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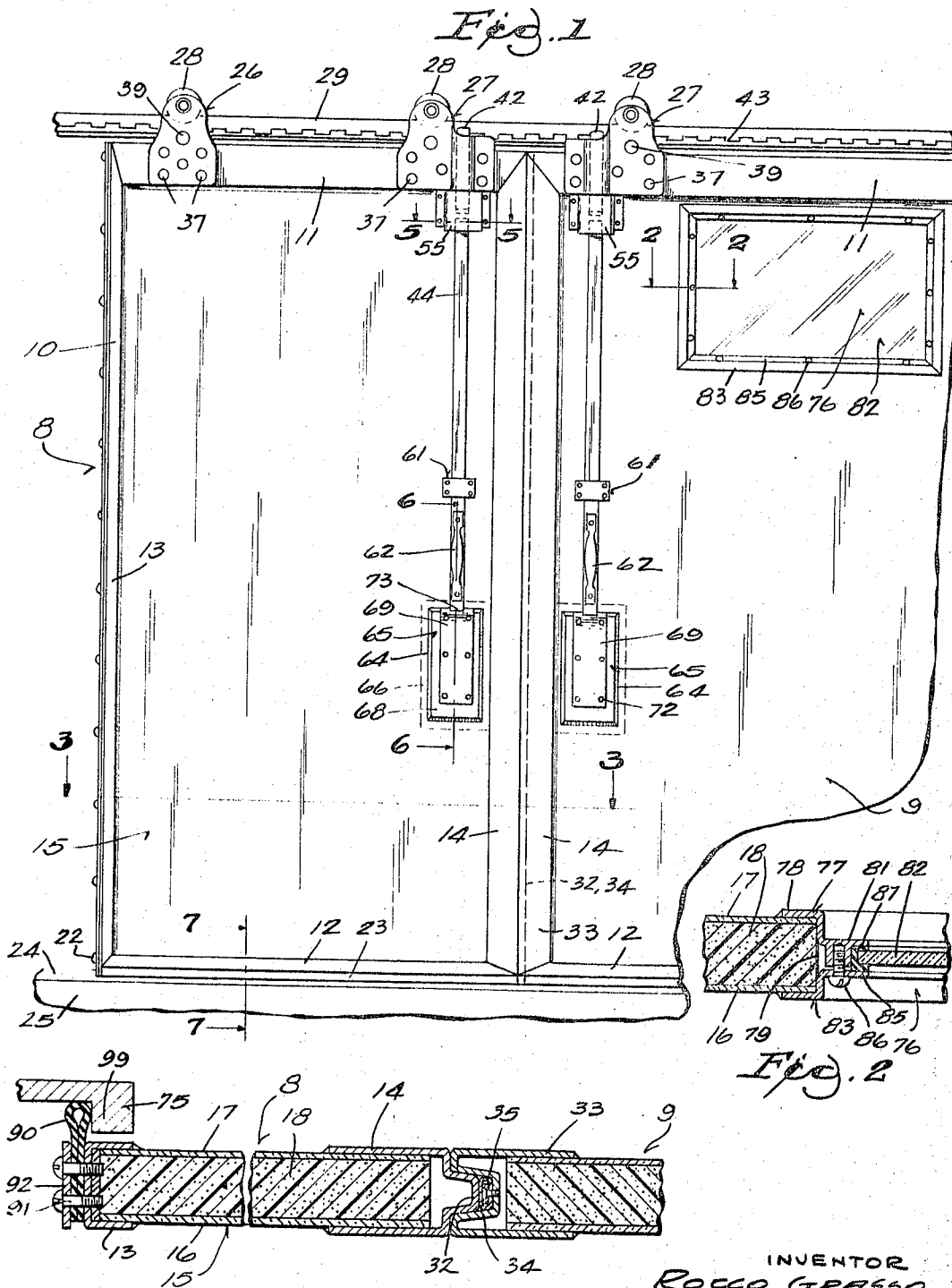
R. GRASSO

