# United States Patent

[11] 3,552,456


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[33] Sweden
[31] No. 3940/1968


[54] **DEBARKING MACHINE OF THE HOLLOW ROTOR TYPE**
**2 Claims, 4 Drawing Figs.**


[52] U.S. Cl. ..... 144/208
[51] Int. Cl. ..... B27l 1/00
[50] Field of Search ..... 144/208.5, 208



[56] **References Cited**
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| | | | |
|---|---|---|---|
| 3,196,912 | 7/1965 | Brundell et al. | 144/208 |
| 3,333,615 | 8/1967 | Robbins | 144/208 |
| 3,361,168 | 1/1968 | Brown | 144/208 |



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**ABSTRACT:** The invention relates to a debarking machine comprising a hollow rotor carrying debarking tools pivotable to and from the axis of the rotor. The machine is of the type in which hydraulic power transmitting means are adapted to act upon the tools to move them onto the axis of the rotor, while pressure accumulator means are mounted on the rotor to supply pressurized liquid to said power transmitting means.


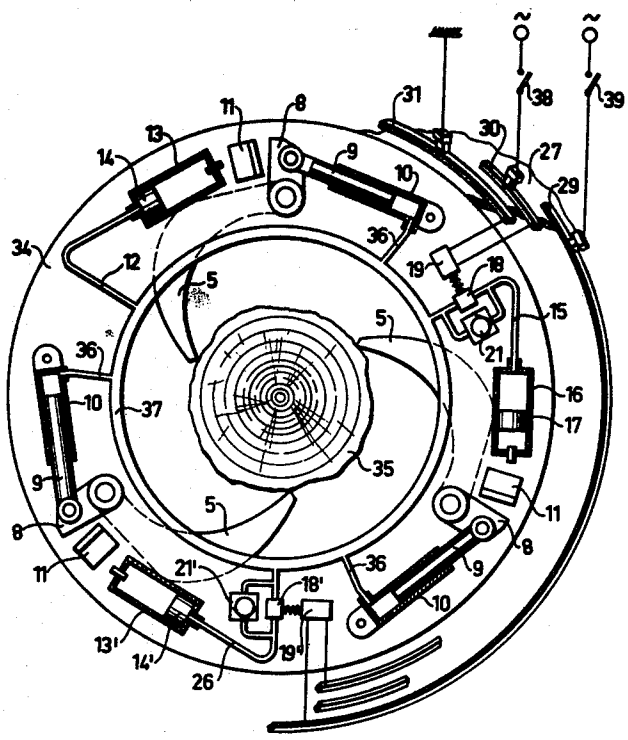

Fig. 1

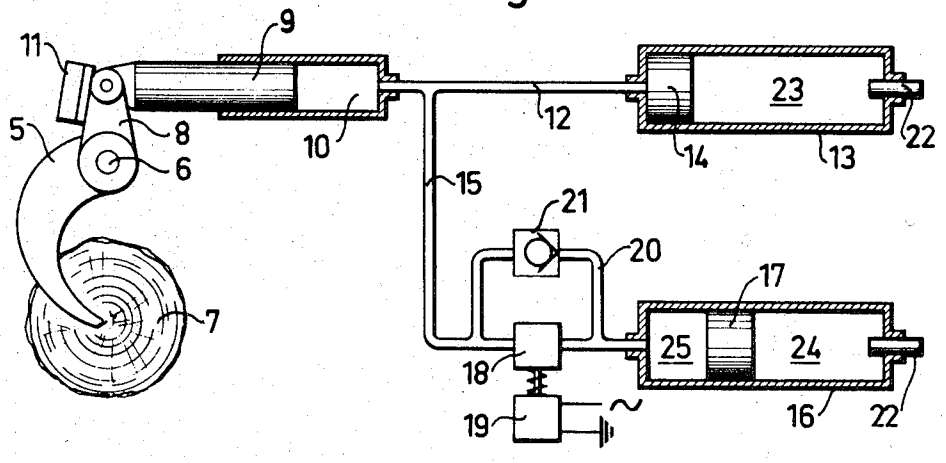
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Fig. 2

