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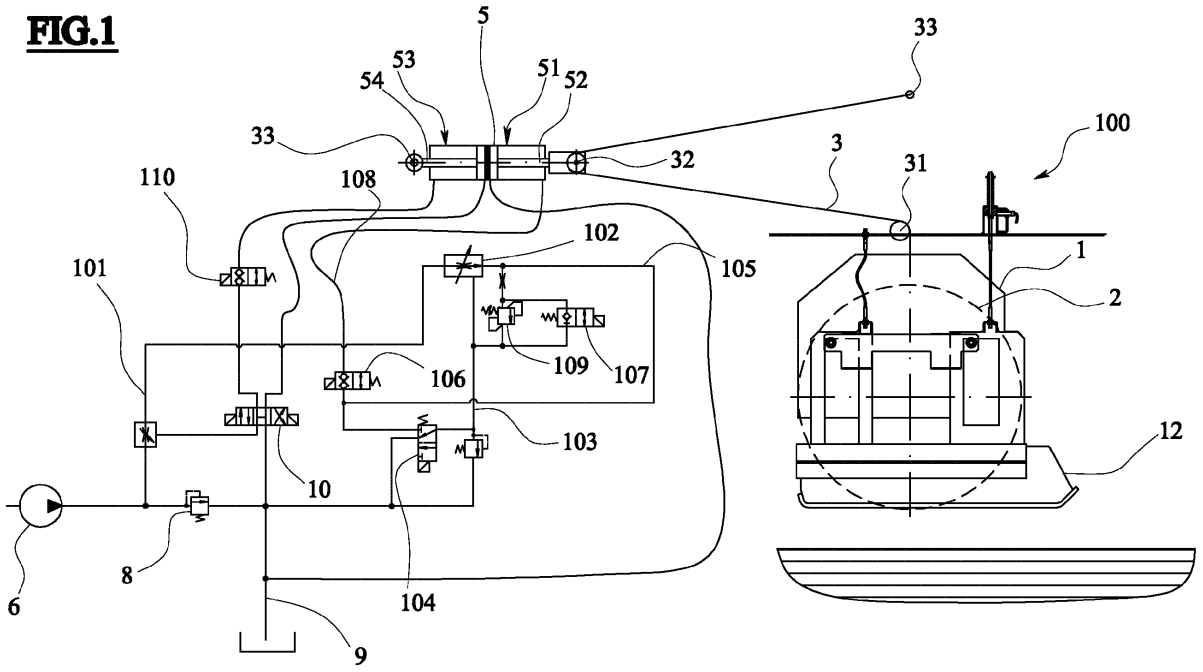
(54) **Oscillating suspension means for a brush of a sweeping machine**

(57) An oscillating suspension means for a brush of a sweeping machine, comprising a support frame for the rotating brush (2), which is suspended from a frame of the machine by means of a double-acting first piston-cylinder group (53) supplied by a pump via a four-way distributor (10), activated either automatically or manually by an operator, the cylinder (5) of the first piston-cylinder group (53) being placed in series with a single-acting second piston-cylinder group (51) made sensitive to means for detecting a sharp rising of the brush.

FIG.1



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Description

[0001] The present invention relates to sweeping machines of a type bearing a rotary brush having an axis that is perpendicular to the advancement direction of the machine, suspended from a self-propelling frame.

[0002] The suspension of the brush from the self-propelling frame is achieved using an articulated frame, provided with springs or equivalent elastic suspension means, which function as a counter-weight to the weight of the frame and the weight of the brush such as to determine a correct force with which the brush presses on the plane on which it is required to act such as to remove dirt therefrom.

[0003] The prior art comprises fluid means, such as for example a hydraulic cylinder-piston group and a relative command group, for determining the rest configuration or work configuration of the articulated frame, and consequently such as to determine the constant force with which the frame keeps the brush pressed onto the plane to be cleaned.

[0004] The articulated suspension of the brush enables it to be raised and lowered as it follows irregularities in the terrain, for example bumps.

[0005] The force remains substantially constant.

[0006] The articulated support frame of the brush is associated to hydraulic shock absorber organs which absorb the shocks of the movement and prevent too-sharp responses to the irregularities in the terrain which cause vertical movements of the brush.

