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DISAPPEARING DOOR STRUCTURE

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2 Sheets-Sheet 2

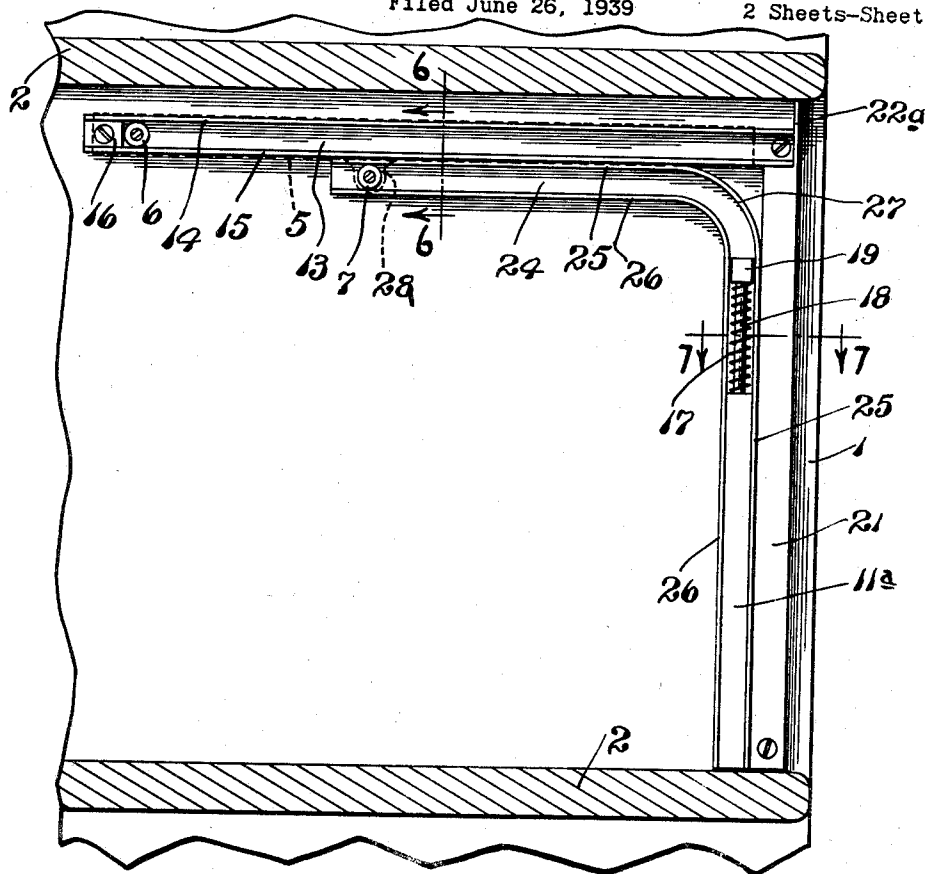


Fig. 5.

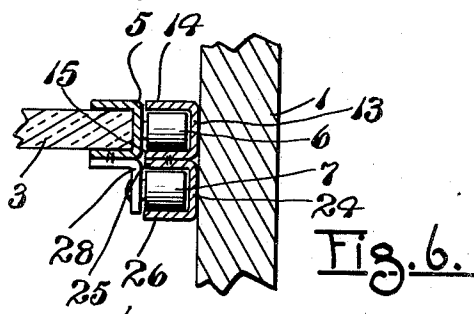


Fig. 6.

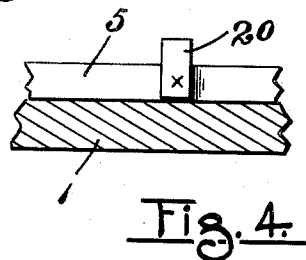


Fig. 4.

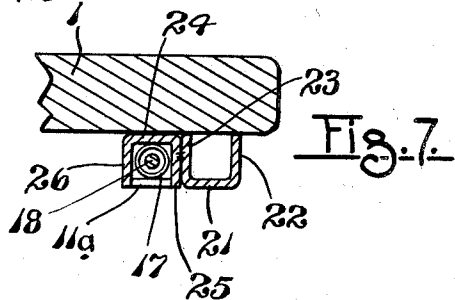


Fig. 7.

