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(54) Hydraulic control unit for a venting valve and a drain valve

(57) The unit of the hydraulic control of the bottom and aeration valves serves for bottom discharge of liquid and viscous substrates from railway cisterns with automatically protection against occurrence of underpressure during discharging and with exact signalization of opened and closed position of these valves. By the manual control-levers (3), through kinematical lever gear created by the driver (4), the gear-lever (5) and the swinging control-lever (6), is controlled the control bellows hydraulic cylinder (11) with closed hydraulic circumference in serial connection with the hydraulic bellows unit (33) of the aeration valve (29) and with the hydraulic bellows unit (35) of the bottom valve (30). The supporting head (12) of the control bellows hydraulic cylinder (11) is through the signal-lever (14), the signal draw rod (17) and the signal driver (20) kinematically connected with the pointers (22) of opened and closed position of valves and is bounded by blocking reaction by help of the double-arm lever (24) and by rotating of driver (4) of the manual control-levers (3).

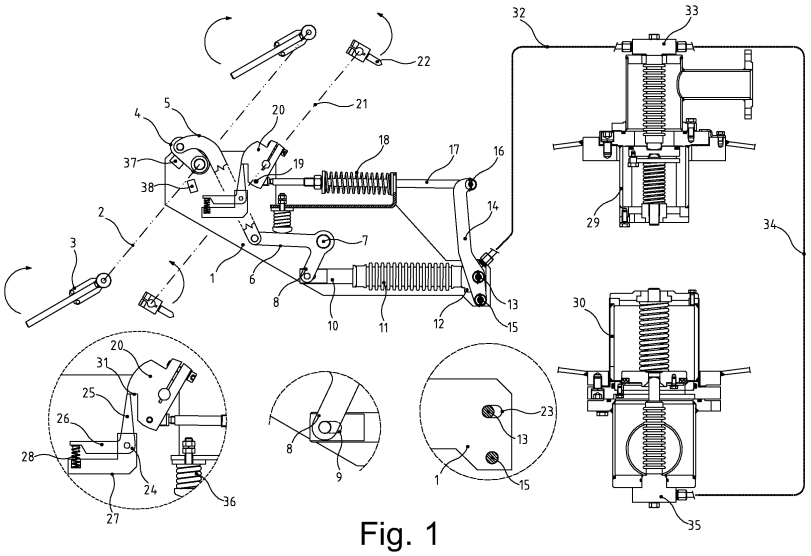

Fig. 1

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Description

Field of the invention

[0001] Technical solution deals with the unit of hydraulic control of the bottom and aeration valves, being in serial hydraulic connection, determined for railway cisterns equipped with bottom discharge of liquid and viscous transported substrates.

Background of the invention

[0002] Existing design solutions of the simultaneous control of the bottom and aeration valves are solved by mechanical control by a cable, by hydraulic system with a central pump and hydraulic cylinders in the bottom and aeration valve and by mechanical-hydraulic bond of the bottom valve with parallel or serial connection of the valves. Disadvantage of the existing systems is a necessity for maintenance of the hydraulic systems with seals, a complicated kinematics of the mechanical-hydraulic systems and space demands of these applications, and all these factors influence failure rates and lifetime and insufficient automatically protection of the cistern against a possible deformation during exhausting phase, in case some failure occur in the parallel mechanical-hydraulic bond during this exhausting phase, and inconvenient protection of the cistern in case of damage of a mechanical cable bond which can result in self-opening of the aeration valve, following with discharge of the transported substrate.

The nature of the technical solution

[0003] The lacks mentioned above are resolved by the unit of hydraulic control of the bottom and aeration valves in serial hydraulic connection of these valves for the railway cisterns according to this technical solution based on, that in a bearer body, fixed to the railway cistern frame, is rotatory fixed a rod of the manual control-levers, firmly connected with a driver, jointly connected with a gear-lever, jointly connected with a swinging control-lever, rotatory located on a pin of the bearing body whereas a short arm of the swinging control-lever is jointly connected to a dilatation groove of the rod of the control bellows hydraulic cylinder, and a supporting head of the control bellow hydraulic cylinder is by a central pin rotatory connected with a signal-lever which is by one marginal pin rotatory fixed to the bearer body, and by the second marginal pin on the longer arm is kinematically connected with a signal draw rod, equipped with a signal spring fixed onto the bearer body and connected by the pin with a signal driver, firmly fixed onto the signal shaft with a pointer of the valves position whereas a movement of the supporting head and the signal-lever is limited longitudinally by the groove in the bearer body, through which penetrates the central pin, and a double-arm lever, with a blocking arm and a buffer arm is placed rotatory in a blocking holder in which is placed a reversible spring supported by an end of the buffer arm whereas a blocking holder is fixed onto the bearer body in such way that in closed position of the aeration valve and the bottom valve, the blocking arm sinks into a slot of the signal driver, and in open position of the aeration valve and the bottom valve is, after rotation of the driver and by its touch with the buffer arm, the blocking arm, , uncovered out of the slot, and the control bellows hydraulic cylinder is serially connected through the discharge pipeline with a hydraulic bellows unit of the aeration valve, and also through a connecting pipeline with the hydraulic bellows unit of the bottom valve.

