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R. R. BUTLER ET AL

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UPWARD ACTING DOOR

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Fig. 1

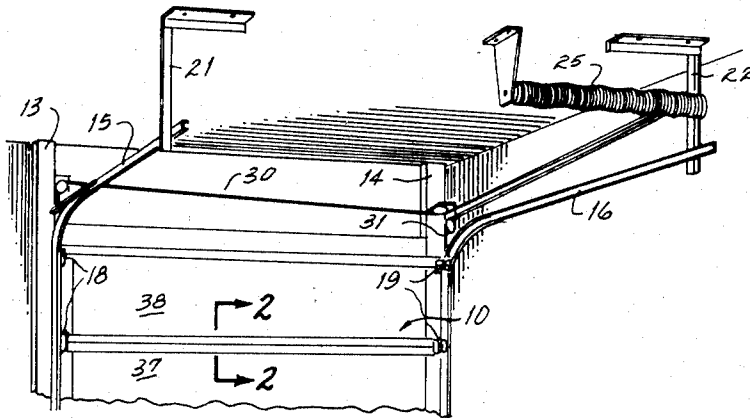


Fig. 2

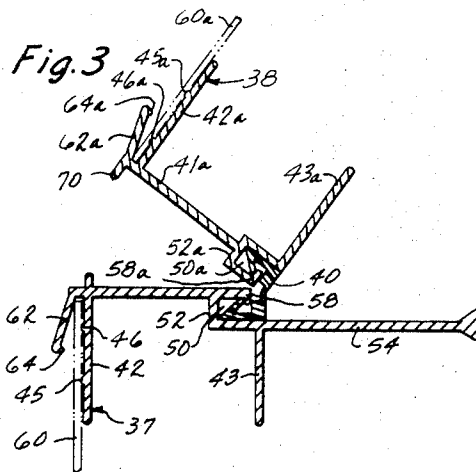
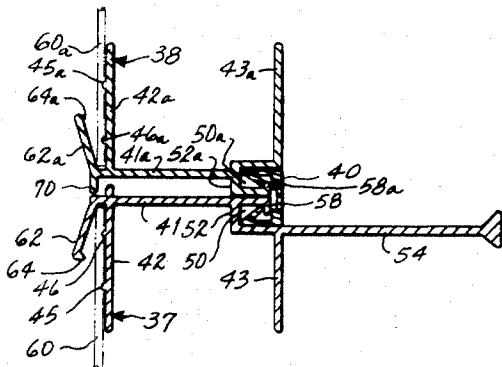
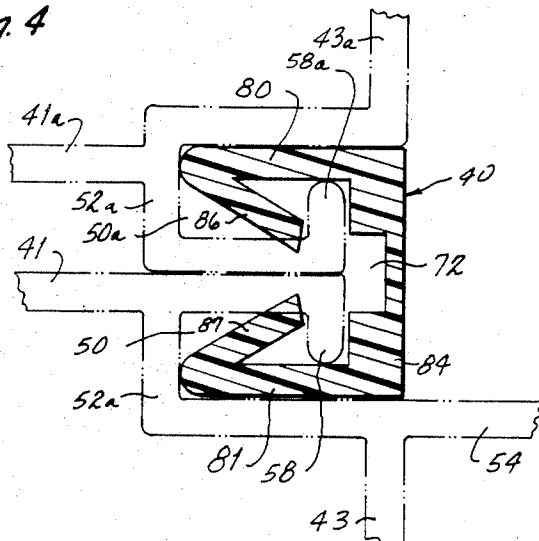


Fig. 4



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1

3,527,283

UPWARD ACTING DOOR

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6 Claims

ABSTRACT OF THE DISCLOSURE

Sections of a hinged upward acting door are connected together economically and in weather-tight condition by a plastic hinge which can be easily inserted into pre-designed elongated channels in abutting sections.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention pertains to sectional upward acting doors which are generally used to close garages, service entrances for commercial buildings, loading dock areas and truck bodies. Certain models of such doors have aluminum frames and glass fiber reinforced resin panels. The frames have abutting edges and are hinged together for articulation when they are opened and closed. The abutting edges are provided with overlapping portions to protect the interior area from weather damage.