[0007] The articulated suspensions of the brushes in the prior art exhibit a drawback which originates from the fact that sometimes rapid responses to the irregularities of the terrain are actually required, and are up to now impossible because of the above-mentioned shock absorber.

[0008] In practice, the brush, raised by the encounter with the bump, and having passed over the bump, does not immediately return to rest on the ground, but because of the shock absorber lowers slowly, thereby missing the zone just downstream of the bump, which therefore does not receive the action of the brush.

[0009] The invention has the aim of obviating the above-mentioned drawbacks with a solution that is simple and economical.

[0010] The aim is attained by a device having the characteristics set out in the independent claim.

[0011] The dependent claims relate to further characteristics destined to improve the efficiency of the invention.

[0012] The device of the invention comprises a support frame for the rotary brush, which is suspended from a cable wound on a pulley which is solidly constrained to a cylinder of a first double-acting hydraulic piston-cylinder group supplied by a pump via a first four-way distributor activated automatically or manually by the operator, the stem of the first piston-cylinder group being attached to the machine frame, and means being comprised for detecting sharp rises of the brush which it encounters and passes over a bump.

[0013] A single-acting second piston-cylinder group is interposed between the pulley and the first piston-cylinder group, which second group is supplied by the pump via a priority valve and a manually adjustable choke, there being provided on the conduit, downstream of the choke and flowed-through by the fluid which the choke enables passage of, a discharge conduit which is opened by a by-pass valve activated by a timer commanded by the means for detecting the sharp rises of the brush, or by the operator.

[0014] The advantages and constructional and functional characteristics of the invention will emerge from the detailed description that follows which, with the aid of the accompanying figures, shows a preferred embodiment of the invention, given purely by way of non-limiting example.

Figure 1 is a diagram of the invention comprising the mechanical and hydraulic parts, with the machine in transfer condition.

Figure 2 is the machine of figure 1 in a different operating position.

Figure 3 is the machine of figure 2 in a different operating position.

Figure 4 is an enlarged view of the hydraulic diagram of the preceding figures.

[0015] The figures illustrate a frame 1 bearing a rotary brush 2.

[0016] The frame 1 is supported by the self-propelling frame of the machine (not illustrated) by means of a chain or steel cable 3 which runs around two pulleys 31 and 32 and is connected to a fixed point 33 of the self-propelling frame.

[0017] The pulley 32 is associated to the stem 52 of a single-acting second piston-cylinder group 51, the cylinder 50 of which is rigidly constrained to the cylinder 5 of a double-acting first piston-cylinder group 53, the stem 54 of which is constrained to the self-propelling frame (not illustrated).

[0018] The hydraulic command circuit of the first and second piston-cylinder groups is as follows.

[0019] The hydraulic pump 6 supplies the priority valve 7, and is set in communication via the maximum pressure valve 8 with the discharge 9.

[0020] The maximum pressure valve 8 is calibrated such as to open at a predetermined pressure, for example 80 bar.

[0021] The valve 7 supplies a first four-way distributor 10 which commands the first piston-cylinder group 53 via a block valve 110.

[0022] The block valve 110 is in the position illustrated in the figures when the distributor 10 is in the neutral central position; the valve 110 opens when the distributor 10 slide is activated to the right or left.

[0023] When the slide of the first distributor 10 is com-

manded to displace to the right in the figure, the left chamber is supplied by the first piston-cylinder group 53, and the cylinder 5 moves to the left, causing the rising of the brush group. The right chamber of the group 53 is set to discharge mode.

[0024] The opposite happens when the slide is commanded to displace to the left, causing the brush group to descend.

[0025] With the slide of the first distributor 10 in the central position, the brush is supported at the desired height.

[0026] The oscillations of the brush for following the irregularities of the terrain, also known as "floating", is commanded by the single-acting second piston-cylinder group 51, except for when the brush encounters a bump, especially when it is followed by a drop.

[0027] In these cases the brush is kept pressed on the terrain only by its own weight, without any contrasting action of the floating means; thus it can descend sharply.

[0028] With reference to the figures, the frame 1 bearing the brush comprises two vertically-mobile flanks 11, singly provided with a lower skate 12.

[0029] The skate 12 is normally at a slightly higher position than the height of the lower part of the brush 2 contacting the terrain.

