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2,916,089

ARTICULATED DOOR

Filed April 16, 1956

2 Sheets-Sheet 1

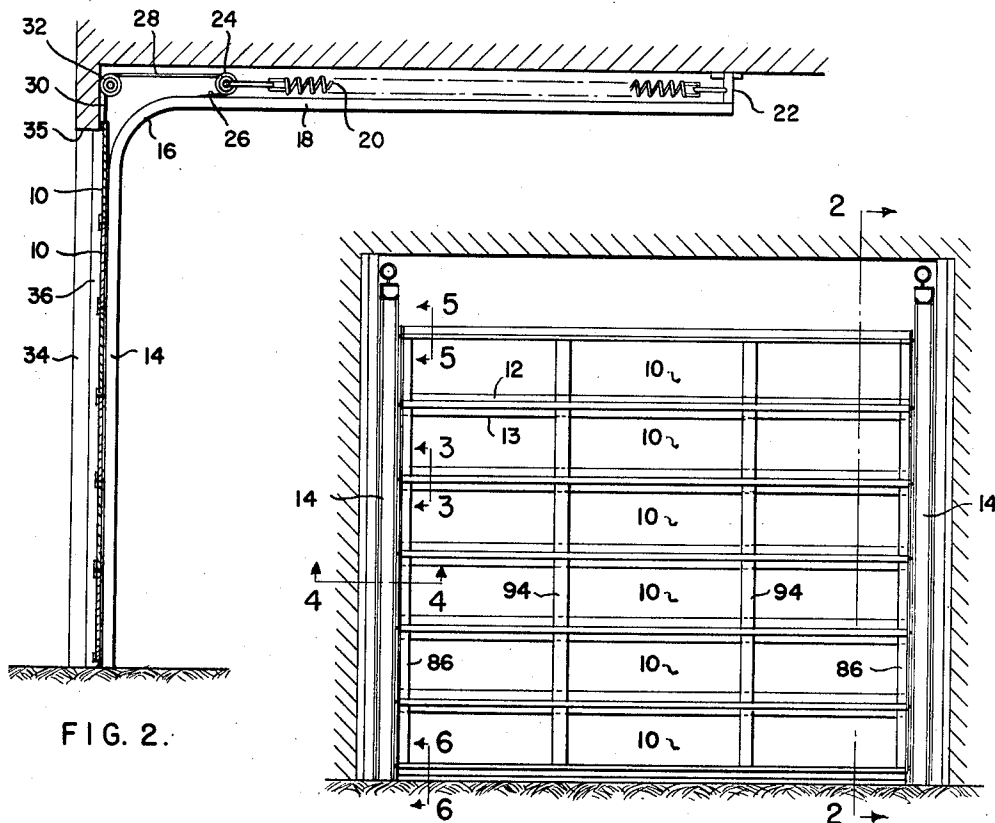


FIG. 2.

FIG. 1.

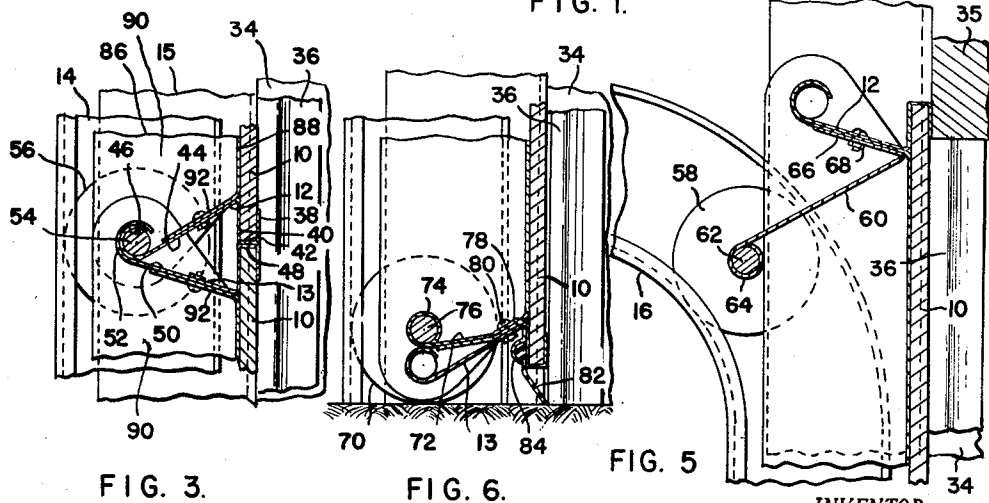


FIG. 3.

