Jan. 12, 1960 E. H. HOPKINS 2,920,340

HINGE MEANS FOR A SELF-CLOSING, GRAVITY-ACTUATED DOOR PANEL

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Fig. 1.

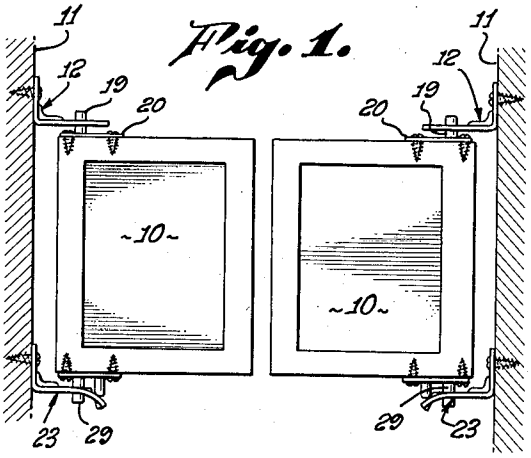


Fig. 3.

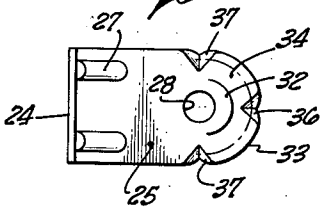


Fig. 2.

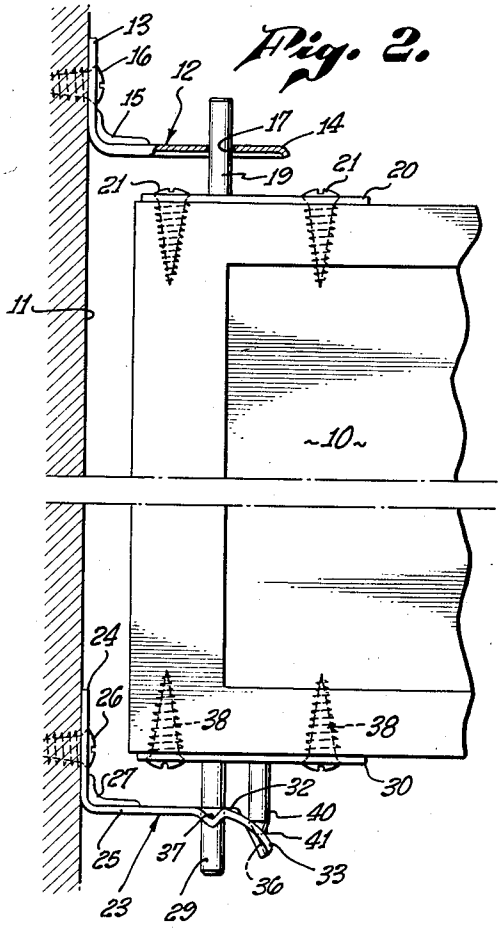


Fig. 4.

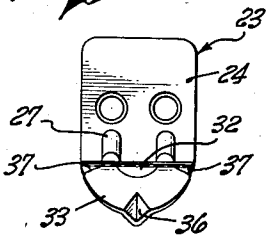
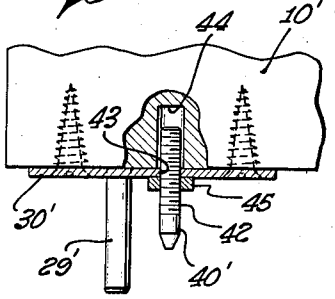


Fig. 5.



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HINGE MEANS FOR A SELF-CLOSING, GRAVITY-ACTUATED DOOR PANEL

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8 Claims. (Cl. 16—153)

This invention relates to hinge means for a self-closing, gravity-actuated, swingable door panel and the like. More particularly, this invention relates to hinge means for a door panel swingable in a horizontal zone with limited vertical displacement of the door panel during swinging movement.

Prior proposed hinge constructions for swingable door panels combining horizontal and slight vertical movement have been expensive, complicated, have provided inadequate retardation of swinging oscillations of the door panel, and usually were not provided with convenient means to hold such a door panel in open position. Such prior hinge constructions known to me have permitted a swinging door to return with great force and to oscillate many times while seeking its normal closed position. The forceful return of such doors was often annoying and dangerous to one just entering the doorway and often caused damage to articles carried by one entering the doorway.

Such swinging door panels are often used in pairs with the pair of panels in horizontal alignment in normal closed position. Accurate alignment was difficult with prior proposed hinge constructions for such door panels because the hinge plates were required to be precisely mounted on a door jamb and sometimes it was necessary to trim top and bottom edges of a pair of door panels to align such edges.

