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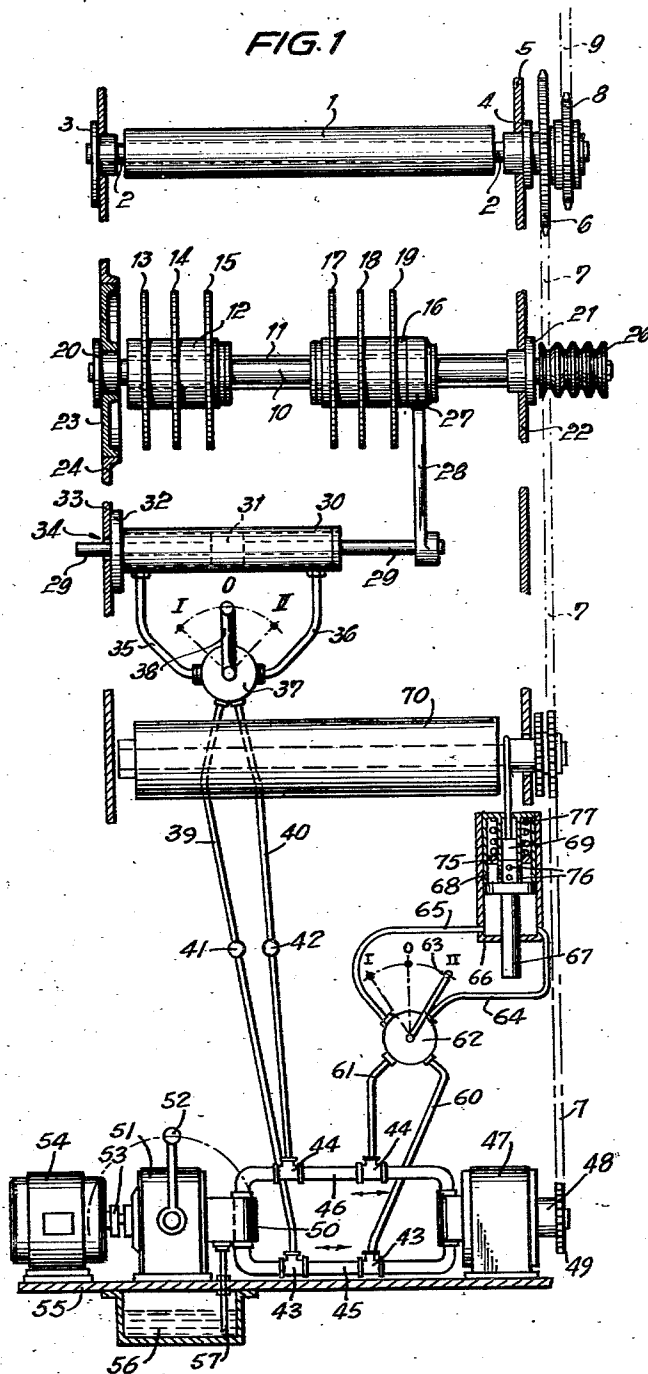
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IMPROVEMENTS IN THE HYDRAULIC MECHANISM OF A CIRCULAR SAW

Filed May 9, 1955

2 Sheets-Sheet 1



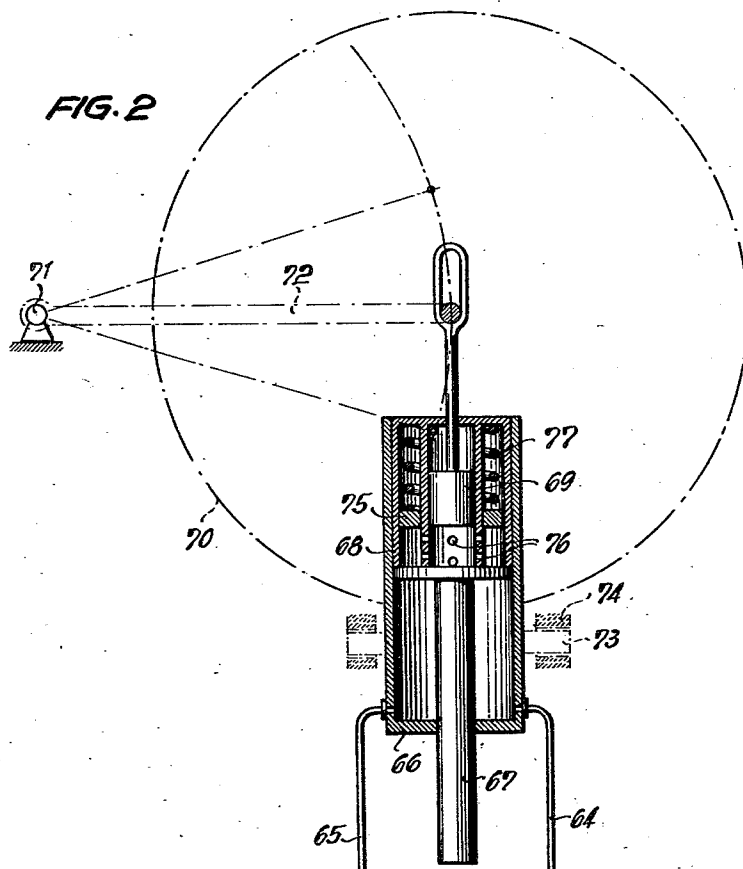
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IMPROVEMENTS IN THE HYDRAULIC
MECHANISM OF A CIRCULAR SAW