FIG. 6.

FIG. 5

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2 Sheets-Sheet 2

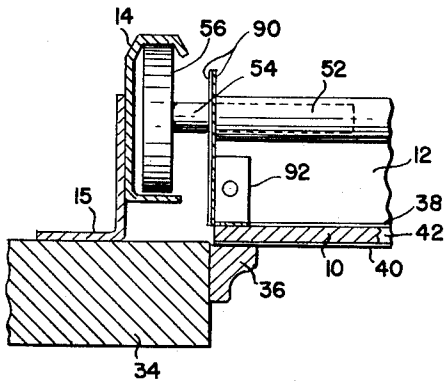


FIG. 4.

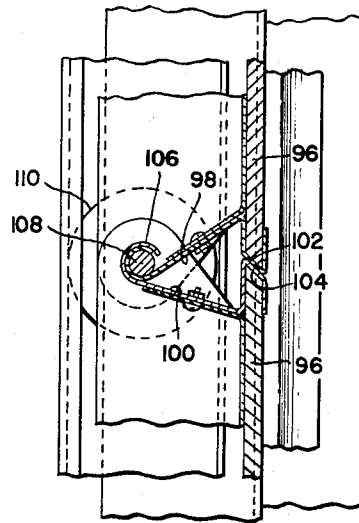


FIG. 7.

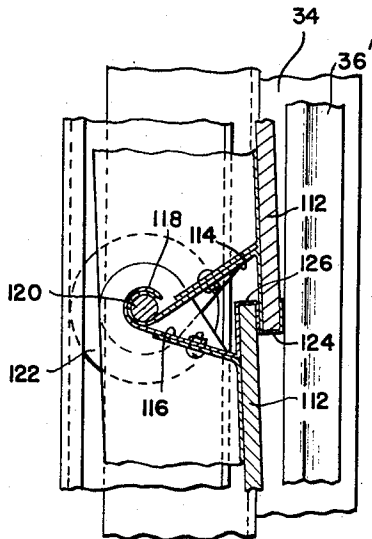


FIG. 8.

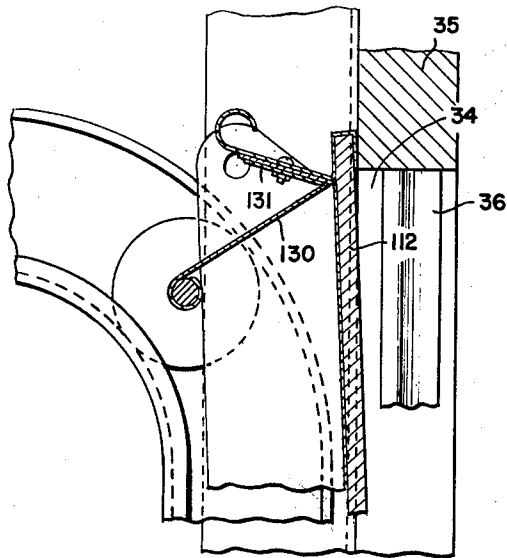


FIG. 9.

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2,916,089

ARTICULATED DOOR

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8 Claims. (Cl. 160—201)

This invention relates to an articulated door structure and, more particularly, to the type of door generally referred to as an overhead door.

It is common practice to build the well known overhead door, such as is conventionally employed for domestic garage doors, of a plurality of panels extending transversely of the garage door opening and in vertical linear array with adjacent edges of the panels of the array hingedly connected by various pairs of hinge forming members connected to adjacent panels. The panels are also provided with roller mounting means for positioning rollers in guide tracks in which the door is supported in its vertical and in its overhead horizontal positions. In order to provide door panels of suitable stiffness having moderate weight it is conventional to employ a light panel supported in a relatively heavy wood frame.

It is the primary object of this invention to provide a simplified door panel construction and an improved panel hinge construction.

It is a further object of the invention to provide a panel hinge construction which will serve simultaneously as reinforcing means for the panels and mounting means for roller mounting shafts.

