June 8, 1943. E. H. ZECHIEL 2,321,118

HINGE

Filed Jan. 9, 1942 2 Sheets-Sheet 1

Fig. 1.

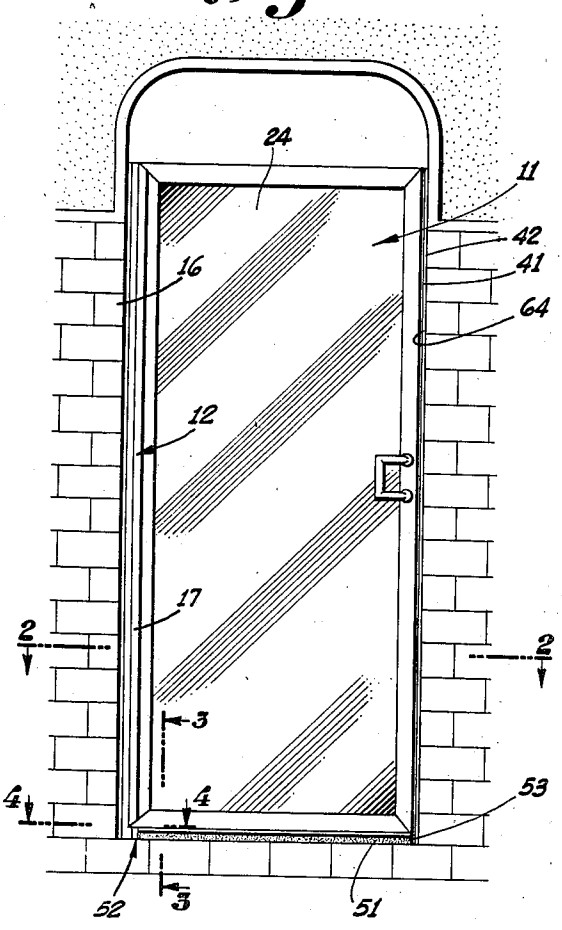
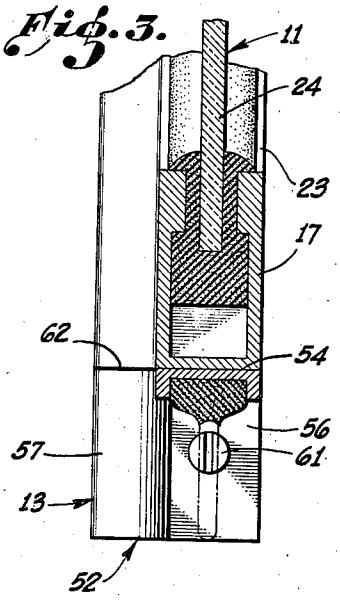


Fig. 3.



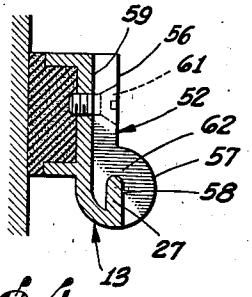


Fig. 4.

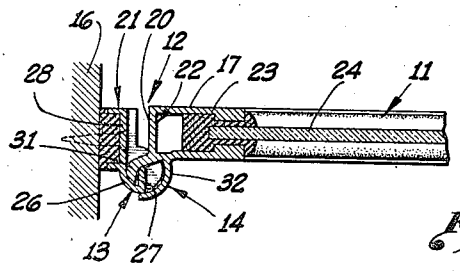
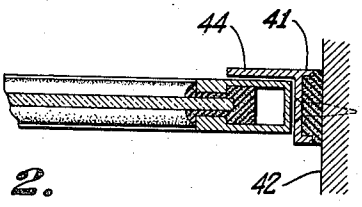


Fig. 2.



