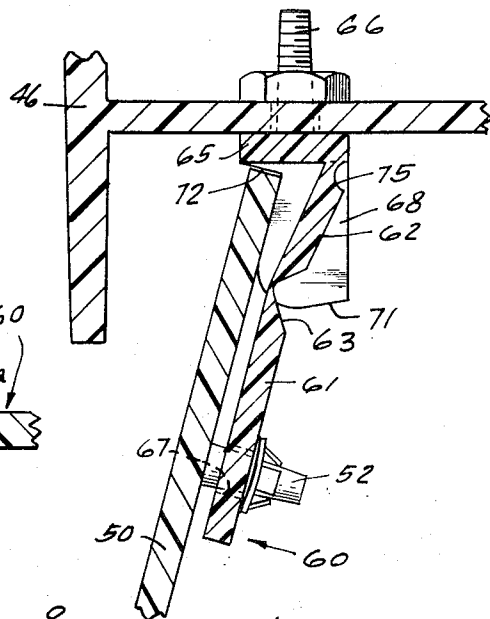
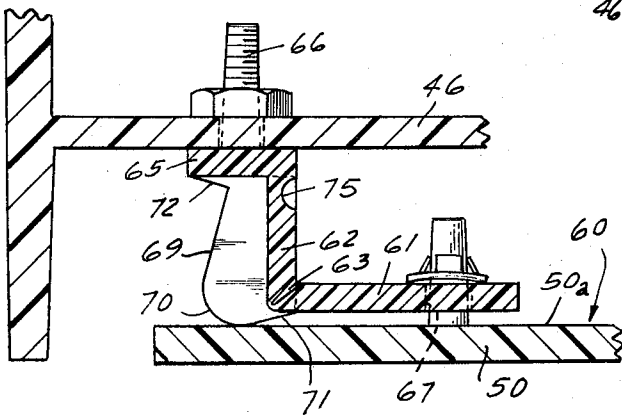


Fig. 8

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HINGE AND DOOR DETENT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention is directed to a hinge structure and particularly to a one-piece hinge structure having an over-center spring characteristic for holding a member in either a closed or open position with respect to another member.

SUMMARY OF THE INVENTION

The present invention is directed to a plastic one-piece hinge having a pair of hinge portions interconnected by a reduced thickness portion about which the hinge portions pivot. In the preferred embodiments the one-piece hinge has contact means or action surfaces which slidably engage a surface of a door. As the door slides on the action surfaces the effect is that of an over-center spring to hold the door in place after being either opened or closed.

Accordingly, it is an object of the present invention to provide a one-piece integral hinge.

Another object of the present invention is to provide a one-piece integral hinge having an over-center spring characteristic for holding a door or part in a closed position and in a predetermined open position.

Other objects, features and advantages of this invention will be readily apparent from the following description of the preferred embodiments taken in conjunction with the accompanying drawings although variations and modifications may be effected without departing from the scope and spirit of the novel concept of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of the hinge of the present invention in a free or undeformed state taken along lines I—I of FIG. 2;

FIG. 2 is a front view of the hinge of the present invention in a free state;

FIG. 3 is a cross-section of the hinge of FIG. 1 mounting a door in a door frame and holding the door in an opened position;

FIG. 4 is a cross-section of the hinge of FIG. 1 mounting a door on a frame structure and holding the door in a closed position;

FIG. 5 is a cross-section of an embodiment of the hinge of the present invention holding a door in the closed position on its frame;

FIG. 6 is the hinge embodiment of FIG. 5, holding the door in the open position;

FIG. 7 is a cross-sectional view of another embodiment of the hinge of the present invention holding a door in a closed position with respect to the door frame; and

FIG. 8 is a cross-sectional view of the hinge of FIG. 7 holding a door in the open position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the preferred embodiment of the present invention a hinge or hinge assembly is indicated at 10 for mounting a door 11 to a door frame 12.

The hinge 10 which is shown in an undeformed or free state in FIGS. 1 and 2, has a flexible or resilient member 13 provided with a portion of reduced thickness 14 which is illustrated as a V-shaped notch that divides the flexible member 13 into a first hinge portion 15 and a second hinge portion 16. The first hinge portion 15 is integrally attached to a base member 17 which has prongs 18,18 for securing the base member 17 to the frame structure 12.

Extending from the base member 17 are a pair of side walls or side members 20,20 each of which terminates in an edge 21 that intersects a second edge 22 at an acute angle to form a contact means or action surface 23. As illustrated, the side walls 20 extend along each side of the portion 15 with spacings 24,24 to allow the portion 15 to flex therebetween.

The second hinge portion 16 has a portion 26 offset from the plane of the first hinge portion 15 by a portion 27. The portion 26 is provided with apertures 28,28 which are used to secure the hinge to the door 11. As illustrated in FIGS. 3 and 4, studs 29 are extended through the apertures 28, and are held by fastening means such as sheet metal fasteners 30.

The reduced portion 14 has a thickness which is less than the thickness of the hinge portions 15 and 16 and is formed as a notch having slanted side walls 31,31 which extend to a bottom surface 32. The portion 14 has a thickness of from 0.012 to 0.018 inches, for example, and a width of about 0.02 inches.