These and other objects of the invention relating particularly to the construction thereof will become evident from the following description when read in conjunction with the accompanying drawings, in which:

Figure 1 is an elevation of a door assembly in closed position as viewed from the inside thereof;

Figure 2 is a vertical section through the closed door taken on the trace 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary vertical section taken on the trace 3—3 of Figure 1;

Figure 4 is an enlarged fragmentary horizontal section taken on the trace 4—4 of Figure 1;

Figure 5 is an enlarged fragmentary vertical section through the upper portion of the door taken on the trace 5—5 of Figure 1;

Figure 6 is an enlarged fragmentary vertical section through the lower portion of the door taken on the trace 6—6 of Figure 1;

Figure 7 shows a modified form of the structure shown in Figure 3;

Figure 8 shows still another modified form of the structure shown in Figure 3; and

Figure 9 shows a modified form of the structure shown in Figure 5 employed in connection with the structure shown in Figure 8.

The door assembly described in connection with the figures is of the conventional overhead type of door. It will be evident that the structure disclosed may equally well be employed in connection with a door moving horizontally. In the figures the door panels are elongated rectangles having their major axes extending horizontally. The invention can equally well be employed in a door having panels whose major axes extend vertically in the case of an overhead door, such as shown

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in Figure 1, or horizontally in the event that a horizontally moving door be involved.

The door assembly shown in Figures 1 and 2 includes a plurality of door panels 10 positioned in linear array and with their adjacent uppermost and lowermost edges in abutting relation. The panels are joined together by transversely extending pairs of hinge forming strips 12 and 13 which, as will be described in greater detail in connection with Figure 3, mount rollers positioned to operate in tracks 14 adjacent to each vertically extending side of the door assembly. When the door assembly is raised, the rollers are carried upwardly in tracks 14, around bends 16 and into overhead track portions 18. The weight of the door is counterbalanced by means of springs 20 each affixed at one end to a track mounting bracket 22 and carrying a roller 24 at the other end over which there passes a cable, one end 26 of which is fixed and the other end of which, as indicated at 28 and 30, passes around a roller 32 and extends downwardly to the bottom of the door where it is attached to the lowermost door panel in the conventional fashion.

The door disclosed herein employs conventional tracks and a conventional counterbalancing system which need, therefore, not be described in detail. When the door is in closed position, the door panels serve as a closure for an opening 34 in a building wall and the door panels 10 are positioned in substantial engagement with a suitable stripping or framing 36 mounted within the door opening 34.

Referring now also to Figures 3 and 4, the formed longitudinally extending strips 12 and 13 are mounted on lower and upper edges, respectively, of each of the panels 10. More specifically, each strip 12 has one of its edges formed with a channel having sides 38 and 40 engaging the sides of a panel 10 adjacent to the lower edge of the panel which is engaged by the base 42 of the channel. Each strip 12 extends transversely of the door assembly from one end of the panel to the other and thus is positioned with its channel in engagement with the lower edge of the panel along its entire transverse length and serves to enclose and reinforce the entire lower edge of the panel. Each strip 12 is formed with a leg 44 extending back from its panel 10 and terminating in an inside coil 46 of cylindrical section.

Each strip 13 has one leg formed with a base 48 with parallel sides in a manner similar to the strips 12 and thus encloses and reinforces the entire uppermost edge of its panel 10. Each strip 13 extends transversely of its associated panel and encloses and reinforces the upper edge thereof.

Each strip 13 is provided with a rearwardly extending leg 50 which terminates in a cylindrically formed flange outside coil 52 concentric with and positioned exteriorly of the cylindrical coil 46 of its adjacent strip 12. It will be evident upon viewing Figure 3 that the concentrically arranged coils 46 and 52 are adapted to rotate around a common center and permit the two strips 12 and 13 to act as two parts of a hinge which thus serve to hingedly connect adjacent edges of the panels 10.

A roller mounting shaft 54 is positioned in the inner cylindrically formed coil 46 at each side of abutting panels and extends into the flange for a sufficient distance from the end of the flange to provide a mounting for a roller 56 mounted on the outer end of the shaft 54 and operating in the adjacent track 14. The tracks 14 are supported by angle brackets 15 from the building wall 34. The hinge axes of the strips 12 and 13 are preferably positioned on horizontal planes extending between the abutting channels 42 and 48, and the shafts 54 and the rollers 56 have their axes of rotation coincident with the hinge axes of their associated strips 12 and 13 and thus lie on the horizontal plane extending

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between their associated abutting channels 42 and 48. When the door is raised from the position shown in Figures 1 and 2 in the tracks 14 to an overhead position in the tracks 18, it will be evident that, as the door panels pass around the curved tracks 16, adjacent panels will hinge with respect to each other around the axes of rotation of the rollers 56. The hinge forming strips provide only a small displacement of the panels as the rollers pass around the curved tracks 16 and thus only a small clearance is required outside of the tracks 16.

