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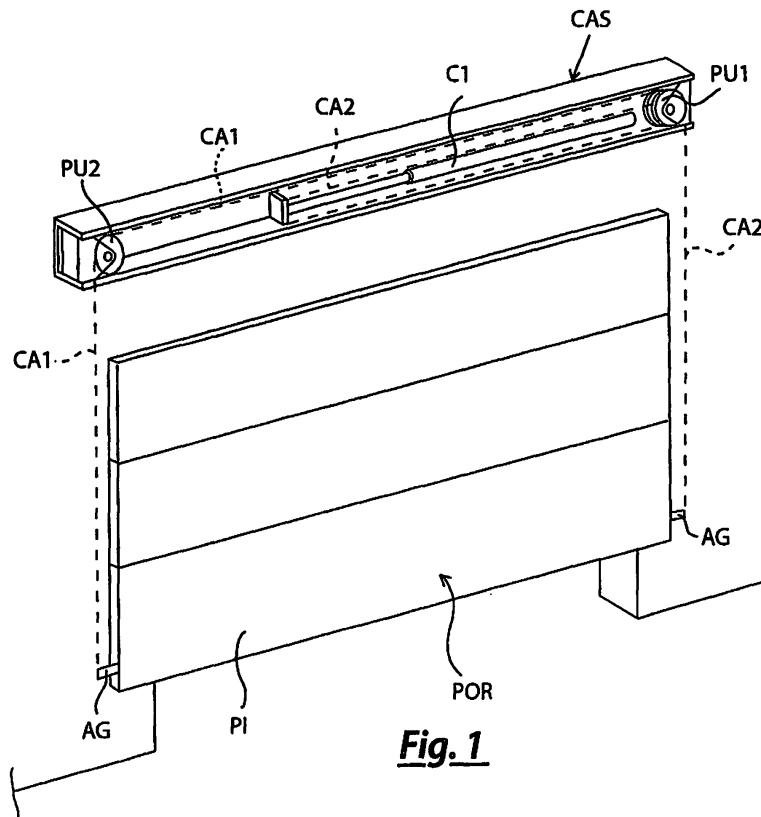
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**(54) Safety system for moving hydraulic-lifting sectional overhead doors**

(57) A device to assure the safety of the automatic mechanization of sectional doors (POR), of the type comprising at least a hydraulic cylinder (C1), connected with at least one hydraulic circuit (MI), which allows the opening or closing of the sectional door (POR) through a 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); between the hydraulic cylinder (C1) and the exhaust tank (SC) placed downstream the engine (M), at least one valve (NS) normally closed, inserted, in particular, between the pipe (TU) and the exhaust tank (SC), and a system for detecting possible leakage of the fluid from the hydraulic circuit (MI) are provided.



**Fig. 1**

**EP 2 072 736 A1**

## Description

**[0001]** The present invention relates to a system for the automatic safety moving of sectional overhead doors with a hydraulic lifting.

**[0002]** Sectional overhead doors, that is gates formed by horizontal sections of simple or isolated panels, are known, which are joined together by hinges, laterally provided with wheels suitable to engage one each other and to rotate within side rails, so as to guide and keep together joined the sections of the panels sliding upward during the opening.

**[0003]** The lifting of the doors can be hydraulic and, if so, it is used a lifting group essentially consisting of a hydraulic cylinder, usually positioned inside a protection and guide seat, which operates a number of lifting and transmission pulleys.

**[0004]** The extension of the hydraulic cylinder, caused by the introduction of oil under pressure, allows to obtain a parallel lifting system of the door.

**[0005]** Such a system allows to produce panels of weight also significantly different one from each other, allowing, for example, to apply reinforcements on the lower panels, which are subject to frequent collisions and damages.

**[0006]** In addition, the system assures greater freedom of application, lower production constraints and insignificant maintenance costs with respect to the lifting systems of the springs type.

**[0007]** The safety rules in force require that the automatic mechanization system of a sectional door must be provided with a device that, in case of failure, allows the door to reach one of the ends of the stroke, and stop until the failure is repaired.

**[0008]** As part of the requirements listed above, the main aim of the present invention is, therefore, to carry out a safety system for moving hydraulic-lifting sectional overhead doors, which, in case of failure, allows a lifting group (and, in a more general sense, to a moving group) of the sectional door to reach the end of stroke and remain stable in that position.