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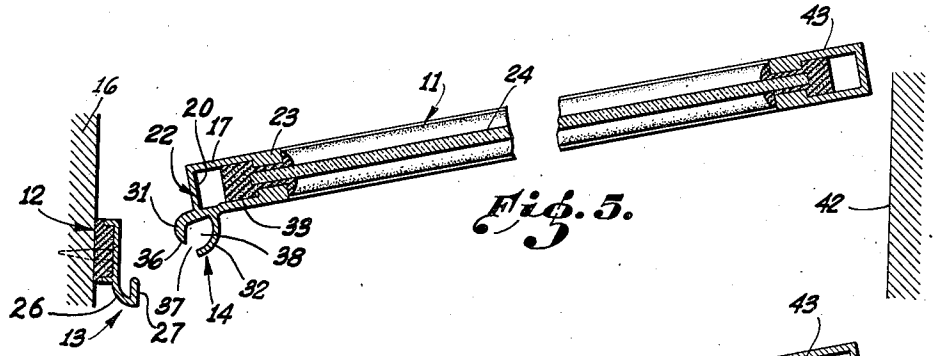


Fig. 5.

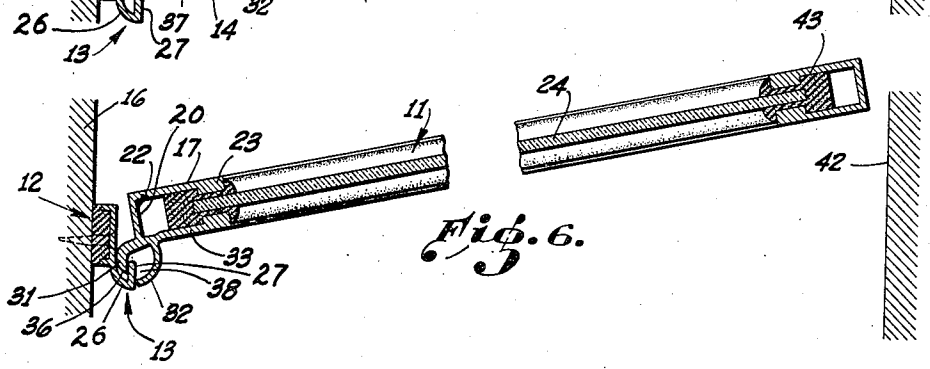


Fig. 6.

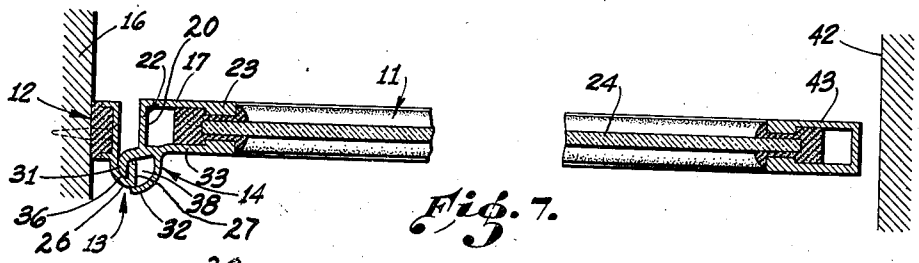


Fig. 7.

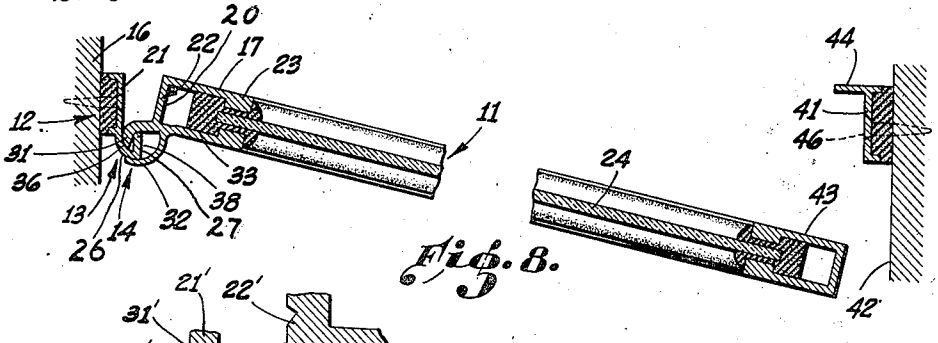


Fig. 8.

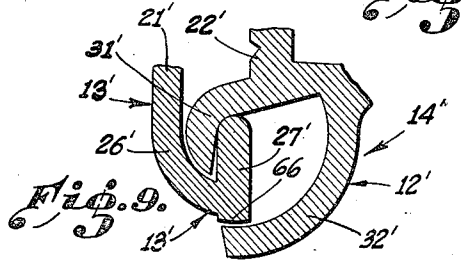


Fig. 9.