The uppermost door panel 10 is shown in Figure 5 in a closed position abutting the header 35 extending across the door opening. To support this uppermost edge of this uppermost panel 10, rollers 58 are positioned in each of the curved track portions 16. A strip 12 extends across the top of the top panel 10 and is identical to the strip 12 extending across the top of each of the other panels 10. Bracket members 60 are provided to support the upper edge of the upper panel 10 in the position shown in Figure 5 from the rollers 58. A member 60 extends inwardly from each end of the strip 12 for only a sufficient distance to mount a roll mounting shaft 62 in a cylindrically formed edge thereof. The other edge of each member 60 is provided with a flange 66 which is attached by means of bolts or other suitable fastening means 68 to the strip 12.

Similarly, at the lowermost end of the lowermost panel 10, the strip 13 which reinforces the lowermost edge of the panel would not properly position the lowermost roller 70 and thus a separate bracket 72 is provided with a cylindrically formed end 74 engaging a shaft 76 mounting the roller 70. The bracket 72 is provided with a flange 78 which is attached to the strip 13 by means of a bolt or other suitable fastening means 80. In order to provide for sealing between the channel of the strip 13 at the lowermost edge of the lowermost panel 10, a rubber strip 82 is provided and supported within a retainer strip 84 affixed to the strip 13 by spot welding or by other suitable fastening means.

Vertically extending members 86 are provided, as shown in Figure 1, in order to retain the channels of the strips 12 and 13 in engagement with the edges of the panels 10 over which they are positioned. The members 86 are of angle formation having a flange 88 lying in engagement with the panels and a vertically extending flange 90. The ends of the flanges 88 are cut free of the flanges 90 and are formed upwardly at the ends thereof as indicated at 92 and attached to the strips 12 and 13 to prevent separation of the strips and thus to prevent the channels of the strips from becoming disengaged from the edges of the panels 10. The ends of flanges 90 of the members 86 are provided with bores through which the roller mounting shafts 54 extend and ends of flanges 90 of adjacent ends of members 86 are in overlapping relation as shown in Figure 4. Thus the loading transmitted between the strips 12 and 13 through the flanges 90 is, in part, transmitted through the shafts 54. Angle reinforcing members 94, similar to the members 86, are provided intermediate to the edges of the door. Each member 94 is attached to the transversely extending strips 12 and 13 of a panel. However, inasmuch as the strips 12 and 13 are continuous, the up-standing flanges of the members 94 do not intersect the strips.

In Figure 7 there is shown a modified form of the invention where door panels 96 are provided with strips 98 and 100 similar to the strips 12 and 13 previously described. The inner edges of the strips 98 and 100 are provided with concentric cylindrically formed coils 106 mounting a shaft 108 supporting a roller 110 in the manner similar to the strips 12 and 13. However, the strips 98 and 100 have their channel formed edges 102, 104, respectively, formed with the base of each channel extending in a plane displaced from a perpendicular to the door panels 96. The angle of this displacement is

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selected so as to provide a slightly overlapping relation between the ends of adjacent panels to provide a rain shed to prevent the entrance of rain water between adjacent panels of the closed door.

A further modification of the door is shown in Figure 8 in which a pair of panels 112 are provided with strips 114 and 116 similar to the strips 12 and 13 described in connection with Figure 1 and having cylindrically formed edges 118 mounting a shaft 120 supporting a roller 122. However, the strips 114 and 116 are so formed as to position their channel formed edges 124 and 126, respectively, in a side-by-side relation when the door is in a closed position, thus providing for a substantial overlap of the lower edge of the upper panel over the upper edge of the lower panel. This arrangement provides a door which, when closed, has the appearance of a lap siding or a shingled wall.

It will be evident that, when the arrangement shown in Figure 8 is employed, the panel 112 must be positioned between vertically extending side members such as the building walls 34 in order to provide closure at the upper portions of the ends of the panels 112. Thus as shown in Figure 8, the framing 36' is moved outwardly from the position occupied by the framing 36 shown in Figure 4. In the arrangement shown in Figures 8 and 9, the roll mounting bracket at the top of the door, as indicated at 60 in Figure 5, will be reformed slightly, as shown at 130 and 131 in Figure 9, in order to tilt the top panel 112 to provide an incline in the panel identical to the incline of the other panels.