**[0009]** Another aim of the invention is to achieve a high safety system for moving hydraulic-lifting sectional overhead doors, which is effective, reliable and relatively inexpensive, compared to the known art.

**[0010]** These aims are achieved by a safety system for moving hydraulic-lifting sectional overhead doors, according to the attached claim 1.

**[0011]** In an advantageous way, the device according to the invention allows to test whether the hydraulic circuit (TU), placed between the motor-pump (M) and the hydraulic cylinder (CI), presents hydraulic oil leakages, since it is the only part of the lifting mechanism that can be damaged, due for example to collisions.

**[0012]** Further aims and advantages of the present invention will be clear from the following description and the attached drawings, related to a preferred and illustrative, but not limited to, embodiment in which:

- figure 1 is a perspective schematic view of a safety sectional door with hydraulic lifting, of the traditional type;
- figure 2 shows a schematic view of the safety system for moving hydraulic-lifting sectional overhead doors, according to the present invention.

**[0013]** Referring to the figures mentioned, relating to an illustrative and preferred, but not limited to, embodiment of the present invention, the sectional overhead door POR is of vertical opening type and it is synchronously raised at the two sides, typically by means of appropriate hooks AG to the lower panel PI, through the hydraulic system of moving (i.e. lifting, in this case) carried out according to the invention, which includes a hydraulic actuator cylinder CI, inserted into a motorization box CAS, placed generally above the door POR, and directly driving two cables CA1, CA2, suitably diverted by means of two respective pulleys PU1, PU2.

**[0014]** Alternatively, instead of using two pulleys PU1, PU2, the lifting system of the sectional door POR may also comprise a double plurality of lifting and transmission pulleys.

**[0015]** It is obvious that, beyond the specific embodiments described, all the combinations of direct thrust or desired multiplication can be realized, by inserting into the box CAS no pulley (1:1 ratio with the stroke of the cylinder CI), two overgears, five or more overgears, etc..., as it is clear that the present invention is likewise applicable to horizontal opening sectional overhead doors, having a proper system of opening and closing, in itself known.

**[0016]** The extension of the hydraulic cylinder CI, caused by a fluid (usually oil) under pressure circulating inside a hydraulic circuit MI, permits to carry out the lifting of the sectional door POR, multiplying, through the tackle system, the draught of the cables CA1, CA2 around the clearance of the pulleys PU1, PU2 used.

**[0017]** The cylinder CI is also connected with the hydraulic motor M, generally located on a wall, at human height, laterally to the door POR, through at least one pipe TU of the hydraulic circuit or motorisation MI.

**[0018]** The hydraulic circuit MI preferably uses a hydraulic pump (not shown in the attached figures), preferably driven by the hydraulic motor M, which leads the oil under pressure to the use, consisting of the hydraulic cylinder CI, for the operation of the door POR.

**[0019]** In particular, the hydraulic circuit MI preferably presents, between the use (cylinder CI) and the exhaust tank SC, a check valve VRI, located downstream the motor M and its hydraulic pump, and a valve NS (consisting, in a preferred, but not limited to, embodiment, by a solenoid valve), normally closed in standard operation and placed at the exhaust tank SC of the motor M.

**[0020]** The lifting system also includes, preferably, that, when the cylinder CI is completely extended, the door POR is fully open.

**[0021]** According to the present invention, at the end

of the stroke of the cylinder CI, a micro-switch MIC is applied which, preferably when the cylinder CI is entirely extended, closes (or opens) an electric circuit of consent of the descent control of the door POR, through contacts NA (one placed on the stem of the cylinder CI and one associated with the micro-switch MIC), which normally close themselves when the cylinder CI is wholly open (even if the operation is possible even with reversed contacts, which open when the cylinder CI is opened and close when the cylinder CI is completely closed).

**[0022]** In another preferred embodiment of the invention, the cylinder CI stops even before its stroke end, at the end of the opening of the door POR, thanks to the operation of the micro-switch MIC (or another micro-switch MIC suitably provided), which acts at the stroke end, closing (or opening) the circuit of consent of the descent control of the door POR.

**[0023]** In any case, the hydraulic lifting circuit MI remains under pressure when the door POR is open, and, in the event that at least one of the pipes TU of the hydraulic circuit MI suffers damages, due for example to collisions, with consequent leakage of hydraulic pressure, the cylinder CI starts retracting, closing the door POR, which falls by gravity, held by the residual pressure within the pipe TU.