[0030] When the brush 2 encounters a bump or relief in the flooring, indicated in figure 3 with the letter D, the skates 12 raise the flanks 11 which in turn activate the sensor 100, the function of which will more fully emerge herein below.

[0031] The stem 52 of the single-acting second piston-cylinder group 51 is made to displace to the left in the figure (rising of the brush) by the action of pressurised fluid in the right chamber, and is made to displace to the right (descent of the brush) due to the weight of the frame bearing the brush.

[0032] The single-acting second piston-cylinder group 51 is commanded as follows. During normal operating conditions, a certain desired pressure, determined by the maximum pressure valve 109, is maintained in the right chamber of the second piston-cylinder group 51 by means of the priority valve 7

[0033] The priority valve 7 is connected to the right chamber of the second piston-cylinder group by means of a conduit 101 on which a choke 102 is located, which choke is manually adjustable by means of a knob (not illustrated). The excess part of fluid, which the choke 102 allows to pass, is sent to the discharge 9 through the conduit 103 and the second two-way distributor 104, which is in the position illustrated in figure 4.

[0034] The part of fluid which the choke 102 allows to pass flows into the conduit 105 and, via the block valve 106, reaches the chamber of the second piston-cylinder group 51 through the conduit 108.

[0035] The valve 106 is normally open, contrarily to what is illustrated in figure 4.

[0036] The block valve 106 blocks only with the brush raised and in the rest configuration.

[0037] When the second distributor 104 is activated, the fluid flowing in the conduit 103 flows together with the fluid that is flowing in the conduit 105 upstream of the solenoid valve 106, which is normally open.

[0038] The conduit 105 is connected to the conduit 103 by the valve 107, which is normally closed as illustrated in figure 4.

[0039] The second distributor 104 is commanded by the operator when the brush is to be raised, for example during a stage of transferring the machine.

[0040] The activation of the distributor 104 enables all the fluid in the conduit 101 to pass into the conduit 108 which opens into the chamber of the single-acting second piston-cylinder group, raising the brush.

[0041] The activation of the valve 107 is performed by activation of the sensor 100 which, via a timer (not illustrated) activates the distributor slide such as to enable the fluid which the choke 102 has enabled to pass to flow directly to the discharge 9 through the second distributor 104.

[0042] The valve 107 will herein below be referred-to as the by-pass valve 107.

[0043] The activation of the by-pass valve 107 causes the support given by the second piston-cylinder group to the brush to be temporarily suspended, enabling a sharp drop of the brush due to its own weight, as the floating action afforded by the second piston-cylinder group 51 is no longer present.

[0044] It can happen that when there are bumps and troughs of a particular height and depth, the vertical excursion of the brush enabled by the floating movement commanded by the piston-cylinder group 51 is not sufficient to guarantee contact of the brush with the ground.

[0045] In this case, in the invention the valve 110 and the distributor 10 are also subjected to receiving command signals from the sensor 100.

[0046] In particular, with the distributor 10 in the closed central position, in which it is situated during the normal operation of the machine, the activation of the sensor 100 causes opening of the block valve 110 as well as the leftwards displacement, as in figure 1, of the distributor 10 slide, and in this way the fluid is supplied to the right chamber of the first piston-cylinder group 53 which thus accelerates the fall of the brush, making possible the sharp drops required in order to follow terrain irregularity.

[0047] The functioning of the device emerges clearly from what is described herein above.

[0048] The invention can be subject to modifications and improvements without its forsaking the ambit of the following claims.

Claims

1. Oscillating suspension means for a brush of a sweeping machine comprising a support frame for a rotary brush (2), which support frame is suspended from a frame of a the machine by means of a cable

(3) wound on a pulley (32) which is solidly constrained to a cylinder (5) of a double-acting first piston-cylinder group (53) supplied by a pump (6) via a first four-way distributor (10) automatically or manually activated by an operator, a stem (54) of the first piston-cylinder group (53) being associated to the frame of the machine, **characterised in that** a single-acting second piston-cylinder group (51) is interposed between the pulley (32) and the cylinder (5) of the first piston-cylinder group (53), the second piston-cylinder group (51) being supplied by the pump (6) via a priority valve (7) and a choke (102), a by-pass valve (17) being located between the conduit (105) downstream of the choke (102) and flowed-through by the fluid to which the choke enables passage and the conduit (103) downstream of the choke flowed-through by the fluid which the choke (102) does not enable passage, the by-pass valve (107) being commanded to open by means for detecting a presence of a bump which causes sharp rising of the brush, and by a timer activated automatically or manually by the operator.

