June 12, 1934. C. F. RUTLEDGE 1,962,913

FLEXIBLE DOOR

Filed Nov. 28, 1930

FIG. 2.

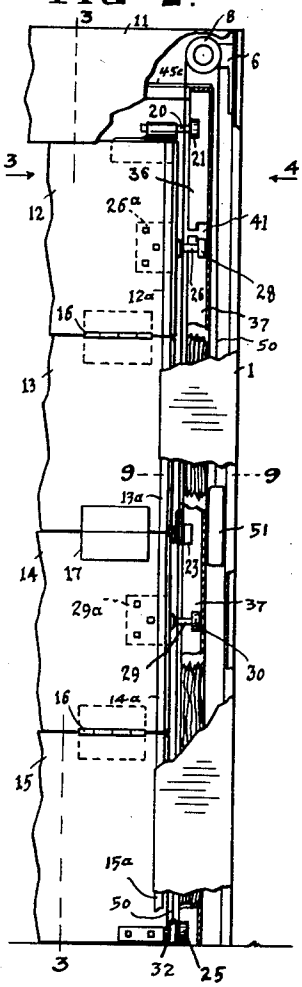


FIG. 3. FIG. 4.

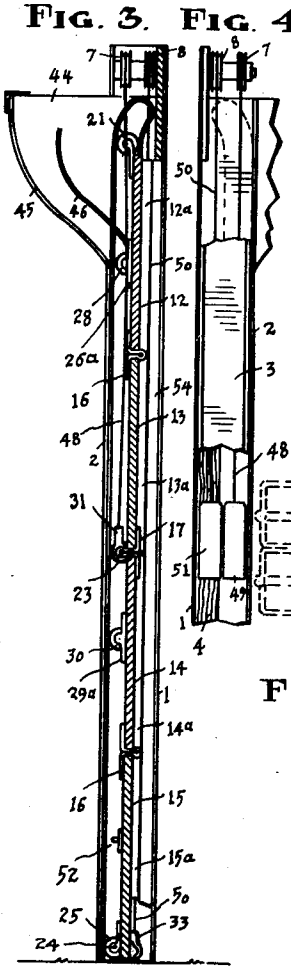


FIG. 6.

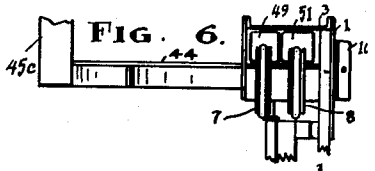


FIG. 7.

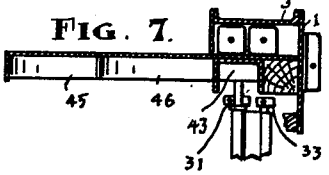


FIG. 5.

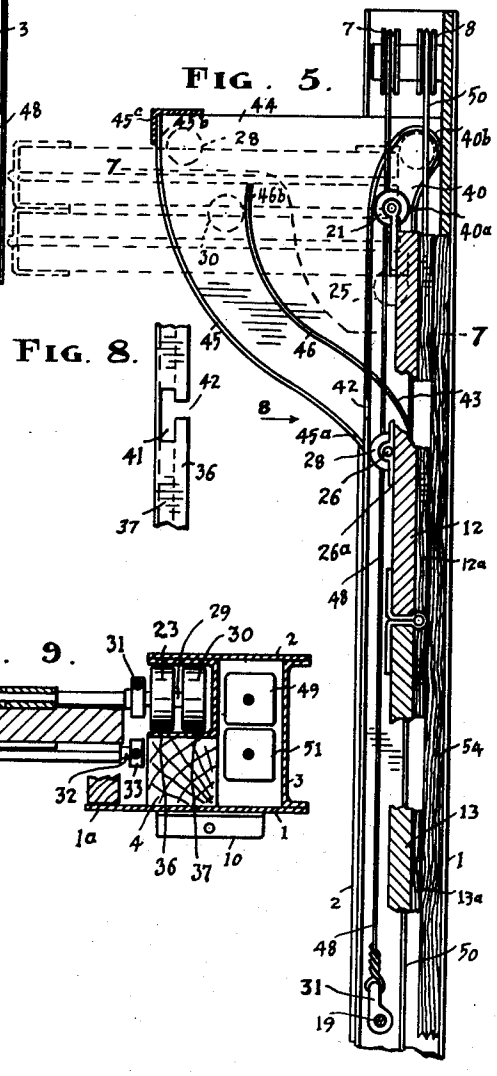
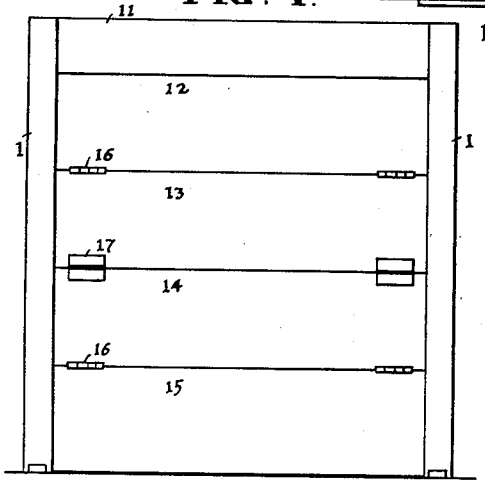