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2,321,118

HINGE

Eugene H. Zechiel, North Hollywood, Calif.

Application January 9, 1942, Serial No. 426,198

6 Claims. (Cl. 16—171)

This invention relates to hinge constructions, and has for an object the provision of an improved and simplified hinge of the longitudinally continuous type known in the trade as the "piano hinge."

Another object of my present invention is the provision of a continuous hinge of the general character indicated, which, instead of employing alternate, coaxially arranged hubs pivotally interengaged by a separate pintle, comprises cooperatively interfitted hubs engaged one within the other in such a manner that the male hub serves as the pintle pivotally interconnecting the two leaves of the hinge.

A further object in this connection is to provide a hinge which is perfectly free swinging throughout its entire range of movement, permanently rattle-proof, and thoroughly dependable in that it can be relied upon indefinitely to support the load imposed upon it, and yet which is so arranged that the two parts are substantially instaneously disconnectible, thereby permitting facile and expeditious mounting and dismounting of the hingedly supported member.

Another object is to provide a longitudinally continuous hinge as described, which is particularly adapted for, but is not necessarily limited to, use in connection with a shower door, for the reason that it provides a substantially water tight joint between the hingedly joined members, and also, because its design is such that it lends itself with particular aptitude for manufacture as an integral part of the metal channel commonly employed as a frame for the glass of conventional glass shower doors.

A further object of my invention is the provision of a hinge for a shower door or the like, which does not detract from the ornamental appearance of the associated fixtures, but, on the contrary, is substantially invisible, and therefore not recognizable as a hinge structure, at all, except under rather close scrutiny.

This invention possesses other objects and valuable features, some of which, with those enumerated, will be set forth in the following description of the preferred embodiment of my invention illustrated in the drawings accompanying and forming a part of the specification. It is to be understood that I do not limit myself to the showing made by these drawings and description as I may adopt variations of the preferred form within the scope of my invention as defined in the claims.

Referring to the drawings:

Figure 1 is a view in front elevation of a glass shower door hingedly supported by means of a hinge construction embodying the principles of the present invention.

Figure 2 is an enlarged detailed view in horizontal section taken upon the lines 2—2 of Fig. 1 with the direction of view as indicated. Portions of the figure are broken away to reduce its length.

Figure 3 is a more highly enlarged detailed view in vertical section taken upon the lines 3—3 of Fig. 1 with the direction of view as indicated.

Figure 4 is another detailed view substantially the same scale as Fig. 3 taken in horizontal section upon the lines 4—4 of Fig. 1.

Figures 5, 6, 7, and 8 are all views similar to Fig. 2 but illustrate the door in successive steps of its mounting upon the jam.

Figure 9 is a detail view in transverse section, drawn to enlarged scale, of a slightly modified form of hinge construction embodying the principles of the present invention.

The drawings illustrate the hinge of my invention as being used for the pivotal support of a glass shower door 11 inasmuch as certain details of the construction of the hinge adapt it particularly for this type of service. However, is is to be understood that the hinge can be applied to other structures such as other types of doors, French windows, and the like, without departing from the spirit of the present invention.

It will be observed that the hinge, which is indicated in its entirety at 12, comprises male and female hub sections 13 and 14, respectively, connected rigidly with the jamb 16 and the hinged edge 17 of the door 11, respectively. It should be understood, however, that these parts can be reversed with equal advantage, i. e., by mounting the male hub 13 upon the door and the female hub 14 upon the jamb. Both of the hub sections 13 and 14 are preferably substantially coextensive in length with the door 11, consequently the hinge construction is substantially invisible, there being no interstices between alternate hubs, which, in more conventional hinges are fully visible and often disfigure the fixtures with which they are associated because of the presence of dirty lubricants therein.

One of the reasons that the hinge of the present invention lends itself with particular aptitude for use in connection with a glass shower door is that the leaf associated with each of the hubs very conveniently can be formed as an in-

tegral portion of a part of the ordinary hardware employed in the construction of such doors and their associated jamb members. With this idea in mind the leaf 21 of the male hub member 13 is of channel section preferably identical in shape and size to the channel member conventionally employed as the jamb of a glass shower door. Similarly the leaf 22 of the female hub section 14 can conveniently be formed as an integral portion of the channel section 23 within which one edge of the glass 24 is mounted.