The present invention contemplates a novel hinge means for hanging a swingable door panel which obviates the disadvantages of prior proposed hinge constructions and which achieves new advantages over such prior hinge constructions.

Therefore, the primary object of this invention is to disclose and provide a simple, inexpensive, positive, gravity-actuated hinge means for a swingable door panel.

An object of this invention is to disclose and provide a hinge means wherein swinging movement of a swingable door panel is gently quickly dampened on its return swing.

Another object of this invention is to disclose and provide hinge means including positive means to position a swingable door panel in normal closed position.

Another object of this nivention is to disclose and provide a novel hinge means which may be easily adjustable to horizontally align a pair of swingable door panels.

A more particular object of this invention is to disclose and provide a novel construction of a hinge plate for the double acting, reversible, swingable door panel, said hinge plate being formed of an integral one-piece stamped or pressed piece of metal stock.

A more specific object of this invention is to disclose and provide a novel hinge means for a swingable door panel in which a jamb hinge plate is provided with a bottom support portion having a load bearing surface disposed in a downwardly inclined plane and partially encircling a pivot axis for a door panel, said surface having indentations or stop means symmetrically arranged about said pivot axis, and a door panel hinge plate having a depending support and positioning pin slidably contacting said load bearing surface on the jamb hinge plate.

Many other objects and advantages of this invention will be readily apparent to those skilled in the art from the following description and drawing in which exemplary embodiments thereof are shown.

In the drawing:

Fig. 1 is an elevational view of a doorway having a pair of door panels hung by hinge means of this invention.

Fig. 2 is an enlarged fragmentary view similar to Fig. 1, partly in section, showing the hinge means of this invention in greater detail.

Fig. 3 is a top view of a bottom jamb hinge plate of this invention.

Fig. 4 is an elevational view of the hinge plate of Fig. 3 taken from the right of Fig. 3.

Fig. 5 is a fragmentary sectional view of a modification of a bottom door panel hinge plate of this invention.

In Fig. 1 is shown a pair of swingable door panels **10, 10** hung by hinge means of this invention in a door frame including spaced door jambs **11**. The panels **10, 10** lie in the doorway in a vertical planar zone and are double acting, that is, each panel may be swung in either direction out of the planar zone and are automatically returned to the planar zone by gravity in normal operation of the door panels.

The hinge means of this invention may comprise a top jamb hinge plate **12** having a jamb portion **13** and an inwardly extending pivot portion **14** integral therewith and extending at substantially right angles thereto. The top plate **12** may be stamped from a single piece of flat metal stock and in the stamping operation, gusset-like laterally spaced ribs **15** may be formed for reinforcing and rigidifying the pivot portion **14**. The jamb portion **13** may be secured to jamb **11** as by suitable screws **16**.

The pivot portion **14** may be provided with a pivot port **17** spaced from jamb portion **13** to slidably receive an upstanding pin **19** fixed to a cooperable door panel hinge plate **20**. Top hinge plate **20** may be elongated and have a width not exceeding the width of the top edge face of the door panel. Top hinge plate **20** may be secured to the panel as by suitable spaced screws **21**.

The hinge means of this invention also includes a bottom jamb hinge plate **23** comprising an integral one-piece jamb portion **24** and a door panel load or support portion **25** extending therefrom at virtually right angles. The jamb portion **24** may be secured to the jamb **11** as by spaced screws **26** adjacent to the bottom of panel **10**. The jamb portion **24** and the support portion **25** may be stamped from a single piece of flat metal stock and in such stamping there may be provided laterally spaced gusset-like ribs **27** providing reinforcement and rigidifying the extended support portion **25**.

The support portion **25** is provided with a pivot port **28** spaced from the jamb portion and aligned with port **17** in the top jamb hinge plate, said port **28** slidably and pivotally receiving a depending pivot pin **29** carried by a bottom door panel hinge plate **30**.

The support portion **25** may include a segmental or part circle reinforcing stamped metal section **32** concentric with port **28**, the metal of section **32** being pressed to lie generally perpendicular to the axis of port **28** and to extend in a part cylindrical portion partially around port **28** for reinforcement of said support portion against vertical door panel loading outwardly of the axis of port **28**.

The support portion **25** includes a downwardly inclined load bearing section **33** providing a segmental or part circle load bearing surface **34** which extends partially around said port outwardly of the metal section

32. The bearing surface 34 may extend toward jamb portion 24 for a short distance inwardly of port 28.

Door panel positioning means may include a lowermost V-shaped indentation 36 pressed in surface 34 in prolongation of the longitudinal center line of the support portion, said V indentation serving as a positioning means for panel 10 in normal closed position. Side V-shaped indentations 37 may be stamped in bearing surface 34 in prolongation of a diameter of port 28 lying transverse to said center line, said side indentations 37 being above indentation 36 and serving as selectable positioning means for panel 10 in open position.

