

June 13, 1950

E. L. JACOB
BULKHEAD DOOR STRUCTURE

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4 Sheets-Sheet 1

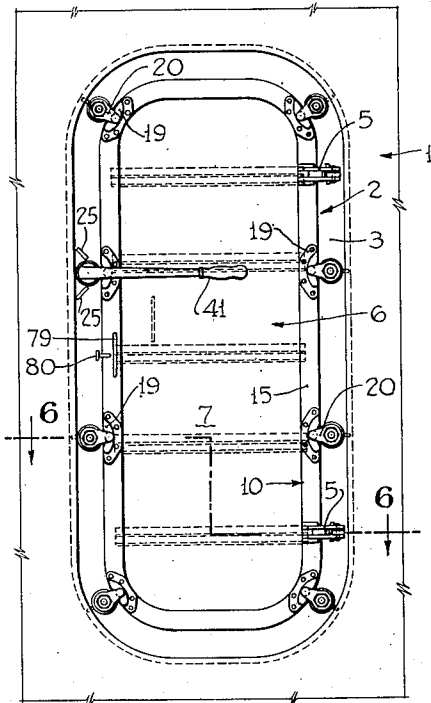


FIG. 1

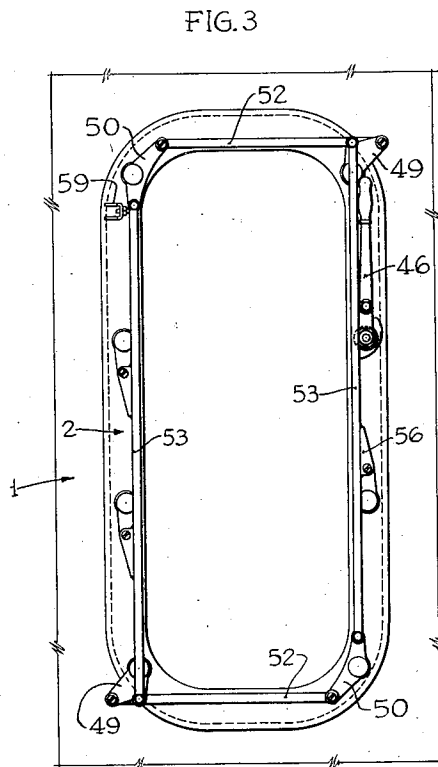


FIG. 3

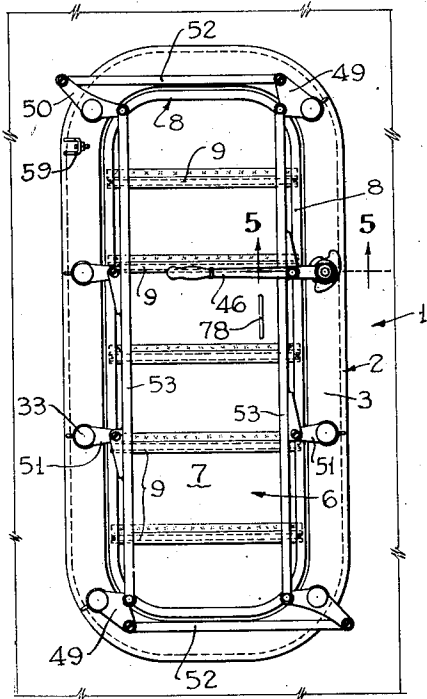


FIG. 2

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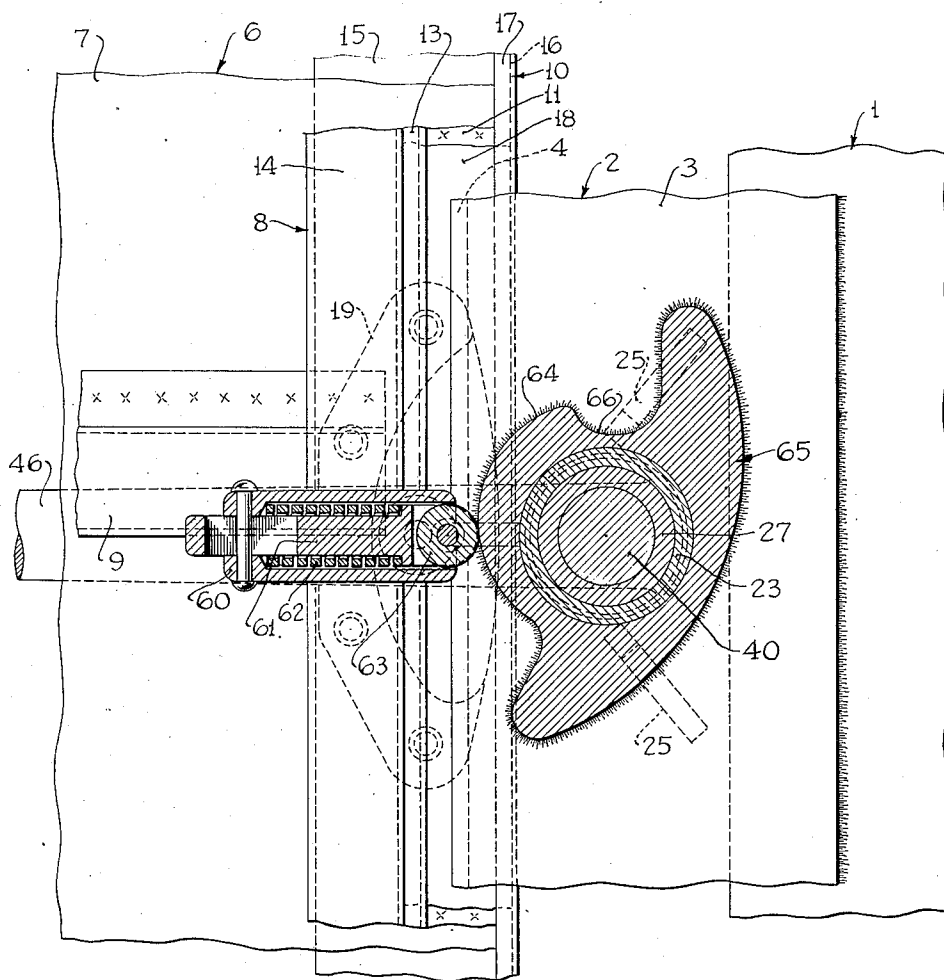
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FIG. 4



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BULKHEAD DOOR STRUCTURE

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5 Claims. (Cl. 114—117)

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The invention relates to quick-operating doors, especially to such doors, hatches, cover members or covers as they are used for closing fluid tightly the bulkheads, hatchways and the like of ships, airplanes and other structures.

Among the objects of the invention is a door or hatch of the indicated type which is of extraordinarily simple construction and light weight. The light weight is an important feature, as heavy doors are sometimes difficult to close by a single person, especially in an emergency, for instance, when a ship rolls in a heavy sea or is listing after damage. Moreover, heavy doors sometimes lead to injury of persons passing them or attempting to operate them.

Another object of the invention is a door or hatch construction in which most of the operating mechanism is under normal conditions removed from the influence of the weather and the water.

A still further object of the invention is an operating mechanism for a door or hatch of the indicated type which can be actuated quickly by one single movement of a lever rather than by the widely used plurality of revolutions of a hand wheel.

Still another object of the invention is an operating mechanism for a door or hatch of the indicated type which leaves the entire opening free of obstructions when the door or hatch is open.

