

May 6, 1952

E. M. GREER ET AL

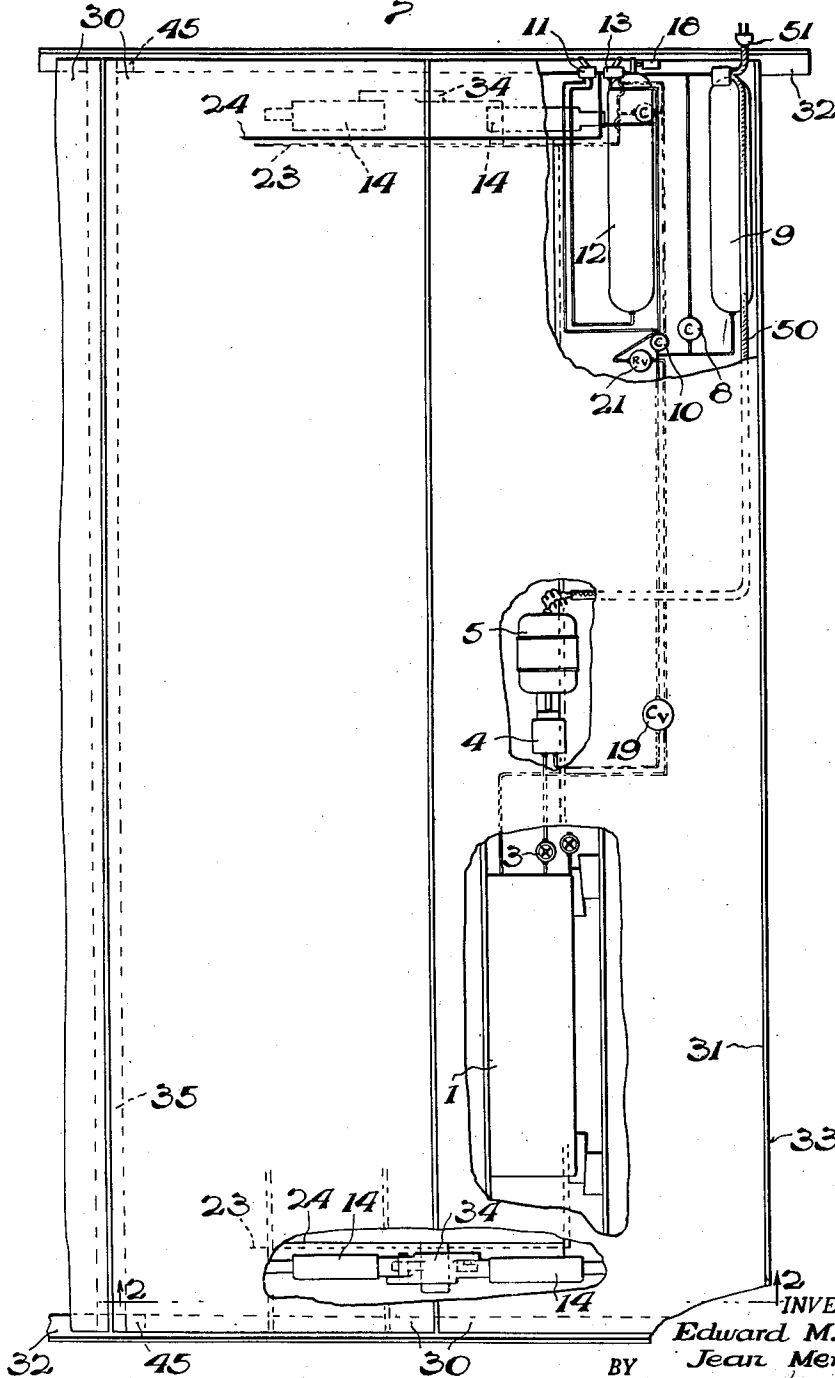
2,595,248

HYDRAULIC SYSTEM FOR POWER-OPERATED HATCH COVERS

Filed March 29, 1948

2 SHEETS—SHEET 1

FIG. 1.