Door panel hinge plate 30 may be secured to the bottom edge face of door panel 10 as by screws 38. Spaced from depending pivot pin 29 on the hinge plate 30 is a depending door panel load-carrying support and positioning pin 40 of shorter length than pivot pin 29, said positioning pin 40 having a tapered or conical end 41 in contact with bearing surface 34. The axes of pins 29 and 40 lie in the neutral plane of door panel 10; that is, a plane bisecting the panel and lying parallel to side faces of the panel. Positioning pin 40, in this example, may be fixed in any convenient manner to hinge plate 30.

In normal closed position, panel 10 lies in the doorway defined by jambs 11 and is supported therein by support and positioning pin 40 in bearing contact with bearing surface 34 at lowermost indentation 36, the side slopes of walls of the indentation providing sufficient resistance for maintaining the door in said position. As the door panel is swung in one direction during passage therethrough, the door is raised in pivotal swinging movement by pin 40 traveling up inclined bearing surface 34 in a curved path about the axis of port 28. In normal opening of door panel 10, pin 40 may travel past an upper side indentation 37 to a position slightly beyond the center of indentation 37. When movement of panel 10 in said one direction is stopped, the weight of the panel will cause swinging thereof toward its normally closed position and pin 40 will downwardly return along its circular path on bearing surface 34. Indentations 37 are relatively shallow and will be overrun by pin 40 so that such normal closing movement will not be prevented. On return movement of the panel 10, pin 40 rides past and across indentation 36, but as it is caused to climb out of the side slope of indentation 36 and then ride up the inclined bearing surface 34 on the opposite side thereof, the steepness of the side slope of indentation 36 serves to substantially brake and retard the return movement of the door so that it travels only slightly beyond indentation 36. It then returns to normal closed position with pin 40 resting in indentation 36. While the swinging movement of the door panel has been explained with respect to opening in one direction, it will be readily understood that the same description applies to swinging of the door panel in the opposite direction because of the symmetry of indentations 37 and 36 about port 28.

If it is desired to position the door panel in open position, the door panel may be swung open until pin 40 rests in an indentation 37. The relatively shallow side slopes of walls of indentation 37 provide sufficient resistance for pin 40 to position the door panel in open position.

It will be understood that in the swinging movement of the panel 10 described above, the panel is elevated or lifted a small vertical distance by reason of the inclined bearing surface 34. Pivot pins 19 and 29 are sufficiently long so that they will not disengage from their respective ports 17 and 28 during such lifting. Normally, the amount of rise of such a door panel may be only a fraction of an inch.

In the modification shown in Fig. 5, the support and positioning pin is axially adjustable so that a pair of panels, one panel being indicated at 10′ and the other panel of the pair not being shown, may be accurately horizontally aligned with respect to their top and bottom edges. In the modification, a support and positioning pin 40′ may be provided with a threaded shank 42 which engages threads provided in an opening 43 in bottom door panel hinge plate 30′. The panel 10′ may be provided with a bore 44 to receive the inner end of pin 40′. To secure pin 40′ in a selected position, a lock nut 45 may be threaded on threads 42. Tightening of lock nut 45 against hinge plate 30 after pin 40′ has been selectively axially positioned will secure said pin in such position.

It should be noted that the inclination of bearing surface 34 should be sufficient so as to cause the force of gravity acting on said door panel to smoothly slowly return the door panel along its path to closed position. The inclination of surface 34 may be varied in accordance with the weight of the door panel supported thereon. Preferably, surface 34 is case hardened to provide a wear resistant surface. It may be waxed or treated with other suitable material so as to offer a minimum of surface friction to the end of pin 40.

All changes and modifications coming within the scope of the appended claims are embraced thereby.

I claim:

1. An integral one-piece hinge plate for use on a double-acting, swingable panel provided with a positioning member, comprising: a jamb-securing portion and a horizontal panel-support portion arranged at virtually right angles with each other; spaced reinforcing means pressed in said portions at the junction of said portions, said support portion having a port spaced from said jamb portion, said port being partially surrounded by a raised segment concentric therewith and reinforcing said support portion against loads applied in spaced relation to the axis of said port; and an inclined load-bearing surface partially encircling said port and extending below the plane of said horizontal support portion, said inclined bearing surface lying generally in a downwardly inclined plane intersecting the axis of said port and the longitudinal axis of said horizontal support portion, the lowest portion of said load-bearing surface being provided with an indentation to cooperate with the positioning member on the panel to normally position a panel in closed position.