The aforesaid and other objects and advantages are achieved mainly by arranging the dogs for clamping the door or hatch shut and the lever-and-rod system for operating the dogs, on the frame of the door opening or the hatchway so that the door or hatch carries only the wedges to be engaged by the dogs, by arranging the axes of rotation at one end of the dogs and levers close to the margin of the opening, and by connecting the rods to the dogs and levers on the side of said axes toward the middle of said opening.

A further feature of the invention resides in the arrangement of the lever-and-rod system for operating the dogs in the interior of the structure to be closed, that is on the side of the wall opposite the side against which the door or hatch abuts.

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Further objects and advantages, as well as features of the invention and its details, will become apparent from the embodiments illustrated in the attached drawing and described in the following:

In the drawing,

Figure 1 is a small-scale, outside elevation of a bulkhead door in closed position, of the door frame and of the surrounding portion of a bulkhead or the like;

Figure 2 is an inside elevation of the same structure shown in Figure 1 with the door and the operating mechanism in closed position;

Figure 3 is an inside elevation corresponding to Figure 2 with the door in open position and thereby out of sight and with the operating mechanism in the open position;

Figure 4 is a fragmentary, inside elevation of part of the structure shown in Figure 2 yet on a much larger scale and partly in section along line 4—4 of Figure 5;

Figure 5 is a fragmentary section along line 5—5 of Figure 2 on the scale of Figure 4; and

Figure 6 is a fragmentary section along line 6—6 of Figure 1 and on the scale of Figures 4 and 5.