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DISAPPEARING DOOR STRUCTURE

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This invention relates to a door structure and more particularly to a door which is adapted to close the opening at the front of a case, cabinet or shelving and which may be lifted and moved inwardly and received within the said case, cabinet or shelving. In doors of this kind the weight of the door would tend to cause it to fall with considerable force and, under the influence of gravity it might strike against portions of the case or shelving with danger of injuring the door or its mounting; and in those instances where the door is partially of glass, the glass might be cracked or perhaps completely shattered, while in substantially all instances, unless the door should be held against such dropping under the influence of gravity, undesirable noises are made.

The present invention is directed to a very practical, useful and yet simple construction of door mounting in which the door is very readily moved from its operative closed position to its open position and back to its closed position, without development of undesired noises of operation and without danger of injury to the door or its mounting in any manner.

The invention may be understood from the following description, taken in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary vertical section showing the door mounting in side elevation at one end of a shelving case wherein the outer opening to the space between two parallel horizontal shelves is adapted to be closed by a door, the mounting for the door being shown in the position it occupies when the door has been retracted into the case.

Fig. 2 is a similar section and elevation, showing the position of the mounting for the door when the door is in its closed position.

Fig. 3 is a fragmentary vertical section at right angles to that shown in Fig. 2, a portion of the door being shown in elevation.

Fig. 4 is a horizontal section and under plan view substantially on the plane of line 4—4 of Fig. 2, looking upwardly in the direction of the arrows.

Fig. 5 is a view in section similar to Fig. 1, showing a different form or embodiment of the invention and one which for many reasons may be preferred, and

Figs. 6 and 7 are vertical and horizontal sections respectively on the planes of lines 6—6 and 7—7 of Fig. 5, looking in the directions indicated.

Like reference characters refer to like parts in the different figures of the drawings.

The shelving to which the door and its mount-

ing are shown applied may have vertical ends 1, between which parallel spaced horizontal shelves 2 are carried. Of course the case may be equipped with other shelves above and below those shown, and it will have the ordinary top cornice and bottom. It is between the front portions of the shelves that the door is adapted to be vertically located when it is closing the entrance to said space. In practice the door consists of a glass plate 3 which has a metal channel border 4 at its lower edge, and similar metal channel borders 5 at its vertical edges.

When the door is in its closed position, as shown in Fig. 3 and as indicated in Fig. 2, two rollers, an upper roller 6 and a lower roller 7, project from each end channel 5 and are received in guides located against the inner side of each of the ends 1 near their front edges. These guides are also of metallic channel form having a bottom web 8 with spaced flanges 9 and 10, the rollers 6 and 7 extending into the space between said flanges. The lower portion of the guide is covered by a cover 11 which extends between and may be integral with the metal from which the guide is made. Such cover 11 extends from a point substantially midway between the upper and lower ends of the guide to the lower end thereof, and also covers an angle member 12 located at the bottom of the guide. The door mounting at the inner side of each end 1 of the case also includes a horizontal guide likewise of channel form, having a bottom or web 13, and upper and lower horizontal flanges 14 and 15. The upper flange 14 extends forward, as at 14a, to the outer flange 9 of the front vertical guide with which it is associated, while the flange 15 of the front vertical guide is cut away as shown, so that the rollers 6 and 7 may pass from their vertical guides into their associated horizontal guides as the door is moved from its closed position into the case, whereupon the rollers 6 and 7 will occupy the positions indicated in Fig. 1, the roller 6 coming against a stop 16 located adjacent the inner end of the horizontal guide described.

Within each of the vertical guides for the door a coiled compression spring 17 is located, at its lower end resting upon the member 12. A rod 18 extends downwardly through the upper portion of the spring 17 and is equipped with a head 19 at its upper end which rests upon the upper end of its associated spring 17.

With the door open, as in Fig. 1, the door being indicated in dotted outline, the heads 19 are elevated. When the door is pulled outwardly the rollers 6 and 7 traverse the lower flanges 15 of

the horizontal guides until said rollers successively reach the vertical guides. The rollers 7 reach said guides first and thereupon move downwardly between the flanges 9 and 10 of the vertical guides, until they engage the upper ends of the heads 19. The weight of the door thereupon compresses the springs 17, so that heads 19 and rods 18 are forced downwardly. The upper rollers 6 remain against the upper flanges 14 and their extensions 14a of the horizontal guides at all times, and when the door is in a vertical position, as in Figs. 2 and 3, the rollers 6 and 7 are in direct vertical alinement, the springs 17 are compressed, and the door is held in its closed position, inasmuch as the force of the springs 18 is in direct vertical alinement with the axes of the rollers 6 and 7. Or as it may be stated, the force of the springs is in a dead center line direction, and is not exerted in any manner so as to cause the door to be tilted away from its closed vertical position.

