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E2F
Selected US specifications from IPC sub-class E05D

(54) **Hinge**

(57) A hinge for pivotally connecting first (1) and second (3) members, which comprises a body (2) for connection to the member 1, a socket (4) for connection to the member 3, an outer arm (5) connected at one end thereof to the socket 4 and at the other end to the body 2, an inner arm (6) pivotally connected at one end to the socket 4 and at the other end to a floating pivot (O) movable in forward and rearward directions during opening and closing of the hinge, and guide means B between said one end of the arm 6 and the body 2 for guiding the movement of the floating pivot O. When a door (3) is opening, the means B guides the floating pivot O forwardly towards the door to move the latter away from the first member (1). Preferably a link (7) is pivoted to the body (2) and to the said other end of the arm (6).

The guide may be a pivoted link 8, a pin slidable in a slot, a gear cooperating with a member etc.

FIG. 1

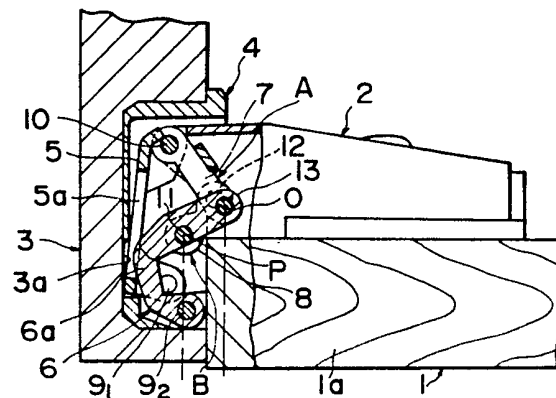
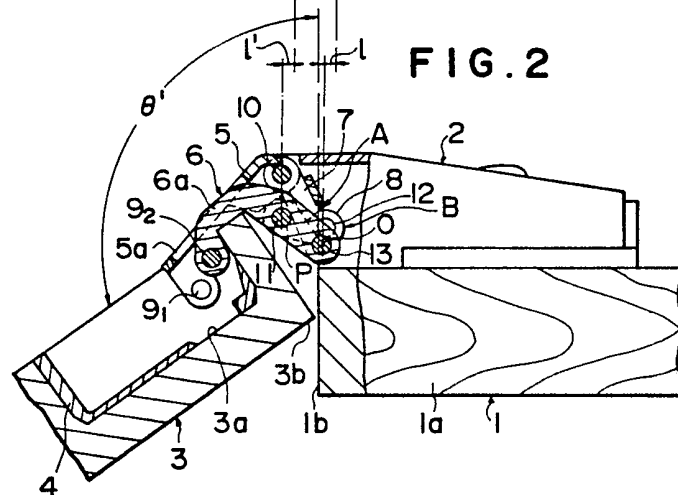