INVENTORS
Edward M. Greer
Jean Mercier.
BY
Howard T. Jeandron
Attorney

May 6, 1952

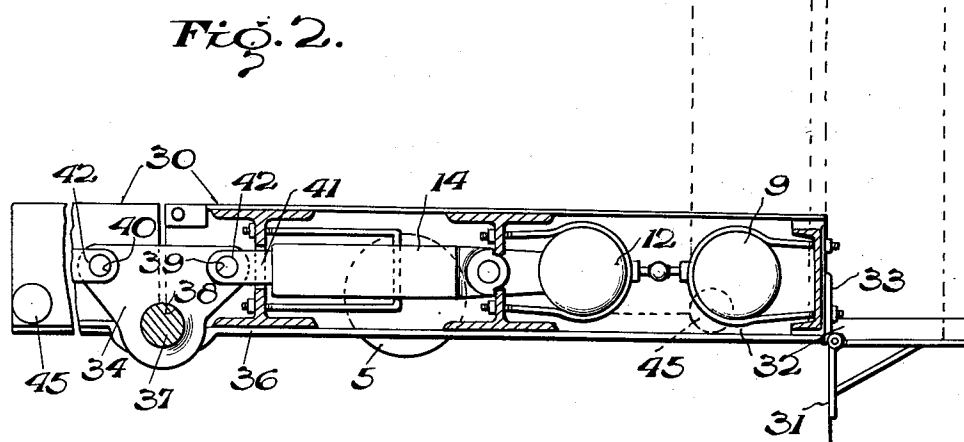
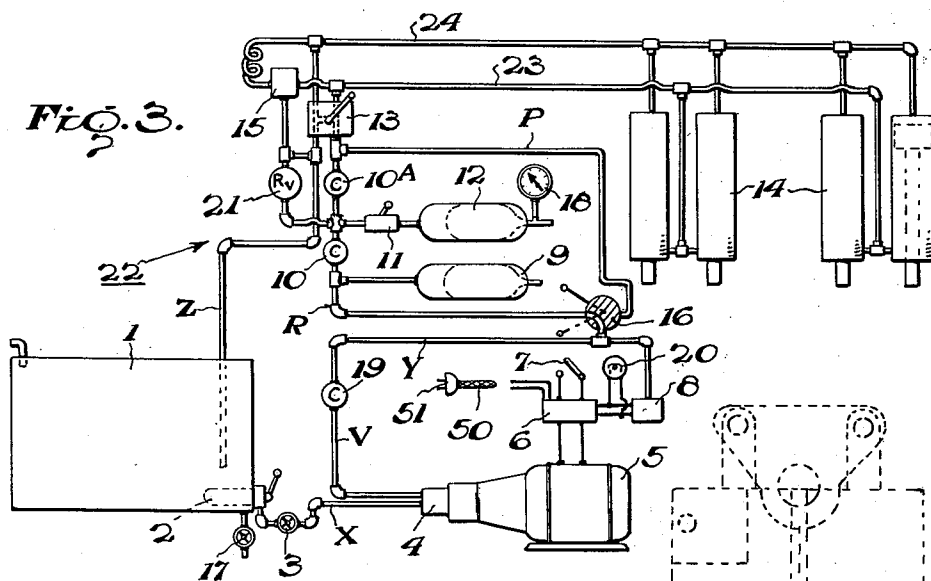
E. M. GREER ET AL

2,595,248

HYDRAULIC SYSTEM FOR POWER-OPERATED HATCH COVERS

Filed March 29, 1948

2 SHEETS—SHEET 2



INVENTORS
 Edward M. Greer
 BY Jean Mercier.
Howard J. Jeandron
 Attorney

UNITED STATES PATENT OFFICE

2,595,248

HYDRAULIC SYSTEM FOR POWER-
OPERATED HATCH COVERS

Edward M. Greer, West Hempstead, and Jean
Mercier, New York, N. Y.; said Greer assignor
to Greer Hydraulics, Inc., Brooklyn, N. Y.