FIG. 8.

FIG. 9.

FIG. 1.



Inventor

CHARLES F. RUTLEDGE

By Thomas L. Ryan

Attorney.

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FLEXIBLE DOOR

Charles F. Rutledge, Hartford City, Ind.

Application November 28, 1930, Serial No. 498,698

11 Claims. (Cl. 20—20)

This invention relates to improvements in flexible doors. In the embodiment shown in the present specification the invention is referred to as being especially intended for garages or other buildings having large or wide doorways. A door of this type consists of panels hingedly connected together, and which are retained movably in runways therefor in such manner that the door may assume status other than vertical when it is raised from the lower or closed position and to an overhead position. A door of this description also comprises counter balancing means whereby the door is capable of being easily moved to the raised or lowered positions.

Advantages to be desired in door construction of the above description are that the door panels when raised may occupy a minimum amount of space; that the necessity of extended overhead trackways may be eliminated; that friction and noise may be minimized; that simplified means for counterweighting the panels may be provided; and that raising and lowering of the panels may be accomplished without shock or overstrain of any of the parts.

To provide means for accomplishing the above named advantages, and also to provide specific improvements in construction whereby the door structure in its entirety is capable of being economically manufactured, and easily handled in transportation and in the installation thereof, and which is durable, dependable, and not liable to get out of order or repair, are the objects of my invention.

The above named objects as well as more specific aims of the invention as will appear in the following description, are accomplished by and the invention is embodied in the new construction, combination and arrangement of parts described in the following specification.

Figure 1 is a front view of my improved flexible door.

Figure 2 is an enlarged front view of the end portions of the door panels, and one of the housings, the greater portion of the face plate of the housing, and the frontal flange of the trackway being broken away.

Figure 3 is a vertical cross section view taken on the line 3—3, and as seen in the direction of arrow 3 in Figure 2.

Figure 4 is a side view of the upper portion of Figure 2 taken in the direction of arrow 4 in Figure 2.

Figure 5 is an enlarged view of the upper portion of the trackway channel, and the branch trackway structure, as seen in the direction of arrow 3, the dotted lines thereon indicating the positions of the panels when at the raised status.

Figure 6 is a top plan view of Figure 5.

Figure 7 is a sectional top plan view taken on the line 7—7 in Figure 5.

Figure 8 is a view of a portion of the trackway channel, as seen in the direction of arrow 8 in Figure 5.

Figure 9 is an enlarged sectional top plan view taken on the line 9—9 in Figure 2.

My invention provides spaced opposed upright housings, door panels hingedly connected to each other, confronting upright channels embodied in said housings, each at its tip portion being of closed formation and curved to constitute a crook, and in its body portion being of formation in cross section to constitute a pair of side-by-side trackways, one being designated as a leader track and the other as a follower track, there being a passway and a gateway in the tread of the follower track at its upper portion, the said gateway extending transversely of and communicating with said passway at its central portion, rollers at the ends of the rear side of the upper edge of the top panel, rollers at the axial center of the hinges that unite the two panels next below the top panel, and rollers at the ends of the rear side of the lower edge of the bottom panel to travel the leader track, rollers at the ends of the rear side and on a plane between the upper and lower edges of the top panel, and rollers at the ends of the rear side and on a plane between the upper and lower edges of the third panel to travel the follower track, a branch trackway structure combined with each of the said channels at a predetermined height thereon, and having a track of curved formation and with lower portion to register at the plane of the aforesaid passway, one tread of said branch track being adapted to be engaged by the lower roller of the top panel, and the opposite tread of said branch track being adapted to be engaged by the lower roller of the third panel, a deflector device to shunt the two last named rollers from the follower track to the branch track, a counterweighting means for the two upper panels, and a counterweighting means for the lower panels.