To open the door it is necessary merely to exert an inward pressure against the upper portion thereof, whereupon the rollers 6 will move backwardly in the horizontal channel guides and the springs 17 will partially lift the door toward open position or until their diminishing force is balanced by that part of the weight of the door which is carried on the heads 19. The door will thereupon be tilted outwardly and downwardly and can be lifted at its lower edge portion to horizontal and moved rearwardly with all of the rollers 6 and 7 received between the flanges 14 and 15 of the upper horizontal guides.

When the door is within the case and in horizontal position as indicated in Fig. 1, its forward portion outwardly and beyond the rollers 7 is adapted to rest upon inwardly extending tongues 20 of metal which may be spot-welded to the under flanges 15 of the horizontal guides as shown, whereby the weight of the free outer portion of the door beyond the roller 7 does not react upwardly solely against the rollers 6 bearing against the under sides of the upper flanges 14 of the horizontal guides. This prevents undue strain upon the rollers and also any tendency to distort the flanges 14 or the lower flanges 15 where the rollers 7 bear thereagainst.

In closing the door, when it is drawn outwardly, if the operator releases his hold upon the door the effect is merely to partially compress the springs 17, which check the door from falling so that its lower edges does not strike against the lower shelf 2. It is of course to be understood that while the channel guides for the rollers 6 and 7 and for the reception of the springs 17 and associated rods 18 and heads 19 are shown as located at the inner sides of the sides 1 of the case, such guides may be inserted in grooves in such sides of the case, the grooves being of a depth to either wholly or partially receive the guides.

In Figs. 5 to 7 inclusive, the guides are of a different form in some respects. The upper horizontal guide having the web 13 and the upper and lower flanges 14 and 15 and the rear stop 16 is substantially the same as previously described, except that the upper flange does not extend forward any farther than the lower flange, and there is no extension such as indicated at 14a in Fig. 1. Associated with the front end of the upper horizontal guide is a vertical post of channel form having a web 21 and two spaced outwardly extending flanges 22 and 23. At its upper end the post has the inner flange 23 and the web 21 cut away, leaving a vertical extension 22a of

the flange 22 which covers the front end of the horizontal upper guide. The post extends from the front end of the horizontal upper guide downwardly to the next lower shelf 2 and is mounted adjacent the front edge of the end 1 of the case to which it is attached.

Underneath the horizontal upper guide and back of the post 21 is a guide also of channel-like form in cross-section, having a web 24 and spaced flanges 25 and 26 extending therefrom, which is bent into a curved form at its intermediate portion as indicated at 27, so that this guide has three sections, a horizontal and a vertical section lying at right angles to each other connected by the curved intermediate section 27. The vertical section of the guide is located back of the flange 23 of the previously described post, with flanges 23 and 25 in contact engagement and preferably spot-welded or otherwise permanently secured together. The horizontal section of this guide lies underneath the intermediate portion of the upper horizontal guide with the flanges 15 and 25 together and permanently secured by spot-welding or its equivalent. The lower portion of the vertical section of this guide is equipped with a covering plate 11a and it is back of this plate that the spring 17 and rod 18 are disposed, and with the head 19 at the upper end of the rod 18, the same as such structure is mounted in the vertical guide in the first described form back of the cover plate 11 as shown in Figs. 1, 2 and 3.

Instead of the rollers 7 being connected directly to the metallic borders 5 at the ends of the door, said rollers are carried by angle brackets 23, the horizontal legs of which are permanently secured by welding to the lower flanges of the borders, said rollers being mounted on the vertical legs of the brackets. The rollers 6 are located on the doors in the same manner as previously described and are received between the flanges 14 and 15 of the upper horizontal guide, while the rollers 7 are received in the last described guide between the flanges 25 and 26 thereof.

