

Nov. 22, 1960

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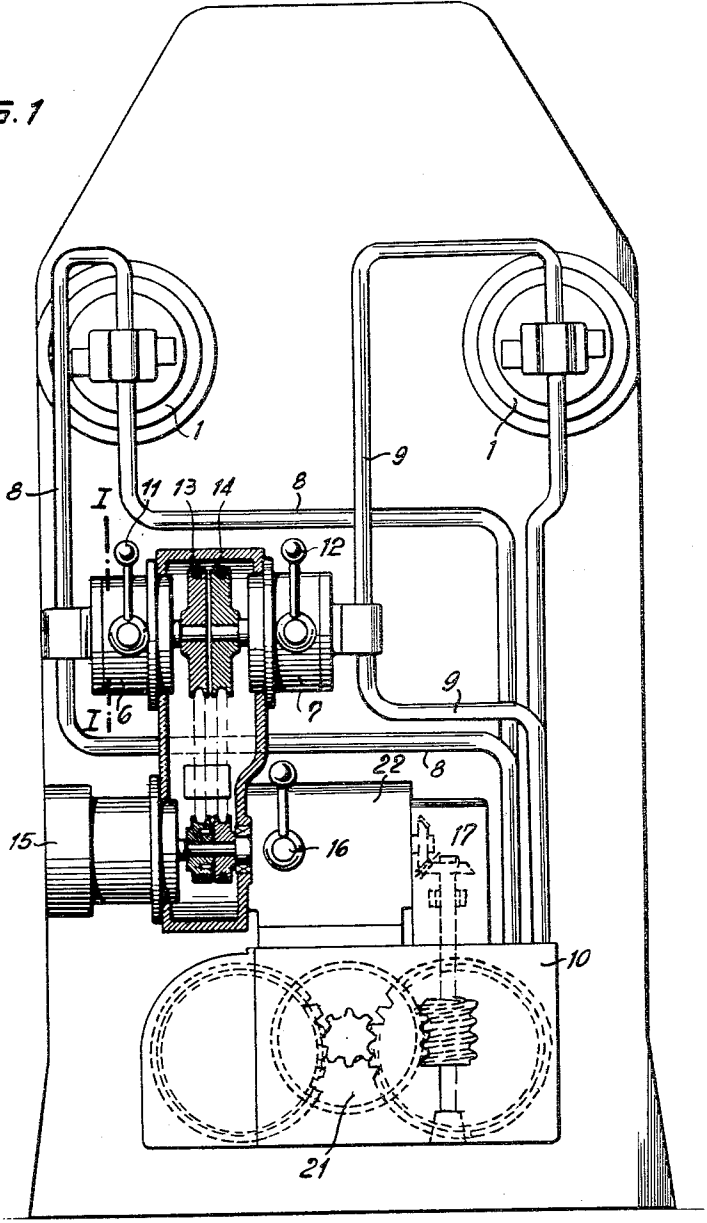
2,961,017