Application March 29, 1948, Serial No. 17,606

3 Claims. (Cl. 60—51)

1

This application is a continuation in part of our co-pending application Serial No. 646,696, filed February 9, 1946, now Patent No. 2,491,261 dated December 13, 1949.

This invention relates to power operated doors of all kinds and more particularly to doors having a motivating device and controls mounted within the doors to move with the doors.

With marine hatch door covers since the hatchway lies in a horizontal plane and the doors are necessarily very heavy there is a great deal of trouble in lifting these doors out of the hatchway opening, usually the hatch doors are lifted with a derrick or hoist and stacked somewhere out of the way. When the doors are placed over the hatch opening, it is necessary to support them at opposite ends of each door with a cross beam.

An object of this invention is to provide one or more doors in which a retracting device is integrated with the door or doors.

A further object of this invention is to provide pairs of doors that contain a retracting device in which all components are integrated with the doors, except the power connection necessary to supply the force to a motivating device.

A still further object of this invention is to provide a plurality of doors that are moved to open or closed position by hydraulic motors, which are supplied with fluid under pressure from a hydraulic pump that is in turn driven by an electric motor and in which all components are mounted within the doors.

Another object of this invention is to provide a pair of pivotally joined doors in which one end of the pair of doors is hinged to an opening and the opposed end of the pair of doors is supported on rollers mounted on horizontal supporting beams and in which two opposed hydraulic cylinders are mounted, one in each door, their pistons being connected to the pivotal member between the doors to provide a closure of the doors when the pistons are at one end of their stroke and a full opening of the doors when the pistons are at the opposite end of their stroke.

A further object of this invention is to provide one or more pair of retractable doors that are pivotally mounted on one side of a horizontal opening and supported by rollers on the opposite extremities of each pair of doors and in which the motivating mechanism is self-contained within the doors.

A still further object of this invention is to provide one or more pair of retractable doors that are interconnected and further may be ex-

2

tended to an aligned position or retracted to a side by side parallel relationship.

A further object of this invention is to provide one or more self-closing doors in which the actuating system is mounted integral with the doors, and in which the actuating system is connected to an articulating element intermediate at each pair of doors.

A still further object of this invention is to provide a power actuating device mounted in one or more pair of hatch door covers with a single control to retract said doors to a side by side parallel relationship and to extend said doors to an aligned horizontal position covering said hatch.

A still further object of this invention is to provide a power storage device mounted in one of a pair of hatch door covers to provide the motivating force to retract said doors to an open position and to extend said doors to a closed position.

Other objects may be apparent by referring to the accompanying detailed description and the drawings in which:

Fig. 1 is a plan view of a portion of a hatch cover incorporating the features of this invention.

Fig. 2 is a cross sectional view taken on line 2—2 of Fig. 1, and

Fig. 3 is a diagrammatic illustration of the power system mounted within the doors.

Referring to the figures there are illustrated a plurality of doors 30 in Figs. 1 and 2, horizontally mounted over a hatch opening 31. The hatch doors 30 have a power motivating device 22 mounted therein. The power motivating device 22 illustrated in Fig. 3 may comprise a fluid reservoir 1 having a filter 2 therein. A supply line X is mounted to the outlet of the filter 2 and is provided with a shut-off valve 3. The supply line X is, in turn, connected to a fluid pump 4. The pump is driven by an electric motor 5 and said motor 5 is controlled by a motor starter 6 which is, in turn, controlled by a switch 7. The starter 6 is also opened or closed by a pressure switch 8. The pressure switch 8 is connected by means of a fluid line to a pressure output line Y of the pump 4. The pressure output line of the pump 4 is provided with a check valve 19 to permit fluid flow in one direction. Line Y is connected to a two position rotary valve 16, so that line Y may be connected with either line R or line P. The line P is in turn connected to the fluid pressure port of the selector valve 13. In addition a check valve 10A is added to the line R between the selector valve 13 and a stand-