**[0024]** When, however, the cylinder CI begins closing, the micro-switch MIC changes state and this state change generates a block of the closing control of the door POR, thus creating a safety stop, as required by the european standards in force concerning security.

**[0025]** In a further preferred embodiment of the invention, the opening stroke of the cylinder CI can be electronically adjusted through the reading of an optometric bar, which may also serve to detect possible leakages of the hydraulic circuit MI, thus denying the consent to the closing control.

**[0026]** The operation of the security system for moving hydraulic-lifting sectional overhead doors, according to the current invention, is essentially as follows.

**[0027]** During the normal use of lifting the valve NS is constantly closed and it will be opened when they desire to close the door POR for the normal use.

**[0028]** To ensure that, even in case of breakages of one or more pipes TU of the hydraulic circuit MI, the door POR gets down in closing position at slow speed until the stroke end, the use of a constant flow valve VFC is also provided, which is positioned directly at the outlet of the hydraulic cylinder CI.

**[0029]** Such a provision allows to keep constant the descent speed of the door POR, even in case of any oil leakage due to the breakage of a pipe TU of the electro-hydraulic circuit MI.

**[0030]** Moreover, in case of absence of the network electricity the use of a simple device of manual opening of the valve NS is also provided, which can be manually handled since the hydraulic gearcase of control of the motor M is located in accessible place; the manual release of the valve NS bypasses the aforesaid block valve

NS, and the door POR gets down by gravity, with recover of the oil in the tank SC.

**[0031]** From the description made the characteristics of the safety system for moving hydraulic-lifting sectional overhead doors, which is the object of the present invention, as well as the resulting benefits, are clear.

**[0032]** It is clear, however, that many other variations can be made to the safety system in question, without for this reason going out of the novelty principles inherent in the inventive idea, as it is clear that in the practical implementation of the invention, the materials, the shapes and dimensions of the illustrated details can be any depending on the needs and the same may be replaced with others technically equivalent.