2. The oscillating suspension means of claim 1, **characterised in that** the choke (102) is adjustable.

3. The oscillating suspension means of claim 1, **characterised in that** the means for detecting the presence of the bump comprise at least a skate (12) located in contact with the terrain, the skate (12) being free to oscillate on the frame (1) which bears the brush in order to activate a sensor (100) which commands at least the by-pass valve (107).

4. The oscillating suspension means of claim 3, **characterised in that** the sensor (100) also commands the distributor (4).

5. The oscillating suspension means of claim 1, **characterised in that** the conduit (105) flowed-through by the fluid which is allowed to pass by the choke (102) runs into a chamber of the single-acting second piston-cylinder group (51).

6. The oscillating suspension means of claim 5, **characterised in that** the conduit flowed-through by the fluid which the choke (102) does not enable to pass through comprises, downstream of the by-pass conduit, a second distributor (104) activated by the operator who alternatively places the second distributor (104) either in communication with the fluid conduit in which the choke (102) has enabled passage or with the discharge.

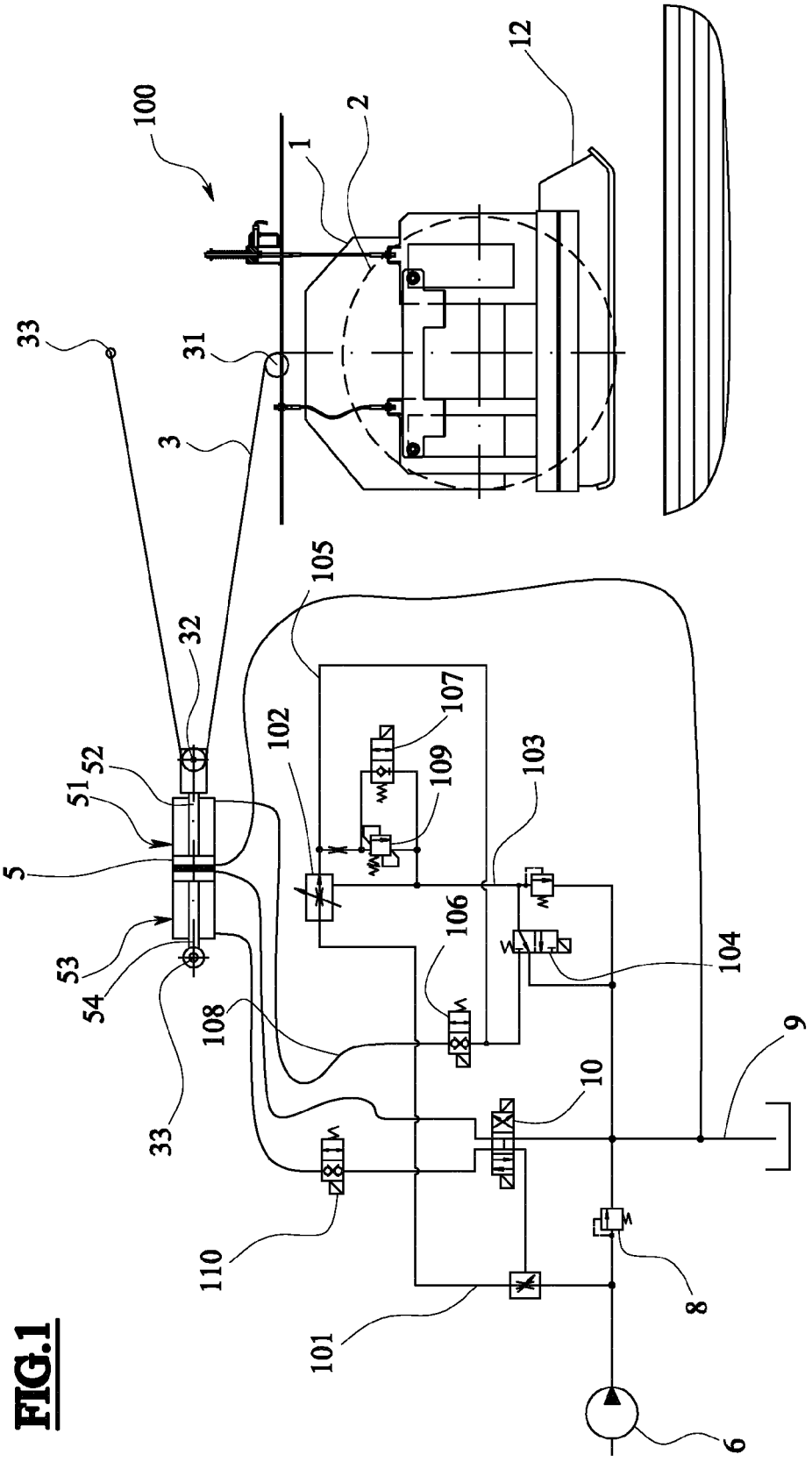
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FIG.1