3

ard pressure accumulator 12 of relatively large capacity to prevent any backing up of fluid pressure when line P is utilized. A second pressure accumulator 9 also of relatively large capacity is connected to the pressure line R which delivers fluid from the pump 4. A check valve 10 is provided in the pressure line R and is connected through check valve 10A to a selector valve 13. The accumulator 12 is connected through a manually operated check valve 11 to the pressure line R connected to the selector valve 13. A relief valve 21 is also connected to the same pressure line Y to limit the pressure that may be stored in accumulator 12 or supplied to the selector valve 13. A gauge 18 may be provided to indicate the pressure of the operating fluid stored in accumulator 12. The selector valve 13 is also connected by means of a return line Z to the fluid reservoir 1.

The selector valve 13 is of a standard design having four ports as indicated in Fig. 3. Poppet valves control the flow of fluid through each port and the poppets are controlled to be opened or closed by the manual means illustrated. Thus, the valve 13 may be placed in a closed position and in either of two open positions. When in the position indicated, the aligned ports will be in communication with each other and the fluid from the line Y will pass directly through the valve 13 to a line 23, while the fluid in a line 24 will be connected directly through the valve 13 to the line Z. Likewise, when the manual member is moved to its opposite position, the diagonally positioned ports will be connected. Thus, the fluid from line Y would flow through to line 24 and the return fluid in line 23 would flow through to the return line Z. A plurality of hydraulic actuating cylinders 14 are connected to the lines 23 and 24, the line 24 being connected to one end of all cylinders, while the line 23 is connected to the opposed end of all cylinders. A thermal relief valve 15 is connected to the lines 23 and 24 so that when an excessive pressure is produced in either line the fluid will be relieved through a return to the line Z. The thermal relief valve is similar in construction to an ordinary relief valve, such as that illustrated at 21. The pressure switch 8 is provided to break the circuit through the starter 6 to the motor 5, and an indicating light 20 may be provided which will be on as long as the motor is operating, and will be off whenever the pressure is excessive or whenever the switch 7 is opened. The reservoir 1 is also provided with a drain valve 17.

Referring to Figs. 1 and 2 there is illustrated a hatch opening 31 having a cross beam 32 at either side thereof. A plurality of hatch doors 30 are positioned in alignment over the hatch opening 31. The doors 30 run the length of the opening 31 and bear on the cross members 32. The plurality of doors are hinged to one side of the opening 31 by a hinge member 33 affixed to the jamb of the opening 31. The doors 30 are provided with an intermediate pivotal or articulating member 34 at either end of each pair of doors positioned between each succeeding pair of doors 30. A hinge 35 is provided between each succeeding pair of doors. The articulating or pivotal member 34 is mounted by means of a plate 36 to the lower side of the doors 30 and has a pivotal pin 37 therethrough. The plate 34 is triangular in shape being provided with three apertures 38, 39 and 40. The pin 37 passes through aperture 38 and a pair of opposed cylinders 14 are mounted in opposed relationship

4

within the doors 30. They may be supported by structural members of the door in any fashion, such as illustrated in Fig. 2 so that the piston rods 41 are free to move and the cylinder is held in a fixed position with the door 30. In the aligned position, as indicated in Fig. 2, the cylinder 14 must have its piston rod 41 in a retracted position and thus the piston rod 41 is connected by means of a pin 42 to the aperture 39, while the opposed piston rod 41 would be connected by means of a pin 42 to the aperture 40. Thus, when a motivating force is supplied to both piston rods 41 the movement of the latter away from the cylinder 14 will result in a force in which the components are necessarily upward; this is due to the fact that their connecting pins are above the center line thrust, thus the pivotal member 34 will be moved upward and since the door 30 is hinged or pivoted at 33 the first door will be moved upward in a pivotal movement until the pistons 41 have completed their extended stroke and the door 30 has reached the position indicated in dotted lines and at the same time the adjoining door 30 will have reached a parallel position indicated in dotted lines. It will be noted that the adjoining door is provided with a roller 45 which bears on the cross beam 32, thus during the retracting action the roller moves from its position indicated in Fig. 2 to the dotted position indicated. It is apparent, referring to Fig. 1, that a second pair of doors 30 hinged to the first pair by the hinge 35 with the same articulating mechanism mounted therein would perform in similar fashion to fold in the same parallel relationship indicated in dotted lines in Fig. 2.