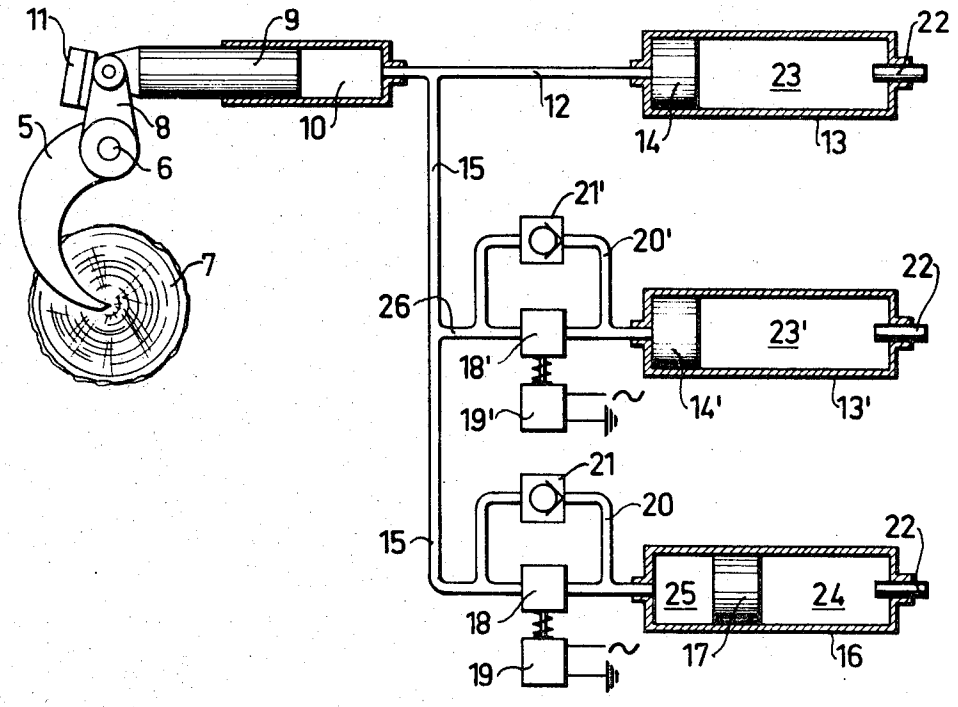
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Fig. 3

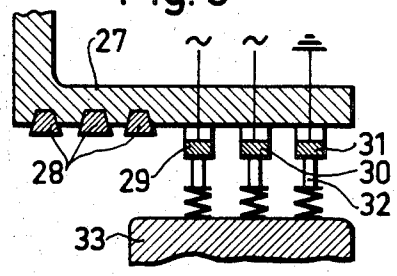
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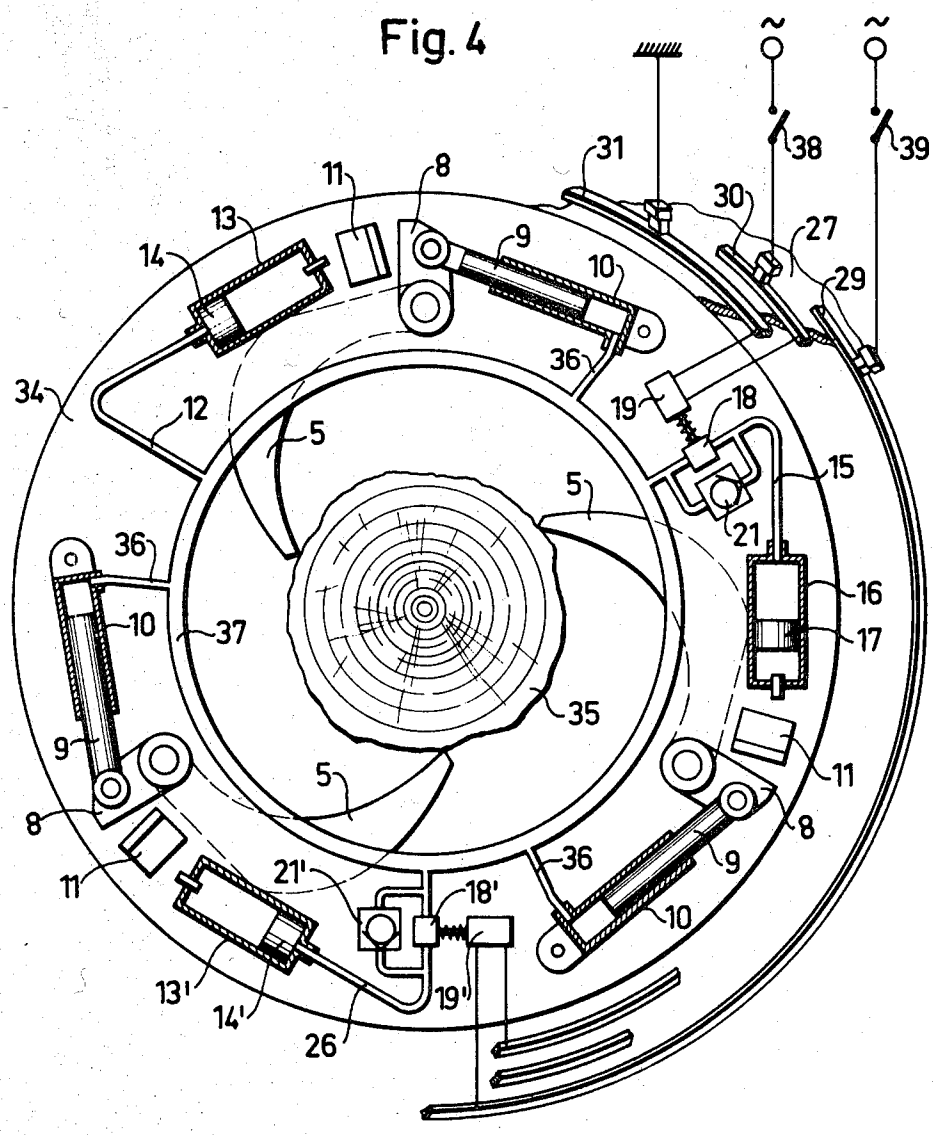
Fig. 4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# DEBARKING MACHINE OF THE HOLLOW ROTOR TYPE

