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Wenzel et al.

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[54] **HYDRAULIC LIFTING JACKS**

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[30] **Foreign Application Priority Data**

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[58] **Field of Search** ..... 91/411 R, 444; 60/97 E, 97 L, 52 US, 52 HC, 52 HB, 52 HA

[56] **References Cited**

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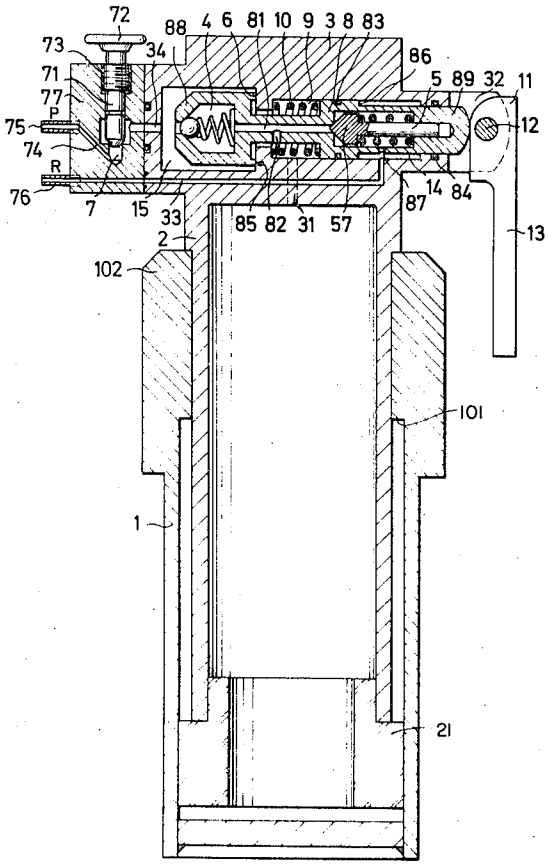
[57] **ABSTRACT**

A hydraulically operated telescopic lifting jack comprises a piston carrying a ram-head which houses a non-return valve, a pressure relief valve and a fluid-release valve. The fluid release valve includes a slide member carrying a valve member and mounted in a guide. A portion of the slide member is of reduced diameter in relation to the guide and defines therewith a chamber which communicates with a fluid feed connection.

3 Claims, 2 Drawing Figures



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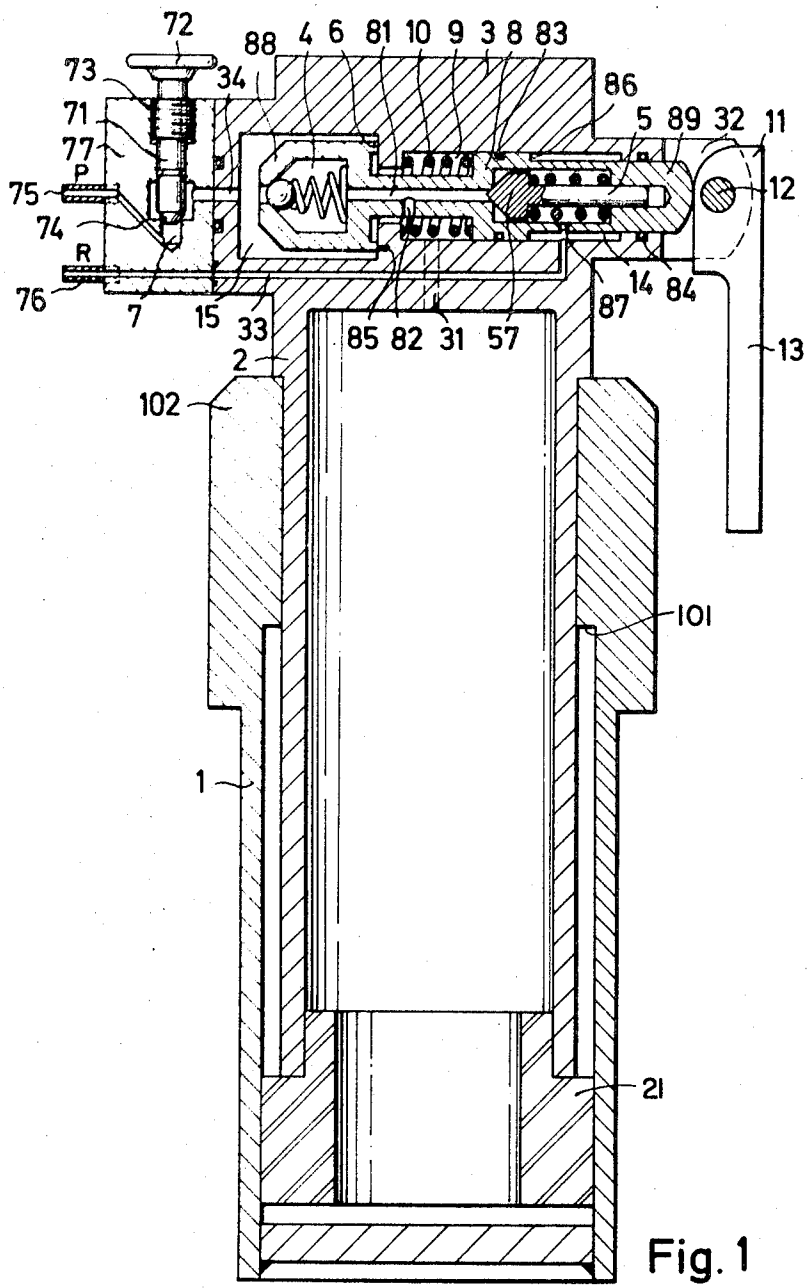

