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(71) Applicant: **Campisa S.r.l.**
20030 Palazzolo Milanese (MI) (IT)

(72) Inventor: **Nelzi, Giampaolo**
20030 Palazzolo Milanese (MI) (IT)

(74) Representative: **Santi, Filippo et al**
Barzano' & Zanardo Roma S.p.A.
Via Piemonte 26
00187 Roma (IT)

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(54) **High safety hydraulic device for the operation of sectional overhead doors**

(57) A high safety hydraulic device for the operation of sectional overhead doors (POR), of the type comprising at least one hydraulic cylinder (CI), connected to at least one hydraulic circuit (MI), which allows the opening or closing of the overhead door (POR), through an electro-hydraulic motor (M), suitable for operating at least one pump for the circulation of a fluid within at least one

pipe (TU) of the hydraulic circuit (MI); in particular, between the hydraulic cylinder (CI) and the discharge tank (SC) placed downstream the motor (M), is provided at least one first solenoid valve (VA), normally closed, placed at the outlet of the hydraulic cylinder (CI) and preferably integral with it, and a second solenoid valve (NS), normally closed, placed between the pipe (TU) and the discharge tank (SC).

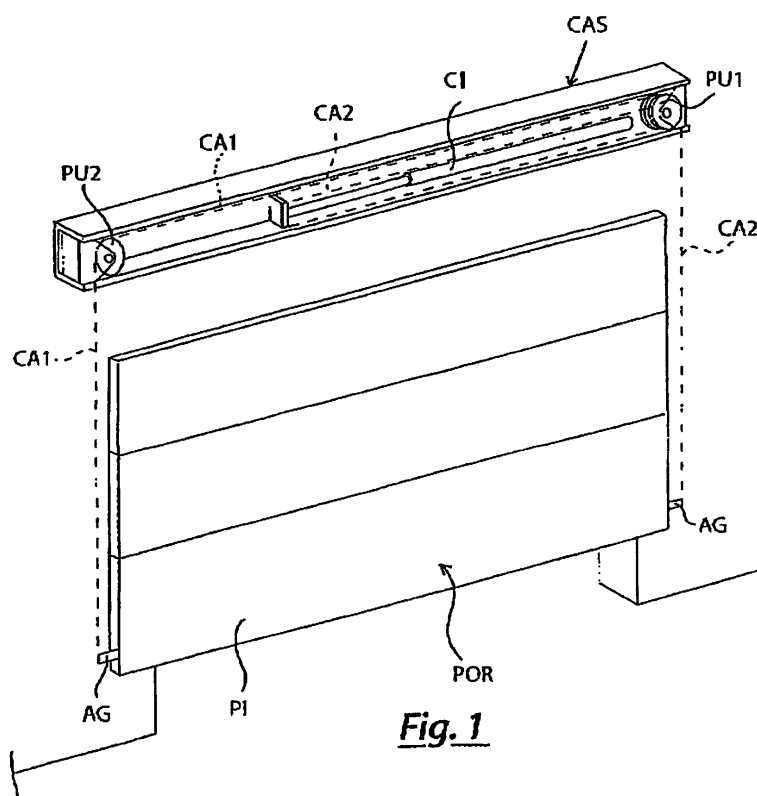


Fig. 1

Description

[0001] The present invention relates to a high safety hydraulic device for the operation of sectional overhead doors.

[0002] They are already known sectional overhead doors, i.e. overhead doors formed by horizontal sections of simple or isolated panels, which have joined together by hinges, which are laterally equipped with wheels suitable to engage and to rotate within side rails, so as to guide and unite one each other the sections of the panels sliding upward during opening.

[0003] These overhead doors generally provide three types of installations:

- a first type, so-called standard, for low ceilings, according to which the panels rotate horizontally just above the light of access to the compartment;
- a second type, so-called vertical, in which the panels slide completely vertically;
- a third type, so-called horizontal raised, according to which the panels rotate horizontally at a certain height above the light of access of the compartment.

[0004] The sectional overhead doors with vertical opening can be manually opened and closed, thanks to the moving of a package of torsion springs, which pull in rotation direction two side drums.

[0005] Two metallic ropes, which hook the last lower panel for the lifting, are also wrapped on the side drums.