1 is a bulkhead or outer wall of a ship or other structure. The margin of an opening in the wall 1 is reinforced by an angle-section frame 2 having its one wide arm 3 in overlapping relation with the margin of and welded to the wall 1 while the other arm 4 projects toward the outside. Supported on the frame 2 by hinges 5 is the door 6 which comprises a main panel 7, an inner marginal rail 8, horizontal transverse reinforcements 9 and an outer marginal rail member 10.

The inner rail member 8 is of Z-section, having a laterally directed arm 11 welded to the marginal portion of the panel 7 and an inwardly directed web 12 provided with a laterally projecting bead 13, and a second arm 14 directed toward the center of the door. The transverse members 9, which may be of Z-section, have one of their flanges welded to the body of panel 7 and another flange to the inner arm 14 of the rail 8.

The outer door rail 10 is of generally angle-section having its one wide arm 15 secured to the outside of the panel 7 while the other narrow arm 16 extends parallel to but is spaced from the web 12 of the inner rail 8 and is provided with

an inturned flange 17 opposite the location of the bead 13.

The outer portion of the web 12, the bead 13 and the arm 11 of the rail 8 together with the arm 16 and the flange 17 of the rail 10 form a channel with a mouth of restricted width for the reception of a resilient weather sealing strip 18 which may consist of soft rubber or any other material of sufficient resiliency and resistance to weather, sea water or whatever influences may be encountered. The beading 13 and the flange 17 hold the resilient strip 13 securely in place. When the door is closed, the outer margin of the flange 4 of the frame 2 presses against the inner surface of the sealing strip 18 and provides for fluid-tight seal.

The members 7 to 10 constituting the body of the door 6, consist of sheet metal, for instance, ordinary carbon sheet steel or high-tensile material such as chromium nickel stainless steel, and are preferably connected with each other by electric spot or seam welding in the regions of overlap, as indicated at different places in the drawing.

In the illustrated embodiment, wedges 19 are riveted to the outer side of arm 15 of the outer door rail 10 and to the door panel 7. One of these wedges is arranged at each of the four corners of the door, and four more wedges are distributed at about equal distances from each other and from the corner wedges along the vertical sides of the door, as clearly shown in Figure 1. For closing the door, the wedges 19 are engaged by dogs 20, 21 rotatably supported in the door frame 2, as presently to be described in detail.

Opposite the location of each wedge 19 a hollow bushing or tube 22, 23 extends through a hole in arm 3 of the door frame 2 and is welded in the hole. 24, 25 are brackets for bracing the bushings 22, 23 against the frame 2. Journalled in the interior of each bushing 22 (see Figure 6) is a shaft 26 by means of bushings 27, 28, preferably of the oil impregnated bronze type, holding between them a fluid seal 29. This fluid seal is preferably of the type now common in the automotive industry for oil-sealing rotating shafts. It consists of a T-section ring 30 of rubber, neoprene or any similar resilient material, two coil spring rings 31 pressing the ends of the cross bar of the T against the shaft 26 and an outer sleeve 32 of brass or other suitable material.

The inner end of each shaft 26 has a head 33, whereas the outer end has a square-section portion 34 and a screw threaded portion 35. The square-section portion 34 is engaged by an interiorly correspondingly shaped portion 36 of one of the dogs 20. The dog 20 is held in place by a nut 37 which may be secured in place by a cotter pin or the like 38 passing through the boring provided in the nut 37 and the shaft portion 35.

The shafts 26 are adjusted in axial direction and axial stresses are transmitted by washers 39 inserted respectively between the head 33 and the inner ends of the bushings 22, 27 and between the dog portion 36 and the outer ends of the bushings 22, 28. The washers 39 are likewise preferably of the oil impregnated bronze type.

A shaft 40 (see Figure 5) is journalled in the sleeve 23 in the same manner as the shafts 26 by means of bushings 27, 28, a fluid seal 29 and washers 39. However, the outer end of the shaft 40 is permanently connected or forms one piece with one end of a long hand lever 41 provided with a shoulder 42 which rests against the outer washers 39, while

the inner end of shaft 40 has a square-section portion 43 and a screw threaded portion 44 over which fits the one interiorly correspondingly shaped end 45 of another long hand lever 46 which is held in place by a nut 47 and presses against the inner washers 39.

The inner portion of the lever 41 forms the dog 21 and is provided, as are all the other dogs 20, with a dog shoe 48. The shoes are held in the dogs 20, 21 by interengaging screw threaded portions and are adapted to engage with their spherical portion the respective wedges 19. While the wedges 19 may consist of an aluminum bronze, the dog shoes 48 may consist of stainless steel.

