United States Patent [19]

Manini

[11] **3,815,361**

[45] **June 11, 1974**

[54] **DEVICE FOR OPERATING HINGED CLOSURES**

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[22] Filed: **Mar. 16, 1972**

[21] Appl. No.: **235,129**

[52] **U.S. Cl.** **60/477,** 60/403, 60/DIG. 10

[51] **Int. Cl.** **F15b 15/18**

[58] **Field of Search** 60/477, 481, 325, 403, 60/406

[56] **References Cited**

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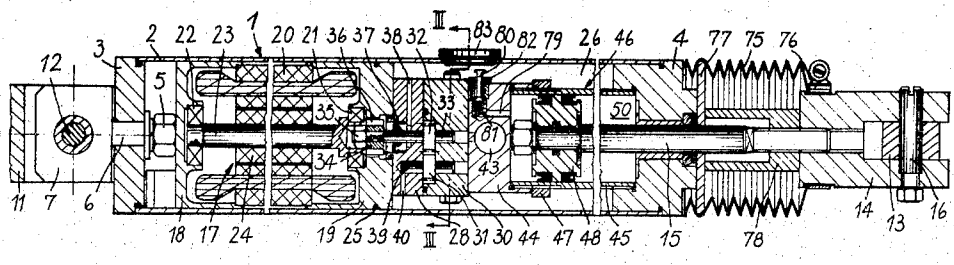
[57] **ABSTRACT**

A device for opening and closing hinged closure including a hydraulic pump driven by an electromotor and feeding a cylinder of a double-action hydraulic jack through valve elements, comprising a tubular container closed by respective caps and accomodating the electromotor and jack in such a manner that the axes thereof are in line with each other and that the shaft of the jack extends axially from said container, the pump being located between the electromotor and the jack, and the container forming with the pump and the jack a water-tight well in respect to the electromotor and serving as tank for the oil, the valve elements including a body, a cylindrical cavity machined in the body which is connected to the forward-action and return-action pipes of the pump and to the opposing chambers of the double-acting jack, a valve of non-return located at one end of the cavity and designed to permit the passage of the forward-action oil toward the cylinder, a small piston guided in the cavity between the inflow openings of the pipes into the cavity and designed to open the non-return valve for the return of the oil from the cylinder to the pump, the forward action and return-action pipes being connected each with the well through adjustable flow-control valves and check valves.