The unit of the hydraulic control of the bottom and aeration valves in the serial hydraulic connection of these valves for railway cisterns, according to this technical solution, for discharge of the cistern in a case of failure of the hydraulic control due to a untightness or impassibility of a hydraulic medium through the connecting pipelines, signalizes the failure by the pointers to a service whereas the bottom and aeration valves are closed automatically, so the underpressure can not damage the cistern, even if the service is not present. Separate hydraulic unit enables its arbitrary location on the railway cistern, and simultaneously it enables lower location of the bottom valve which ensures a versatility of use of this solution for various design solutions of the railway cistern. The whole system has only static tightening elements, created by screw connections, so operation is without a maintenance and failure.

Scheme of the figures in drawing

[0004] The technical solution will be explained more detailed by the drawing, where Fig. 1 schematically illustrates one of the possible construction solutions of the unit of the hydraulic control of the bottom and aeration valves in the serial hydraulic connection of these valves for the railway cisterns.

Example of realization

[0005] The unit of the hydraulic control of the bottom and aeration valves in the serial hydraulic connection of these valves for the railway cisterns according to Fig. 1 consists of bearer body 1 fixed to the railway cistern frame, in which is rotatory fixed a rod 2 of the manual control-levers 3, firmly connected with the driver 4, jointly connected with gear-lever 5, jointly connected with swinging control-lever 6, rotatory located on the pin 7 of the bearer body 1 whereas the short arm 8 of the swinging control-lever 6 is jointly connected to the dilatation groove 9 of the rod 10 of the control bellows hydraulic cylinder 11. The supporting head 12 of the control bellows hydraulic cylinder 11 is by the central pin 13 rotatory connected with the signal-lever 14 which is by one marginal pin 15 rotatory fixed to the bearer body 1, and by the second marginal pin 16 on the longer arm is kinematically

connected with the signal draw rod 17, equipped with the signal spring 18, fixed onto the bearer body 1, and connected by the pin 19 with the signal driver 20, firmly fixed onto the signal shaft 21 with the pointers 22 of the valve positions. The movement of the supporting head 12 and the signal-lever 14 is limited longitudinally by the groove 23 in the bearer body 1 through which penetrates the central pin 13. The double-arm lever 24 with the blocking arm 25 and buffer arm 26 is placed rotatory in the blocking holder 27 in which is placed the reversible spring 28, supported by end of the buffer arm 26. The blocking holder 27 is fixed onto the bearer body 1 in such way that in the closed position of the aeration valve 29, and the bottom valve 30, the blocking arm 25 sinks into the slot 31 of the signal driver 20, and in open positions of the aeration valve 29 and the bottom valve 30, is, after rotation of the driver 4 and by its touch with the buffer arm 26, the blocking arm 25 uncovered out of the slot 31. The control bellows hydraulic cylinder 11 is serially connected through the discharge pipeline 32 with the hydraulic bellows unit 33 of the aeration valve 29, and also through the connecting pipeline 34 with hydraulic bellows unit 35 of the bottom valve 30. Arresting spring 36 supporting by the bearer body 1 abuts onto the swinging control-lever 6. Position of the driver 4 is limited by arresting buffer 37 and by end buffer 38. The whole hydraulic system is closed and filled with brake fluid whereby a temperature dilatation of the brake fluid is compensated by the dilatation groove 9 in the closed position of the both valves, and by the help of unlimited uplift of the bottom valve 30 at open position of the both valves. The aeration valve 29 has the mechanically limited uplift.