The male hub section 13 comprises two flanges 26 and 27. The flange 26 is of arcuate cross section and extends laterally from the channel shaped jamb member 21. Where the flange 26 first leaves channel 21 it is substantially in planar alignment with the web 28 of the channel 21, whence the flange extends through substantially 90° of arc so that adjacent its outer edge the flange 26 extends in a plane substantially perpendicular to and offset from the web 28 as is clearly seen in Fig. 2. The flange 27 is a terminal flange inasmuch as it is carried at the extreme outer edge of the arcuate flange 26. This terminal flange 27 extends inwardly, i. e., towards the center of the arc described by the flange 26—in fact center of this arc preferably lies within the terminal edge of the flange 27; and it is about this arc's center that the two hinge sections rotate with respect to each other.

The female hub section 14 also comprises a pair of flanges 31 and 32, these flanges, however, being in opposed relationship inasmuch as they both are mounted directly upon the leaf 22 of this hinge section and extend in different directions therefrom. The initial portion of the flange 31 represents a continuation of one side 33 of the associated channel 23; and at a short distance from the outer face of the web 20 of this channel the flange 31 is deflected outwards thus presenting a lip 36 which preferably is curved on its outer face whereas its inner face is substantially flat and disposed in a plane extending at only slight angularity to that of the web 20. The flange 32 extends from the side 33 of the channel 23 offset towards the center of the door 11 from the web 20 of the channel 23. This flange 32 is arcuate with the result that although the portion of the two flanges 31 and 32 which are proximal to the channel 23 are divergent with respect to each other, their outer portions converge toward each other. The two flanges 31 and 32 terminate, however, short of actual contact with each other thus leaving an opening 37 leading into the space 38 embraced by the flanges 31 and 32. Furthermore, the flange 32 terminates short of the plane of the flat inner side of the lip 36 of the other flange 31 as is most clearly shown upon Fig. 5. The center of the arc described by the flange 32 is disposed closely adjacent or actually within the line of intersection of the lip 36 with the remainder of the flange 31. In size the inner face of the flange 32 of the female hub is substantially the same as, or slightly larger than, the outer face of the arcuate flange 26 of the male hub.

Fig. 2 illustrates the manner of interengagement of the male and female hubs 13 and 14, respectively, when the hinge is assembled so as to pivotally support the door 11 upon the jamb 16. The arcuate flange 26 of the male hub 13 curves around the outer edge of the lip 36 of the flange 31 of the female hub 14, and hence through the opening 37 so as to dispose the terminal flange 27 of the male hub inside the space 38 embraced between the flanges 31 and 32 of the female hub 14. Accordingly, the terminal edge of the flange 27 lies closely adjacent the line of intersection of the lip 36 and the remainder of the flange 31 and the flange 27 operates to prevent separation of the hinge section in a direction parallel to a tangent to the arcuate flange 26 taken adjacent its outer edge, i. e., in a direction perpendicular to the face of the jamb 16.

As stated, the arcuate flange 32 of the female hub section 14 terminates short of the plane of the flat inner face of the lip 36 of the other flange 31; but the distance between this plane and the extreme terminal edge of the arcuate flange 32 is less than the thickness of the terminal flange 27 of the male hub section 13 with the result that when the door is in its fully closed position as illustrated in Figs. 2 and 7, the outer edge of the arcuate flange 32 extends into overlapping relationship with the arcuate flange 26 of the male hub section 13 and thereby prevents separation of the hub sections in a direction substantially parallel to this terminal flange 27.

It is this engagement between the inner face of the flange 32 of the female hub with the outer face of the arcuate flange 26 of the male hub which retains the extreme edge of the terminal flange 27 seated within the line of intersection of the lip 36 with the remainder of the flange 31 of the female hub section. During opening and closing movements of the door 11 the female hub section pivots in a rocking movement about this extreme edge of the terminal flange 27; and when the door has swung open through 90° thus swinging the lip 36 of the flange 31 so far that the plane of its inner face then is perpendicular to the face of the jamb 16, the arcuate flange 32 of the female hub will have slid through 90 degrees around the arcuate outer face of the flange 26 of the male hub so that separation of the hub sections by movement of the door directly away from the jamb 16 is then prevented by such engagement between the two arcuate flanges 32 and 26. When in that position the flanges 32 and 26 are held against separation in a direction parallel to the face of the jamb and downwards as viewed upon Figs. 2 and 5 to 8 inclusive, is prevented by the engagement of the terminal edge of the flange 27 of the male member with the inner face of the lip 36 of the flange 31 of the female member.