The heads 33 of the shafts 26 at the four corners of the door are permanently connected or form one piece with double-armed levers or bell cranks 49, 50, respectively, while the heads of the remaining shafts 26 are connected with single arm levers 51. The operating lever 46 and the ends of the levers 49, 50 and 51 are journalled to and interconnected by four rods, two horizontal rods 52 and two vertical rods 53. The arrangement is such that upon movement of one or both of the operating levers 41, 46 about the axis of their shaft 40 all dogs will be swung by means of the rods 52, 53 and their levers 49, 50, 51 either into the locking position in which they engage the wedges 19 and point toward the center of the door, that is, into the position shown in Figures 1, 2 and 4 to 6, or into the open position illustrated in Figure 3. In the open position not only the dogs but the entire lever-and-rod system is outside the confines of the door opening, as is clearly apparent from Figure 3. In the closed position the dogs 20, 21, the levers 41, 46, 51, one arm of each lever 49, 50, and the rods 53 are partly within the confines of the opening. At least some of the levers extend, as shown in the drawing, in the same general direction from the respective axes as the dogs with which they are connected.

A typical connection between the rods and the levers of the dogs is illustrated in Figure 6. This connection consists of a screw bolt 54 passing through an opening 55 in a lateral extension 56 of the respective rod 53 and through a hole in the outer end of the respective lever 51. The extensions 56 may be welded to the rods 53. The bolt is held in place resiliently by a spring washer 57 and a nut 58. Lever 46 is connected to one of the extensions 56 in practically the identical manner as shown in Figure 5. The holes 55 or at least some of them may be elongated, as indicated in Figure 6, so as to permit adjustment transversely to the longitudinal extent of the rod 53. Such transverse adjustability is especially necessary if, as illustrated in the embodiment, the axes of the shafts 26 at the four corners are not exactly on a straight line with the axes of the remaining shafts 26 and 40. Note that the arms of the members 49 and 50 to which the vertical rods 53 are attached are also slightly shorter than the arms or levers 51. Obviously, other means than the elongated holes may be employed for obtaining the lateral play between the levers 51, 46 and the rods 53.

The employment of a system of levers and rods 52, 53, 49 and 50 which constitute together a closed figure is of importance so as to obtain by a single operating means a secure locking action by each set of cooperating wedges and dogs.

The opening movement of the lever-and-rod system is limited by an adjustable stop 59 which may consist of a bolt screw threaded into a

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bracket secured to the door frame 2, as clearly shown in Figures 2 and 3.

Mainly for the purpose of holding the entire locking mechanism in the open position, the lever 46 (see Figures 4 and 5) is provided with a bushing 60 in the interior of which is guided a plunger 61 biased by a compression spring 62 and carrying a roller 63. The roller travels on a cam surface 64 provided on a cam member 65 which surrounds the bushing 23. The cam surface 64 has a deep recess 66 into which the plunger 61 with its roller 63 is pressed by the spring 62 when the lever 46 has reached the open position and from which it can be removed only by applying a considerable amount of force on one or both of the levers 41, 46 in the closing direction. The cam surface 64 is long enough to take care of the wear on the engaging surfaces of the wedges 19, the dog shoes 48 and of the seal 18.

It is obvious that the door can be opened or closed, respectively, by swinging one of the levers 41 or 46 about an angle of approximately 90° and that in the open position no member of the operating mechanism or of the door projects into the door opening. It is further obvious that the door is extremely light because it consists of the sheet metal main panel 7, the rails 8, 9 and 10 and the wedges 19 only, but it does not have to be of such heavy construction as in the case where the operating mechanism is carried by the door and has to be enclosed between two panels so as to protect it from the sea and the weather when the door is swung open.

The only parts of the mechanism illustrated in Figures 1 to 6 which are on the outside are the dogs with the outer ends of the supporting shafts as well as the outer operating lever 41. This arrangement of the dogs on the outside has a certain advantage, as in an emergency it permits the opening of the door from the outside by engaging the dogs, for example, if the lever system on the inside should have been put out of action by being disrupted or bent. On the other hand, the support of the shafts 26 and 40 in the door frame and the particular type of fluid seal surrounding these shafts are believed to give perfect assurance that no water will penetrate into the interior and that the shafts will at all times be kept in easily movable condition.

Only the main elements of the door which have a bearing on the present invention are illustrated in detail in the drawing and described in the foregoing. It is obvious, however, that the door is provided with inside and outside grabs 78, 79 and hasps 90 for locking the door, as diagrammatically shown in Figures 1 and 2, and with other accessories which are customary or may be desired.