Referring to Fig. 1 the reservoir 1 is mounted integral with the door 30. Likewise, the motor 5 and pump 4 are supported on or mounted into the door 30 and the accumulators 9 and 12 are strapped within the door 30 by structural bands or other supporting means and the component parts illustrated in Fig. 1 are connected to perform, as shown in Fig. 3.

In operation the reservoir 1 is provided with the hydraulic fluid to be used and the motor 5 and its starter 6 are connected by means of an extension line 50 to a plug 51 which may be connected to an external source of power. The accumulators 9 and 12 are filled at the air valve end with a gas at a predetermined pressure. The mechanism is now ready to function. For operation the switch 7 is closed causing the motor 5 to be operated and the pump 4 to pump fluid to the system. Due to the small pump utilized delivering approximately 22 cu. in. per minute and a maximum p. s. i. of 1500, the electric motor must supply about .086 H. P. The shut-off valve 3 is opened, thus the fluid from the reservoir 1 passing through the filter 2 will be supplied to the pump 4 and the pump 4 will supply fluid under pressure through the check valve 19 to the accumulator 9 storing fluid under pressure within the accumulator 9 and, likewise, the fluid pressure passing through the check valve 10 will be stored in the accumulator 12 passing through the manual check valve 11. Since the accumulators chosen for this system are necessarily large in capacity (40 to 50 cu. in.) with operating pressures of 100 to 1500 p. s. i., the small volume supplied by the pump will require an elapsed time of a few minutes to store sufficient fluid under pressure for a work operation. Once the accumulators have been fully charged, with the valve 13 in intermediate closed position, the system is ready for operation. The fluid pressure in the

5

supply line Y will pass to the selector valve 13 which is controlled by the manual means illustrated. Thus, in one position the fluid pressure passes through the line 24 to the same end of all hydraulic cylinders 14 connected to the line 24, to expel the piston rods 41 which, as already explained, will cause the doors 30 to be folded into a retracted position. During this stroke of the piston rods 41 the fluid in the cylinder 14 will be expelled through the line 23 to which all cylinders 14 are connected, and thus, the return fluid will pass through the selector valve 13 to the return line Z which, during the operation of the pump 4, will cause the fluid to be circulated back into the supply line Y. It is apparent that the doors 30 may be extended from their open position, indicated in dotted lines in Fig. 2, to a closed aligned position by reversing the selector valve 13, thus the fluid under pressure from line Y will be redirected to the line 23 and thus to the opposite end of the cylinders 14 causing the piston rods 41 to be retracted, thus causing the doors to move outward on the rollers 45 until they reach an aligned position, as indicated in Fig. 2. It is, likewise, true that during this stroke of the piston 41 the fluid on the opposite side of the piston in each cylinder 14 will pass through the line 24 back through the selector valve 13 to the return line Z in the same fashion as already described. It is to be noted that during either stroke of the piston rods 41 whether retracting or extending, the fluid under pressure supplied to the cylinders 14 must come from the accumulators 9 or 12 as the pump 4 could not supply a sufficient volume of fluid to actuate the pistons during their work stroke. Although the accumulators are the source of power, the pump 4 continues to replenish the fluid under pressure that is dissipated during each work stroke, and when the pump 4 has boosted the system and accumulators up to the maximum setting the pressure switch 8 will again cut off the power to the electric motor 5. Any excessive heat developed in the operation of this device which causes a rise in fluid pressure in line 23 or 24 will be relieved through the thermal relief valve 15. This maximum pressure is necessarily above the operating pressure used in cylinders 14.

It is apparent that any defect in the system, such as the reservoir 1 being drained by the fluid supply demanded or the failure of the motor 5 to operate would leave the doors 30 in an inoperative position. Therefore, the storage of an operating pressure in the accumulator 12 permits the full retraction and full extension of the doors 30 by operating the manual check valve 11 so that the pressure stored therein may be supplied through the selector valve 13 in the fashion already described.