In accordance with conventional practice the door 11 is provided with a stop 41 affixed rigidly to the jamb 42 opposite the jamb 16 to which the door is hinged. As stated hereinabove when the door is in its fully closed position, this being determined by engagement of the outer edge 43 of the door 11 when a flange 44 on the door stop 41 the extreme edge of the arcuate flange 32 of the female hub section is disposed in overlapping relationship with the arcuate flange 26 of the male hub section 13. However, when it is desired to dismount the door 11 from the jamb 16 on which it is hinged it is necessary only to remove the stop 41, it being understood that this stop 41 is mounted, as by screws 46 or the like so as to permit facile mounting and dismounting of the stop 41. After the stop 41 has been removed the door can be swung beyond its closed position slightly, to substantially the position illustrated in Fig. 6 wherein the extreme edge of the arcuate flange 32 of the female hub section has been withdrawn from its overlapping engagement with the arcuate flange 26 of the male hub section. Thereafter all that is necessary to dis-

mount the door is to move the entire door bodily upwards and to the right slightly as viewed upon Figs. 5 to 8 inclusive, i. e., from the position illustrated in Fig. 6 to the position illustrated in Fig. 5. Accordingly, it is not necessary to slide one hub section axially with respect to the other to effect their engagement or disengagement as is the case with more conventional continuous hub type hinges. This is another of the features which particularly adapt the hinge of the present invention for use in connection with shower doors for the reason that it is quite common for such doors to be installed in locations where they cannot be opened far enough to permit fastening the jamb channel 21 in place while the door is operatively mounted thereupon. Neither is it feasible first to fasten the jamb channel 21 in position and then to engage the door thereupon by sliding axially the full length of the door for the reason that overhead structure prevents raising the door high enough to permit the lower edge of the door to be slipped over the upper edge of the hub section carried by the jamb.

Mounting the door upon the jamb after the male hub section 13 has been rigidly secured thereupon is accomplished in the reverse manner from that already described. This is accomplished before the stop 41 has been mounted. The door 11 is first placed in approximately the position illustrated in Fig. 5, i. e., swung slightly beyond its fully closed position. This will permit the lip 36 of the flange 31 of the female hub section to be slid behind the terminal flange 37 of the male hub section as indicated in Fig. 6. Continuing movement of the door bodily downward, i. e., in translatory movement until the extreme edge of the terminal flange 27 engages the line of intersection of the lip 36 with the remainder of its flange 31. It will be found that the extreme edge of the arcuate flange 32 of the female hub section will then have passed the inner edge of the terminal flange 27 of the male hub section with the result that the door can then be swung to its closed position as illustrated in Fig. 7 and then beyond that to its open position as in Fig. 8. Thereupon, the stop 41 should be mounted in operative position as in Figs. 2 and 7 which will effectually prevent the door from swinging to that position in which it can be released from the jamb 16 on which it is hinged.

Means are provided preferably adjacent the bottom of the door to support the weight of the door and thereby retain it at the desired elevation above the threshold 51. Such means conveniently takes the form of a cleat 52 substantially corresponding in length to the space 53 which is to be left between the threshold 51 and the bottom edge 54 of the mounted door. This cleat 52 comprises a flat portion 56 having an enlarged bead 57 along one edge thereof. A notch 58 is formed in the outer face of the bead 57 complementary to and adapted to receive the terminal flange 27 of the associated portion of the male hub 13; and that face 59 of the flat portion 56 is formed complementary to the outer face of the jamb channel 21 against which it is securely but removably clamped as by one or more machine screws 61. The lower end of the female hub section 14 rides upon the upper face 62 of the cleat 53 and thereby serves to support the door 11 at its desired elevation within the doorway 64 for which it serves as a pivoted closure.