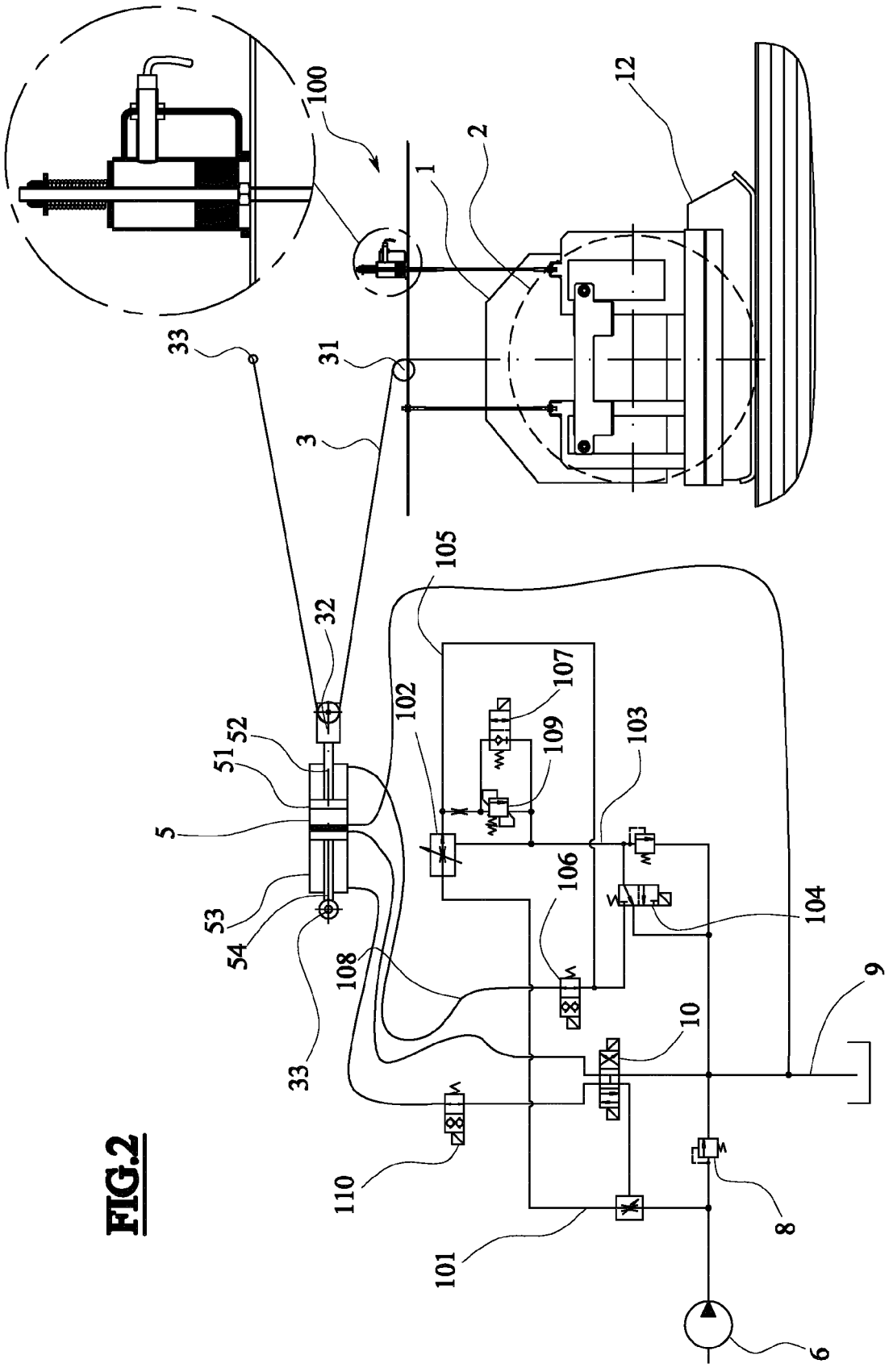
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FIG.2