FIG. 2



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FIG. 1

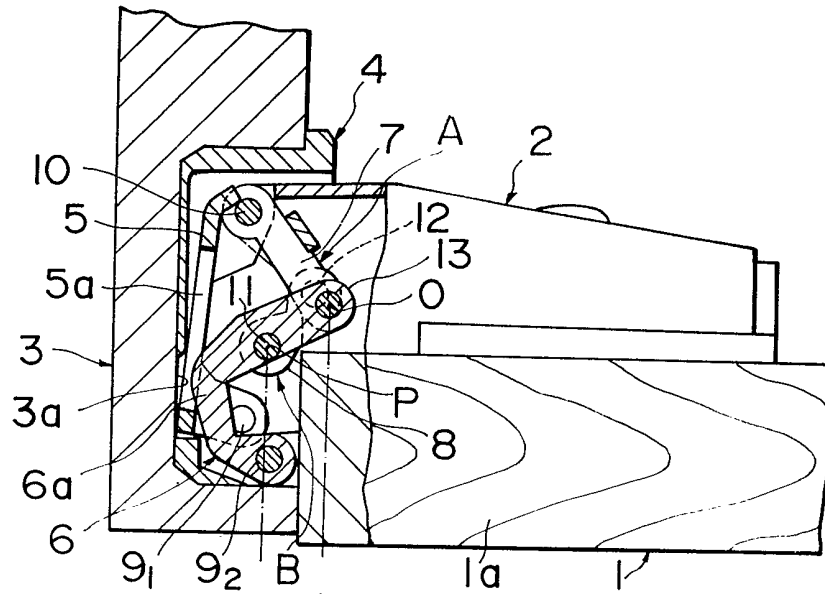


FIG. 2

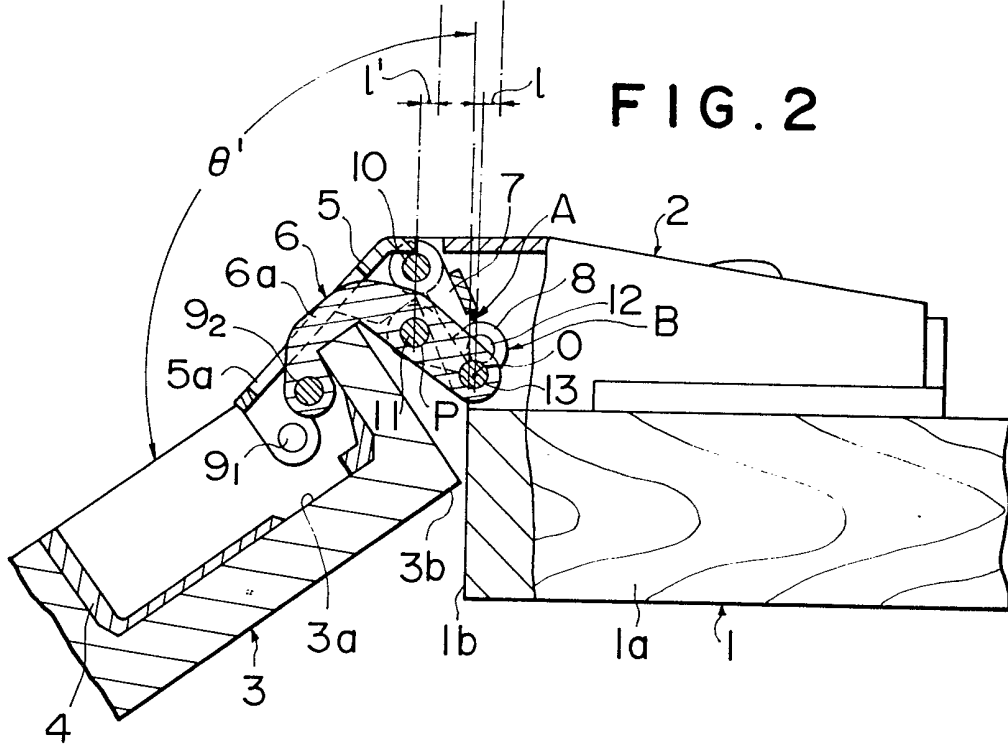


FIG. 3

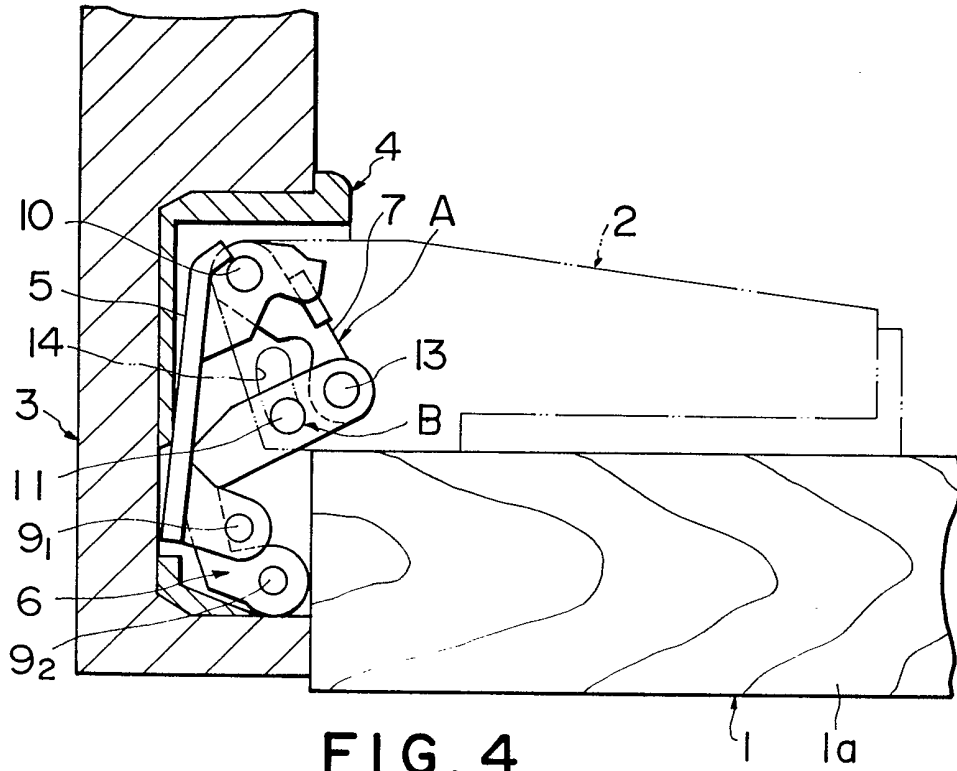
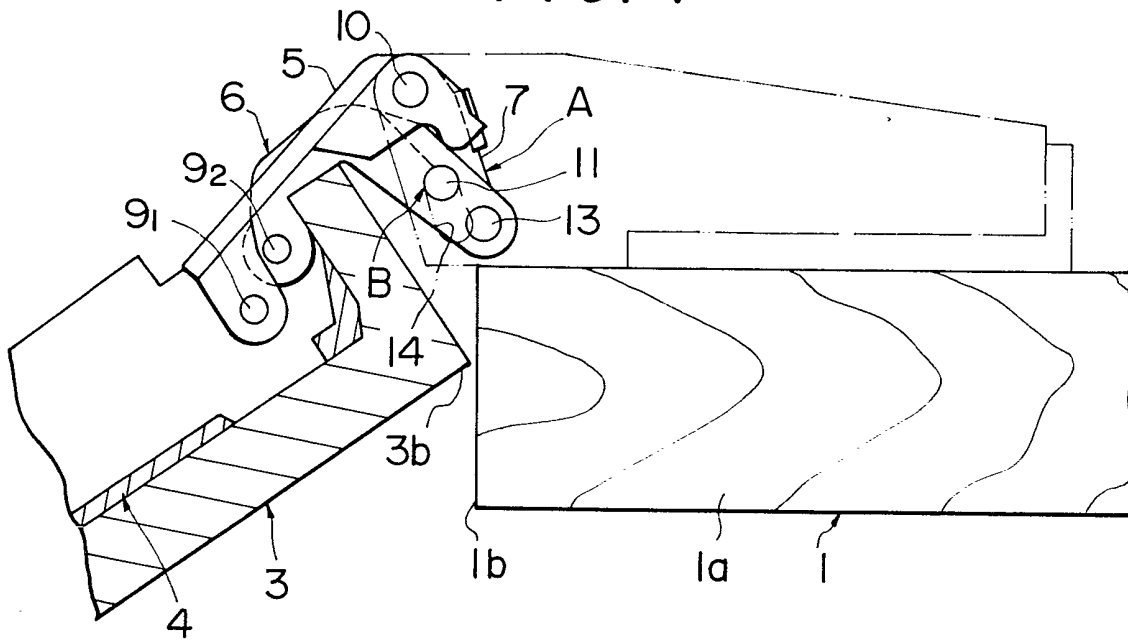