The Swedish Pat. specification 179,777 describes such a debarking machine in which hydraulic cylinders are provided to cause the tools to resiliently engage the surface of a log passing through the rotor, and said cylinders are then connected to a hydraulic-pneumatic pressure accumulator in which gas and liquid are separated by a diaphragm.

Further, the U.S. Pat. No. 3,333,615 describes a similar debarking machine in which the tool force may be changed by increasing or reducing the amount of liquid in a hydraulic-pneumatic pressure accumulator by means of a pump and a valve both operated electrically. Thus, the force of the tools may be changed continuously until the desired debarking effect is obtained. However, an inconvenience of this device is that the readjustment needs a rather long time so that the required tool force is often not obtained until a whole log has been incorrectly debarked in passing through the rotor.

The object of the invention is to provide a device by means of which the force acting on the tools can be changed stepwise and practically instantaneously. For that purpose, at least two pressure accumulators having different pressure levels are provided to be optionally connected to the hydraulic power transmitting means by setting valves, whereby a stepwise change of the hydraulic force acting upon the tools is made possible.

The invention will be further described with reference to the accompanying drawings, in which:

FIG. 1 shows diagrammatically how a debarking tool may be operated by means of one of two pressure accumulators;

FIG. 2 shows a similar view of an embodiment with three pressure accumulators;

FIG. 3 shows an axial section through a portion of the cylindrical rotor wall and adjacent portion of a stator; and

FIG. 4 shows diagrammatically a radial section through a debarking rotor, in which the device shown in FIG. 2 is mounted.

In FIG. 1, 5 designates a debarking tool secured to a rotatable shaft pivot 6. The tool is shown in its initial position before the end surface of a log 7 adapted to be fed into the rotor not shown. An arm 8 secured to the shaft pivot 6 and projecting radially therefrom has its outer end linked to a piston 9 which is movable in a hydraulic cylinder 10. The inward movement of the tool 5 into the initial position shown is limited in that the arm 8 hits a rubber-coated stop member 11 secured to the rotor.