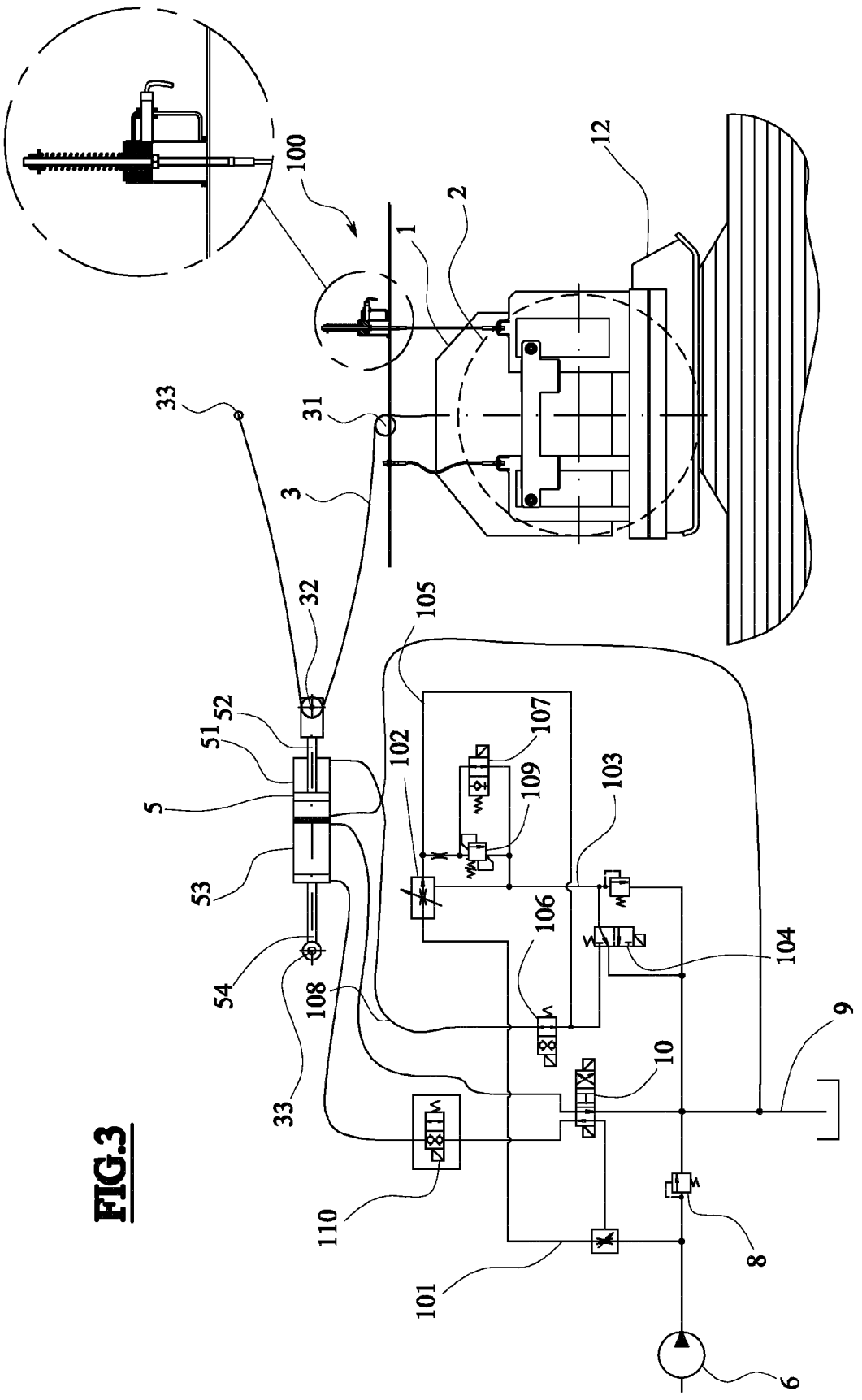
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FIG.3