3,348,337

SLIDING DOOR

Filed Feb. 4, 1965

2 Sheets-Sheet 1



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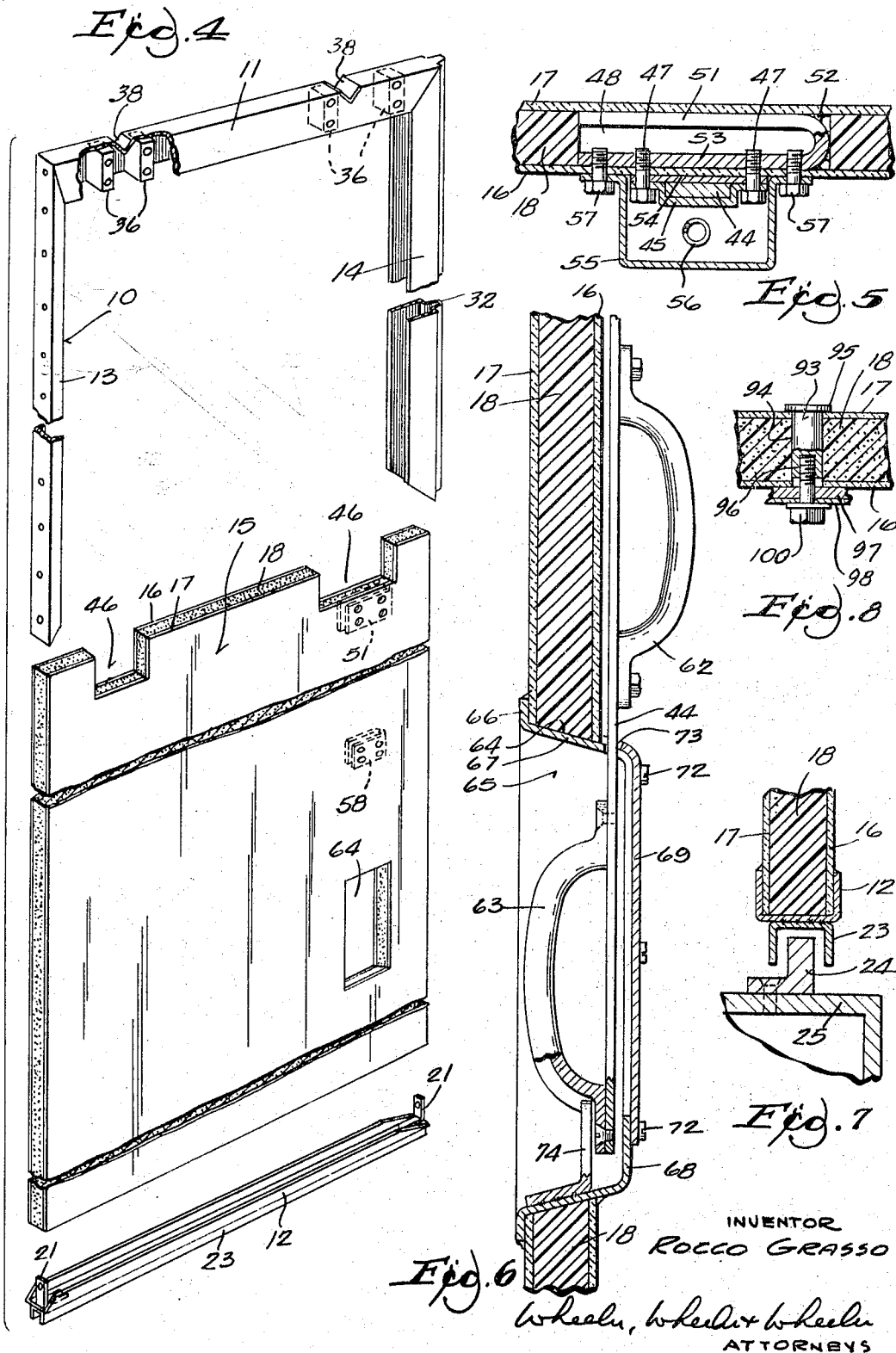
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SLIDING DOOR

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9 Claims. (Cl. 49—449)

This invention relates to a sliding door and more particularly to a lightweight sliding railroad baggage car door.