[0006] Alternatively, according to more recent embodiments, it is used a group of lifting of the sectional overhead door consisting essentially of a hydraulic cylinder, placed within a protection and guidance seat, which operates a plurality of lifting and transmission pulleys.

[0007] The extension of the hydraulic cylinder, caused by the introduction of oil under pressure, allows to obtain a parallel lifting system of the overhead door.

[0008] Such a system permits you to create panels of weight also significantly different one from each other, allowing, for example, the application of reinforcements on the lower panels, which are subject to frequent collisions and damages.

[0009] Furthermore, the system ensures greater freedom of application, lower production constraints and paltry maintenance costs than the lifting systems of the spring type.

[0010] However, the most recent lifting systems of hydraulic type also have some disadvantages and limitations, particularly from the safety point of view.

[0011] Indeed, according to the safety standards in force, in case of failure to a hydraulic lifting equipment, the latter must be able to get anyway the stop and rest in that position, which is not the case in the current hydraulic lifting systems.

[0012] As part of the requirements mentioned above, main aim of the present invention is, therefore, to make a high safety hydraulic device for the operation of sec-

tional overhead doors, which, in case of failure, allows to a lifting group (and, more generally, to a moving group) of sectional overhead door to get the stop and remain stable in that position. Another aim of the invention is to provide a high safety hydraulic device for the operation of sectional overhead doors, which assures the descent of the overhead door at a constant speed, even in the event of failure or rupture of the hydraulic circuit.

[0013] A further aim of the invention is to carry out a high safety hydraulic device for the operation of sectional overhead doors, which is effective, reliable and relatively inexpensive, compared to the known art.

[0014] These aims are achieved by a hydraulic device for the operation of sectional overhead doors, according to the attached claim 1.

[0015] In an advantageous way, the device according to the invention allows to test the part of the hydraulic circuit of lifting and, in general, of operating of the sectional overhead door, which could suffer failures, for example due to collisions, in order to ascertain the presence of any dripping of fluid for the breakage of pipes of the aforesaid hydraulic circuit.

[0016] Further aims and benefits of the present invention will be clear from the following description and the attached drawings, provided purely for explanatory and not limited example, in which:

- figure 1 is a prospective schematic view of a sectional overhead door of safety with hydraulic lifting of the traditional type;
- figure 2 is a schematic view of the hydraulic motorization circuit for lifting sectional overhead doors according to the present invention. With reference to the figures mentioned, referring to an illustrative and preferred, but not limiting, embodiment of the present invention, the sectional overhead door POR is of the vertical opening type and it is raised synchronously at the two sides, in general by appropriate drawbars AG applied to the lower panel PI, through the hydraulic device of operation (or lifting, in this case) made according to the invention, which includes an actuator hydraulic cylinder CI, inserted into a motorization box CAS placed generally above the overhead door POR and directly driving two cables CA1, CA2, properly diverted through two respective pulleys PU1, PU2.

[0017] Alternatively, instead of using two pulleys PU1, PU2, the lifting system of the sectional overhead door POR may also include a double plurality of lifting and transmission pulleys.

[0018] It is obvious, moreover, that, beyond the special embodiments described, all the desired combinations of direct thrust or multiplication may be carried out, inserting into the box CAS no pulley (ratio 1:1 with the stroke of the cylinder CI), two multipliers, five or more multipliers, etc., as it is clear that the present invention is similarly applicable to horizontal opening sectional overhead

door, having a proper opening and closure system, in itself known.

[0019] The extension of the hydraulic cylinder CI caused by the introduction of a fluid (usually oil) under pressure circulating in a hydraulic circuit MI, allows to carry out the lifting of the overhead door POR, multiplying, through the hoist system, the draught of the cables CA1, CA2, around the clearance of the pulleys PU1, PU2 used.

[0020] The cylinder CI is also connected with the electro-hydraulic motor M, generally wall positioned, at man height, laterally to the overhead door POR, by means of at least one pipe TU of the circuit or hydraulic motorization MI.

[0021] The hydraulic circuit MI makes use of a hydraulic pump (not shown in the attached figures), driven by the electro-hydraulic motor M, which brings the oil under pressure too the utilization, consisting of the hydraulic cylinder CI, for the operation of the overhead door POR.