FIG. 4



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FIG. 7

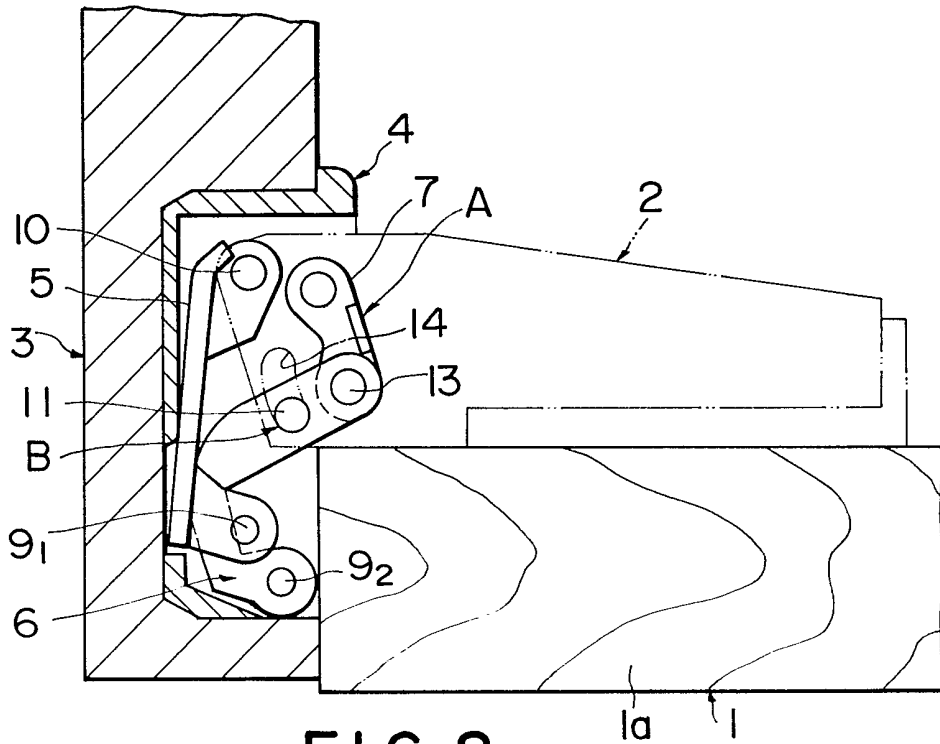


FIG. 8

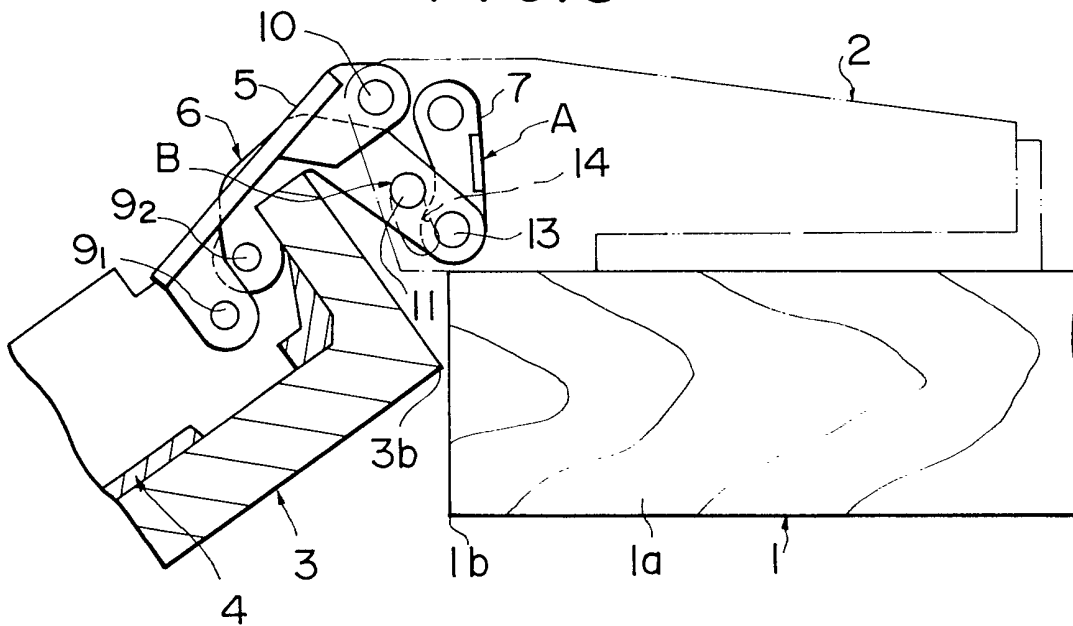


FIG. 9

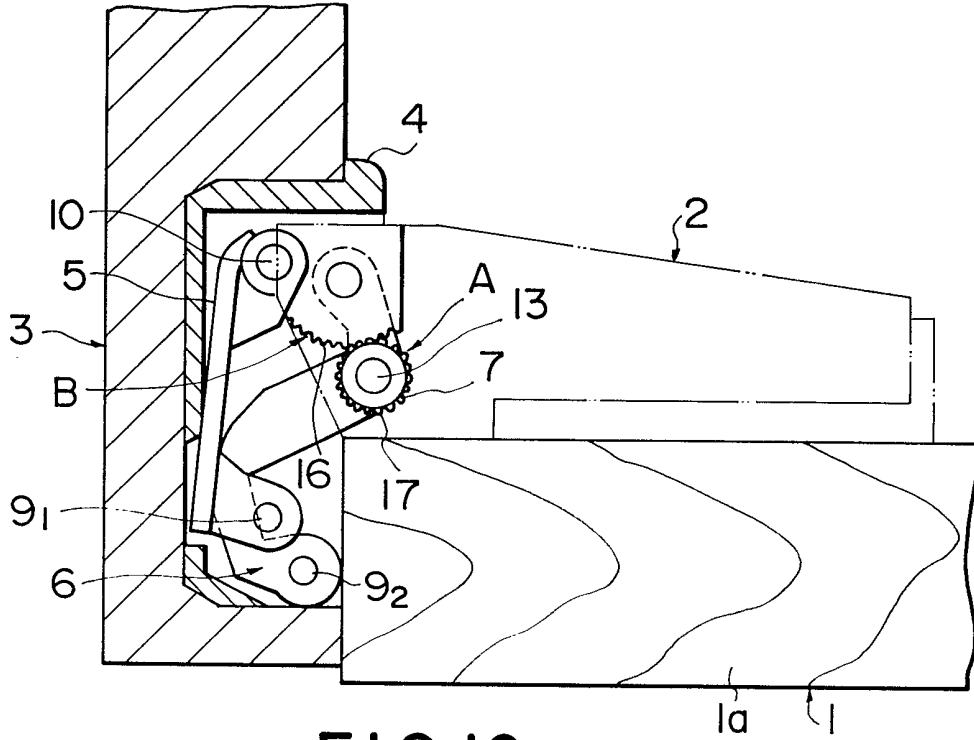


FIG. 10

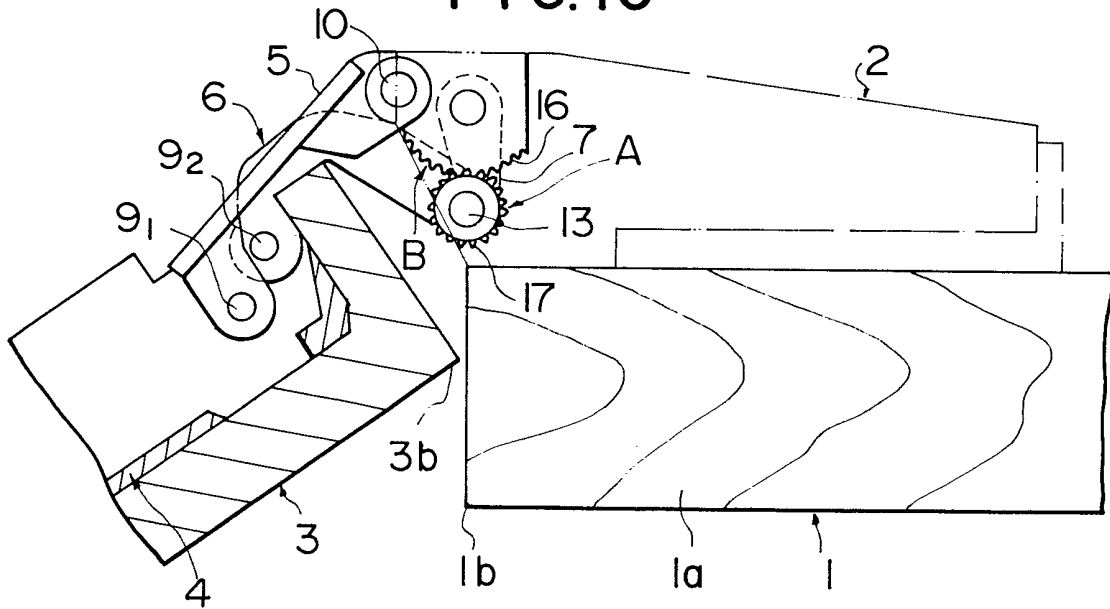


FIG. 11

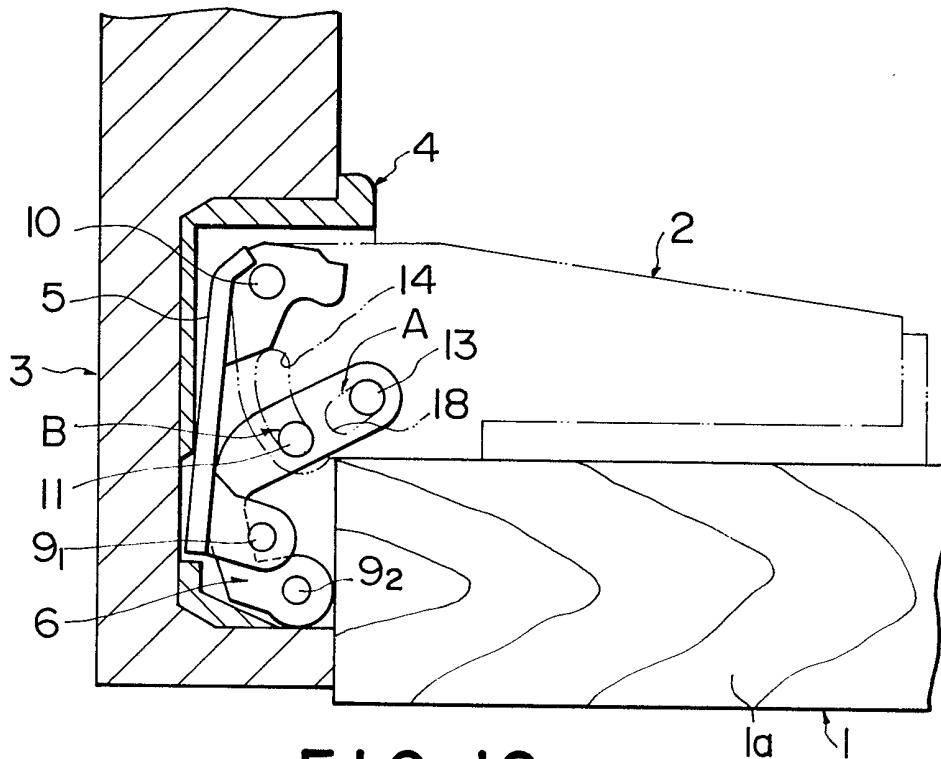


FIG. 12

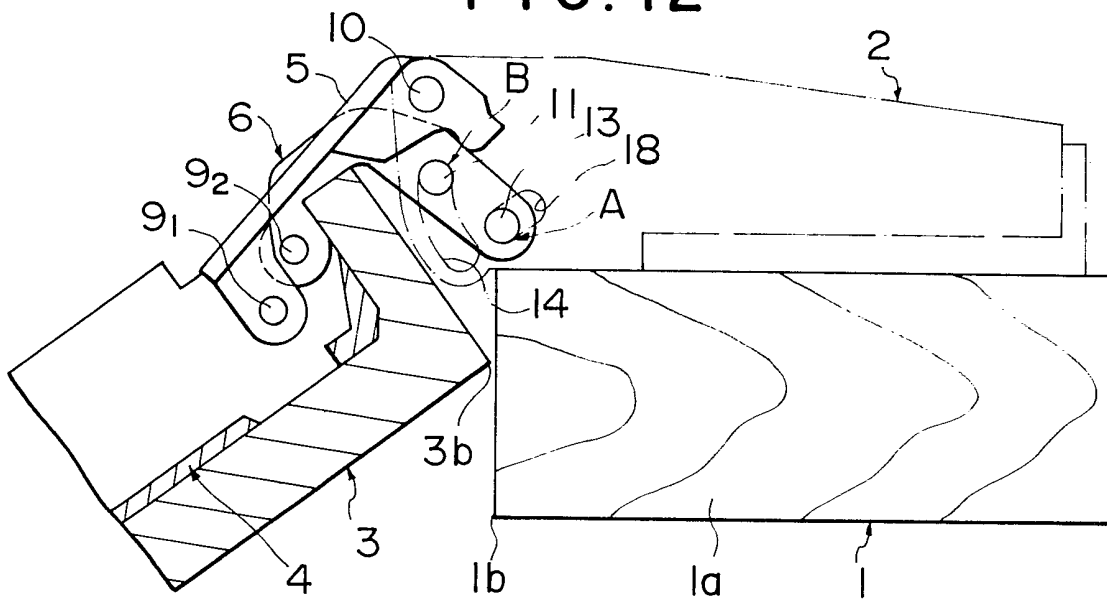


FIG. 13

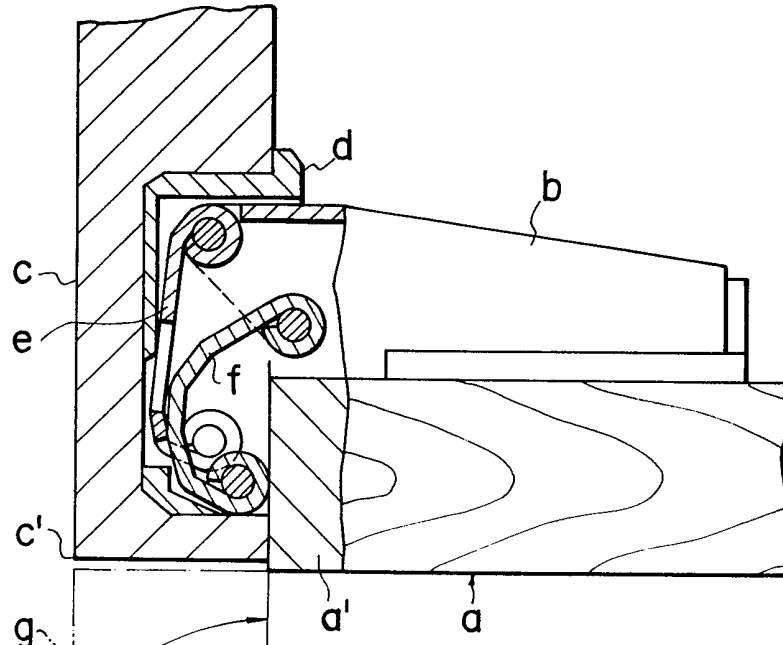
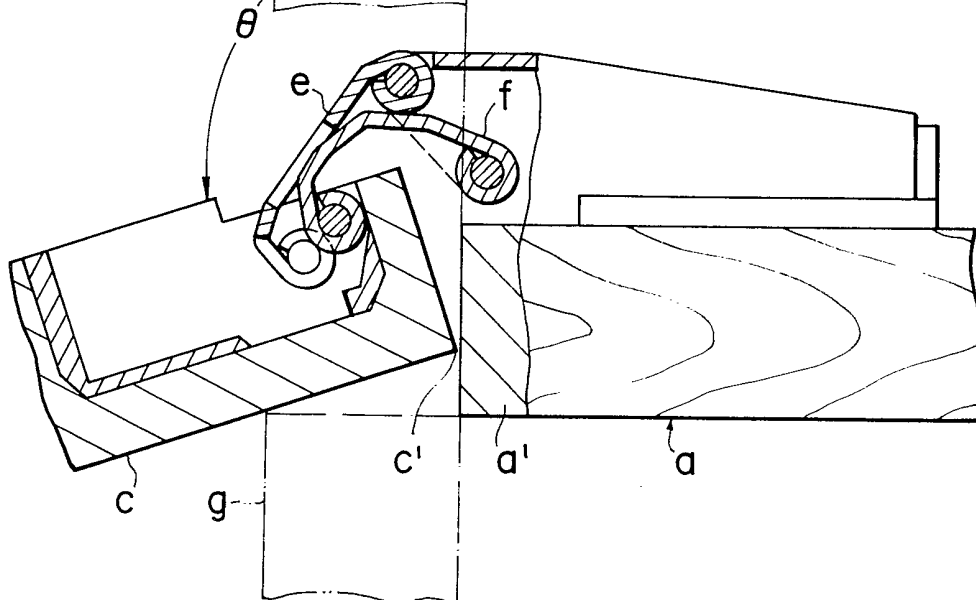


FIG. 14



SPECIFICATION

Hinge

5 This invention relates to a hinge for mounting a door or the like.

10 When the thickness of a hinge-mounted door is relatively large, there is a risk of it engaging the door frame or a side panel of a cabinet or like on which it is mounted, when the door is opened widely unless the hinges displace the door forwardly of the frame or cabinet during opening. Various proposals have been made for dealing with this problem, including the design or special hinges. However, most of these proposed hinges are rather complex, and as a result are of large size and expensive to make, and further can be dangerous in operation in that the user's fingers can be trapped therein.