The sliding door of the present invention comprises an integral metal frame within which is a "core" or "sandwich" of laterally spaced, relatively thin front and back face panels between which there is an intervening ply of lightweight filler material such as plastic foam. The panels are desirably fabricated of fiberglass. The frame may be fabricated of aluminum or stainless steel channel members. In the assembly of the door, all parts are bonded together by an adhesive material, desirably an epoxy cement. The cement, together with the mechanical interlock of the parts, bonds all of the parts together in a unitary and rigid assembly.

Various items of door hardware are mounted on the frame or panel portions of the door. These are firmly attached to the door and to special anchors within the door structure and for which the foam filler is relieved or provided with anchor receiving voids. The anchors are fastened rigidly to the frame or the panels and the hardware is mounted to the anchors. This provides a firm rigid mounting for the hardware without loss of strength in the door structure.

The structure of the present invention improves on prior art sliding doors, as the one shown in United States Patent 1,940,971, in which the door is made of wood or metal. Such doors are quite heavy and have sufficient strength, thickness and density to permit mounting the hardware directly on the door panel. In the lightweight "sandwich" construction of the present invention, the panels are too thin for direct mounting of the hardware. The anchors aforesaid strengthen the door in the vicinity of the hardware to permit mounting the hardware, notwithstanding the lightweight construction aforesaid.

Doors fabricated according to the present invention have the following features and advantages:

(1) The door is relatively light in weight, thus reducing its mass and inertia so that it is easier to open and close. This feature reduces the possibility of injuring operating personnel who might get caught between the door and the door jamb. Lightness in weight also reduces the weight of the car.

(2) Damage to the door panels can be easily repaired by fiberglass repair techniques, insertion of filler material and use of epoxy cement. This repair can be accomplished at less cost than cutting and welding inserts into steel doors of the type heretofore common in the art.

(3) The ease of fabrication and lower cost of material makes the door of the present invention less expensive than conventional prior art doors.

(4) Doors fabricated according to the present invention have a better over-all appearance because the fiberglass panels provide flush surfaces, as distinguished from conventional doors having structural discontinuities.

(5) The fiberglass laminate or sandwich construction has better weather resistance than conventional steel or wooden doors.

(6) The laminate sandwich provides inherent insulating qualities not possessed by conventional steel doors.

(7) Inasmuch as the weight of the door is much less than in the prior art, the door hangers and other hardware may be made lighter in weight and gauge, thus further reducing the over-all cost.

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The invention also relates to a special recessed mounting the door latch handle and to a window frame construction specially designed for the sandwich type of panel construction.

Other objects, features and advantages of the invention will appear from the following disclosure in which:

FIG. 1 is a fragmentary side elevation from the inside of a baggage car with a pair of sliding doors embodying the present invention.

FIG. 2 is a fragmentary cross section taken along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary cross section taken along the line 3—3 of FIG. 1.

FIG. 4 is a perspective view in spaced apart relation of various components of doors embodying the present invention.

FIG. 5 is a fragmentary cross section taken along the line 5—5 of FIG. 1.

FIG. 6 is an enlarged fragmentary vertical section taken along the line 6—6 of FIG. 1.

FIG. 7 is an enlarged fragmentary cross section taken along the line 7—7 of FIG. 1.

FIG. 8 is a fragmentary cross section taken through a door embodying the invention and showing a hardware anchor incorporated therein.

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

The doors usually come in pairs 8, 9, as shown in FIG. 1. The construction of each is very similar.