3 Claims, 4 Drawing Figures



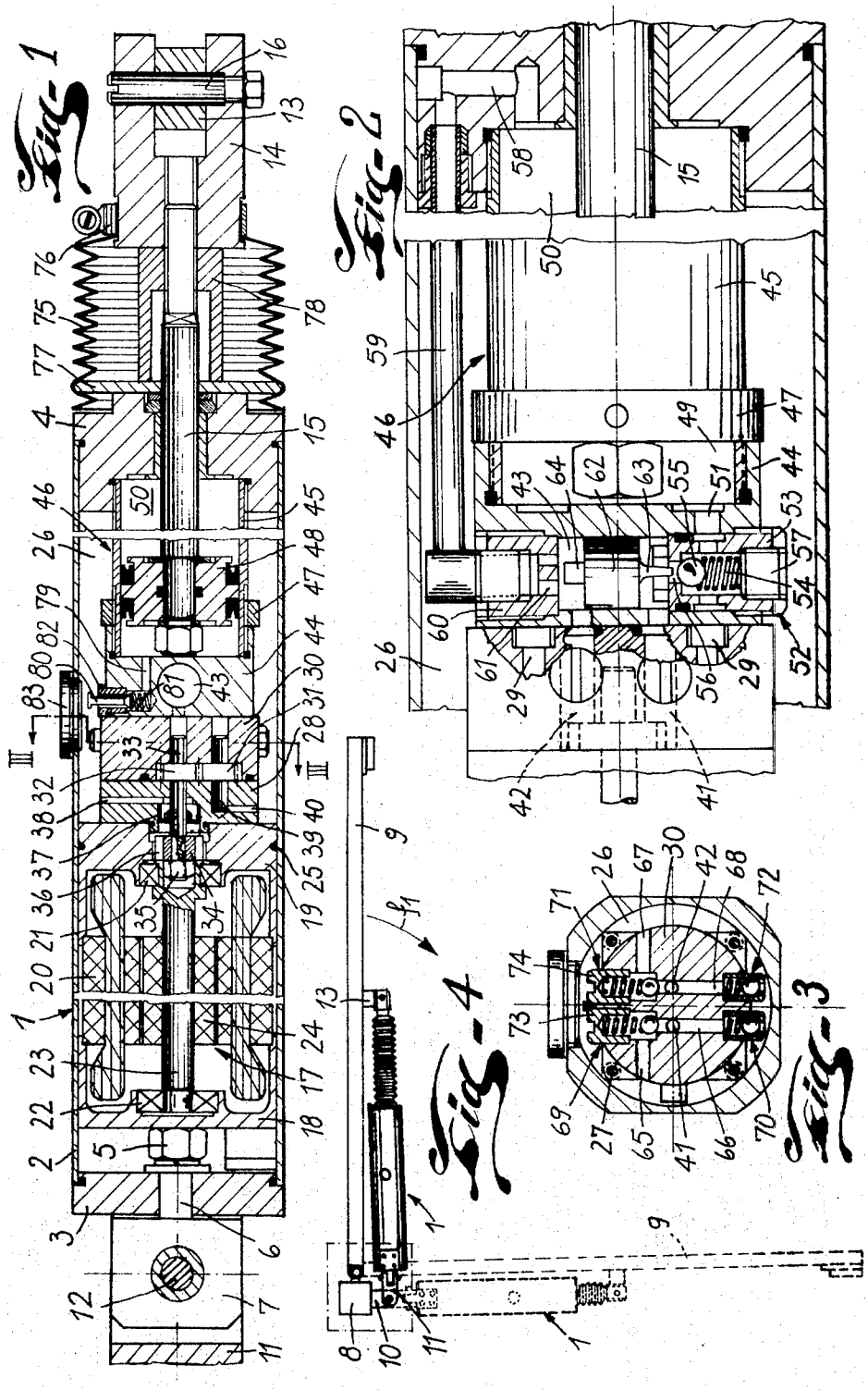


Fig-1
Fig-2
Fig-3
Fig-4

DEVICE FOR OPERATING HINGED CLOSURES

BACKGROUND OF THE INVENTION

The present invention concerns a device for opening and closing hinged closures, such as gates, doors, and the like, comprising a hydraulic pump driven by an electromotor and feeding the cylinder of a double-acting jack through valve elements.

Devices for opening and closing hinged closures are already in existence. However, they have the disadvantage of containing separated components which consequently involve complex structures and laborious installations.

An object of the present invention is that of providing a device of limited size and available as a single assembly, so as to be more easily installed in comparison with conventional devices.

Another object of the invention is to provide a device which permits locking the hinged closure in a desired position, thus rendering superfluous the installation of bolts, bars and the like in the hinged closure.

SUMMARY OF THE INVENTION

According to the invention there is provided a device including a hydraulic pump driven by an electromotor and feeding a cylinder of a double-acting hydraulic jack through valve elements, and characterized in that it comprises a tubular container closed at the ends thereof by respective caps and accommodating said electromotor and jack in such a manner that the axes thereof are aligned with each other and that the shaft of the jack extends axially from said container, the pump being located between the electromotor and the jack, and the container forming with said pump and said jack a water-tight well with respect to the electromotor and serving as tank for the oil, and that said valve elements comprise a block, a cylindrical cavity formed in said block which is connected to the feeding and return conduit of the pump and to opposite chambers of the double-acting jack, a valve of non-return type located at one end of said cavity and permitting the passage of oil toward the cylinder to cause elongation of said jack, a small piston guided in said cavity between the openings of said conduits into said cavity and designed to open the said non-return valve for the return of the oil from the cylinder to the pump during shortening of said jack, said conduits being connected each with said well through adjustable relief valves and check-valves.