20 In the accompanying drawings, Figs. 13 and 14 are fragmentary side views of one known two-blade hinge in closed and opened states respectively, which overcomes some of the problems noted above and in particular allows the door to open more widely than conventional hinges. Referring to these Figures, the hinge comprises arms e and f pivotally secured at one end to a body b secured to a door mounting frame a, and a socket d fixedly let in to a door c. The construction of this known hinge is simple and it provides a relatively large displacement of the door forwardly of the frame during opening. However, even this displacement is insufficient to allow really wide opening. Thus, as shown in Fig. 14, the edge c' of the door c collides with the end of side plate a' of the frame a and with any adjacent door g, when door c is opened to the angle θ , thus effectively limiting the opening angle of the door.

45 We have now devised an improved hinge of the above type to allow a greater opening angle, the hinge of the invention being of small size, simple construction and relatively inexpensive. The larger opening angle is achieved, in accordance with the present invention, by providing connecting means at or near the end of the second arm f, at the frame side, to shift the position of the door forwardly, away from the frame, when the door is opened, (the second arm f not being secured to a predetermined position on body b) and by providing guiding means to guide the shift of the door. In this way, the door can be displaced forwardly a greater distance on opening than in the hinge of Figs. 13 and 14, and with greater control, so allowing wider opening of the door without excessively complex hinge arrangements.

60 The invention thus provides a hinge comprising a body for attachment to the first member, a socket for attachment to the second member, a first arm pivotally connected at one end thereof to the socket and at the

70 other end to the body a second arm pivotally connected at one end thereof to the socket and at the other end to a floating pivot, and guide means for guiding the floating pivot in an arcuate path when the hinge is opened and closed.

75 According to the present invention, when a door is provided with hinges of the invention, as it is opened the guide means guides one end of the second or inner arm with the result that the other end of the inner arm (attached to the door) is moved in a direction outwardly of the frame. Thus, as the door is being opened, it is also being moved outwardly at each hinge to allow a greater opening angle.

80 In order that the invention may be more fully understood, embodiments thereof will now be described by way of example only with reference to the accompanying drawings, in which:

85 *Figures 1 and 2* are fragmentary side views of a first embodiment of hinge of the present invention, in a door which is shown closed and open respectively;

90 *Figures 3 and 4* are fragmentary side views similar to Figs. 1 and 2 but showing a second embodiment of hinge according to the present invention;

95 *Figures 5 and 6* are fragmentary side views similar to Figs. 1 and 2 but showing a third embodiment of hinge according to the present invention;

100 *Figures 7 and 8* are fragmentary side views similar to Figs. 1 and 2 but showing a fourth embodiment of hinge according to the present invention;

105 *Figures 9 and 10* are fragmentary side views similar to Figs. 1 and 2 but showing a fifth embodiment of hinge of the invention; and

Figures 11 and 12 are fragmentary side views similar to Figs. 1 and 2 but showing a sixth embodiment of the invention.