Door 8 is typical and consists of a relatively rigid metal frame 10 (FIG. 4) consisting of a top rail 11, bottom rail 12, and side stiles 13 and 14. The respective frame parts or members 11, 12, 13, 14 are channel-shaped in cross section to receive therewithin the prefabricated sandwich or core 15. Core 15 consists of front and back relatively thin panels 16, 17 laminated to an intervening relatively thick but extremely lightweight ply of filler material 18. In practical embodiments of the invention, plies 16, 17 consist of fiberglass sheets approximately $\frac{3}{32}$ " thick. The ply of filler material 18 desirably consists of polyurethane foam. In a practical embodiment of the invention, foam ply 18 is $1\frac{1}{8}$ " thick, but has very little weight. The panels 16, 17 are bonded to the filler 18 with coextensive coatings of epoxy cement.

As illustrated in FIG. 4, one technique for assembling the prefabricated core 15 into the frame 10 is to prefabricate frame parts 11, 13 and 14 in a U-shaped configuration and to slide the prefabricated core 15 thereinto endwise. The bottom rail 12 of the frame 10 may then be slipped over the bottom edge of the core 15 and mated with the lower ends of the frame side stiles 13, 14. The various miters at the corners of the frame may be welded together to integrate the frame parts. Alternatively or in addition thereto, the lower rail 12 may be provided with angle brackets 21 which fit within the channels of the side stiles 13, 14 and are fastened thereto by screws 22 (FIG. 1).

Another technique for assembling the door parts is to simply embrace each edge of the prefabricated laminated core 15 with the separate channel-shaped frame elements 11—14 inclusive and then weld or otherwise fasten the corners of the frame together.

As an alternate or in addition to welding the corners of the frame, the outside margins of the core panels 16, 17 can be given a coat of epoxy cement which will adhere to the inside of the channel flanges of the frame elements 11—14 inclusive. The epoxy cement comprises means

uniting the frame, panels and filler in a substantially rigid assembly.

In any event, the frame and core parts are bonded together to unite all parts in a unitary rigid structure in which all parts contribute to the strength of the structure. However, because of the inherent lightweight characteristic of the foam filler 18, the door will be much lighter than doors heretofore used in railroad baggage cars and the like. Such prior doors are typically made of relatively heavy steel or wood.

Means are provided for mounting one or both of the doors 8 on the frame of a railroad car. While various other arrangements can be employed, in the disclosed construction, bottom rail 12 of the door is desirably provided with a downwardly open channel 23 as shown in FIG. 7. The channel flanges embrace a guide rib or track 24 mounted on the car frame or floor 25 to guide the door for sliding movement.

As in the construction shown in the prior Patent 1,940,971, the door is suspended on hangers 26, 27 from an overhead rail 29 on the car frame. The hangers 26, 27 are provided with rollers 28 which ride on rail 29 which is mounted on the inside of the baggage car over the door opening. Typically there will be two sliding doors 8, 9 in paired, side by side relation, as shown in FIG. 1. Stile 14 of door 8 has a rib 32 formed along one edge of the door. Stile 33 of the adjacent door 9 has a groove 34 complementary to rib 32. Groove 34 will desirably have a rubber or like weather strip 35 along its bottom so that when the doors 8, 9 are closed, as shown in FIG. 3, rib 32 will enter groove 34 and compress slightly the weather strip 35, thus to insure a tight weatherproof seal between the two doors 8, 9.

The doors are made in any appropriate size, depending upon the size of the door opening in the side of the baggage car. In a typical example, one door 8 might be three feet wide and the other door 9 five feet wide, to cover an eight foot wide door opening.

Because of the laminate core type of construction embodied in these doors in which the foam filler 18 has little strength, special measures are provided to mount door hardware on the doors. As best shown in FIG. 4, the channel of top rail 11 of the frame 10 is provided with anchor blocks 36 which are embraced by the flanges of the channel 11 and held in place by epoxy cement or the like. These provide a firm support for the bolts 37 by which the hangers 26, 27 are fastened to the door. An angle piece 38 may also be welded in place as shown in FIG. 4 where the web of the channel 11 is cut away, thus to accommodate for the through bolt 39 in the hanger and to reinforce the channel where the web is cut into. The core 15 is cut out or notched at 46 to fit around the anchor blocks 36.