In the embodiment of my invention as it is shown in the drawing, I have illustrated the several features and details of construction in the form and arrangement deemed preferable, it being understood that they may be modified within the scope of the invention as defined by the appended claims. The present structure has a height over all of about eight and one-half feet,

and a width of about eight feet, and it is intended especially for doorways of garages. The height of the doorway opening is about eight feet.

The said upright housings are of right and left formation, and are similar in construction. Each is rectangular in cross section, and comprises a frontal plate 1, a rear plate 2, and side plate 3. Embodied therewith is a body stud 4 which may be of wood, as shown in Figure 9. The plates may be of any suitable formation in cross section, and of metal or wood, the material first named being shown in the present instance. Journaled in a suitable block 6 at the top of the housing, are pulleys 7 and 8, (see Figure 5), the functions of which will presently be referred to, The said housings set up on a suitable foundation, are spaced apart the proper distance, the foot portion of each being secured by an anchor bolt (not shown) at the foot clip 10. They are stayed at their upper portions by a transverse lintel or head plate 11.

The space between the plates 1, 2, and 3, is occupied by the parts of the counterweighting means which will presently be described. The door panels, four in number, preferably of wood, are designated as the top panel 12, intermediate panels 13 and 14, and bottom panel 15. The panels are provided with hinge butts 16 and 16 which have their centers at the front side of the panels, and by hinge butts 17 which have their centers at the rear side of the panels. The said butts 16 are connected together by suitable pins. The butts 17 are connected together by pins 19. Each of said pins 19 has an extended shoulder portion which constitutes a pintle. These pins are secured against movement by a nut 19*a*.

Upon a pintle 20 which is suitably secured at each end of the rear side of the upper edge of the top panel, is journaled a roller 21. On the pintle of hinge pin 19 of the butts 17, is journaled a roller 23. Upon a pintle 24 suitably secured at each end of the rear side of the lower edge of the bottom panel, is journaled a roller 25. The rollers 21, 23, and 25 are spaced about one inch from the ends of the respective panels, as seen in Figure 9.

At each end of the rear side of the top panel 12 and at position spaced a predetermined distance below the center of the roller 21, a pintle block 26*a* having a pintle 26 is fastened by suitable bolts. Journaled on said pintle 26 is a roller 28.

At each end of the rear side of panel 14, and at position spaced a predetermined distance below the center of the roller 23, a pintle block 29*a* having a pintle 29, is fastened by suitable bolts. Journaled on said pintle 29 is a roller 30.

These rollers 28 and 30 are spaced such distance from the ends of the panels, that they may travel in a plane aside from the vertical plane in which the rollers 21, 23, and 25 are intended to travel.

Loose on each of the pins 19 is an eyelet 31. On a stud 32 which is secured to each end of the frontal lower edge of panel 15, is loosely retained an eyelet 33. The functions of these eyelets will presently be referred to.

The runways for the said door panels are of right and left formation. Each comprises an upright section of sheet metal plate, channel shaped in cross section, and which may be designated as a channel. The said channel is of the suitable depth in cross section, as shown in Figure 9, its opposed sides serving as trackways for the aforesaid rollers. The marginal portions of said sides constitute what may be designated as the leader track 36, and the base portions of the said sides constitute what may be designated as the follower track 37. Demarkation of these tracks is indicated by the dotted line in Figure 8.

The extreme upper portion of each of said channels is curved to constitute a crook 40, the end thereof being of closed formation constituting a socket 40*b*. In the side of the follower track 37 at a height coincident with the plane of roller 28 is an opening designated as a passway 41. Communicating with said passway at its side portion is a transverse gateway 42 which extends through the adjacent leader track 36. The said passway 41 and gateway 42, are of dimensions, as shown in Figure 8, to permit the passing therethrough of the rollers 28 and its pintle 26, and the roller 30 and its pintle 29 of the panels 12 and 14 respectively.