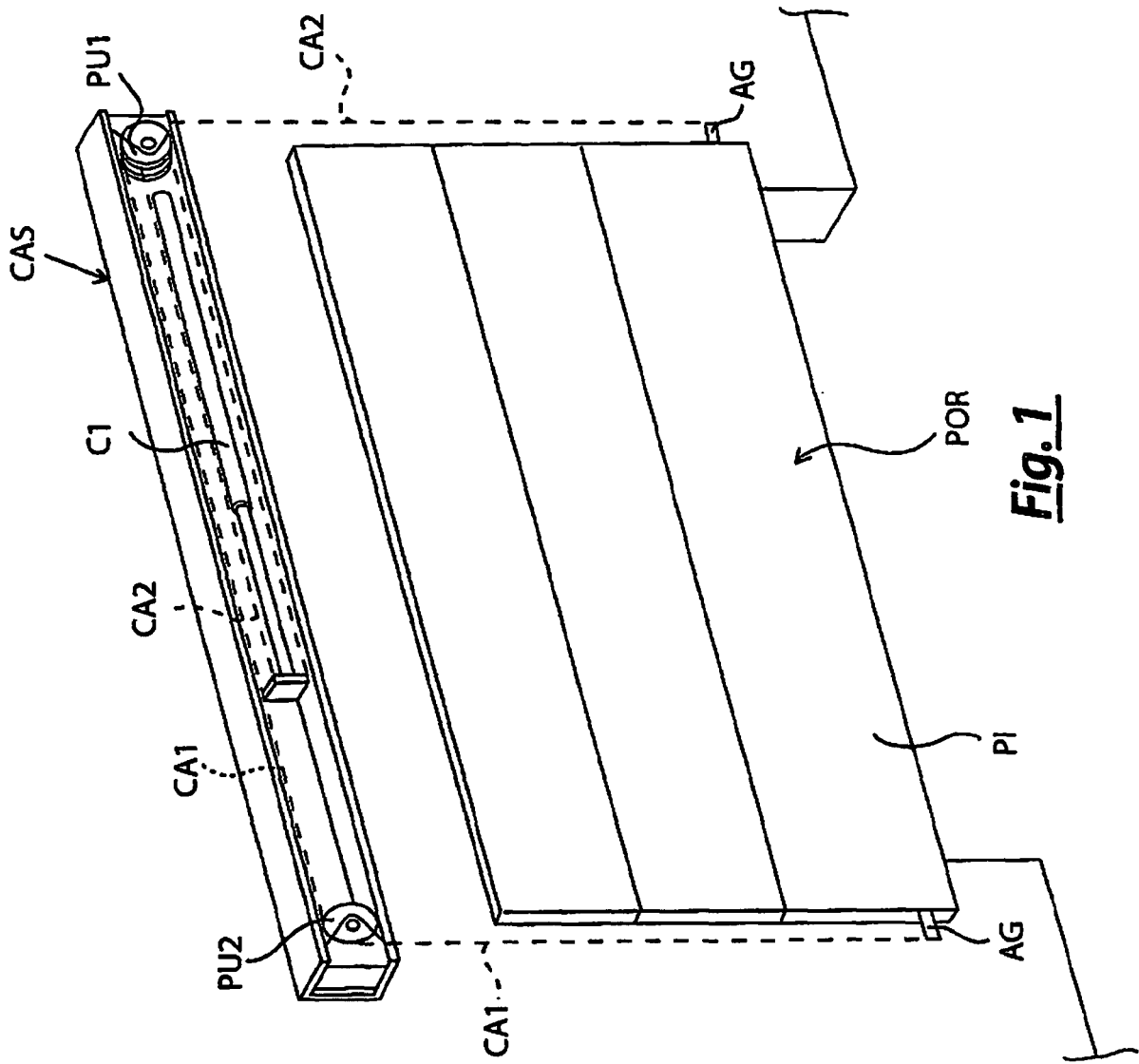
### Claims

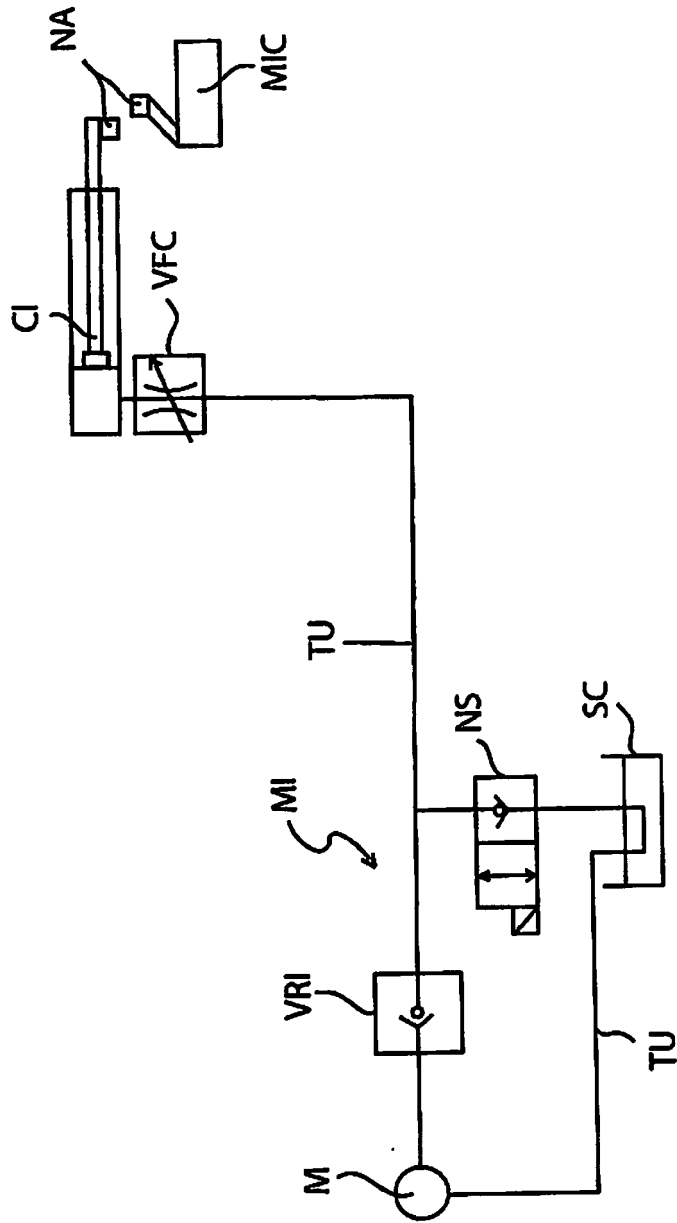
1. Safety system for moving hydraulic-lifting sectional overhead doors of the type comprising at least one hydraulic actuator cylinder (CI), connected with at least one hydraulic circuit (MI), which allows the opening or closing of the sectional door (POR), through a hydraulic force generated for example by 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), which conveys the fluid under pressure to said hydraulic cylinder (CI) for the operation of the sectional door (POR), said hydraulic circuit (MI) remaining under pressure when the door (POR) is open, **characterized in that** a micro-switch (MIC), suitable to drive an electric circuit of consent of the closing control of the sectional door (POR) is connected with said hydraulic cylinder (CI).
2. Safety system as claim 1, **characterized in that** between said hydraulic cylinder (CI) and an exhaust tank (SC), located downstream said hydraulic motor (M), at least one valve (NS), closed in normal operation, positioned between said pipe (TU) and said exhaust tank (SC), is arranged.
3. Safety system as claim 1, **characterized in that** said sectional overhead door (POR) is of the vertical opening type, indifferent if completely vertical or horizontally sloping more or less at the top.
4. Safety system as claim 1, **characterized in that** said sectional overhead door (POR) is of the vertical opening type and said hydraulic actuator cylinder (CI) is inserted into a motorization box (CAS), directly operating lifting cables (CA1, CA2), suitably diverted through respective pulleys (PU1, PU2) of lifting and transmission.
5. Safety system as claim 1, **characterized in that** said micro-switch (MIC) is applied at the end of the stroke