2. A hinge plate as stated in claim 1 wherein said load-bearing surface includes a pair of diametrically opposed indentations at the upper portions of the load-bearing surface to cooperate with the positioning member on the panel to normally position a panel in opened position.

3. An integral one-piece hinge plate for use on a swingable panel provided with a positioning member, comprising: a jamb-securing portion and a panel-support portion arranged at virtually right angles with each other; reinforcing means pressed in said portions and integral therewith at the junction of said portions, said support portion having a port spaced from said jamb portion; an inclined load-bearing surface partially encircling said port and extending below the plane of said support portion; means including an embossed segment concentric with said port and integral with said load-bearing surface for reinforcing said support portion against loads applied outwardly of said port, said inclined bearing surface lying in a downwardly inclined planar zone intersecting the axis of the port and the longitudinal axis of the support portion; and means provided on said load-bearing surface for selective cooperation with the positioning member on the panel for selectively positioning the panel.

4. A hinge member for use in supporting a swingable panel having a pivot pin projecting downwardly therefrom and a positioning member projecting downwardly from the panel parallel to the pivot pin, said hinge member comprising a plate of substantially uniform thickness having a vertical jamb portion and a panel-support-

ing portion including an inner section extending substantially perpendicularly from said jamb portion, said panel-supporting portion being provided with a port outwardly from the juncture of said jamb portion and said panel-supporting portion to receive said pivot pin and an outer section inclined downwardly from the outer end of said inner section and having an arcuate bearing surface for said positioning member outwardly of and generally concentric with said port and a corrugation formed therein at the lowest portion of said bearing surface providing an indentation for engagement by the positioning member to position the panel in a predetermined position, and said panel-supporting portion having formed therein a raised arcuate corrugation outwardly of and generally concentric with said port and between said port and said arcuate bearing surface for reinforcing said panel-supporting portion against loads applied thereto in spaced relation to said port.

5. A hinge member as claimed in claim 4 wherein two additional corrugations are formed in said panel-supporting portion each spaced at approximately 90° around the axis of said port from said first corrugation and approximately at the juncture of the inner and outer sections of said panel-supporting portion and defining indentations adapted respectively to receive the positioning member to position the panel in corresponding positions selectively.

6. A hinge member as claimed in claim 4 wherein a pair of reinforcing corrugations are formed therein at the juncture of said jamb portion and said panel-supporting portion each of said corrugations extending continuously from one of said portions to the other in spaced relation to each other and to the side edges of said plate.

7. A hinge member for use in supporting a swingable panel having a pivot pin projecting downwardly therefrom and a positioning member projecting downwardly from the panel parallel to the pivot pin, said hinge member comprising a plate of substantially uniform thickness having a vertical jamb portion and a panel-supporting portion including an inner section extending substantially perpendicularly from said jamb portion, and an outer section inclined downwardly from the outer end of said inner section, said panel-supporting portion being provided with a circular port extending perpendicularly therethrough at the juncture of said inner and outer sections and spaced outwardly from the juncture of said jamb portion and said panel-supporting portion to receive said pivot pin, and said outer section having an arcuate bearing surface for said positioning member outwardly of and generally concentric with said port, a corrugation formed therein at the lowest portion of said bearing surface providing an indentation for engagement by the positioning member to position the panel in a predetermined position, and a raised arcuate corrugation immediately outwardly of and generally concentric with said port and between said port and said arcuate bearing surface and of such height that the upper and lower faces of the panel-supporting portion immediately surrounding said port lie in the planes of the upper and lower faces of the inner section.

8. A hinge member for use in supporting a swingable panel having a pivot pin projecting downwardly therefrom and a positioning member projecting downwardly from the panel parallel to the pivot pin, said hinge member comprising a plate having a vertical jamb portion and a panel-supporting portion including an inner section extending substantially perpendicularly from said jamb portion, and an outer section inclined downwardly from the outer end of said inner section, said panel-supporting portion being provided with a port at the juncture of said inner and outer sections and spaced outwardly from the juncture of said jamb portion and said panel-supporting portion to receive said pivot pin, and said outer section having an arcuate bearing surface for said positioning member outwardly of and generally concentric with said port and an indentation formed therein at the lowest portion of said bearing surface providing a seat for engagement by the positioning member to position the panel in a predetermined position, and said panel-supporting portion having formed therein a raised segment outwardly of and generally concentric with said port and between said port and said arcuate bearing surface for reinforcing said panel-supporting portion against loads applied thereto in spaced relation to said port.

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