Adjacent to said passway 41, and between the treads 37 of the follower track, a deflector plate 43 is secured. It is positioned with such relation to the said passway 41, that upon raising the door panels, the roller 28 is caused to leave the track 37 and to move through the passway. A metal plate 44 which is secured to each of said channels at its upper portion, constitutes a support for branch trackway tread 45, and a branch trackway tread 46. The foot 45*a* of tread 45 is at a plane which is coincident with the plane of the center of the roller 28, and with the bottom of the passway 41. The said tread 45 in its intermediate and upper portion is of the curvature of an arc struck from the center of the crook socket 40*b*. The curvature of said treads 45 and 46 and the positions of the head portions 45*b* and 46*b* thereof are such that in the moving upwardly of the panels, the tread 45 causes roller 21 to pass up the bend of the crook, and the head portion 45*a* which will have become engaged by roller 28 stays the said roller 21 at its position of repose in the socket 40*b* of said crook. The head portion 46*b* of the tread 46 stays the roller 30 at the position of alignment as it appears in the dotted lines in Figure 5. A transverse strut bar 45*c* whose ends are connected to the tops of the branch track way plates 44, serves as a stay member between the said plates 44 when the door structure will have been erected.

To balance the weight of the door panels, a cable 48 extends from the eyelet 31 of the pintle of roller 23, over pulley 7 and it is connected to weight 49; and a cable 50 which extends from the eyelet 33 from the bottom of the end of the frontal face of the bottom panel 15, and over the pulley 8, is connected to a weight 51. Helical springs, common in flexible door structures, may be used instead of the weights, if desired.

Secured to the rear face of the marginal portion 1*a* of each of the housing plates 1, is an upright closure strip 54, of wedge shaped formation and which extends from the upper portion of said housing to its bottom, as shown in Figure 3. Near the ends of the frontal face of each of the door panels are wedge shaped closure strips 12*a*, 13*a*, 14*a* and 15*a* (see Figure 3) which are so positioned as to register in alignment with the aforesaid closure strip 54. The said closure strips have their face edges of such incline and they are of such variations in depth with relation to the said closure strip 54 that when the door panels are at the lowered or closed position, the said strips are in closed engagement with the aforesaid strip 54 of the door housing. Whereas the jointure thus obtained between the door

panels and the housings is weather proof, there is no tendency of the door to bind or stick, and it is at all times capable of being easily moved.

My improved flexible door structure complete consists of the housings, the lintel plate, the runway units, the door panels, rollers and fittings, cables, and weights. The several parts referred to are capable of being manufactured, handled, and transported economically, and also they are capable of being easily assembled and installed.

To install the invention the pintle blocks 26*a* and 29*a* are removed. The panels, connected together by their hinges and in folded status, are lain in horizontal position at the door site, the top panel being stayed at such incline that the rollers 25, 23 and 28 are in vertical alignment. The housings and the runway units are then set up and are stayed in their positions suitably spaced as shown, the rollers 25, 23 and 28 of the door panels being in position within the lower portion of the leader track 36. The head plate 11, and stay bar 45*c* are then secured in place. The hooks on the free ends of the cables 48 and 50 are engaged with the eyelets 31 and 33. The cables are then trained over the pulleys 7 and 8 and secured to weights 49 and 51 respectively. The panels are then raised to the upright position shown, the rollers 21, 23, and 25 occupying the leader track 36. The pintle blocks 26*c* and 29*c* are then bolted to place, the rollers 28 and 30 thereof occupying their positions in the follower trackway 37.

The several parts now occupy their respective positions as shown in the drawing, it being understood that the weights 49 and 51 are of specific gravity necessary to properly counter the weight of the panels. Rollers 21, 23 and 25 occupy the leader track 36. Rollers 28 and 30 occupy the follower track 37. Roller 21 is in position adjacent to the bend 40*a* of the crook 40. Roller 28 is in position adjacent to the base 45*a* of the branch track tread 45. Whereas the trackways and the rollers are shielded from the weather, suitable access to the rollers is had for the purpose of lubrication.

The door is raised in the usual manner by imparting a lifting pull at handle 52 of the bottom panel. As rollers 21 of top panel 12 pass the bends 40*a* and into the sockets of the crooks 40, the rollers 28 of said top panel and pintles 26 will have traveled through the openings 41 and gateways 42 respectively, and along the tread 45 and come to rest at engagement with the head 45*b* of said tread. Concurrently with the action of the weights 49 effecting the above movement, there is, by the action of the weights 51, the movement of the rollers 23 and 25 up the leader tracks 36. At the same time the rollers 30, traveling up the follower track 37, will have been shunted by the deflector plate 43 through the passway 41 into the branch trackway whence they come to rest in engagement with the heads 46*b* of the tread 46. The nature of the action above described, in the movement and delivery of the panels to the overhead folded status, as shown by the dotted lines in Figure 5, is such that whereas the panels are moved speedily, quietly and without vibration, their arrival at destination is easy and free from impact or shock. The nature of the retention of the panels while they are in the raised or dotted line status as shown in Figure 5, is such that locking or fastening them is not necessary. To lower the panels, a pull imparted at the handle 52 results in the roller 30 leaving the head 46*b* of the branch track tread 45, and the other rollers freely travel down the trackways, the action of the rollers 28 in leaving the head 45*b* and traveling the tread 45 being to negative any tendency of the door to race as it nears the lowered position.