of said hydraulic cylinder (CI) and, through appropriate contacts, is suitable to close (or open) the electrical circuit of consensus of the closing control of the sectional door (POR), when the hydraulic cylinder (CI) is all extended and the sectional door (POR) is completely open. 5

can be manually operated, for closing the sectional door (POR).

6. Safety system as claim 1, **characterized in that** said hydraulic cylinder (CI) stops even before the end of its stroke, at the end of the opening of the door (POR), thanks to the operation of said micro-switch (MIC). 10
7. Safety system as claim 1, **characterized in that** in case of damage of said hydraulic circuit (MI), said hydraulic cylinder (CI) starts retracting, pulled down by the weight of gravity of the sectional door (POR), the closing stroke being held by the residual pressure existing inside the pipe (TU) of said hydraulic circuit (MI). 15  
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8. Safety system as claim 7, **characterized in that** said micro-switch (MIC), in case of oil leakages in the hydraulic circuit (MI), changes status since said hydraulic cylinder (CI) is retracted and has released it, and said status change prevents the automatic closing moving of the sectional door (POR). 25
9. Safety system as claim 1, **characterized in that** the opening stroke of the hydraulic cylinder (CI) is electronically adjustable through the reading of an optometric bar. 30
10. Safety system as claim 9, **characterized in that** said optometric bar is suitable to electronically block the closing automatism of the sectional door (POR), when said optometric bar detects a shortening of the stroke of the hydraulic cylinder (CI), which is the result of fluid leakage inside the hydraulic circuit (MI). 35
11. Safety system as claim 2, **characterized in** a between said hydraulic cylinder (CI) and said exhaust tank (SC) at least one check valve (VRI) is placed, located downstream the electro-hydraulic motor (M) and the hydraulic pump thereof. 40  
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12. Safety system as claim 1, **characterized in that** directly at the outlet of said hydraulic cylinder (CI) at least one constant flow valve (VFC) is positioned, suitable to keep constant the descent speed of the sectional door (POR), even in case leakages in the hydraulic circuit (MI) occur. 50
13. Safety system as claim 2, **characterized in that** said valve (NS) is constituted in particular by a solenoid valve. 55
14. Safety system as claim 2, **characterized in that** said valve (NS) is provided with a release system, which





**Fig. 2**



EUROPEAN SEARCH REPORT

Application Number  
EP 08 42 5686

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 154 303 A (CAVALLERO LOUIS T ET AL) 27 October 1964 (1964-10-27) * page 5, paragraph 1 * * figure 9 *  -----	1	INV. E05F15/08 E05F15/00
			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		20 April 2009	Van Kessel, Jeroen
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone                      Y : particularly relevant if combined with another document of the same category                      A : technological background                      O : non-written disclosure                      P : intermediate document</p> <p>T : theory or principle underlying the invention                      E : earlier patent document, but published on, or after the filing date                      D : document cited in the application                      L : document cited for other reasons</p> <p>.....                      &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 42 5686

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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20-04-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3154303	A	NONE	
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82