BRIEF DESCRIPTION OF THE DRAWING

The invention will become more evident from the following detailed description of a preferred embodiment which is illustrated by way of example in the accompanying drawing in which:

FIG. 1 shows a sectional view of the device according to the present invention;

FIG. 2 shows a view of the valve elements of the device, in an enlarged scale and perpendicular to the sectional view of FIG. 1;

FIG. 3 shows a sectional view taken along line III—III of FIG. 1, and

FIG. 4 shows an application of the device to a hinged closure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the above figures, the device as a whole is indicated at **1** and comprises a tubular container **2** closed at the ends thereof by caps **3** and **4**. To cap **3** is secured, through bolt **5**, the tang of an extension **7** with which, as will be more evident from FIG. **4**, the device is hinged onto the inside surface of vertical jamb **8** to which is further hinged the hinged closure **9** (for example, a gate) which is to be opened or closed. From jamb **8** bracket **10** juts out to which is articulated along a vertical axis a piece **11** to which, in turn, said extension **7** is pivoted by means of pivot pin **12** whose axis is perpendicular to said vertical axis. The hinged closure is provided with a tongue **13** for connection to the other end of device **1**, which end consists of a piece **14** screwed onto the threaded portion of shaft **15** and rotatably joined to said tongue **13** by means of a pin **16.**

Shaft **15** is guided in seal-tight manner in cap **4** and, as will be seen further on, can be pushed forward or withdrawn within the container **2** in such a manner as to produce a lengthening or shortening of device **1** and therefore a swinging of hinging closure **9** around its hinged axis from the position indicated by the solid line to that indicated by the broken line in FIG. **4.** In the interior of container **2** is housed an electromotor **17** whose shields **18** and **19** support the stator **20** and, through means of bearings **21** and **22,** shaft **23** of rotor **24.** Between the outside diameter of shield **19** and the inside surface of container **2,** in an annular groove in shield **19,** there is a seal ring **25** which prevents any withdrawing of oil from well **26** in to electromotor **17** in view of the fact that the well **26** is the tank of the hydraulic circuit of the device. To the shield **19** is secured, through screws **27,** plate **28** to which disc **30** is fixed by screws **29.**

A cavity is formed in disc **30** in which there are two meshing gears **31** and **32** constituting a hydraulic pump. Gear **32** is rotatably secured to pin **33** which is connected to shaft **23** by means of a joint of cross-type which comprises a ring **34,** keyed onto pin **33** by means of a key and locked axially by bolt **35,** which is provided with radial arms **36** arranged cross-wise and extending into recesses formed in the adjacent hollow portion of shaft **23.** The oil leading out along pin **3** is prevented by seal-ring **37** to pass into electromotor **17** and discharged into well **26** through hole **38.** In this way pin **33** is lubricated at the same time. In a similar manner, the oil which lubricates pin **39** which supports gear **31** is discharged into well **26** through hole **40.**

The feeding and return conduits of the pump are indicated as **41** and **42** and lead, on one side, into the chamber in which gears **31** and **32** rotate in opposed points of said chamber with respect to the vertical plane passing through the pins **33** and **39** and, on the other side, into a cylindrical cavity **43** formed perpendicularly to the longitudinal axis of the device in a block **44** attached to disc **30.** Said block defines tubular portion into which is screwed sleeve **45** (FIG. **2**) which constitutes the cylinder of a double-acting hydraulic jack indicated as **46.** Cylinder **45** is screwed, on the opposite end, into cap **4** and is locked against any possible rotation by ring-nut **47.** Piston **48** which slides in cylinder **45** divides the same **45** into two chambers **49** and **50** and is fixed onto shaft **15** previously mentioned. The

oil inlet hole into the interior of cylinder 45 is shown as 51 and its connection with the feeding conduit 41 is controlled by a valve of non-return type or check valve 52. Said valve comprises a nipple 53 screwed into the cavity 43 and containing a spring 54 which forces with one end a small ball 55 against an orifice 56 and abuts with the opposite end on a plug 57 screwed into the nipple itself. The return of the oil from chamber 50 of cylinder 45 occurs through a hole 58 formed in cap 4 and connected to cavity 43 through a small pipe 59 which extends in the interior of well 26 between the tubular container 2 and the cylinder 45.