In conventional overhead door construction, fairly heavy wooden framing is employed around each panel. This framing is generally wood and is of the order of 1 3/4 inch thick and 3 to 5 inches wide. The framing supports panels which may be glass, plywood or other desired material. My door construction permits the use of 1/4 inch plywood panels without the use of any heavy wood reinforcing framing. The continuous transversely extending strips 12 and 13 provide sufficient stiffening and support for the plywood panels to prevent excessive bow in the panels in response to manually applied pressure thereon when the door is in a closed position or in response to the weight of the panels when the door is in an overhead or opened position. Both the channel formed portions and the cylindrical formed portions of the strips serve as reinforcing members in conjunction with the webs 44 and 50 serving to stabilize these webs and thus each of the strips is, in effect, a web type truss serving the dual function of a panel reinforcing member and a hinge member. The fact that the two hinge members may operate without the need of a hinge pin provides a further saving in material and a further reduction in the weight of the structure. As previously noted, however, the cylindrical hinge forming portions of these strips provide convenient mounting means for the short shafts mounting the rollers on which the door operates.

The cost of the conventional door construction employing the relatively heavy framing previously noted is increased due to the requirement of the provision of some sort of milling along abutting edges of adjacent panels to provide suitable rain shed. In place of this, the very simple arrangement described in connection with Figure 7 may be employed in connection with my invention when a perfectly smooth door appearance is desired.

Furthermore, it is possible by the employment of my invention to provide the door panels in the appearance of overlapping shingles and, if desired, the wood surface may be serrated or otherwise marked to give the appearance of shingles, thus providing a desirable architectural feature in conjunction with an extremely simple, rigid and inexpensive door construction.

What is claimed is:

1. An articulated overhead door comprising a plurality of horizontally extending panels in linear array, horizontally extending means hingedly connecting adjacent longi-

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tudinal panel edges, each of said connecting means comprising a pair of members extending the length of its adjacent panel edges, the members of each pair each including an uppermost and lowermost channel formed portion receiving the edge of its adjacent panel and having substantially parallel channel sides engaging the inner and outer faces of its associated panel, the opposite ends of the inner sides of each channel of each pair of channels being formed with legs, at least one of which is disposed at an acute angle with respect to its adjacent channel side; with said legs each extending away from the panels and converging toward each other with the lowermost of said legs inclined upwardly from the channel side and with both legs terminating in concentric cylindrical hinge coils, said channel portions, extending legs and hinge coils forming a substantially triangular reinforcing structure for adjacent panels connected thereby, a pair of spaced tracks positioned adjacent to transversely opposite sides of said linear array of panels, and means supported by said connecting means and mounting rollers positioned in said tracks supporting said array of panels for movement in said tracks.

2. A door structure in accordance with claim 1 in which the bases of adjacent channel formed portions of adjacent members lie in substantially parallel planes and in abutting relation.

3. A door structure in accordance with claim 1 in which the bases of adjacent channel formed portions of adjacent members lie in abutting relation on surfaces displaced from surfaces normal to the planes of their respective panels.

4. A door structure in accordance with claim 1 in which the bases of adjacent channel formed portions of adjacent members lie in staggered relation to position adjacent panels in overlapping relation.

5. A door structure in accordance with claim 1 including means extending transversely of each panel and connected to said members for retaining the channels in position on the panel.

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6. A door structure in accordance with claim 1 including reinforcing means extending transversely across each panel between said members having end portions overlapping the leg portions of adjacent triangular reinforcing means, and in which said roller mounting means are positioned within said concentric cylindrical hinge forming coils and extend through said overlapping end portions of said triangular reinforcing means on adjacent panels.

7. A door structure in accordance with claim 1 including reinforcing means extending transversely across each panel between said members for retaining the channels in position on the panel and in which each panel is formed of only a single sheet of material supported against deflection only by said connecting and reinforcing means.

8. A door structure in accordance with claim 1 including means mounted on the flange extending away from the uppermost channel of the uppermost panel mounting uppermost rollers and means mounted on the flange extending away from the lowermost channel of the lowermost panel mounting lowermost rollers, said uppermost and lowermost rollers being positioned in said tracks to support the uppermost and lowermost portions, respectively, of the door assembly.

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