A conduit 12 connects the rear end of the cylinder 10 to one end of a cylinder 13 which contains a movable piston 14, and another conduit 15 extends from the conduit 12 to another cylinder 16 likewise containing a movable piston 17. A normally open valve 18 disposed in the conduit 15 is closed on supply of current to a solenoid 19, but the valve 18 is bypassed by a branch conduit 20 which contains a nonreturn valve 21 opening in the direction away from the cylinder 16. The two cylinders 13 and 16 are adapted to function as pressure accumulators, and for this purpose their rear ends are provided with nipples for supply of pressurized gas up to the desired pressures. Thus, the space 23 behind the piston 14 is filled with gas of high pressure so that in the initial position shown the piston 14 has been moved into contact with the fore end wall of the cylinder 13. The space 24 behind the piston 17 in the cylinder 16 is filled with gas of lower pressure, but the piston 17 is in an intermediate position, because the fore cylinder space 25, the system of conduits 12, 15, 20 and the cylinder space inside of the piston 9 are filled with an amount of liquid measured correspondingly.

The debarking tool 5 is preferably of the so-called self-opening type, i.e., it has an edge directed to the end surface of the advanced log, and because of its engagement this edge causes the tool to climb onto the cylindrical surface of the log. Thus, when the rotor is rotated clockwise in FIG. 1, the tool is caused to swing clockwise from the position shown in FIG. 1, whereby the piston 9 is moved into the cylinder 10 against the action of the gas pressure prevailing in the low-pressure accumulator 16. Hereby, the tool is in the known way brought to bear on the cylindrical log surface by means of a resilient force which increases as the volume of the cylinder space 24 decreases. Despite the open conduit 12, the high-pressure accumulator 13 is inoperative, because the piston 14 in the position shown acts as a fixed wall.



If a higher tool force is desired, the solenoid valve 18 is closed. In such case, when the tool 5 is rotated clockwise from its initial position in FIG. 1, the movement of the piston 9 causes the piston 14 of the high-pressure accumulator 13 to be forced back, as the flow of liquid to the low-pressure accumulator 16 is now blocked, and the tool is then actuated by the high pressure in the pressure gas chamber 23. However, a special case occurs, if the solenoid valve 18 is closed during the debarking of a log, the diameter of which decreases progressively. As the piston 14 of the high-pressure accumulator 13 initially is in its inoperative position, it cannot force any liquid into the cylinder 10, and thus the cylinder 10 is still influenced by the low pressure only. When the tool is rotated anticlockwise because of the decreasing diameter of the log, the required amount of liquid is supplied from the space 25 of the low-pressure cylinder 16 through the nonreturn valve 21, which opens in this direction, as mentioned above. When the log has passed through the rotor and the tool 5 moves back to its initial position (FIG. 1), liquid is still supplied to the cylinder 10 from the low-pressure accumulator 16, and not until the tool is lifted by the next log does the communication with the low-pressure accumulator 16 become blocked, so that the piston 14 of the high-pressure accumulator 13 is pressed backwards against the action of the high pressure in the space 23.

On the other hand, if the solenoid valve 18 is closed during the debarking of a log advanced with its top end foremost, the tool force will be immediately increased although not to the same value as when readjustment is made while the machine is running idle, in which case the piston 14 because of its longer stroke causes a higher degree of compression of the gas in the space 23.

Consequently, in certain circumstances it is not possible to increase the force immediately but, on the other hand, said force may always be reduced immediately by opening the solenoid valve 18. Because of the gas pressure in the space 23 the piston 14 is then immediately moved into its inoperative end position while transferring a corresponding amount of liquid to the low-pressure accumulator 16. In fact, the possibility of quickly reducing the force acting on the tools is more important than a possibility of increasing the pressure immediately in any situation. If a high-pressure set is too great, a considerable loss of wood and damage to the log may be caused, and it is then desired to reduce the pressure instantaneously. If, on the other hand, it might not be possible to carry out a required increase of the tool pressure instantaneously, the result will only be a less satisfactory debarking. This fault, however, may be remedied by passing the log through the machine a second time.

The embodiment shown in FIG. 2 differs from the one in FIG. 1 only in that a further pressure accumulator has been added, so that it becomes possible to choose between three different levels of pressure. Where convenient, the same reference numerals have been used. In FIG. 2, a conduit 26 extends from the conduit 15 to an accumulator 13', the gas space 23' of which is filled with gas up to a pressure between the pressures in the gas spaces 23 and 24 of the other two accumulators 13 and 16, respectively. A normally open valve 18' inserted in the conduit 26 is controlled by a solenoid 19', and in the same way as in FIG. 1 the valve 18' is bypassed by a branch conduit 20' containing a nonreturn valve 21' which permits a flow in the direction away from the accumulator 13'. In the initial position shown, the piston 14' of the medium pressure accumulator 13' is held in its inoperative end position in the same way as the piston 14 of the high pressure accumulator 13, but also in this case the piston 17 of the low-pressure accumulator 16 occupies an intermediate position. If