COMMON DRIVE FOR RAISING THE TOP FEED ROLLERS
AND ADVANCING THE ROLLERS OF FRAME SAWS

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3 Sheets-Sheet 1

FIG. 1



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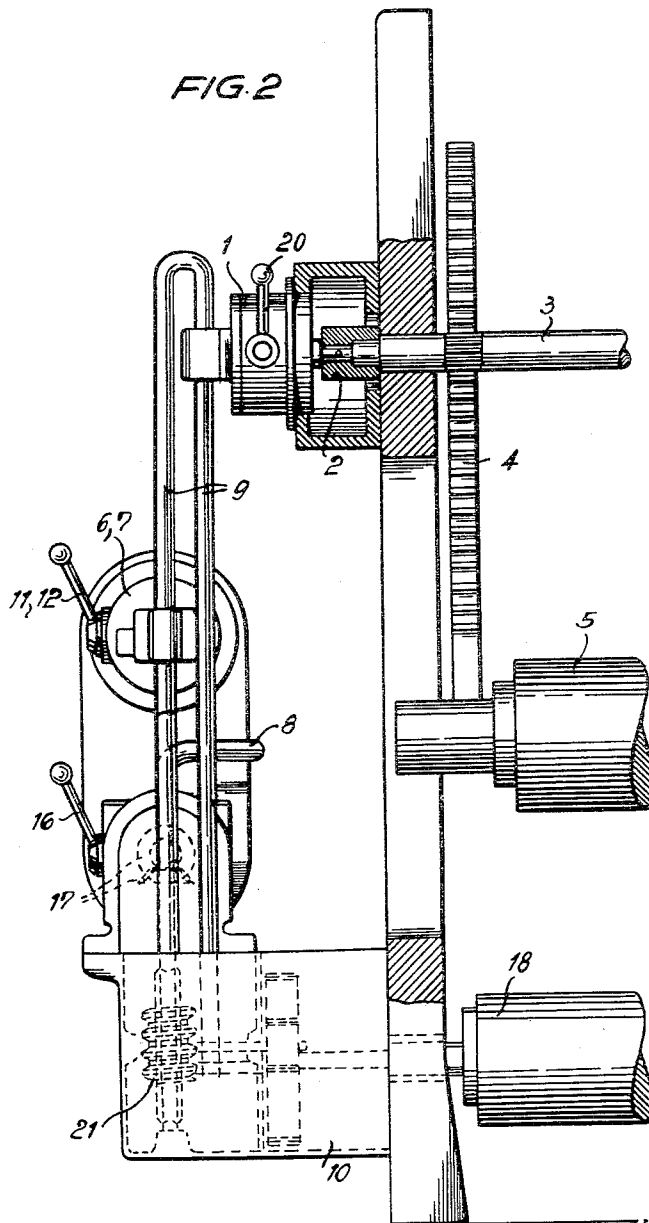
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

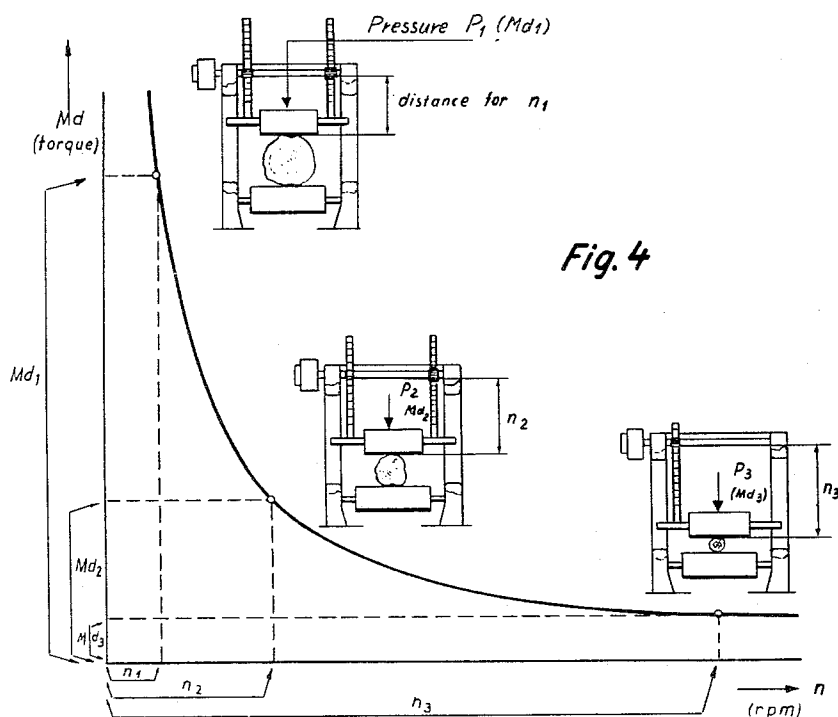


Fig. 4

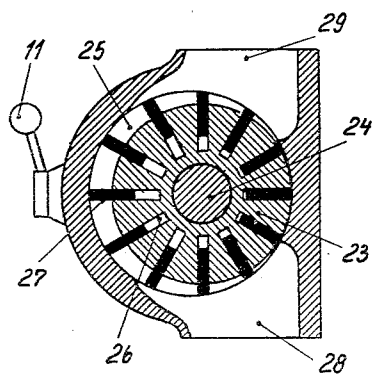


Fig. 3a

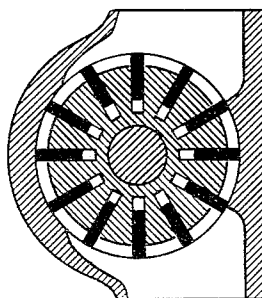


Fig. 3b

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2,961,017

COMMON DRIVE FOR RAISING THE TOP FEED ROLLERS AND ADVANCING THE ROLLERS OF FRAME SAWS

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2 Claims. (Cl. 143—84)