[0022] In particular, the hydraulic circuit MI preferably presents between the utilization (cylinder CI) and the discharge tank SC, a check valve VRI, located downstream the motor M and the relative hydraulic pump, a first solenoid valve VA, normally closed, placed outside the hydraulic cylinder CI, and a second solenoid valve NS, usually closed in normal functioning, located at the discharge tank SC of the motor M.

[0023] Keeping closed the solenoid valve VA and pumping oil inside the pipe TU of the hydraulic circuit MI through the electro-hydraulic motor M, in case the circuit MI does not have drippings due to breakage, the motor M increases its own electricity (in amperes) consumption.

[0024] According to such a consideration, it is therefore possible to provide the use of a voltage or amperage detector suitable to signal this consumption increase, so as to consequently detect the correct functionality of the hydraulic circuit MI.

[0025] In such a case, i.e. when the detector signals an increase in electricity consumption by the motor M (and then when the hydraulic circuit MI does not have drippings), the solenoid valve VA opens and the sectional overhead door POR is free to be operated and, in particular, to raise (in the case of vertical opening sectional overhead doors POR). The hydraulic circuit MI may provide additional slowing down valves, preferably compensated and calibrated or adjusted for the desired speed of closing of the overhead door POR, as well as solenoid valves for controlling the opening and/or closing of the overhead door POR in case of alarm (theft, fire, presence of obstacles, etc.) or lack of the network electric supply.

[0026] In the normal use, the solenoid valve VA remains constantly closed until the detection of incidental drippings in the hydraulic circuit MI, shortly after opening for controlling the operation of the overhead door POR (in opening or closing, or upward or downward, in case of vertical opening overhead doors).

[0027] The solenoid valve NS is constantly closed and it will be energized when it is desired to close the overhead door POR for the normal use. The functioning of

the whole electro-hydraulic plant usually occurs with network current, but also may be occurred with power supplied from low voltage (for example, 12 volts DC) capacious batteries.

[0028] The electro-hydraulic motor M runs with network voltage, but also with the very low voltage power supplied by batteries and in this case the overhead door POR always operates with the current supplied by the battery which is constantly recharged by a special recharge device constantly connected to the network.

[0029] In addition, in order to ensure the descent of the overhead door POR at a constant speed a constant flow valve has been so far provided, positioned in an electro-hydraulic control unit placed downstream the hydraulic circuit MI, near the tank SC.

[0030] According to the present invention, however, it is possible to envisage the use of a constant flow valve VFC, which is positioned directly at the outlet of the hydraulic cylinder CI, upstream or downstream the solenoid valve VA.

[0031] Such a provision allows to keep constant the speed of descent of the overhead door POR, even in the event in which a possible dripping of oil occurs for the breakage of a pipe TU of the electro-hydraulic circuit MI.

[0032] This mode is supplementary and alternative to the possibility of blocking the movement and, in particular, the descent of the overhead door POR (in case of vertical opening sectional overhead doors POR), controlling the closure of the solenoid valve VA.

[0033] If there is no network current, moreover, it is possible to provide the use of a simple device of manual remote opening of the solenoid valve VA, such as, for example, a cable which, from floor height, when pulled, operates a lever which manually unlocks the solenoid valve VA (running in a way similar to a bicycle brake), which allows the closure of the overhead door even in case of network power lack.

[0034] From the description made the characteristics of the hydraulic device for the operation of sectional overhead doors, which is the object of the present invention, are clear, as well as the resulting advantages.

[0035] It is evident, however, that many other variations can be made to the hydraulic device in question, without for this reason going out of the novelty principles inherent of the idea inventive, as it is clear that, in the practical implementation of the invention, materials, shapes and sizes of the details could be any, depending on the needs, and the same could be replaced with others technically equivalent.

Claims

1. High safety hydraulic device for the operation of sectional overhead doors (POR), of the type comprising at least one actuator hydraulic cylinder (CI), connected to at least one hydraulic circuit (MI), which allows the opening or closing of the overhead door (POR)

through an electro-hydraulic motor (M), suitable for operating at least one pump for the circulation of at least one fluid within at least one pipe (TU) of the hydraulic circuit (MI), **characterized in that** between said hydraulic cylinder (CI) and a discharge tank (SC), placed downstream said electro-hydraulic motor (M), at least one first solenoid valve (VA) is provided, closed in normal functioning, placed at the outlet of said hydraulic cylinder (CI) and preferably integral with said hydraulic cylinder (CI), and at least one second solenoid valve (NS), closed in normal functioning, placed between said pipe (TU) and said discharge tank (SC).