In the event of a failure of the accumulator 9 it is understood that the accumulator 12 may be utilized for operation. If both accumulators 9 and 12 were to fail the rotary valve 16 may be moved to another position and the fluid under pressure from line Y would be supplied directly to the selector valve 13 and in turn to the fluid motors 14. When line Y is connected to line P the operation of the fluid motors would necessarily be very slow, due to the small volume supplied. It is apparent that this system is capable of performing with the power stored in either accumulator or directly from the fluid pressure developed by said pump.

Various groupings or pairs of doors may be used to provide the necessary cover according to the

6

size of the hatchway to be covered. For instance, a small hatchway may be covered with a single door having a pivotal plate associated with it, or as described a pair of doors may be used. A larger hatchway may be covered with two pair of doors, all operating from the one side, and a still larger hatchway may be covered by three pair of doors, in which two pair operate from one side, while a single pair operates from the opposite side, and so it is possible to group the pairs to be retractable and extendable over most any size hatchway.

Another feature of this invention is the fact that a single door may have the complete power system mounted therein. In such case there will be a single motivating means and a pivotal actuating plate associated with the door. Also one or more doors may be removable as an operative unit except for the hinge pins to mount them to the hatchway and when removing a single door the pivotal pins to connect it to the articulating members between each door, and the plug providing power, the door or doors may be quickly removed for repair or maintenance of the component parts mounted therein, or a complete unit having the same component parts may be quickly installed for continued operation of the hatchway cover.

A further feature of this device is the positioning of the main hinge for the group of doors; it may be mounted a sufficient space back of the supporting framework to permit the doors to be retracted to a nested relationship clear of the opening.

Various modifications of the articulating members may be used without departing from the spirit of this invention, or various forms of power devices may be incorporated within the doors to operate with the articulating members that are mounted between the pairs of doors without departing from the spirit of this invention. Thus various changes and modifications may be employed to accomplish a similar result without departing from the spirit of this invention, and this invention shall be limited only by the appended claims.

What is claimed is:

1. A fluid system including a pair of accumulators to be charged with fluid under a predetermined pressure, a selector valve connected to said accumulators to regulate the discharge of fluid therefrom, one of said accumulators being connected directly to said selector valve, a plurality of fluid motors connected to said selector valve, said fluid motors being connected in parallel relationship so that the selector valve provides the means to operate all fluid motors in one direction when the selector valve is positioned in its first position, and to operate all fluid motors in an opposite direction when said selector valve is positioned in its opposite position, and a manually operated check valve interposed between the other of said accumulators and said selector valve, whereby when the fluid pressure from said first accumulator reaches a minimum value, said check valve may be opened to operate said fluid motors from said second accumulator.

2. A fluid system according to claim 1 in which the fluid motors absorb a larger volume of fluid per stroke than the pump supplying source can deliver in the period of time that it takes to complete the stroke of said fluid motors.

3. A fluid system according to claim 1 in which the second accumulator may be utilized to pro-

7

duce the operation of the fluid motors in a plurality of complete cycles.

EDWARD M. GREER.
JEAN MERCIER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
569,774	Thorpe et al. -----	Oct. 20, 1896

Number
1,480,257
1,947,727
2,190,653
5 2,253,112
2,264,375
2,347,379
2,392,471
2,393,805
10 2,396,984
2,406,173
2,437,520

8

Name	Date
Gerlinger -----	Jan. 8, 1924
McCune -----	Feb. 20, 1934
Dunn -----	Feb. 20, 1940
De Boysson -----	Aug. 19, 1941
Hill et al. -----	Dec. 2, 1941
Teeter -----	Apr. 25, 1944
Fox -----	Jan. 8, 1946
Parker -----	Jan. 29, 1946
Broadston et al. -----	Mar. 19, 1946
Stephens -----	Aug. 20, 1946
Gunning -----	Mar. 9, 1948