Procedure of opening of the aeration valve 29 and the bottom valve 30 by the help of the unit of the hydraulic control is as follows. By gradual rotating of the manual control-lever 3, the driver 4 gradually rotates from the arresting buffer 37 up to end buffer 38. During this rotation of the driver 4, as long as the driver 4 uncovers the blocking arm 25 out of the slot 31, is the central pin 13 of the supporting head 12 without movement in the starting position in the groove 23 whereas the brake fluid is pushed out from the control bellows hydraulic cylinder 11 through the discharge pipeline 32 to the hydraulic bellows unit 33 which opens the aeration valve 29, and then the brake liquid is pushed out through the connecting pipeline 34 to the hydraulic bellows unit 35 which opens the bottom valve 30 whereas the aeration valve 29 opens in advance. When the driver 4 uncovers the blocking arm 25 out of the slot 31, till then blocked signal driver 20 is released, so by a press in the control bellows hydraulic cylinder 11, the supporting head 12 is displaced in the groove 23 into the second marginal position, by which is displaced also the signal-lever 14, and the signal draw rod 17 by overcoming of the signal spring 18, causes through the signal driver 20 and the signal shaft 21 a rotation of the pointers 22 into position signalizing an opening of the both valves. The power of prestress of the signal spring 18 is set in such way that at failure of tightness of the control hydraulic system, the hydraulic press has zero value, and so, no rotation of the pointers 22 occurs, and this signalizes to the service, that the both valves stayed closed due to a failure. In case, there occurs a mechanical damage of the discharge pipeline 32 or of the connecting pipeline 34 in such way, that they are impassable, a rotation of the driver 4 to its end position up to the end buffer 38 is impossible, and in that case uncovering of the blocking arm 25 out of the slot 31 does not occur, so, the pointers 22 signalize again that at least the bottom valve 30 stayed closed due to the failure. In the case of untightness failure during exhausting phase, the both valves are closed automatically, and the pointers 22 signalize the closing of the both valves, due to the failure. During function state, the both valves it is possible to close by rotating of the manual control-lever 3 to the starting position which causes that the driver 4 abuts onto the arresting buffer 37. Mutual activity of kinematics of the gear from the manual control-levers 3 up to swinging control-lever 6, and the arresting spring 36, ensures an automatically arresting of the manual control-levers 3 in the position with both valves of the railway cistern closed or in the position with both valves of the railway cistern opened.

[0006] The unit of the hydraulic control may be utilized also at top discharge, where the bottom valve is replaced by the top discharge valve with hydraulic bellows unit. In case the pipeline connections are resistant against the damage causing impassibility of the hydraulic media, then it is possible to omit the double-arm lever with the blocking and buffer arm.

Claims

1. The unit of the hydraulic control of the bottom and aeration valves in serial hydraulic connection of the aeration and bottom valve for the railway cisterns with the bottom discharge of the liquid and viscous transported substrates, **characterized in that** in the bearer body (1), fixed to the railway cistern frame, is rotatory fixed the rod (2) of the manual control-levers (3), firmly connected with the driver (4), jointly connected with the gear-lever (5), jointly connected with the swinging control-lever (6), rotatory located on the pin (7) of the bearer body (1) whereas the short arm (8) of the swinging control-lever (6), is jointly connected to the dilatation groove (9) of the rod (10) of the control bellows hydraulic cylinder (11), and the supporting head (12) of the control bellows hydraulic cylinder (11) is by the central pin (13) rotatory connected with the signal-lever (14) which is by one marginal pin (15) rotatory fixed to the bearer body (1), and by the second marginal pin (16) on the longer arm is kinematically connected with the signal draw rod (17), equipped with the signal spring (18), fixed onto the bearer body (1), and connected by the pin (19) with the signal driver (20), firmly fixed onto the

signal shaft (21) with the pointers (22) of the valve positions, whereas a movement of the supporting head (12) and the signal-lever (14) is limited longitudinally by the groove (23) in the bearer body (1) through which penetrates the central pin (13), and the double-arm lever (24) with the blocking arm (25) and the buffer arm (26) is placed rotatory in the blocking holder (27) in which is placed the reversible spring (28), supported by end of the buffer arm (26) whereas the blocking holder (27) is fixed onto the bearer body (1) in such way that in the closed position of the aeration valve (29), and the bottom valve (30), the blocking arm (25) sinks into the slot (31) of the signal driver (20), and in open position of the aeration valve (29) and the bottom valve (30) is, after rotation of the driver (4) and by its touch with the buffer arm (26), the blocking arm (25) uncovered out of the slot (31), and the control bellows hydraulic cylinder (11) is serially connected through the discharge pipeline (32) with the hydraulic bellows unit (33) of the aeration valve (29), and also through the connecting pipeline (34) with the hydraulic bellows unit (35) of the bottom valve (30).