It is known, in frame saws wherein the top feed rollers are suspended on two toothed racks which are moved up and down, to effect the raising, lowering and weighting of the top rollers by means of hydraulic pistons.

In one of the known constructions, a hydraulic control piston acts on the one end of the shaft of the top feed roller, the two racks of which are coupled together through an idler pinion shaft. This construction does not, however, prevent tilting because, during the upward or downward movement of the toothed racks, the lower surfaces of the teeth on one rack and the upper surfaces of the teeth on the other rack always rest against the corresponding pinion-shaft teeth.

In another known construction, a sprocket is keyed onto one end of the pinion shaft which raises and lowers the toothed rack, and a chain, on which the control piston of a horizontally mounted hydraulic cylinder acts, runs over the sprocket. In this case, however, the thrust movement of the piston is only converted into the rotary movement of the pinion shaft through the chain drive, as a result of which the transmission system becomes complicated, liable to breakdown, and inaccurate, particularly in the event of a reversal of movement.

All hydraulic control-piston systems, however, have the primary disadvantage that they are not, by themselves, capable of effecting a simple and automatic adaptation to the widely different shapes and diameters of the logs travelling through, often in rapid succession, and to the correspondingly widely different, rapidly changing weighting pressures and reaction forces arising in the course thereof.

It is true that, with hydraulic control pistons for roller lifting devices, it is already known to influence the weighting pressure of the feed rollers by means of a special pressure regulator, although regulation of the setting speed is impossible by this means.

It has now been found that a hydraulic adjustment, which meets all the requirements is provided in a simple manner on a frame saw having a saw frame comprising at least one adjustable top feed roller and at least one bottom driving roller, the article to be sawn being conveyed between these rollers, at least one toothed rack on which the top feed roller is supported in the frame, and a shaft which is mounted in the frame and has a pinion which is operationally connected to the toothed rack, the combination of a hydraulic rotary motor, a rotary pump for the hydraulic rotary motor, and an electric motor in driving connection with the pump of a regulating device in order to control the output of the hydraulic rotary motor, the hydraulic rotary motor being directly coupled to the shaft carrying the pinion as a

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result of which the toothed rack and the top feed roller can be moved up and down and the material being sawn is weighted when the top feed roller rests thereon with a pressure which is derived from the initial torque of the hydraulic rotary motor.

This application is a continuation-in-part of United States application Serial No. 507,064, filed on May 9, 1955, in which former application the subject matter of Figs. 1 and 2 have been disclosed and claimed, the subject matter of Figs. 3a, 3b and 4 being added in this application.

Apart from the considerable advantages of the fact that this driving system is uniform in construction and action and only requires one source of power, and that the hydraulic motors act directly on the pinion shafts or only through torque members, as a result of which it is not only possible to dispense with an intermediate conversion in the power-transmission train but also tilting is avoided, there is the particularly great advantage that, because of their known hyperbolic speed-torque characteristic, adjustable hydraulic rotary motors, in particular, have an action which automatically meets all the requirements of frame-saw operation. This characteristic, at a low speed, that is to say a slow adjusting speed, or raising or lowering speed of the top feed rollers, provides a heavy torque, that is to say a heavy pressure of said rollers, while as the speed increases, that is to say as the adjusting speed increases, it provides less torque, that is to say a lower pressure of the feed rollers. This provides the desired action for frame-saw operation, because when the logs have a large diameter and accordingly there is only a short adjusting distance, for which only a low adjusting speed is needed, the feed rollers automatically exert the high pressure necessary for the large log, as a result of the associated heavy torque. Conversely, when the timber has a small diameter and accordingly there is a large adjusting distance for which a high adjusting speed is needed, the low pressure necessary for the small log is automatically exerted by the feed rollers as a result of the associated low torque.