Fig. 1

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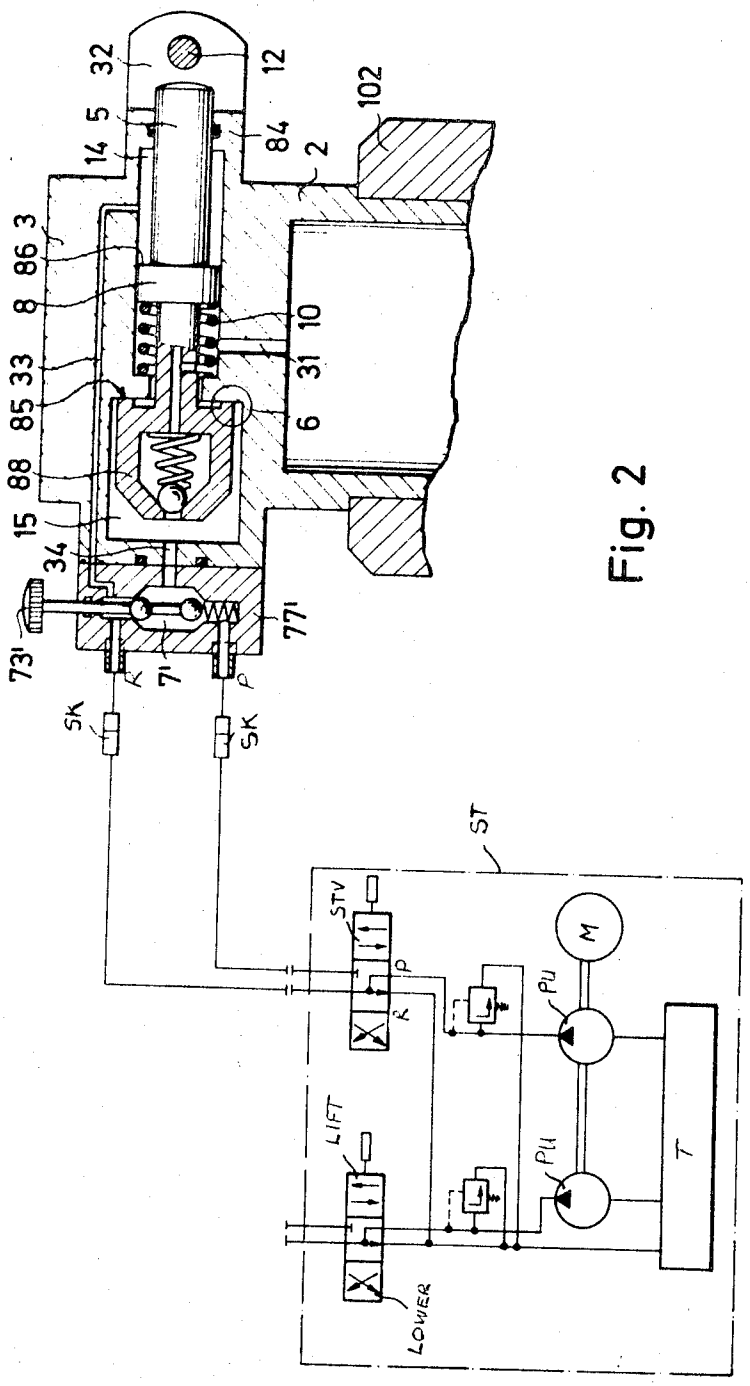

Fig. 2

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HYDRAULIC LIFTING JACKS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to hydraulically operated telescopic jacks for lifting, for example, a container, a bridge section, or a vehicle chassis.