Description of the prior art

Generally, door panel sections for upward acting doors are connected together by spaced hinges which are pairs of metal plates having interengaging hinge pins. The plates are arranged so that each plate of a pair is fastened to one of a pair of abutting panels. While some of the panels are arranged to have interlocking abutting edges, these have not always proven to be weathertight. Furthermore metal hinges are subject to corrosion and rusting. To prevent such rusting and provide for easy operation it is advisable to oil the hinge pins from time to time. Not only is this messy but requires some adequate maintenance schedule to keep rust from forming.

To avoid the drawbacks of the prior art, the plastic hinge of the present invention was developed to cooperate with a groove provided in each edge of abutting panel edges. The configuration of the plastic hinge is such that it can be easily snapped in place in the grooves of the panels but not withdrawn without either breakage or considerable difficulty. The ease of its placement shortens the time required to manufacture the door, resulting in a more economical production schedule.

Further, the plastic material from which the hinge is made has surprising resistance to breakage. In actual tests, the hinge has been tried with thousands of opening and closing movements within a temperature range of -95° F. to $+180^{\circ}$ F. without failure.

It is an object of the present invention to provide a novel upward acting door with an improved hinge arrangement.

It is another object of the present invention to provide a novel upward acting door with an improved hinge which is durable, economical and resists deterioration.

It is yet another object of the present invention to provide a novel upward acting door which has an easily operable hinge providing weather-resistant construction.

Further objects and improvements will become apparent to those skilled in the art from the following detailed description taken in conjunction with the accompanying

2

drawing in which like numerals indicate like elements and in which:

FIG. 1 is a perspective view of the overall installation of the upward acting door of the invention;

FIG. 2 is a cross-sectional view of a portion of the novel door taken along lines 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view similar to that of FIG. 2 but with the door sections displaced relative to one another as the door is raised along its track, and

FIG. 4 is an enlarged cross-sectional view of the plastic hinge of the invention, inserted into grooves of abutting sections.

Referring now to FIG. 1 of the drawings, an upward acting door 10 is mounted to close an opening formed between door jambs 13 and 14. Door 10 is arranged to ride in tracks 15 and 16 by means of rollers 18 and 19. Tracks 15 and 16 are secured for a portion of their lengths to jambs 13 and 14 and then, after forming a turn, are supported near their free ends by supporting brackets 21 and 22, respectively.

A torsion spring 25 is positioned to cooperatively engage cables 30 and 31 attached to the bottom edge (not shown) of door 10 to assist in raising the door in the usual manner. Door 10 is made up of a series of panel sections, only two of which, 37 and 38, are shown.

The description, thus far, concerns a conventional upward acting door, door mechanism and components as generally known to those skilled in the art. These mechanisms and components operate in the well known manner to raise and lower the door 10.

Reference may be had to FIGS. 2 and 4 for a more detailed consideration of the novel plastic hinge 40 of the invention and its manner of connection with the adjoining panel sections.

FIG. 2 shows abutting edges of panel sections 37 and 38 with hinge 40, in engagement therewith, with the door in its closed or lowered condition. The lower panel section 37 comprises a generally U-shaped structure of extruded aluminum or other metal with a base 41 and two upstanding, parallel flanges 42 and 43 in spaced relationship. Flange 42 is connected integrally along one edge of base 41 and has a series of longitudinal ribs 45 and 46. Flange 43 is connected integrally and longitudinally along the upper edge of a channel-shaped groove 50. Groove 50 is formed by base 41, a short upward longitudinal flange 52 and a rearward extending flange 54. Flange 54 extends outwardly beyond the end of base 41 and in conjunction with flange 43 performs a strengthening function for the panel section 37. Groove 50 is partially closed by a short flange 58 extending longitudinally along the free end of base 41 and extending toward but short of the underside of flange 54, leaving a gap for the insertion of hinge 40.

At the front edge of panel section 37 is a lightweight, reinforced plastic panel 60 held in place by the crimping action of short flange 62 against flange 42. A longitudinal inwardly projecting rib 64 along the upper edge of flange 62 aids in holding panel 60 in place.

Since the upper panel section 38 is substantially complementary to that of panel section 37, the corresponding members have been designated with corresponding members having the suffix *a* appended.

It should be noted that the structure which forms groove 50a is connected to an edge of base 41a and is slightly offset with respect to the major axis of base 41a. The purpose of this arrangement is to permit a shorter flange 79 along the opposite edge of base 41a to serve as a stop when the door is in its closed position.