Hangers 26, 27 are of slightly different construction. Hangers 27 incorporate a latch bolt 42. This latch bolt cooperates with the latch rack 43 as shown in the prior Patent 1,940,971 aforesaid. In the prior patent, an operating stem or locking bar, such as stem 44 was mounted on the inside of the door on guide brackets simply fastened directly and solely to the relatively thick material of the door. In the device of the present invention, however, the relatively thin fiberglass panels 16 will not furnish a strong enough support for the fastener such as bolts 47 by which the straps are fastened. Accordingly, special provision is made to securely anchor guide straps 45, 61 to anchors internally of the core 15.

In the case of strap 45, filler 18 is relieved or provided with a void at 48, as best shown in FIG. 5. A U-shaped metal anchor 51 is positioned within the void 48 between the front and rear panels 16, 17. It is desirably firmly bonded in position with means such as epoxy cement on all surfaces of the anchor which contact the panels 16, 17 and the filler 18, as indicated by reference character 52. One flange 53 of the anchor 51 which is in face contact with fiberglass panel 16 then provides a solid anchorage

into which the bolts 47 may be threaded into pretrapped holes, as indicated in FIG. 5.

Moreover, a wear plate 54 is desirably placed on the outside surface of the panel 16. The reciprocating stem 44 slides on wear plate 54. The wear plate 54 is clamped to the panel 16 by the same fastener such as bolts 47 which fasten the strap 45 thereon.

Anchor 51 also provides a mounting for an optional cap 55 which covers a spring 56 and other mechanism which is part of the latch actuator. Cap 55 is fastened to the anchor 51 through the panel 16 by bolts 57. All details of the latch actuator are not shown herein, as they are no part of the present invention. Reference is made to prior Patent 1,940,971 for such details.

As stem 44 is raised against the pressure of spring 56, the latch 42 will disengage from the rack 43 to permit the door to be shifted along track 29. The spring 56 biases the latch 42 into engaged position with the rack, as shown in the prior Patent 1,940,971, and also biases the stem 44 to its lowermost position.

Accordingly, the pressure of the bolts 47, 57 and the stresses to which the strap 45 is subject are distributed over a broad area of the panel 16. The panel is reinforced by the wear plate 54 and the anchor flange 53, thus providing a strong and secure anchorage, notwithstanding the lightweight nature of the door construction. This secure anchorage is resistant to impact stresses and shear stresses which might tend to tear the fiberglass panel 16.

A similar anchor 58 is provided as shown in FIG. 4 to which the strap 61 is attached. Strap 61 provides a guide for another portion of the reciprocating stem 44.

Stem 44 has an operating handle 62 on the inside of the door. It is desirable that the stem 44 may be operated from outside of the rail car. For this purpose a recessed mounting for an external handle 63 is provided, as best shown in FIG. 6. Handle 63 is mounted directly on the stem 44. The core 15 is cut through as shown at 64 in FIG. 4. Both panels 16, 17 and the filler 18 are cut away to form a through opening.

A handle confining shell 65 is positioned in the opening 64. The shell has a flange or lip 66 which butts up against the margins of panel 17 around the opening 64. The shell also has a somewhat tapered side wall 67 which spans from panel 17 to panel 16 and which extends inwardly of panel 16 and terminates in a bottom or back wall 68 which desirably has an opening and an access plate 69 removably attached to the back wall 68 over the opening by the screws 72. Flange 66 and wall 67 of the shell are secured to the panels 16, 17 and the filler 18 by means such as epoxy cement on all contacting surfaces, thus rigidifying the panel structure around the opening 64 cut therethrough. Shell side wall 67 and access plate 69 are provided with registering openings 73 through which the stem 44 reciprocates on manipulation of either handle 62 or 63.

Shell 65 is also provided with a stop 74 against which handle 63 abuts in the lowermost position thereof, thus to define said lowermost position.

Because of this construction, handle 63 is substantially recessed within the width of the core 15. Accordingly, the handle 63 does not project outwardly and does not interfere with sliding of the door past the jamb 75 of the car door opening, as shown in FIG. 3.