2. Hydraulic operation device as claim 1, **characterized in that** said overhead door sectional (POR) is of the vertical opening type and, in general, of the completely vertical opening or bending in horizontal more or less at the top.

3. Hydraulic operation device as claim 1, **characterized in that** said sectional overhead door (POR) is of the vertical opening type and said actuator hydraulic cylinder (CI) is inserted into a motorization box (CAS), directly driving lifting cables (CA1, CA2), properly diverted through respective lifting and transmission pulleys (PU1, PU2).

4. Hydraulic operation device as claim 1, **characterized in that** said electro-hydraulic motor (M) drives at least one hydraulic pump, which brings the pressure fluid to said hydraulic cylinder (CI), for the operation of the sectional overhead door (POR).

5. Hydraulic operation device as claim 1, **characterized in that** between said hydraulic cylinder (CI) and said discharge tank (SC) at least one check valve (VRI) is arranged, positioned downstream the electro-hydraulic motor (M).

6. Hydraulic operation device as claim 1, **characterized in that** the use of at least one current and/or voltage and/or amperage detector is provide, suitable to signal the current and/or electricity consumption by said electro-hydraulic motor (M), in the operating conditions according to which said first solenoid valve (VA) is kept closed and the fluid flows within said hydraulic circuit (MI).

7. Hydraulic operation device as claim 6, **characterized in that** said first solenoid valve (VA) opens and the sectional overhead door (POR) is free to be moved at the signalling of an increase of current and/or electricity consumption by said electro-hydraulic motor (M).

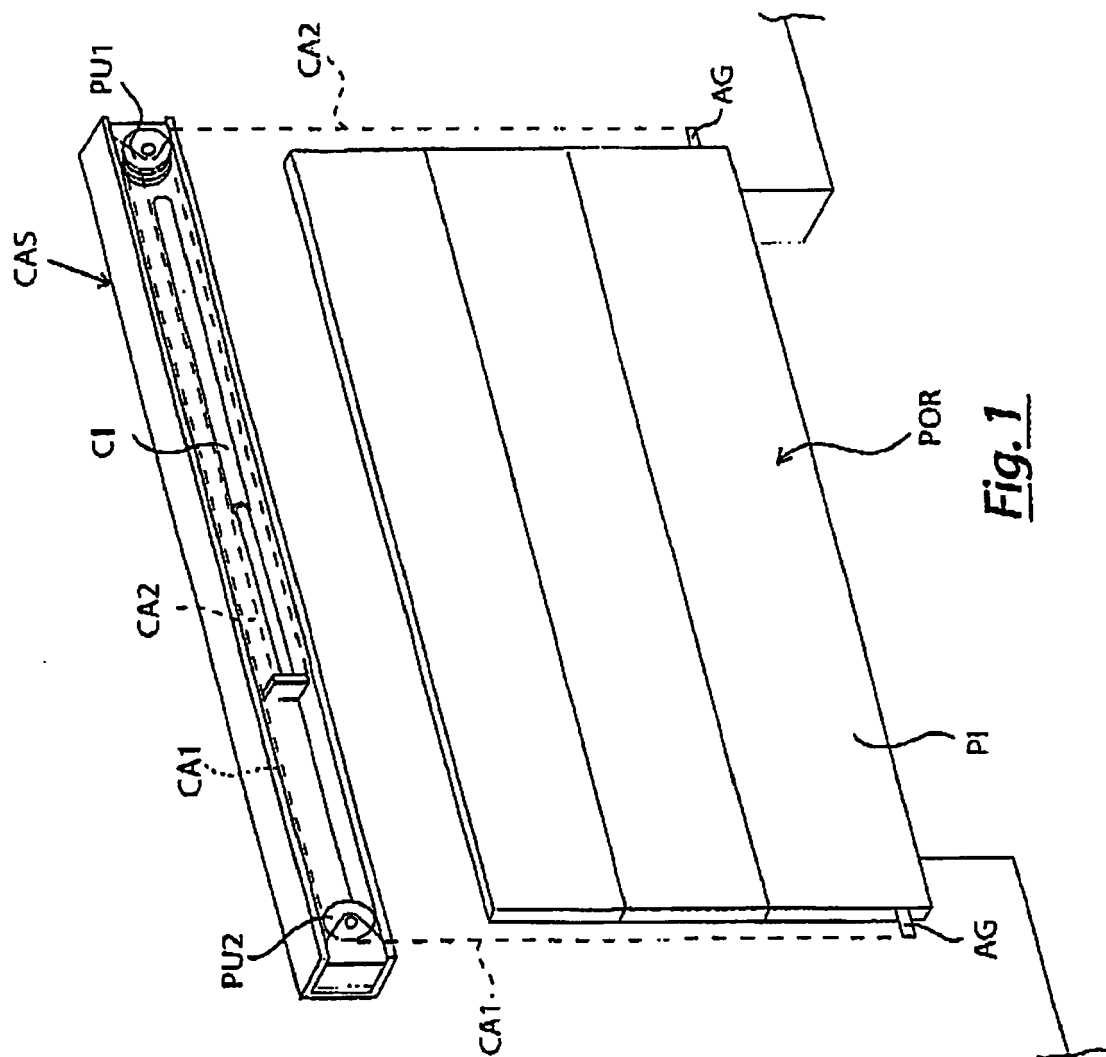
8. Hydraulic operation device as claim 1, **characterized in that** said first solenoid valve (VA) is controlled