The joint between small pipe 59 and block 44 is accomplished through means of a nipple 60 screwed into cavity 43 and in which several holes 61 are provided. To prevent the hydraulic circuit comprising the conduits 41,42, the chambers 49,50 and the tube 59 to be by-passed by the cavity 43, a small piston 62 is slidable in said cavity 43. This piston is movable between the openings of the conduit 41,42 into said cavity 43 and is provided on its opposite ends with protuberances 63 and 64 designed to act against small ball 55 through orifice 56 or, alternatively, to come to rest against nipple 60, in this last position however permitting the oil to pass through the holes 61.

Conduits 41 and 42 (see FIG. 3) further communicate, respectively, with passages 65, 66 and 67, 68 along which are located relief valves 69, 71 and check valves 70, 72 of a type substantially similar to that mentioned above as 52, of which relief valves 69, 71 are designed to open when the oil pressure in pipes 41, 42 exceeds a pre-established value, while check valves 70, 72 open when a decrease in pressure occurs in conduits 41, 42 with respect to well 26.

Advantageously, the force counteracting the opening of valves 69, 71 is adjustable through the provision of adjusting plugs 73, 74 which, may be screwed more or less in disc 30 in order to, vary the force with which the little springs press the respective small balls against the adjacent orifices.

The device described is completed by a rubber cylindrical bellows 75 which, on one end, is attached to piece 14 by means of a cylindrical clamp 76 and, on the other end, is held by plate 77 which is fixed to the external face of cap 4 and acts as a stop-plate for sleeve 78 and as a jam-nut to prevent any possible rotation of piece 14.

The operation of the device is the following. Suppose that the hinged closure 9 must be moved from the open position indicated by the broken line in FIG. 4 to that of closed position. The electromotor 17 is started and also the pump 31, 32, so that the oil, through conduit 41, enters cavity 43 displacing the small piston 62 toward nipple 60 and thus opening ball 55 of valve 52.

The oil can then pass through hole 51 into chamber 49 of cylinder 45 acting on piston 48 and pushing shaft 15 outwards. Simultaneously there is a return of oil to the pump through hole 58, small pipe 59, holes 61 and conduit 42. It is to be noted that during elongation of jack 46 the quantity of oil fed from the pump is greater than that which returns to it. Every time the piston 48 is displaced to right in FIG. 1 the increase and decrease in volume of chambers 49, 50 respectively as determined by the movement of piston 48 within cylinder 45, are not equal because of the presence in chamber 50 of shaft 15, for which reason a part of the oil must be drawn in from well 26 through valve 72.

If the action of the electromotor 17 is prolonged even after the hinged closure 9 has reached its final position, so that device 1 can no longer increase its length, the oil fed from conduit 41 opens valve 69 and discharges into well 26 through passage 65.

When, instead, one wishes to move the hinged closure 9 from the closed position to the open position, one activates the electromotor 17 in the opposite direction due to which the oil fed by the pump, through conduit 42, holes 61, small pipe 59 and hole 58, enters chamber 50 of cylinder 45 and pushes piston 48 against block 44. Since simultaneously the small piston 62 is forced toward the nipple 53, protuberance 63 opens ball 55 of valve 52, and the return of oil from the chmber 49, through conduit 41 to the pump is made possible. Since the quantity of oil fed by the pump to chamber 50 is less than that which returns to it from chamber 49, for the same reasons explained above, a part of the return oil is discharged into well 26 through valve 69.

It is to be noted that, during the opening phase of the hinged closure, the oil pressure in conduit 41 is greater than that in conduit 42, since the face of the piston which controls the volume of chamber 49 has a greater surface than that of chamber 50 due to the presence in the latter of shaft 15. In this way while the relief valve 69 opens the valve 71 remains in closed position, thus assuring the passage of oil into chamber 50 and therefore re-entry of shaft 15.