110 The present invention will now be described in more detail with reference to the accompanying drawings.

115 Figs. 1 and 2 show a first embodiment of hinge according to the present invention. This comprises a body 2 capable of being fixedly secured to a door mounting frame 1, a cup-shaped socket 4 engaged fixedly within a recess 3a formed in door 3, an outer first arm 5 and an inner second arm 6 for connecting the body 2 and the socket 4. This first embodiment of hinge further comprises a first link 7 and a second link 8.

120 The first and second arms 5 and 6 are contained in the socket 4 when the door is in a closed state as shown in Fig. 1, and the first arm 5 is formed substantially in U-shaped cross-section so that the second arm 6 can be disposed inside the first arm 5. The second arm 6 is formed of a simple flat plate.

130 The first and second arms 5 and 6 are constructed and arranged generally in the same

manner as in the conventional hinge shown in Figs. 13 and 14, their one ends being pivotally secured by shaft pins 9_1 , 9_2 spaced to eliminate any mutual interference, with the front sides thereof in the socket 4, and with the other end of the first arm 5 being pivotally secured by a shaft pin 10 to the forward upper end of the hinge body 2. In contrast to the known hinge of Figs. 13 and 14, however, the hinge of Figs. 1 and 2 further comprises pivotal connecting means A and guide means B. The connecting means A is a mechanism for arcuately moving the other end of the second arm 6 in forward and backward directions. In the first embodiment of the hinge of the invention, the connecting means A comprises a first link 7 pivotally secured to the body 2 via the shaft pin 10 (which also pivotally supports the first arm 5), and a shaft pin 13 for pivotally securing the other ends of the first link 7 and the second arm 6. As described above, the pivotally securing point O of the shaft pin 13 can thus move or float arcuately in forward and backward directions, on link 7 as radius about shaft pin 10.

The guide means B is a mechanism for guiding the pivotally securing point O forwardly when the door is opening. The guide means B of this embodiment comprises a second link 8 pivotally secured to the body 2 by the shaft pin 12, and a shaft pin 11 for pivotally securing the other end of the link 8 to a portion of the second arm 6 spaced from the other end thereof.

The first and second links 7 and 8 are considerably shorter than the first and second arms 5 and 6, and the second link 8 is shorter than the first link 7. Thus, the pivotally securing point P of the shaft pin 11 is arcuately movable forwardly about shaft pin 12 as a centre and the second link 8 as a radius, by the movement of the second arm 6 upon opening or closing of the door 3, thereby shifting forwardly the point P of the shaft pin 13 during opening as described above.

The pivotally securing points O and P are arranged to move forwardly distances of l and l' respectively, when the door is opened from the closed state of Fig. 1, thereby allowing opening of the door 3 to an angle θ' as shown in Fig. 2, which is larger than the angle θ in Fig. 14. Thus, when the door 3 is opened or closed by the hinge of this first embodiment, the first arm 5 is rotated at the shaft pin 10 of the pivotally securing point with the body 2 as a fulcrum point, while the second arm 6 is rotated at the second link 8 pivotally secured from the other end of the second arm 6 at the shaft pin 12 of the pivotally securing point with the body 2 as the fulcrum point. At this time, the first link 7 is rotated at the shaft pin 10 of the pivotally securing point with the body 2 as a fulcrum point. Accordingly, the pivotally securing point O of the second arm 6 pivotally secured to

the shaft pin 10, and the pivotally securing point P of the second link 8 to the second arm 6, are displaced forwardly by the distances l , l' , when the door is opened from the closed state, thereby reducing or eliminating any problem of edge 3b of the door 3 colliding with the end 1b of the side plate 1a of the door mounting frame 1, or with another door (not shown) mounted adjacent thereto.

In the first embodiment of the invention shown in Figs. 1 and 2, a window opening 5a is formed in the portion of the first arm 5 opposite to the second arm 6 so that the bent portion 6a of the second arm 6 can be disposed in the window opening 5a of the arm 5, whereby avoiding interference between the two arms and providing an opening angle θ' of wide degree with the hinge of this embodiment of small size.

The door 3 is mounted in the same manner as with the known hinge of this type in the lateral direction of the door 3, by screwing the body 1 to the inner surface of the side panel 1a of the door mounting frame 1, and screwing the socket 4 into a recess 3a on the inside of the base end of the door 3.

In a second embodiment of a hinge according to the present invention shown in Figs. 3 and 4, the fundamental construction is substantially the same as that of the first embodiment and the same reference numerals designate the same or equivalent members and components. However, guide means B comprises an arcuate guide slot 14 formed in the body 2, and a shaft pin 11 on a portion of the second arm 6, pin 11 being slidably received in guide slot 14. Shaft pin 11 is thus guided in the slot 14 to function in the same way as second link 8 (in Figs. 1 and 2).