in closing only when drippings in the hydraulic circuit (MI) are detected, while said second solenoid valve (NS) is constantly closed and is controlled in opening to close the sectional overhead door (POR) in normal functioning.

9. Hydraulic operation device as claim 1, **characterized in that** directly at the outlet of said hydraulic cylinder (CI) and upstream or downstream said first solenoid valve (VA) at least one valve of constant flow (VFC) is placed, in order to keep constant the speed of descent of the sectional overhead door (POR), even in case that drippings occur in the hydraulic circuit (MI).

10. Hydraulic operation device as claim 1, **characterized in that** said solenoid valve (VA) is provided with a manual release system which can be manually remote-controlled.

11. Hydraulic operation device as claim 1, **characterized in that** the operation of said sectional overhead door (POR) is interrupted by controlling the closure of said first solenoid valve (VA).



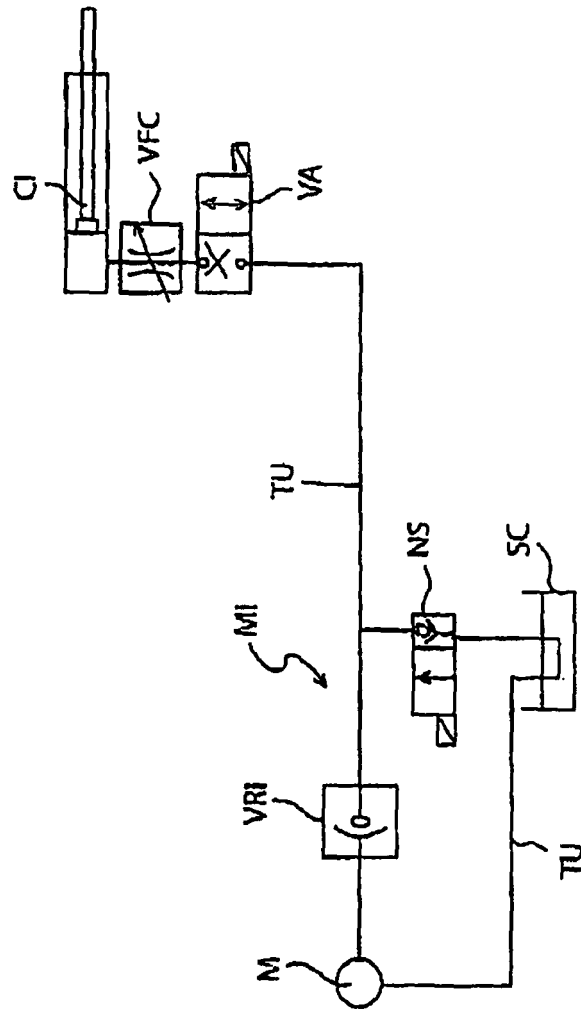


Fig. 2