The details as shown throughout, while being of the general form and structure deemed suitable in the present embodiment, are susceptible of changes, alterations and modifications, incident to such varying conditions and requirements as may arise in the practice of my invention. The invention is therefore to be construed as of the full breadth and scope outlined in the appended claims.

What I claim as my invention is—

1. A flexible door of the kind described, comprising opposed upright housings, door panels hingedly connected to each other, confronting upright channels embodied in said housings, each at its top portion being of closed formation and curved to constitute a crook, and in its body portion being of formation in cross section to constitute a pair of side-by-side trackways, one being designated as a leader track and the other as a follower track, there being a passway and a gateway in the tread of the follower track at its upper portion, the said gateway extending transversely of and communicating with the said passway at its central portion, rollers at the ends of the rear side of the upper edge of the top panel, rollers at the axial center of the hinges that unite the two panels next below the top panel, and rollers at the ends of and on the rear side and lower edge of the bottom panel to travel the leader track, rollers at the ends of and on the rear side and on a plane between the upper and lower edges of the top panel, and rollers at the ends of and on the rear side and on a plane between the upper and lower edges of the third panel to travel the follower track, a branch trackway structure combined with each of the said channels at a predetermined height thereon, and having a track of curved formation with lower portion to register at the plane of the aforesaid passway, one tread of said branch track adapted to be engaged by the lower roller of the top panel, and the opposite tread of said branch track being adapted to be engaged by the intermediate roller of the third panel, a deflector device to shunt the two last named rollers from the follower track to the branch track, and counterbalancing means for the door.

2. A flexible door of the kind described, comprising opposed confronting runway units, each of which has a crook and socket at its upper end, and each of which comprises two aligned trackways one of which is designated as a leader track, and one of which is designated as a follower track, a branch track communicating with each of said follower tracks at its upper portion and having curvature of an arc struck from the crook socket, a door consisting of panels hingedly connected together, and having rollers at its top edge, and at an intermediate hinge center, and at its bottom edge, to operate in said leader track, rollers on the top panel and an intermediate panel operable in said follower track, a deflector device to shunt the last named rollers from the follower track into the branch track whereby the rollers of the said top edge are caused to move into and be retained in said crook sockets when the panels are raised, and counterbalancing means for said door.

3. In flexible door construction of the kind described, opposed upright guides, forwardly di-

rected and rearwardly directed extensions thereof, horizontally aligned flexibly connected door panels, pivotal connections between the door panels and said guides whereby when the panels are raised to overhead status they assume position in parallel folded relation, certain of said connections being positionable in the extensions for causing at least one of the panels to move forwardly and upwardly and counterbalancing means for the door.

4. In door construction of the kind described, opposed upright guides each having parallel trackways, a retainer guide at the upper portion of each of said guides, the said retainer guide having oppositely directed branch trackways into which the trackways of the said upright guides have entry, flexibly connected horizontal panels, pivotal connections on the said panels to operate in the trackways of the said opposed guides so that when the panels are raised, said pivotal connections pass into the trackways of the retainer guide, and counterbalancing means having connections with said door.

5. Door construction of the kind described, comprising opposed upright guides each having parallel trackways, pairs of door panels arranged in vertical relation, edge to edge, the panels of the upper pair being hinged together at their frontal faces, and the panels of the lower pair being hinged together at their frontal faces, rollers at the rear faces of the meeting corners of the lower panel of the upper pair and the upper panel of the lower pair, rollers adjacent the bottom corners of the lower panel of the lower pair, rollers at the rear faces of the top corners of the top panel of the upper pair, said rollers above named being operable in one of the said trackways, hinge connection between the lower panel of the upper section, and the upper panel of the lower pair, rollers on the rear side of the top panel of the upper pair, rollers on the rear side of the top panel of the lower pair, said last named rollers being operable in the other of said trackways, the last above named trackway being inclined rearwardly at its upper portion and thence widened, and the first above named trackway at its upper portion being terminated in the form of a pocket in which the upper roller may become seated, a cable extending from the bottom panel of the lower pair, a cable extending from the bottom panel of the upper pair, and devices connected to said cables to counterbalance the weight of said pairs of panels.