FIG. 3 shows the hinged panel sections of FIG. 2 in operative condition when the door is being opened or closed and the panel sections are in different planes as

they ride over the bend in tracks 15 and 16. It can easily be seen that the hinge 40 flexes longitudinally along a central recessed axis. The recessed area 72 is provided by a thin section of hinge 40 between major flanges 80 and 81. Flanges 80 and 81 extend perpendicularly away from the main centrally longitudinally recessed web portion 84. Longitudinal flanges 86 and 87 are formed by retroflexion of flanges 80 and 81, respectively at an acute angle toward web 84.

Thus, the hinge 40 is generally U-shaped in cross-section with an interior pair of flanges 86 and 87 integral with the free edges of spaced parallel flanges 80 and 81 separated by a central web 84; the interior flanges 86 and 87 being positioned at acute reverse angles with respect to the spaced flanges 80 and 81 and lie interiorly of the U-shaped cross section. The free ends of the interior flanges 86 and 87 are cut at an angle to engage the interior faces of short flanges 58 and 58a respectively. The latter flanges form short stubs partially enclosing otherwise U-shaped cross-sectional grooves 50 and 50a respectively.

Extension 54 forms a small shelf which can be grasped for manually opening or closing the door 10.

The material of which hinge 40 is made is of a high molecular weight polymer, preferably a polyallomer plastic. The name polyallomer is applied to block copolymers of propylene and ethylene, which have the highly ordered crystalline structure of polypropylene but differ chemically because of the incorporation of ethylene into the molecule.

A particular commercial polyallomer formulation has a density of 0.902, one of the lightest commercially available solid plastics; brittleness temperature to -40° F.; heat distortion temperature to 210° F. at 66 p.s.i., has greater resistance to abrasion and fatigue from flexing than polypropylene, and is superior to linear polyethylene in flow characteristics, moldability, hardness, and mold shrinkage.

While a polyallomer plastic is preferred, suitable other high molecular weight plastic material may be substituted.

In summary, a novel plastic hinge arrangement is provided for a weather-tight hinged door having a long effective life. The hinge has flanges which engage grooves in abutting panels of the door.

While a particular embodiment of this invention has been shown and described, changes and modifications will occur to those skilled in the art and it is intended to include such changes and modifications in the scope of the appended claims.

We claim:

1. A hinged sectional door comprising, hingedly secured panel sections, each of said panel sections having at least two spaced frame members separated by a panel marginally secured to respective longitudinal edges of said frame members, each of said frame members having longitudinal edges remote from said edges secured to said panel,

said latter longitudinal edges of said frame members having a recessed longitudinal groove,

and a plurality of high polymer plastic hinges of generally U-shaped cross-section, each hinge having a central web portion integrally and longitudinally connected to a pair of flanges generally perpendicular to said central web portion and spaced from each other,

said hinges further having a pair of inwardly and centrally extending flanges individually, integrally and longitudinally connected to the free ends of respective ones of said perpendicular flanges, said hinges being inserted into mating ones of said longitudinal grooves of frame members.

2. A hinged sectional door as recited in claim 1 in which said hinge is of polyallomer material.

3. A hinged sectional door as recited in claim 1 in which said central web of said hinge has a recessed area facing said grooves of said frame members.

4. A hinged sectional door as recited in claim 1 in which each of said longitudinal grooves has a longitudinal flange partially closing each of said grooves for engagement with the ends of said inwardly and centrally extending flanges.

5. A hinged sectional door as recited in claim 4 in which said longitudinal flanges are located inwardly of said longitudinal edges of said frame members a distance equal to the thickness of said central web of said hinge whereby the rear faces of the hinge and the frames are coplanar.

6. A hinged sectional door comprising at least two adjacent main panel sections, each section having at least one longitudinal edge having a generally U-shaped groove therein,

each of said grooved edges having parallel inside walls and a longitudinal flange located along an outer edge of said U-shaped groove and partially closing said groove

and plastic hinge means mounted and arranged to enter said grooves and engage said longitudinal flanges while spanning the space between said main panel sections

said plastic hinge means being generally U-shaped in cross-section and having a central web section and spaced outwardly extending parallel flanges integrally connected to said central web section and having inwardly reflexive flanges integrally connected along free edges of said parallel flanges and forming acute angles with respective ones of said parallel flanges for engagement with the inside walls of said grooves and with said longitudinal flanges of said grooves.

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