Since both flanges of both hub sections are continuous and substantially coextensive in length to the door and jamb with which they are associated they provide a substantially invisible hinge, or at least a hinge which is not readily identifiable as such because of the absence of interstices between alternate hubs such as those employed in the conventional hinge wherein hubs are interconnected by a removable pintle. The absence of such interstices also aids in making the hinge a substantially water-tight joint. However, in the event that the interior surfaces of the hinge should become contaminated by the sediment which frequently accumulates on fixtures associated with a shower stall it can readily be removed simply by dismounting the door and then wiping the exposed surfaces of the cooperative hinge parts. The completely open nature of both male and female hub sections permits easy access to both the exterior and the interior surfaces thereof so that such cleansing can be accomplished readily.

Figure 9 illustrates a slightly modified form of my improved continuous hinge, wherein the male hub member 13' is provided with a slight bead 66 on the outer face of the arcuate flange 26'. This bead 66 is disposed on that portion of the flange 26' which is concealed behind the outer edge of the arcuate flange 32' of the female hub section 14' when the door is closed. Consequently the bead 66 might be considered a continuation of the terminal flange 27'. Its function is to provide a bearing surface to retain the flange 32' spaced from the portion of the flange 26' which is visible, and thereby protect this visible portion from the scratching and wear which are apt to develop in the absence of such spacing means. In other respects, this modification is the same as that previously described, the male hub 13' being mounted upon its supporting leaf 21' and engaged by the opposed flanges 31' and 32' of the female hub 12', which is carried by the leaf 22'.

I claim:

1. In a hinge of the character described, a pair of cooperative hinge leaves adapted to be mounted respectively on a stationary member and on a member movable with respect thereto, a female hub on one of said leaves comprising an arcuate flange and a retaining flange extending divergently from their associated leaf, the outer portions of said flanges extending toward each other but terminating in relatively spaced relation to define an opening leading to the space embraced by said flanges, and a male hub on the other of said leaves comprising an arcuate flange curving around the outer edge of said retaining flange of said female hub and through said opening into said embraced space and a radial flange extending radially inwards from both of said arcuate flanges to said retaining flange where it is disposed substantially at the center of the arcs of said arcuate flanges, the inner face of said female arcuate flange slidably engaging the outer face of said male arcuate flange of said male hub as relative rotary motion occurs between said hubs.

2. In a hinge of the character described, a pair of cooperative hinge leaves adapted to be mounted respectively on a stationary member and on a member movable with respect thereto, a female hub on one of said leaves comprising a pair of opposed flanges extending divergently from their associated leaf, the outer portions of said flanges extending toward each other but terminating in relatively spaced relation to define an opening leading to the space embraced by said

flanges, and a male hub on the other of said leaves comprising an arcuate flange curving around the outer edge of one of the flanges of said female hub and through said opening into said embraced space and a radial flange extending radially inwards from said arcuate flange, the terminal edge of said radial flange being disposed substantially at the center of the arc of said arcuate flange and engaging the inner face of said flange around the edge of which said arcuate flange extends, the inner face of the other flange of said female hub also being arcuate about said center and slidably engaging the outer face of said arcuate flange of said male hub as relative rotary motion occurs between said hubs, said arcuate flange of said female hub extending beyond the intersection of said flanges of said male hub to engage said arcuate flange of said male hub and thereby restrain said hubs against separation in a direction substantially parallel to said radial flange in all normal relative positions of said hubs.

3. In a hinge of the character described, a pair of cooperative hinge leaves adapted to be mounted respectively on a stationary member and on a member movable with respect thereto, a female hub on one of said leaves comprising a pair of opposed flanges extending divergently from their associated leaf, the outer portions of said flanges extending toward each other but terminating in relatively spaced relation to define an opening leading to the space embraced by said flanges, and a male hub on the other of said leaves comprising an arcuate flange curving around the outer edge of one of the flanges of said female hub and through said opening into said embraced space and a radial flange extending radially inwards from said arcuate flange, the terminal edge of said radial flange being disposed substantially at the center of the arc of said arcuate flange and engaging the inner face of said flange around the edge of which said arcuate flange extends, the inner face of the other flange of said female hub also being arcuate about said center and slidably engaging the outer face of said arcuate flange of said male hub as relative rotary motion occurs between said hubs, said arcuate flange of said female hub terminating short of the plane of the outer face of said radial flange of said male hub when said male hub has swung to one of its extreme positions whereby said hubs can be separated by lateral movement in a direction parallel to said radial flange.