The invention is not restricted to the illustrated embodiments but is liable to modifications which will occur to those skilled in the art. Such modifications are covered by the spirit and the language of the attached claims.

What is claimed is:

1. In a quick-operating cover structure of the indicated device, a wall surrounding an opening, a cover member adapted for movement into and away from the opening, a plurality of dogs supported by said wall rotatably about axes extending transversely to the plane of the wall and arranged close to the margin of the opening, said dogs being adapted for engaging the cover member and pressing it against the frame in the closing position, levers rigidly connected with said

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dogs, at least some of said levers extending in the same general direction from the axes as said dogs, a plurality of rods journaled to and interconnecting the levers and generally paralleling the margins of the opening, and common means for moving together said levers and rods in the closing position in which the dogs and the levers point toward the middle portion of the door and the rods connected with such levers are within the confines of the opening, and in the open position in which the dogs, levers and rods are outside the confines of the opening thereby permitting unimpeded passage through the opening.

2. In a device of the indicated type, inner and outer operating levers interconnected by a shaft rigidly connected with them and extending through a sleeve in a wall in which said shaft is rotatably supported, a cam surface provided on a member surrounding said sleeve and reinforcing the connection of the latter with said wall, a cam follower supported by one of said levers movably in a direction transversely to the cam surface, means between the said one lever and the cam follower for biasing the latter against the cam surface, a recess in said cam surface for the reception of the cam follower holding said levers in the open position of the device and permitting closing movement only if sufficient force is applied for overcoming the resistance offered by said biasing means against the removal of said cam follower from said cam recess.

3. In a structure of the indicated type having: a wall surrounding an opening, a cover member for said opening for movement against and away from said wall, a plurality of cover member engaging dogs in the form of elongated levers, said dogs being supported by said wall rotatably about axes extending transversely to said wall, being arranged at points distributed along the margin of said opening and projecting in closing position into the confines of said opening; said structure comprising a plurality of rods, pivot connections between said rods and parts rigidly connected with said dogs at points radially spaced from the respective axes of said dogs in the same general radial direction as said dogs, with the effect that the rods connected with said parts of the dogs are also in the closing position of the dogs within and in the open position outside the confines of said opening.

4. In a structure of the indicated type, comprising a wall surrounding an opening, a cover member for said opening, hinge means along one side of said opening supporting said cover member for movement toward and away from said wall, a plurality of dogs engaging said cover member for holding it against said wall, said dogs being supported by said wall rotatably about axes extending transversely to said wall and arranged at spaced points along the margins of said opening, and means interconnecting said dogs for their simultaneous movement, the combination with a single pair of long hand levers secured respectively by one of their ends on opposite sides of said wall to a shaft and connected with said means interconnecting said dogs, said shaft transversing said wall, said levers being arranged on the side of said opening opposite said hinge means extending from said shaft in the same general direction as said dogs relative to the opening, said dogs, said interconnecting means at least in part and said long levers extending in the closing position into the confines of said opening

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and in the open position along the respective side of said opening thereby not impeding passage through the latter.

5. In a bulkhead structure and bulkhead door: said bulkhead structure surrounding an opening and supporting said bulkhead door for movement into peripheral engagement with the margins of said opening; a plurality of dogs in the form of elongated levers; said dogs being supported by said bulkhead structure rotatably about axes extending transversely to said bulkhead structure, being arranged with spacing from each other along the margin of said opening, and projecting in closing position into the confines of said opening; said bulkhead structure and door comprising furthermore: a plurality of rods, pivot connections between parts rigidly connected with said dogs at points radially spaced from the axes of said dogs in the same general direction as said dogs, said rods together with said dogs extending in the closing position of the dogs into the con-

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finer of said opening and in the open position along the margins of said opening.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

10	Number	Name	Date
	229,905	Mosler -----	July 13, 1880
	797,768	Fisher -----	Aug. 22, 1905
	1,258,234	McKee -----	Mar. 5, 1918
	2,140,570	Young -----	Dec. 20, 1938
	2,179,495	Court et al. -----	Nov. 14, 1939
15	2,209,060	Lambert -----	July 23, 1940
	2,216,012	Jacob -----	Sept. 24, 1940
	2,234,776	Persson -----	Mar. 11, 1941
	2,355,025	Arthur -----	Aug. 1, 1944
20	2,378,119	Arthur -----	June 12, 1945
	2,383,435	Jacob -----	Aug. 21, 1945

Certificate of Correction

Patent No. 2,511,267

June 13, 1950

ELLIS L. JACOB

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 5, line 67, for the word "device" read *type*;
and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of September, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.