With the door received within the case and lying horizontally in the upper portion thereof between the upper horizontal guides, to close the door it is drawn outwardly, whereupon rollers 6 move between the guide flanges 14 and 15 and the rollers 7 between the guide flanges 25 and 26. The rollers 7 upon reaching the curved section 27, change direction and move into the vertical sections of the last described guides until heads 19 are engaged, whereupon the springs 17 are compressed and the door may be closed in the same manner as previously described with reference to the structure shown in Fig. 1. There is no danger of the door being drawn outwardly in a horizontal plane too rapidly and have the rollers 7 strike against the outer flanges of the vertical guides as in Fig. 1, as said rollers 7 are compelled to follow the curved path of the section 27, and the door is compelled to correspondingly follow the rollers, with an automatic change of position of the door from horizontal to vertical without impact of the rollers against any parts of the guide flanges which might produce jar and breakage in the door or injury to the guides. The guide assemblies, one for each end of the case, may be readily fabricated and assembled and welded together before securing to the inner sides of the ends of the case.

There are many other changes in detail of structure which may be resorted to without change in the principle of operation or in the es-

5 sential structure of this invention. The constructions described are very easy to operate, are readily manufactured and easily installed, and have proven particularly simple and effective in operation.

I claim:

10 1. A mounting for doors comprising, two guides of channel form disposed substantially at right angles to each other to provide a continuous pas-
15 sage between the flanges of said guides, one of said guides being positioned substantially vertical and the other substantially horizontal, a cover member for the lower part of the vertical guide, whereby said vertical guide at its lower portion is
20 of rectangular form in cross section and has a continuous vertical opening therethrough a supporting member in the lower part of the vertical guide, a compression spring located in said ver-
25 tical guide and normally extending from said supporting member above said cover, a rod extending downwardly through the upper portion of said coiled compression spring, and a head at the upper end of the rod resting upon the upper end of said spring and located between the side flanges
of the vertical guide, as and for the purposes described.

30 2. Door guides adapted to be attached at the inner sides of the vertical ends of a case, each guide comprising, channel members one adapted to be located substantially vertically at the inner side of an end of the case and adjacent the front edge thereof, and the other extending rearwardly from the upper end portion of the vertical guide, said guides having open sides, a cover closing the
35 lower portion of the open side of each vertical guide, an elongated coiled spring in each vertical guide extending from the lower end thereof above said cover but short of the upper end of said guide, and a rod having a head at its upper end extending downwardly through the upper end portion of each coiled spring, as specified.

40 3. A mounting for doors comprising, a guide of channel form having two sections, one adapted to be located substantially horizontal and the other substantially vertical with an intermediate curved section between and integral therewith whereby there is provided a continuous passage
45 between the flanges of said guide, a second guide

of channel form located immediately over the horizontal section of the first guide a cover member for the lower part of the vertical section of said first guide, a compression spring located in the vertical section of said first guide normally
5 extending above the upper end of said cover, means for supporting the lower end of the spring, a rod extending through the upper portion of said spring and a head in the upper end of the rod resting upon the upper end of said spring, said
10 head, spring and rod being located between the flanges of said vertical section of the guide.

4. A construction containing the elements in combination defined in claim 3, combined with a
15 vertical member located alongside of and in front of the vertical section of said first guide and having its upper end extending to and closing the front end of the second guide.

5. Guide means for a door adapted to be positioned vertically to close the open front side of a
20 case, said door being adapted to be lifted and moved into the case to occupy a substantially horizontal position, said guide means comprising horizontal guide means adapted to be secured adjacent the upper part of and at each end of the
25 case and vertical guide means adapted to be secured adjacent the front and on each end of the case and adapted to carry the door, spring means located in the vertical guide means adapted to be downwardly compressed when the door is
30 closed and to expand vertically on release when the door is opened, a rod extending through a portion of the spring, and means on the upper end of said rod resting on the upper end of said
35 spring.

6. A mounting for doors comprising, a guide having spaced apart sides and including horizontal and vertical sections connected by an intermediate curved section to provide a continuous
40 passage between said sides of the guides, compressible spring means located in the vertical section between its sides adapted to be compressed in a downward direction, means supporting the lower end of said spring, a rod extending through said spring and means on the upper end of said
45 rod resting on the upper end of said spring, as and for the purposes specified.

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