When the action of the pump ceases, the device remains locked in the assumed position, and it is not possible to cause shaft 15 to re-enter into cylinder 45, if for example a force is acting upon hinged closure 9 in the direction indicated by arrow f 1 in FIG. 4. In fact, forcing the hinged closure 9 in said direction f 1 with the electromotor 17 de-energized, any reflow of oil through hole 51 remains intercepted by valve 52, whose small ball 55 can close orifice 56 since small piston 62 is in a neutral position. Indeed if electormotor 17 is de-energized, the pump is stopped and consequently no pressure may be exerted on the small piston 62. On the other hand, during forcing of the hinged closure, only the oil contained in the chamber 49 is compressed, while the oil contained in the cylindrical cavity 43, well 26 and chamber 50 is subjected to no pressure. The device described thus renders unnecessary the use of bolts or padlocks.

However, it could become necessary to open the hinged closure 9 manually in case of failure of electricity for activating electromotor 17. For this purpose, in order to effect the re-entry of shaft 15, which as previously stated is locked through the action of preventing the oil re-flow by means of valve 52, there is provided a conduit 79 which connects well 26 with chamber 49. Said conduit 79 is controlled by a small pin 80 having a conical head which, by means of spring 81, tightly abuts-on the underneath seat of a bushing screwed into block 44. Pin 80 is accessible from the exterior through a plug or cap 83 provided in tubular container 2. Appropriately the cap 83 is provided with, so that the cap cannot be removed by anyone who is not in possession of the relative key and who otherwise could activate device 1 by depressing pin 80. Further advantageously, cap 83 is located in proper position to permit access to plugs 73, 74, whose adjustment makes it possible to

vary the opening pressure of valves **69, 71** to adapt the pressure of the oil supplied by the pump to the resistance opposed by the hinged closure.

From what has been stated, it is obvious that when the hinged closure has reached its final open position, corresponding to that of the maximum re-entry of shaft **15** into cylinder **45,** the pressure obtained by the oil in conduit **42** opens valve **71** and permits the discharge of the oil into well **26.**

What is claimed is:

1. A device for opening and closing a hinged closure including a hydraulic pump driven by an electromotor and feeding a cylinder of a double-acting hydraulic jack through valve elements, and characterized in that it comprises a tubular container closed at the ends thereof by respective caps and accommodating said electromotor and jack in such a manner that the axes thereof are in line with each other and that the shaft of the jack extends axially from said container, the pump being located between the electromotor and the jack, and the container forming with said pump and said jack a water-tight well with respect to the electromotor and serving as tank for the oil, and that said valve elements comprise a block, a cylindrical cavity formed in said block, which is connected to feeding and return conduits of the pump and to opposite chambers of the double-acting jack, a valve of non-return type located at one end of said cavity and permitting the passage of oil toward the cylinder to cause elongation of said jack, a small piston guided in said cavity between the openings of said conduits into said cavity and designed to open the said non-return valve for the return of the oil from the cylinder to the pump, during shortening of said jack, said conduits being connected each with said well through adjustable relief valves and check-valves.

2. A device as claimed in claim **1,** comprising a passage formed in said block opening at one side into an end of the cylinder of the jack and on the other side into said well, a manually operated valve for intercepting flow in said passage, a cap provided in said tubular container in alignment with said valve to permit operation of said valve when the cap is removed.

3. A device as claimed in claim **2,** wherein said block defines a tubular portion into which is screwed one end of the cylinder of said jack, the opposite end of said cylinder being screwed into the cap which closes the tubular container and through which the shaft of said jack is led to the outside.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,815,361 Dated November 11, 1974

Inventor(s) Giusonne' MANINI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the title page after the line identifying the application number insert the following:

/30/ Foreign Application Priority Data
March 22, 1971 Italy..... 3372 A/71

Signed and Sealed this

thirtieth Day of September 1975

[SEAL]

Attest:

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Attesting Officer

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