the tool 5 is to be brought into engagement by means of the accumulator 13', the solenoid valve 18 of the low-pressure accumulator 13 is to be used, both solenoid valves 18, 18' are closed. Of course, still more accumulators may be mounted in the same way, in that the general rule is to close the solenoid valves of all accumulators having a lower pressure than the one desired. For the rest, the function is in principle the same as that of the embodiment described in connection with FIG. 1.

In the described devices for stepwise change of the operating forces of the tools, there is no equalization of pressure between the various accumulators because of leakage or redistribution of liquid at the resetting of valves, while a log is present in the rotor. In such cases, where a determined amount of liquid is forced into an accumulator having a lower pressure, the initial state is reestablished, as soon as the tool has assumed its initial position. Further, the device described has the advantage that any volume changes in the hydraulic system because of leakage to the surroundings, variations of temperature or an adjustment of the stop member 11 are automatically compensated for by the quantity of liquid in the foremost space 25 of the low-pressure accumulator 16. The maximum pressure in the system is influenced only by a possible leakage of gas from the high-pressure accumulator space 23.

FIG. 3 is intended to illustrate how in the known way the electric current may be transmitted to the solenoids mounted in the rotor. 27 designates the cylindrical wall of the rotor, which is externally provided with peripheral grooves to receive driving belts 28. Beside these belts, the rotor carries three slip rings 29, 30, 31 spaced axially and cooperating with resilient brushes 32 mounted on the inside of the surrounding stator 33. Two of the slip rings, 29 and 30, are insulated and each of them is connected to one phase of a source of alternating current, while the third slip ring 31, which need not be insulated, may be connected to earth. Often the third slip ring 31 may be entirely dispensed with in that the rotor may serve as earth.

FIG. 4 shows a radial section through a rotor provided with three debarking tools 5 as well as the device shown in FIG. 2. Here, the tools are shown lifted on to the surface of a log 35 introduced into the rotor 34. The cylinders 10 of the pistons 9 linked to the tool arms 8 are by means of conduits 36 permanently in communication with a liquid distribution duct 37 extending in a circle around the inner periphery of the rotor. The three accumulators 13, 13' and 16 are connected to said distribution duct 37 by means of the conduits 12, 26 and 15, respectively. By way of the slip rings 29—31 each of the two solenoids 19 and 19' is connected between earth and one of the phases of the alternating current. In FIG. 4, the switches 38, 39 are open, and thus the solenoid valves 18, 18' are also open, so that the tools 5 are influenced by the low-pressure accumulator 16, the piston 17 of which, in the position of the tools shown, has been moved backwards in relation to the initial position shown in FIG. 2. Owing to the distribution duct 37 all the tools are actuated simultaneously by the adjusted pressure. The slip rings 29—31 mounted around the rotor are here shown in a diagrammatic perspective view.

The device described may be modified in several respects within the scope of the invention. For instance, the gas pressures in the accumulators may be replaced by springs inserted to act upon the movable pistons.

I claim:

1. A debarking machine comprising a hollow rotor carrying debarking tools pivotable to and from the axis of the rotor, hydraulic power transmitting means adapted to act upon the tools to move them onto the axis of the rotor, and pressure accumulator means mounted on the rotor to supply pressurized liquid to said power transmitting means, characterized in that at least two pressure accumulators having different pressure levels are provided to be optionally connected to the power transmitting means by setting valves, whereby a stepwise change of the hydraulic force acting upon the tools is made possible.

2. A debarking machine as claimed in claim 1, characterized in that the accumulator having the highest pressure level is connected to the power transmitting means through a permanently open conduit, in that each accumulator having a lower pressure level communicates with with said power transmitting means through a conduit containing a solenoid-operated shutoff valve, in that a branch conduit bypassing the shutoff valve contains a check valve opening in the direction from its accumulator, and in that the amount of liquid in the whole hydraulic system is measured such that only the lowest pressure accumulator contains a small amount of liquid, even when the tools are in an inoperative position with their edges close to the axis of the rotor.