A further important advantage of the common drive according to the invention consists in that the speed-torque characteristic of the infinitely variable hydraulic rotary motor is also effective for the rotary drive of the feed rollers, in a manner which is desirable for frame-saw operation because with large diameter logs, a high feed power is available with a slow rate of feed, in keeping with and necessary for the heavy pressure of the top rollers, and conversely, with small diameter logs, a low feed force is available with a high rate of feed in keeping with and desirable for the low pressure of the top feed rollers. This double advantage of the drive according to the invention, which, for the first time, fully utilizes the characteristic of the infinitely variable hydraulic rotary motor for both lifting and feed in frame-saw operation, is lacking in the common hydraulic drive for the lifting and feed which has previously been suggested but in which only the feed is equipped with hydraulic rotary motors while hydraulic control pistons are used for actuating the lifting.

A further important advantage of the infinitely variable hydraulic rotary motors used, according to the invention, for lifting the feed rollers, consists in that with these rotary motors any desired length of setting distance can be provided for the feed rollers because the rotary motor

permits any desired angle of rotation; accordingly, it is possible to equip both small machines having a small feed roller-setting distance and large machines having a large setting distance, with one and the same rotary motor, whereas, with the piston hydraulic system, a short control cylinder is provided for a small machine and a long control cylinder for a large machine because of the limited setting distance and for reasons of economy.

The rotary hydraulic drive for lifting the feed rollers previously met with objections because the hydraulic rotary motors are difficult to construct and operate although they have to transmit very large forces which change rapidly and violently or have to absorb correspondingly large reaction forces. Furthermore, it was feared that the frequency of actuation would lead to unacceptable heating of the transmission and that, when the rotary motor was used jointly for the lift and the feed, the desired uniformity and simultaneity of action would not be obtained.

Other features, advantages and possible applications are revealed in the following description, given by way of example only, taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 shows a hydraulic adjusting and driving device according to the invention, seen from the side of the frame;

Figure 2 is a corresponding view in the direction of the bed of the saw;

Figure 3a shows a section along the line I—I in Figure 1 with the rotor in such a position that the pump is delivering;

Figure 3b shows a section on the line I—I of Figure 1 with the rotor in such a position that the pump is not delivering;

Figure 4 shows a torque-speed characteristic curve for the rotary hydraulic drive of the saw frame, the position of the top feed rollers being illustrated in diagrammatic form for three different operating points.

Referring to the drawings 1 are two motors which deliver the torque for adjusting the top feed rollers and each of which is equipped with a rotor. As can be seen from Figure 1, the units serve to adjust the height of a front and rear top feed roller. The torque produced by each hydraulic unit or motor 1 is transmitted through coupling members 2 and the shaft 3, which is provided with teeth by milling and known as a pinion shaft, and the toothed rack 4, to the shaft of the top feed roller 5 (Figure 2) so that the latter is raised or lowered or, if it is resting on the log, is weighted.

In Figure 2, the shaft 3 and the top feed rollers 5 and the bottom feed rollers 18 are shown broken away for representational reasons. The principle of the complete saw frame is shown by the diagrammatic illustrations in Figure 4. According to this, two toothed racks 4 can act on each top feed roller 5 being driven through a common shaft 3 and a pinion. Although this form of construction is of advantage, it is also possible, as shown in the third diagrammatic drawing, to have only one toothed rack per top feed roller. The hydraulic motors 1 are fed from the hydraulic pumps 6 and 7 through pipelines 8 and 9 (Figure 1). The hydraulic pumps each comprise an adjustable rotor. The container for the hydraulic medium, for example oil, is provided by the oil chamber of an infinitely variable hydraulic gear 10 which may be equipped, for example with a driven oil pump and a driving oil motor and from which the drive for the lower feed rollers 21, which serve particularly for the advance of the logs, is derived to some extent in the form of a control mechanism (Figure 2). Nevertheless, the oil chamber may also be introduced into the system elsewhere and in another manner.