2. Description of the Prior Art

When lifting cumbersome loads such as large containers, four telescopic lifting jacks are normally required, these being brought to bear on the four corners of the container. The jacks are extended and retracted by an installation that incorporates pressure generation and distribution equipment and is connected by two pressure lines to each of the four jacks with the aid of hydraulic quick-release couplings. While such an arrangement allows one-man operation, this applies only to the actions of lifting, holding and lowering, and not to the diverse operations of attaching the load to the jacks themselves and releasing it from them. These operations have to be carried out individually at each load attachment point and presuppose that each jack can be extended and retracted independently of the others and hence also independently of a central distribution system.

Moreover, loading operations often require that a jacked-up container shall be left standing for a time. There are consequently several sets of four jacks in use. On the other hand, it is uneconomic to keep available for every jack an installation of its own, with a compressor and distribution arrangements, which ought instead to be transferable according to need. This requirement makes further demands on the distribution system, since the jacks have to retain their pressure independently of the compressor while under load, yet must be both raised and lowered either by remote or by manual control.

An object of the invention is to provide a hydraulic telescopic jack having a ram-head which can be supplied with pressure fluid, and hence moved, by the use of only two pressure lines from a central installation, its movements can be both purely hydraulically remote-controlled and manually controlled and it can maintain the position in which it is set for as long as desired, even while under load and disconnected from the central installation.

SUMMARY OF THE INVENTION

According to the invention, there is provided in a hydraulically-operated telescopic lifting jack, a cylinder, a piston slidable within the cylinder, a ram-head carried by the piston, a first connection for hydraulic fluid, means defining a path for hydraulic fluid through the ram-head between said first connection and said cylinder, valve means mounted on said ram-head and controlling the flow of hydraulic fluid along said path, said valve means including a non-return valve, an over-pressure valve, and a lowering valve, said lowering valve comprising means defining a guide in said ram-head, a slide member mounted in said guide, a portion of said slide member being of reduced diameter in relation to said guide to define piston means, and said portion defining with said guide a chamber, a second connection for hydraulic fluid, and means defining a passage extending between said chamber and said second connection.

Further according to the invention, there is provided in a hydraulically operated telescopic lifting jack, a cylinder, a piston slidable within the cylinder, first and second feed connections for hydraulic fluid, means defining a fluid path between said first feed connection and said cylinder, a non-return valve in said path permitting flow of fluid into said cylinder, a pressure-relief valve controlling the maximum pressure of fluid flowing along said path, a fluid-release valve for releasing fluid from said cylinder and comprising cylinder means, piston means slidable in said cylinder means, and a valve member rigid with said piston means, and means defining a fluid path between said second connection and said cylinder means, so that fluid can be fed into said cylinder means to move said piston means in a sense to open said valve member.

Preferably, to extend the jack the ram-head is secured by means of pegs or other connecting members in a recess in the part that is to be lifted, pressure fluid fed from a pump is forced into the cylinder from a central distribution system through a "Lift" control valve. Flowback of the fluid thus pumped in is prevented by the non-return valve as soon as the pressure in the feed line is removed, so that the ram-head is hydraulically "locked" at the level to which it has been raised and stays there.

Preferably, in order to be able to raise the jack manually at will, as is necessary in adjusting and securing it at the load-lifting point, there is provided in or on the ram-head, a pre-control valve that can be closed at will and which is generally open. For adjustment purposes, however, this pre-control valve is closed, the feed line then being brought under pressure from distribution system through the "Lift" control valve. By careful opening of the pre-control valve, the jack can be extended slowly and very precisely, as required. This procedure can be carried out individually at each of the load lifting points with each of the jacks positioned thereat. Once all the jacks have been adjusted, the control valve is returned to its closed position and the pre-control valves are opened once more; the installation is then in working order, ready to lift the load and to hold, transfer or set it down as required.