The hinge 10 is preferably molded of a plastic material. When the hinge 10 is used to mount a door 11 on a door frame 12 as illustrated in FIGS. 3 and 4, the second hinge portion 16 receives a block portion 11a of the door 11. Integral studs 29 in the block portions extend through the apertures 28 and are gripped by the fasteners 30. The base member 17 which extends at an oblique angle to the first hinge portion 15, has its studs 18 extending through the apertures 12a in a curved portion 12b of the frame structure 12. The studs 18 may be fastened with sheet metal nuts 33.

With the door 11 secured to the frame 12 and disposed in the closed position as illustrated in FIG. 4, the contact means or action surfaces 23 engage a surface 11b of the door 11 and are adjacent to a stop or projection 34.

As the door 11 is swung from the closed position shown in FIG. 4 to the fully opened position in FIG. 3, the various portions of the hinge deform or flex so that the opening of the door acts like the movement of an over-center mechanism. In particular, the side members 20 initially resist opening of the door by acting against the surface 11b. As the door is opened against this resisting force, the various portions of the hinge deform to allow the edges 23 of the side members 22 to slide along the surface 11b. The resisting force tends to bias the door closed until an intermediate position is reached corresponding to the trip position in an over-center spring. After the intermediate position has been reached, the side members 20 tend to bias the door into an open position, and the door snaps open under this bias force. As shown in FIG. 3, the side members 20 are in a position to hold the door open.

As the door is closed, the reverse is true, and after the intermediate or trip position is reached, the door snaps shut under the biasing arrangement provided by the side members 20. The point of sliding contact between the side members 20 and the surface 11b at the point 23 of FIG. 4 may be lubricated if desired to assure easy opening and closing of the door.

Another embodiment of the present invention is indicated in FIGS. 5 and 6 by the reference numeral 40. The hinge 40 has first and second hinge portions 42 and 43 interconnected by a line 44 of reduced thickness. The first hinge portion 42 is integrally connected to a base member 45 which has integral studs 47 which extend through apertures 48 in a door frame 46 and are held in place by nuts 49. The second hinge portion 43 has apertures 51 for receiving projections 52 of a door 50. These projections are held in the apertures 51 by clips 53.

The hinge 40 has a pair of side members 55 constructed similar to the side members 20 in FIG. 1. The members 55 have an action surface 56 defined by a curve surface interconnecting edge surfaces 57 and 58. The action surface 56 engages a surface 50a of the door 50 to provide a pivot point for the door to pivot about during opening and closing.

As in the embodiment shown in FIGS. 1 through 4, the hinge 40 also acts as an over-center mechanism to bias the door 50 closed and open depending upon its initial position. However, the action of the side members 55 is modified over the device shown in FIGS. 1 through 4 in that the side members 55 are rounded at the action surface 56. This has the effect of causing the door to swing more easily from the closed to the open position and reduces the bias applied to the door in either position.

Another embodiment of the present invention is generally indicated at 60 in FIGS. 7 and 8. The hinge 60 has first and

second hinge portions 62 and 64 interconnected by a line 63 of reduced thickness.

The embodiment shown in FIG. 7 has an action surface 70 which is formed of a larger radius than the action surface in FIG. 5. This modification further increases the ease of moving the door between open and closed positions and tends to further reduce the over-center effect of the side members identified by the numeral 69 in FIGS. 7 and 8.

Also in FIGS. 7 and 8, the side members have a surface 72 which acts as a stop to resist excessive outward movement of the door beyond the position shown in FIG. 8. It is apparent that other modifications of the contour of the side members may be effected to vary the type of bias and type of over-center action desired for the door movement.

I claim as my invention:

1. A one-piece hinge comprising: first and second integral hinge portions separated by a line or reduced thickness to provide a hinge action between the two portions, one of said first and second hinge portions having means for being secured to a door and the other of said portions having means for being secured to a door frame, one of said integral hinge portions having relatively resilient members formed integrally therewith in spaced relation to their associated hinge portion and extending to the vicinity of said line of reduced thickness to control the pivotal movement of the door, said resilient members being capable of flexing independently of the flexing at

said line of reduced thickness.

2. A one-piece hinge in accordance with claim 1 wherein one of said hinge portions has an offset flange for securing the hinge to a door frame and wherein resilient members are formed integrally with said offset portion.

3. A one-piece hinge in accordance with claim 2 wherein said resilient members are caused to extend to such a length as to contact the door and to act as an over-center spring as the door is moved between opened and closed portions.

4. A hinge according to claim 1 wherein said resilient members have contact means engageable with a surface of the door secured to the hinge for providing a pivot point for the door during movement thereof, said contact means being disposed adjacent to said reduced portion.

5. A hinge according to claim 4, wherein the contact means of each of said resilient members is provided by a point of intersection of a pair of edge surfaces intersecting at an acute angle.

6. A hinge according to claim 4, wherein said contact means of each of said resilient members is a curved surface having a radius of curvature which is small with respect to the thickness of said resilient members.

7. A hinge according to claim 4, wherein said contact means of each of said resilient members is a curved surface having a radius of curvature which is large with respect to the thickness of said resilient members.

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