The fundamental construction of the third embodiment shown further in Figs. 5 and 6 is the same as that of the first embodiment, except that pivotally connecting means A comprises a first link 7 and a shaft pin 13. One end of the first link 7 is commonly used as a shaft pin 10 but not pivotally secured to a body 2, but the link 7 is pivotally secured to the body 2 by pivotally securing shaft pin 15 provided entirely separately. Thus, the forward movement of the shaft pin 13 of the third embodiment is achieved provided in essentially the same manner as in the first and second embodiments of a different construction.

A fourth embodiment of hinge according to the present invention is shown in Figs. 7 and 8 and employs the different shaft construction from that of the third embodiment for pivotally connecting means A, in combination with a guide slot 14 as exemplified in the second embodiment as guide means B.

In a fifth embodiment shown in Figs. 9 and 10, pivotally connecting means A is constructed in the same manner as the third and fourth embodiments having the first link 7, but guide means B is different from those of the

previous embodiments of the invention.

More specifically, a toothed guide member 16 is fixed on body 2, the teeth being formed on a downwardly facing arcuate periphery,

5 and the guide means is a toothed guide gear 17 engaging the teeth of member 16 and being secured to the second arm 6 coaxially with the shaft pin 13 of the pivotally securing point of the first link 7 and the second arm 6. 10 The guide gear 17 is guided forwardly in engagement with the guide member 16 of the body 2 when the closed door shown in Fig. 9 is opening as shown in Fig. 10, and the shaft pin 13 is restricted by the first link 7 at this time so that the shaft pin 13 does not shift forwardly on a circular locus.

In a sixth embodiment of hinge according to the invention, shown in Figs. 11 and 12, guide means B employs a guide slot 14 and a shaft pin 11 in the same manner as the second and fourth embodiments, and pivotally connecting means A employs substantially the same construction as the guide means B. More particularly, the pivotally connecting means A comprises an arcuate opening 18 in body 2, with the shaft pin 13 slidably engaged in the opening 18, thereby restricting and guiding the shaft pin 13 to be forwardly movable in the same manner as the previous 30 embodiments of the invention.

According to the present invention described above, the guide means B can shift forwardly the shaft pin 13 of the second arm 6 upon opening of the door, with the result 35 that the door can be opened while the socket 4 is displaced forwardly, thereby greatly increasing the opening angle of the door provided with a hinge of the invention.

In Figs. 11 and 12, the shaft pin 13 of the second arm can be selectively moved forwardly. Therefore, as is apparent from a comparison of the arcuate locus of movement of the shaft pin 9₁ about shaft pin 10 of the first arm 5 as a centre, with the arcuate locus of shaft pin 9₂ about shaft pin 13 of the second arm 6 as a centre, the shaft pin 9₁ gradually rises (as viewed in the Figures) while moving forwardly (to the left in the Figures), while the shaft pin 9₂ abruptly rises while moving forwardly. Consequently, the door can be sufficiently displaced forwardly and upwardly with the forward moving arrangement of the shaft pin 13, with the result that the risk of the edge of the door colliding with an end of the side plate of the door mounting frame (as shown in Fig. 2) is greatly reduced, and also the risk of early collision with the adjacent door (described with respect to Fig. 14) can be effectively eliminated.

The pivotal connecting means A and the guide means B of the present invention do not fundamentally alter the simple construction of the known so-called conventional two-blade hinge, the mere addition of a small member or 65 the provision of a slot in the body being suffi-

cient to make a hinge of the invention. Consequently, a hinge of the present invention can readily be made in small size, of high strength and of low cost.

70

CLAIMS

1. A hinge for pivotally connecting first and second members, which hinge comprises a body for attachment to the first member, a socket for attachment to the second member, a first arm pivotally connected at one end thereof to the socket and at the other end to the body, a second arm pivotally connected at one end thereof to the socket and at the other end to a floating pivot, and guide means for guiding the floating pivot in an arcuate path when the hinge is opened and closed.

2. A hinge according to claim 1, wherein said other end of said second arm is pivotally connected to connecting means which are pivotally mounted on the body.

3. A hinge according to claim 2, wherein said connecting means comprises a first link pivotally secured to the body by a pin which also connects said other end of said first arm to the body and a further pin for pivotally connecting the link to the other end of the said second arm.

4. A hinge according to claim 2, wherein said connecting means comprises a first link pivotally secured to the body by a pin, and a further pin for pivotally connecting the other end of said link to said other end of said second arm.

5. A hinge according to claim 2, wherein said connecting means comprises an arcuate slot in said body, and a pin fixedly secured to said other end of said second arm and slidably engaged in said slot.

6. A hinge according to any of claims 1 to 5, wherein said guide means comprises a second link pivotally secured to said body and to said second arm at a point spaced from said other end thereof.

7. A hinge according to any of claims 1 to 5, wherein said guide means comprises an arcuate guide slot in said body and a pin in the region of said other end of said second arm and slidably engaged in said guide slot.

8. A hinge according to any of claims 1 to 5, wherein said guide means comprises an arcuate toothed member fixedly secured to said body, and a guide gear engaged with said toothed member at a pivotally connecting portion for pivotally connecting the other end of said first link and the other end of said second arm in the connecting means.

9. A hinge substantially as herein described with reference to Figs. 1 and 2, or 3 and 4, or 5 and 6, or 7 and 8, or 9 and 10, or 11 and 12, of the accompanying drawings.

12. A door mounted in facing relationship on a door frame by two or more hinges at one side of the door, the hinges being as defined in any of claims 1 to 9, whereby upon 130

opening of the door, the said side of the door
is moved away from the door frame.

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