In one preferred embodiment of the invention, the pre-control valve is a three-way valve, which connects either the feed-line connection or the distribution-system connection to the cylinder or to a passage in communication therewith. In this manner, it is possible for the jack to be manually lowered, by opening the lowering valve, even when the feed line is under pressure. To begin with, the pressure-carrying feed line is cut off by operation of the pre-control valve; the ram will not continue to move out. Then, if the lowering valve also be operated, the jack can be lowered even while the feed line is still full.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a longitudinal section of a jack in accordance with the invention; and

FIG. 2 is a fragmentary section through a modified form of the jack shown in FIG. 1, and shows a block diagram of a central distribution system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the drawings, the jack comprises a lifting ram having a cylinder **1** which is inserted in a supporting foot (not shown) and a hollow piston **2** which is movable along longitudinal guides in the cylinder **1.** Mounted in the head **3** of the ram are the necessary valves, namely a non-return valve **4** in the form of spring-loaded ball valve, an overpressure valve **5** in the form of a spring-loaded conical valve, a lowering valve **6,** and a pre-control valve **7.** The non-return and overpressure valves, which lie co-axially one behind the other and are joined together by a passage **81,** are housed within a slide member **8** of the lowering valve **6,** with the non-return valve **4** inside the head **88** of the member **8** and the overpressure valve **5** nearer to the tail portion **89** thereof. The passage **81** is in communication, through a radial opening **82,** with a chamber **9,** which accommodates a restoring spring **10** of the lowering valve **6** and is in communication, through a passage **31,** in the ram-head **3,** with the interior of the hollow piston and the cylinder.

The tail end portion **89** of the slide member **8,** that is to say the end portion of the slide member **8** remote from its head **88,** is reduced in diameter and made leakproof by packing rings **83** and **84.** The tail end portion **89** of the slide member **8** projects out of the ram-head and has its end face bearing against a cam **11,** which is mounted in a bifurcation **32** of the ram-head for pivotal movement about a pin **12,** under the action of a hand lever **13.**

By means of the packing rings **83** and **84** and a seat **85** of the lowering valve **6** constituted by the head **88,** the slide member **8** forms three chambers in the ram-head **3,** namely: a central chamber **9** a chamber **14** surrounding the reduced-diameter tail end portion **89,** in which the shoulder of the reduced-diameter portion forms a ring-shaped plunger face **86,** and which communicates with the atmosphere through a passage **33** in the ram-head **3;** and a chamber **15** which contains the head **88** of the slide member **8** and has an opening **34,** leading to the exterior.

Mounted on the ram-head **3,** over the opening **34** in the chamber **15,** is a casing **77** of the pre-control valve **7,** the spindle **71** of which can be moved axially in a screwthread **73** by means of a handwheel **72,** so that a conical valve-member can close or open a passage **74** which provides communication between the opening **34** and a connection **75** for a pressure feed line P. The chamber **14** communicates, via a passage **33** with a connection **76** for a pipe R.

A central distribution system ST incorporates two pumps PU connected in parallel but independent of each other, which feed four hydraulic (only one shown) jacks. The pressure connections of both pumps are branched via distribution valves STV to serve two jacks each. Of the four jacks being applied at any moment to a load, the two opposite each other at one end of the load are served by one pump, the same applying to the pair of jacks at the other end of the load. Differences between the lift and lower movements of two jacks on the same side of the load but at different ends, on the other hand, require to be levelled out through the distribution system.

As will be immediately apparent, if a leak should occur at any point in the hydraulic system, the non-return valve **4** can still be relied on to shut off the fluid contained in the cylinder and piston space, so that the jack will still hold its load. It is therefore possible for the jack, when under full load, to be separated from the hydraulic system by two quick-release couplings, SK, in the two pipes P and R, so as to enable the same distribution system, ST for instance, to be used in conjunction with a different set of four jacks for lifting a second container or other load.

REMOTE CONTROL

When the distribution valve STV in the distribution system ST is moved from its neutral central position to a "Lift" position, the pump PU driven by a motor or internal-combustion engine M for example, drives fluid under pressure from a tank T through the feed pipe P and the normally open pre-control valve **7,** into the chamber **15** in the ram-head **3.** From the chamber **15,** the lowering valve **6** being closed, the fluid overcomes the opposition of the non-return valve **4** and flows along the passage **81** and through the radial opening **82** into the central chamber **9,** whence it passes by way of the passage **31** into the cylinder **1.** The hollow piston **2** rises under the pressure exerted on its end face for as long as the valve STV remains in its "Lift" position, or until a piston ring **21** abuts an inner shoulder **101** of a cylinder collar **102.** When the pressure within the cylinder is likely to exceed the permitted maximum pressure the overpressure valve **5** at the rear of the passage **81** in the tail end portion **89** of the slide member **8** opens and the fluid fed in flows through a radial opening **87** behind a conical valve member **57** of the valve **5** into the rear chamber **14** and from there through the passage **33** and the pipe R, attached to the connection **76,** returns to the tank T.