It may be desirable in one or more of the doors to provide a glazed window 76, as shown in FIGS. 1 and 2. For this purpose an opening 79 is cut through the panels 16, 17 and the filler 18. Complementary window pane frames 77, 83 are then applied to opposite sides of the door. Frame 77 is applied to the outside of the door. It has a flange 78 bonded by epoxy cement or the like to the margins of the panel 17 around the opening 79. The frame 77 has an inwardly offset flange 81 within the opening 79. Flange 81 provides a shoulder against which the wire glass pane 82 is received.

In order to provide for ready replacement of the pane

82, window frame 83 which is applied to the interior side of the door and against the panel 16, has an outermost flange 84 in face relation to the margins of panel 16 about the opening 79, but having no fixed connection to the panel 16. Frame 83 has an inwardly offset flange 85 which forms a shoulder opposite to shoulder 81 of frame 77. Flange 85 is releasably fastened to the flange 81 by the screws 86. The edge of the pane 82 between shoulders 81, 85 is desirably protected by a rubber seal 87. To replace the pane 82, screws 86 are removed and the entire frame 83 may then be removed.

Accordingly, the window 76 consists of a fixed frame 77 permanently attached to panel 17 and a removable frame 83 which is held in place only by the screws 86. The two frames 77, 83 cooperate to dress the raw edges of the opening 79, as well as providing a frame for the pane 82.

As best shown in FIG. 3, edges of the doors may be provided with weather stripping, such as strip 90 which is clamped to the stile 13 by screws 91 and clamp strip 92. The door jamb 75 desirably has a shoulder 99 against which the weather strip 90 abuts in the closed position of the door, thus to weatherseal the door against the jamb.

FIG. 8 shows another form of hardware anchor 93. It is received in an opening 94 through the door. It has a flange 95 received against panel 17 and a tapped hole 96 into which bolt 100 is threaded. A fastener such as bolt 100 may clamp plates 97, 98 to the door. One or another of the plates 97, 98 represents a hardware bracket piece or the like.

What is claimed is:

1. A door construction including a core having top, bottom, and side edges and comprising a single, unitary bonded sandwich of plastic material, said core including a pair of spaced parallel facing panels and an inner, light-weight filler located between said facing panels, said core including an aperture therethrough, a shell having a dish portion received in said aperture and extending beyond one of said facing panels, said dish portion having an opening disposed outwardly of said one facing panel, a locking bar extending through said opening and along and outwardly of said one facing panel, means on said door guiding movement of said locking bar, a handle located in said dish portion and attached to said locking bar, a frame having top, bottom, and side members of channel shaped formation respectively receiving the top, bottom, and side edges of said core, and means uniting said frame members to said core to provide a substantially rigid assembly of said frame and said core.

2. In a door mounted for sliding movement, the combination of a core having top, bottom, and side edges and comprising a single, unitary bonded sandwich of plastic material, said core including a pair of spaced parallel facing panels and an inner, light-weight filler located between said facing panels, said core including an aperture therethrough, a door handle shell having a dish portion received in said aperture and extending beyond one of said facing panels, said shell also having a lip extending from said dish portion and disposed in overlapping relation to the margin of said other facing panel extending about said aperture, said dish portion having an opening disposed outwardly of said one facing panel, a locking bar extending through said opening and including a portion extending along and outwardly of said one facing panel, means on said one facing panel for guiding reciprocating movement of said locking bar, a first handle located in said dish portion and attached to said locking bar, a second handle carried by said locking bar portion, whereby said locking bar can be displaced by a user at either side of said door, a frame having top, bottom, and side members of channel shaped formation respectively receiving the top, bottom, and side edges of said core, and means uniting said frame members to said core to provide a substantially rigid assembly of said frame and said core.