6. In a door construction, the combination of a plurality of door sections hingedly connected together and arranged to be folded overhead for door opening, guides pivotally associated with certain of said sections and arranged in two parallel planes adjacent each end of the door, opposed confronting runway units of double depth associated with said guides, a branch track communicating with each runway, and a switch device of single depth positioned at the junction of the branch track and the runway for shunting the guides from the runway into the branch track.

7. In a door construction, the combination of opposed confronting runway units each of which has a forwardly directed combination crook and socket at its upper end, and each of said units comprises a pair of parallel ways, there being a lateral opening in the way opposite the socket, a branch trackway extending rearwardly from the lateral opening and having the curvature of an arc struck from the socket, and deflector means adjacent the lateral opening to cause a door roller to leave the trackway and to pass through said opening.

8. In a folding door structure of the character described, the combination of a pair of confronting runways each terminating in a head structure including a rearwardly directed plate body portion, a pair of spaced tracks, a curved track forming a rear wall and of predetermined curvature and merging with the rear track near its upper end, an intermediate track portion carried by the plate portion adjacent the curved wall and extending downwardly toward the point of mergence, an upwardly and forwardly directed pocket forming wall extending laterally from the plate body near its upper forward end, and a crook forming rear wall continuation of the pocket having its lower portion in substantial alignment with the rear track.

9. A flexible door of the kind described, comprising opposed upright housings, door panels hingedly connected to each other, confronting upright channels embodied in said housings, each at its top portion being of closed formation and curved to constitute a crook, and in its body portion being of formation in cross section to constitute a pair of side-by-side trackways, one being designated as a leader track and the other as a follower track, there being a passway and a gateway in the tread of the follower track at its upper portion, the said gateway extending transversely of and communicating with the said passway at its central portion, rollers at the ends of the rear side of the upper edge of the top panel, rollers at the axial center of the hinges that unite the two panels next below the top panel, and rollers at the ends of and on the rear side and lower edge of the bottom panel to travel the leader track, rollers at the ends of and on the rear side and on a plane between the upper and lower edges of the top panel, and rollers at the ends of and on the rear side and on a plane between the upper and lower edges of the third panel to travel the follower track, a branch trackway structure combined with each of the said channels at a predetermined height thereon, and having a track of curved formation with lower portion to register at the plane of the aforesaid passway, one tread of said branch track adapted to be engaged by the lower roller of the top panel, and the opposite tread of said branch track being adapted to be engaged by the intermediate roller of the third panel, a deflector device to shunt the two last named rollers from the follower track to the branch track, and counterbalancing means for the door.

10. In a door of the character described, the combination of a plurality of door sections horizontally hinged together and arranged for folding and movable into an overhead folded position, the upper edge of the upper door section and the lower edge of the second section initially being movable upwardly, guide members carried by and at one end of the upper and next lower section, a support for each guide member projecting beyond the end of the section, and counterbalancing means at one side of the door and associated with said sections, said means including a cable and an overhead pulley, the plane parallel to the door opening and including the initial contact of the cable with said pulley is positioned rearwardly of a parallel plane which includes a plurality of guide member supports when the sections are in closed position, said cable between its pulley contact and its door connection being positioned

forwardly of said first mentioned plane at the guide support positioned intermediate the top and bottom of the upper section, and assisting in the initial breaking or folding movement of the door sections relative to each other.

11. In a door of the character described, the combination of a plurality of door sections horizontally hinged together and arranged for folding and movable into an overhead folded position, the upper edge of the upper door section and the lower edge of the second section initially being movable upwardly, guide members carried by and at one end of the upper and next lower section, a support for each guide member projecting beyond the end of the section, and counterbalancing means at one side of the door and associated with said sections, said means including a cable and an overhead pulley, the plane parallel to the door opening and including the initial contact of the cable with said pulley is positioned rearwardly of a parallel plane which includes a plurality of guide member supports when the sections are in closed position, said cable between its pulley contact and its door connection being positioned forwardly of said first mentioned plane at the guide support positioned intermediate the top and bottom of the upper section, and connected to the door adjacent the bottom of the second uppermost section, and assisting in the initial breaking or folding movement of the door sections relative to each other.

CHARLES F. RUTLEDGE.