To lower the ram, the distribution valve STV is moved to a "Lower" position, the fluid fed by the pump PU then being driven, through the pipe R and the passage **33** into the chamber **14,** where the pressure of the fluid acts on the ring-shaped plunger face **86,** so that the slide member **8** is moved to the left (as viewed in the Figures). This movement opens the lowering valve **6** and the fluid in the cylinder and piston space is forced by the loaded piston **2** through the chamber **15** and the passage **74** back into the pipe P through which it passes to the tank T.

MANUAL CONTROL

To raise the jack manually, the pre-control valve **7** is first closed by means of the handwheel **72.** Next, the distribution valve STV in the distribution system ST is moved to its "Lift" position, so that fluid is delivered under pressure, by way of the pipe P, at the now closed pre-control valve **7.** By careful unscrewing of the valve spindle **71** to a certain extent, the passage **74** is opened to a certain extent so that pressure fluid is fed as described previously into the cylinder space and the piston **2** rises. This upward movement can be stopped by closing the valve **7,** whatever the position of the piston, and the piston is then hydraulically locked in that position.

For central remote control (a number of jacks being jointly and simultaneously controlled), the distribution valve STV is once more moved to its central position, whereupon the pre-control valve **7** is opened to its fuli extent.

To lower the piston manually, the lever **13** is pivoted causing the cam **11** to thrust the slide member **8** of the lowering valve **6** to the left whereby to open the valve **6**, so that the fluid in the cylinder and piston space is forced by the load on the piston into the chamber **15** and from there into the pipe P. This, of course, presupposes that the pipe P is not under pressure, for which reason the distribution valve STV must be set to "Lower."

This additional change-over in the distribution system ST is superfluous when the pre-control valve is of the three-way type, as is shown in the embodiment FIG. **2**, in which the construction of the ram-head **3** and the arrangement of the valves and of passages in the ram-head **3** are the same as in FIG. **1**, like parts in the two embodiments being designated by the same reference numerals. In the embodiment shown in FIG. **2**, the pre-control valve **7'** connects the opening **34** in the chamber **15** in the ram-head casing **3** either to the pipe P or to the pipe R, the path to the other pipe being closed in each case.

If, when the ram is being lowered by operation of the lever **13**, the fluid cannot escape via the pipe P from the cylinder and piston space because the pipe P is blocked within the distribution system ST, the path to this pipe can be blocked through the pre-control valve **7'** and a path opened to the pipe R instead, which is open in the basic position of the distribution valve STV, so that the excess fluid from the cylinder can flow through the pipe R into the tank T.

The invention is not limited to the two practical examples illustrated and described. In particular, the construction and arrangement of the various valves may be different although the coaxial arrangement of the valves is preferable, because it results in a particularly small ram-head construction and is specially suitable for the use of a normal hydraulic pit prop, which merely requires the addition of the pre-control valve, while the tail end portion of the slide member of the lowering valve must be reduced in diameter so as to form a ring-shaped plunger face. It will also be appreciated that the pre-control valve need not necessarily be mounted in or on the ram-head, provided it be hydraulically connected to the feed aperture thereof.

What is claimed is:

1. In a hydraulically-operated telescopic lifting jack,
a cylinder,
a piston slidable within the cylinder,
a ram-head carried by the piston,
a first connection for hydraulic fluid,
means defining a path for hydraulic fluid through the ram-head between said first connection and said cylinder,
valve means mounted on said ram-head and controlling the flow of hydraulic fluid along said path, said valve means including
a non-return valve,
an overpressure valve, and
a lowering valve, said lowering valve comprising:
means defining a guide in said ram-head, and
a slide member mounted in said guide, a portion of said slide member being of reduced diameter in relation to said guide to define piston means, and said portion defining with said guide a chamber,
a second connection for hydraulic fluid, and
means defining a passage extending between said chamber and said second connection.

2. A jack as claimed in claim **1**, comprising:
a pre-control valve, which can be opened at will, carried by said ram-head beyond said first connection.

3. A jack as claimed in claim **2** comprising
means defining a further chamber in said ram-head, said further chamber housing said non-return valve and said lowering valve, and wherein said pre-control valve is a three-way valve and selectively connects either one of said first and second connections to said further chamber.

* * * * *