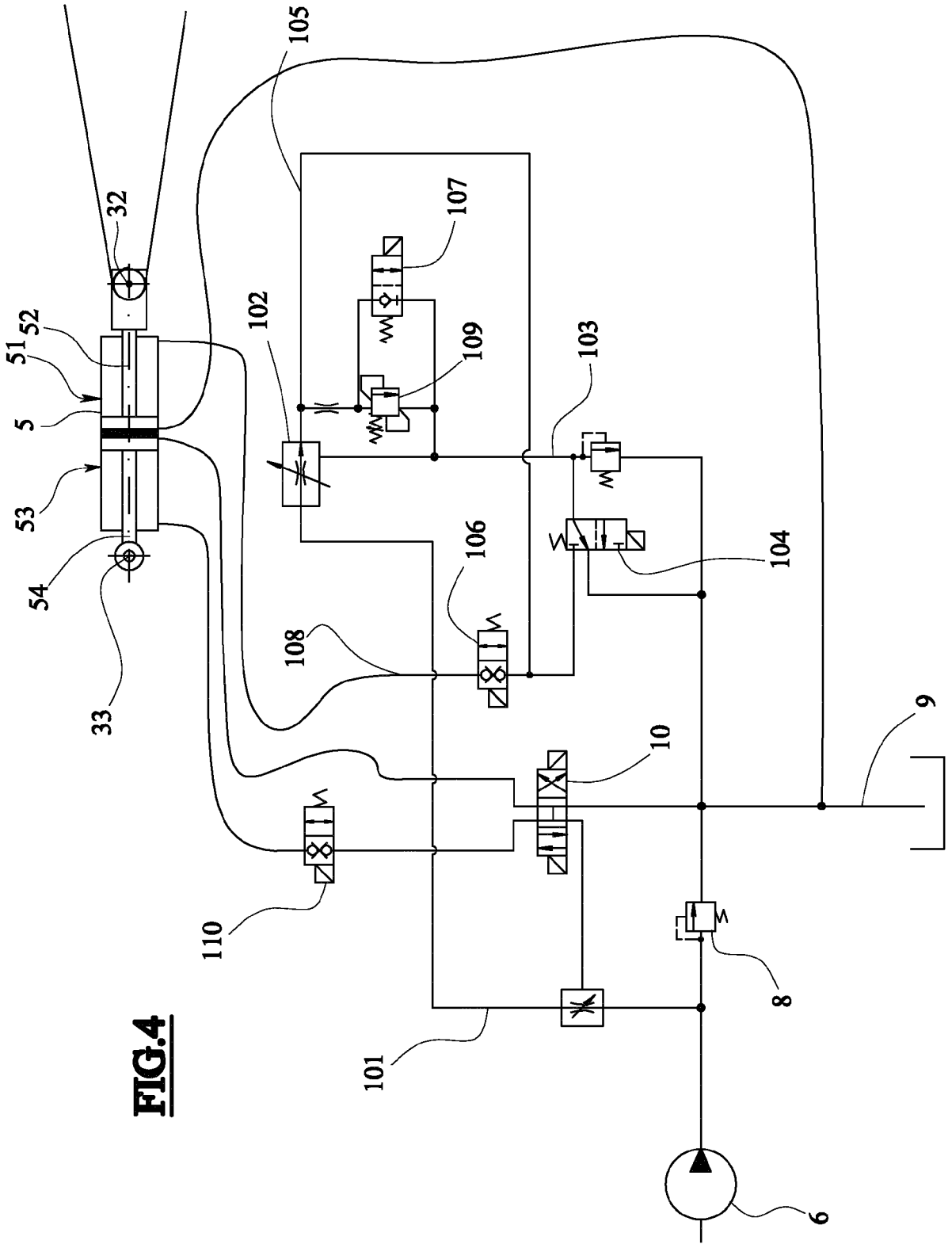

FIG.4