4. In a hinge of the character described, a pair of cooperative hinge leaves adapted to be mounted respectively on a stationary member and on a member movable with respect thereto, a female hub on one of said leaves comprising a pair of opposed flanges extending divergently from their associated leaf, the outer portions of said flanges extending toward each other but terminating in relatively spaced relation to define an opening leading to the space embraced by said flanges, and a male hub on the other of said leaves comprising an arcuate flange curving around the outer edge of one of the flanges of said female hub and through said opening into said embraced space and a radial flange extending radially inwards from said arcuate flange, the terminal edge of said radial flange being disposed substantially at the center of the arc of said arcuate flange and engaging the inner face of said flange around the edge of which said arcuate flange extends, the inner face of the other flange of said female hub also being arcuate about said center and slidably engaging the outer face of said arcuate flange of said male hub as relative rotary motion occurs between said hubs, said arcuate flange of said female hub terminating short of the plane of the outer face of said radial flange of said male hub when said male hub has swung to one of its extreme positions whereby said hubs can be separated by movement in a direction parallel to said radial flange, and removable stop means rigid with said stationary member in position to engage said movable member and restrict it against movement to disengaging position of said hubs.

5. In a hinge of the character described, a pair of cooperative hinge leaves adapted to be mounted respectively on a stationary member and on a member movable with respect thereto, a female hub on one of said leaves comprising a pair of opposed flanges extending divergently from their associated leaf, the outer portions of said flanges extending toward each other but terminating in relatively spaced relation to define an opening leading to the space embraced by said flanges, and a male hub on the other of said leaves comprising an arcuate flange curving around the outer edge of one of the flanges of said female hub and through said opening into said embraced space and a radial flange extending radially inwards from said arcuate flange, the terminal edge of said radial flange being disposed substantially at the center of the arc of said arcuate flange and engaging the inner face of said flange around the edge of which said arcuate flange extends, the inner face of the other flange of said female hub also being arcuate about said center and slidably engaging the outer face of said arcuate flange of said male hub as relative rotary motion occurs between said hubs, said arcuate flange of said female hub extending beyond the intersection of said flanges of said male hub to engage said arcuate flange of said male hub and thereby restrain said hubs against separation in a direction substantially parallel to said radial flange in all normal relative positions of said hubs, and means providing a raised portion on that portion of the outer face of said arcuate flange of said male hub member beyond which said arcuate flange of said female hub member normally extends whereby contact is prevented between the normally exposed portion of said outer face of said arcuate flange of said male hub member of said arcuate flange of said female hub member.

6. In a hinge of the character described, a pair of cooperative hinge leaves adapted to be mounted respectively on a stationary member and on a member movable with respect thereto, a female hub on one of said leaves comprising a pair of opposed flanges extending divergently from their associated leaf, the outer portions of said flanges extending toward each other but terminating in relatively spaced relation to define an opening leading to the space embraced by said flanges, and a male hub on the other of said leaves comprising an arcuate flange curving around the outer edge of one of the flanges of said female hub and through said opening into said embraced space and a radial flange extending radially inwards from said arcuate flange, the terminal edge of said radial flange being disposed substantially at the center of the arc of said arcuate flange and engaging the inner face of said flange around the edge of which said arcuate flange extends, the inner face of the other flange of said female hub also being arcuate about said center and slidably engaging the outer face of

said arcuate flange of said male hub as relative rotary motion occurs between said hubs, said arcuate flange of said female hub terminating short of said male hub when said male hub has swung to one of its extreme positions whereby said hubs can be separated by movement in a direction parallel to said radial flange, and removable stop means rigid with said stationary member in position to engage said movable member and restrict it against movement to disengaging position of said hubs, and means providing a raised portion on that portion of the outer face of said arcuate flange of said male hub member beyond which said arcuate flange of said female hub member normally extends whereby contact is prevented between the normally exposed portion of said outer face of said arcuate flange of said male hub member and said arcuate flange of said female hub member.

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