The rotor 23 of the hydraulic pump 6 or 7 is mounted, as shown in Figures 3a and 3b, on the shaft 24 which is displaceable parallel to itself within the interior 25 of

the stator, by actuation of the hand lever 11. The diameter of the interior 25 of the stator is larger than the diameter of the rotor 23. In these hydraulic motors or pumps, which are known per se, the rotor 23 comprises deep grooves 26 which are arranged radially and in which are radial vanes 27 of rubber or the like which are constantly urged outwards, by resilient force, against the inner wall of the stator housing. As a result of this arrangement, the space between the rotor and stator is divided into a plurality of cells filled with liquid and rotating with the rotor. It is immediately obvious that, with the rotor in the position shown in Figure 3a, on rotation of the rotor in clockwise direction, liquid is drawn out of the aperture 28 and liquid is forced out of the aperture 29.

In the position shown in Figure 3b, the shaft 24 has been displaced, by means of the actuating lever 11, until the rotor and stator are running concentrically. It is clear that in this position no liquid is delivered.

Instead of the pumps 6 and 7, the hydraulic motors 1 may also be equipped with control rotors of the type which are actuated by means of the hand lever 20, or both the pumps and motors may comprise control rotors.

Figure 4 shows the torque-speed characteristic of such a drive for a saw-frame. The particular operating point is selected by actuating the hand lever of the control rotors. As can be seen from the three diagrams, the selection of the operating point depends on the thickness of the log to be sawn.

A high pressure, which corresponds to a heavy torque transmitted through the coupling 2, is necessary with large diameter logs in order to hold the heavy logs reliably in position. At the same time, the adjusting speed of the feed rollers only needs to be low because the large diameter of the log only leaves a small distance for the feed rollers to travel. Conversely, with thin logs, the log leaves a large distance over which the feed rollers have to travel quickly so as to save time. At the same time, the operating condition is met that the pressure should be low because otherwise there is a risk of a curved cut, for example as a result of distortion of the log as a result of the combination of high pressure and unevenness in the log.

Remote-control members, which are controlled in the usual manner, may, if necessary, act on the operating levers 11, 12 and 20. The drive of the pumps 6, 7 is effected by means of two belt drives 13, 14 which are driven by the electric motor 15 provided for the joint drive of the lifting means and the feed. At the same time, the motor also drives an infinitely variable rotary hydraulic gear 22, which comprises an infinitely variable oil pump and an infinitely variable oil motor, both of which may be similar in construction to the pumps 6, 7 and the motors 1 and which are actuated by means of the common lever 16. The gear 22 drives the feed rollers 18 through the bevel wheels 17 and other transmission members.

The known characteristic of the infinitely variable hydraulic rotary motor which can be utilized according to the invention, has an advantageous effect not only for raising and lowering the roller but also for the advance of the logs according to the operational requirements which exist, in that the particular effects desired for raising and feed are provided simultaneously. When the timber has a large diameter, a heavy torque is needed for the feed, with a low rate of feed and conversely, when the timber has a small diameter, a low torque is needed with a high rate of feed. Thus the heavy torques for raising and feed as well as the low torques, always appear simultaneously, so that the requirements of frame-saw operation both for lifting and feed can always be met to the best advantage.

I claim:

1. Method for raising and lowering the upper roller carried by a vertical rack in a frame saw, said method

comprising applying to said rack a drive having a falling torque-speed characteristic and regulating said drive to cause said upper roller to bear upon the object to be sawn.

2. Method for raising and lowering the upper roller **5** carried by a vertical rack and for simultaneous advancing movement of the lower rollers in a frame saw, said method comprising applying to said rack and to said lower rolls simultaneously a drive having a falling torque-speed characteristic and regulating said drive to cause **10** said upper roller to bear upon the object to be sawn.

2,234,009
2,569,842

57,373
29,514
666,776
790,440

References Cited in the file of this patent

UNITED STATES PATENTS

Robinson ----- Mar. 4, 1941
Zweifel et al. ----- Oct. 2, 1951

FOREIGN PATENTS

Germany ----- July 6, 1891
Sweden ----- Sept. 17, 1910
Germany ----- Nov. 19, 1938
Great Britain ----- Feb. 12, 1958