3. A door construction including a member having two facing surfaces and a void extending between said surfaces, a shell having a dish portion received in said void and extending beyond one of said surfaces, said dish portion having an opening disposed outwardly of said one surface, a locking bar extending through said opening and along and outwardly of said one surface, means on said door for guiding movement of said locking bar along said one surface, and a handle located in said dish portion and attached to said locking bar.

4. A door construction including a member having two facing surfaces and a void extending between said surfaces, a door handle shell having a dish portion received in said void and extending beyond one of said surfaces, said dish portion having an opening disposed outwardly of said one surface, a locking bar extending through said opening and having a portion extending along and outwardly of said one surface, means on said door for guiding movement of said locking bar along said one surface, a first handle located in said dish portion and attached to said locking bar, and a second handle carried by said locking bar portion, whereby said locking bar can be displaced by a user on either side of said door.

5. A door construction including a member having two facing surfaces and a void extending between said surfaces, a door handle shell having a dish portion received in said void and extending beyond one of said surfaces, said shell also having a lip extending from said dish portion and disposed in overlapping relation to the margin of said other surface extending about said void, said dish portion having an opening disposed outwardly of said one surface, a locking bar extending through said opening and along and outwardly of said one surface, means on said door for guiding reciprocating movement of said locking bar along said one surface, and a handle located in said dish portion and attached to said locking bar.

6. A door construction in accordance with claim 5 wherein said dish portion includes a side wall extending through said void and a bottom wall extending outwardly beyond said one surface, and wherein said opening is located in said side wall and extends in said bottom wall across a major portion thereof, and an access plate removably connected to said bottom wall in covering relation to the portion of said opening extending in said bottom wall.

7. A door construction including a member having two facing surfaces and a void extending between said surfaces, a door handle shell having a dish portion received in said void and extending beyond one of said surfaces, said shell also having a lip extending from said dish portion and disposed in overlapping relation to the margin of said other surface extending about said void, said dish portion having an opening disposed outwardly of said one surface, a locking bar extending through said opening and having a portion extending along and outwardly of said one surface, means on said one surface for guiding movement of said locking bar for reciprocation along said one surface, a first handle located in said dish portion and attached to said locking bar, and a second handle carried by said locking bar portion, whereby said locking bar can be displaced by a user on either side of said door.

8. A railroad car comprising a car frame, a door including a core having top, bottom, and side edges and comprising a single, unitary bonded sandwich of plastic material, said core including a pair of spaced parallel facing panels and an inner, lightweight filler located between said facing panels, said core including an aperture therethrough, a shell having a dish portion received in said aperture and extending beyond one of said facing panels, said dish portion having an opening disposed outwardly of said one facing panel, a locking bar extending through said opening and along and outwardly of said one facing panel, means on said door guiding movement of said locking bar, a handle located in said dish portion and attached to

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said locking bar, a frame having top, bottom, and side members of channel shaped formation respectively receiving the top, bottom, and side edges of said core, and means uniting said frame members to said core to provide a substantially rigid assembly of said frame and said core, and means mounting said door on said car frame for movement between open and closed positions.

9. A railroad car comprising a car frame, a door including a core having top, bottom, and side edges and comprising a single, unitary bonded sandwich of plastic material, said core including a pair of spaced parallel facing panels and an inner, lightweight filler located between said facing panels, said core including an aperture there-through, a door handle shell having a dished portion received in said aperture and extending beyond one of said facing panels, said shell also having a lip extending from said dished portion and disposed in overlapping relation to the margin of said other facing panel extending about said aperture, said dished portion having an opening disposed outwardly of said one facing panel, a locking bar extending through said opening and including a portion extending along and outwardly of said one facing panel, means on said one facing panel for guiding reciprocating movement of said locking bar, a first handle located in said dished portion and attached to said locking bar, a second

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handle carried by said locking bar portion, whereby said locking bar can be displaced by a user at either side of said door, a frame having top, bottom, and side members of channel shaped formation respectively receiving the top, bottom, and side edges of said core, and means uniting said frame members to said core to provide substantially rigid assembly of said frame and said core, and means mounting said door on said car frame for sliding movement between open and closed positions.

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