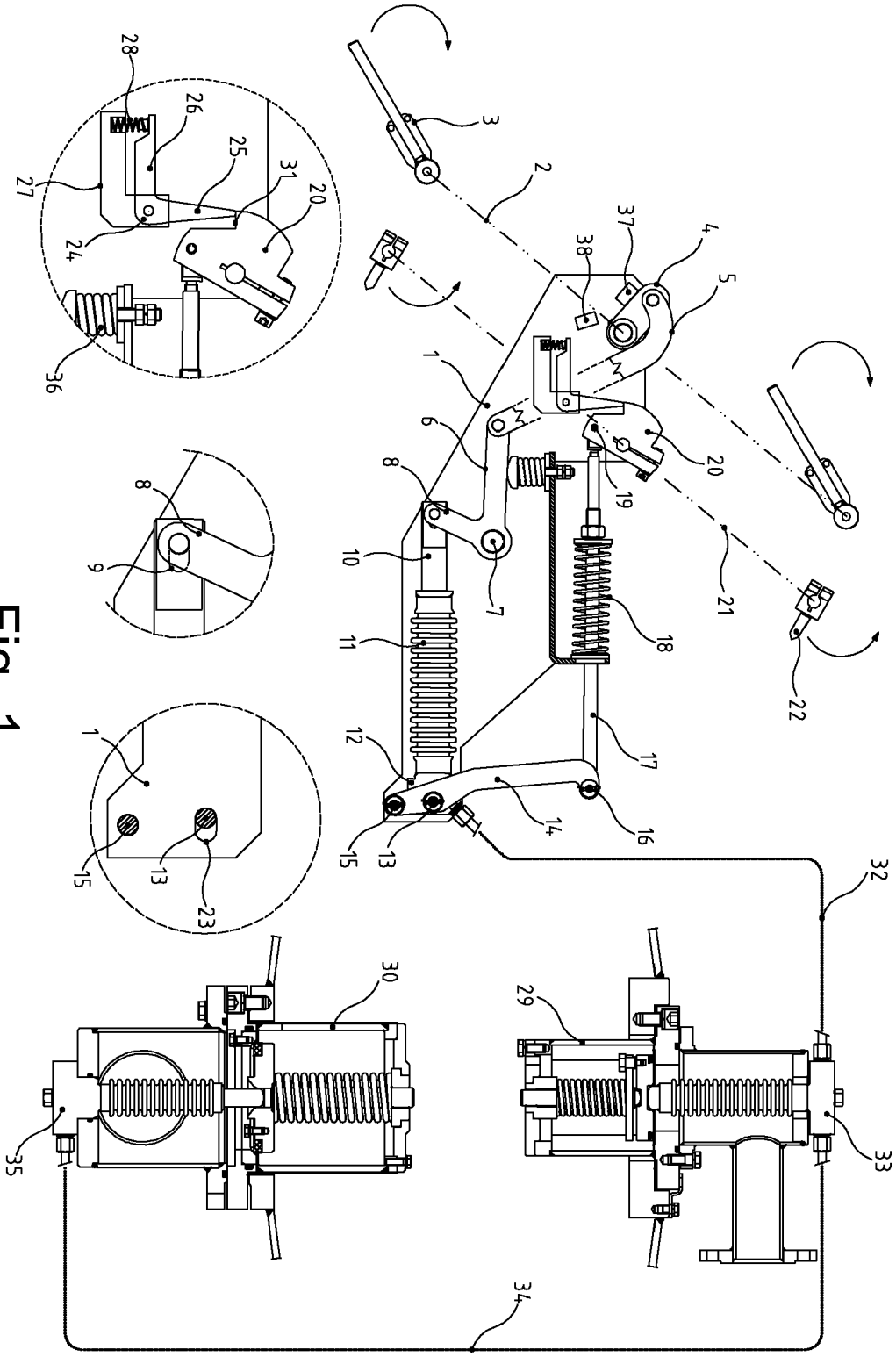
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Fig. 1