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1 Claim. (Cl. 143—37)

In circular saws hitherto known, having a hydraulic setting mechanism for the saw-blade hub and a separate hydraulic driving mechanism for the rotation of the feed rollers, and hence for the plank feed, there is, inter alia, the disadvantage that the two independent mechanisms, which are very convenient because of the hydraulic system, also require separate controls and consequently take up a comparatively large amount of room and make the saw considerably more expensive. Above all, however, the two mechanisms have to be operated separately from one another during actual running, thus greatly increasing the difficulty of the very strenuous work of operating such a high-speed machine, and also increasing the risk of mistakes if, as often happens, the distance between saw blades has to be altered in a very short period between the passage of two planks.

It has now been found that all these disadvantages of the known circular saws equipped with hydraulic setting of the saw-blade and hydraulic feed mechanism, are overcome in a simple manner by providing a common hydraulic pump for the hub-setting and for the roller-drive, the hydraulic hub-setting circuit being connected via a control valve to the hydraulic system between the pump and the hydraulic feed-roller circuit and the hub-setting circuit being so dimensioned that the idle-running resistance of the circuit in the intervals between sawing, with the feed rollers continuing to run substantially at a rated speed, is sufficient to set the hub in these intervals with the control valve open. A hydraulic device for controlling the vertical displacement of the upper feed rollers may also be connected to the hydraulic system between the pump and the hydraulic feed-roller circuit.

The constant running of the feed rollers, made possible by means of a single infinitely variable driving mechanism, which at the same time can be adjusted and operated finely and accurately, has the great advantage that, in each sawing interval, there is a saving of time and power in stopping and more particularly re-starting the feed rollers, which is very favourable economically and from the point of view of technical operation because a sawing interval, involving adjustment of width, often occurs every few seconds, so that when the rollers are re-accelerated the heavy plank also has to be accelerated, the plank having lagged behind even when the work is carried out quickly and efficiently. For example, with normal plank lengths of about 6 metres, and with a normal feed of about 80 metres per minute, a resetting of the width and hence of the saw-blade hub, takes place approximately every six seconds. If the feed rollers were stopped and restarted every time, the rollers would have to be accelerated equally often to 80 metres per minute, i. e. to about 1.3 metres per second.

The adaptation of the pump delivery, of the resistance of the hub-setting circuit and of the idle-running resistance of the feed circuit to one another does not involve any difficulties. For example, the constant running of the feed rollers is assured when the motor driving

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the hydraulic pump has an output of about 3 H. P. when the hub-circuit pipes connected to the pump have an internal diameter of 6 to 8 mm., and when the pipes of the feed-drive mechanism connected to the pump have an internal diameter of 19 to 20 mm., whereas the feed rollers stop when the hub-circuit pipes have an internal diameter of more than 10 mm. With normal high-speed rollers, the idle-running resistance of the feed circuit is sufficient to set the saw-blade hub, with full power, in the sawing interval.

The idle-running resistance of the feed rollers acts like a flow-restrictor or a backwash. It is true that the oil still flows through under these idle-running operating conditions in order to maintain the idle running of the rollers, but the oil, flowing only slowly in the pipelines leading to the rollers, meets such a comparatively high flow resistance, that an adequate amount of oil flows in the branch pipe at an adequate pressure and speed to set the saw-blade hub. Physically, therefore, the idle-running resistance acts with comparatively high static pressure on the oil flowing to the hub-setting mechanism.

In a practical embodiment, about 60 litres of oil per minute were used to drive the feed rollers when running idle, whereas only 4 litres of oil per minute were necessary for the setting of the hub. If the difference of 4 litres of oil per minute was supplied to the connected-up setting mechanism, then, if the idle-running feed-drive mechanism was likewise connected up according to the invention, there was still the fully adequate amount of 60—4=56 litres of oil per minute left over for driving this mechanism.

As was further found, the new mechanism can be supplemented most advantageously by providing the circuit for the setting mechanism of the saw-blade hub with a valve which makes it possible to shut off the supply line to the setting mechanism, when the hydraulic pump is driving the feed, working under full load.

The saw-blade hub is advantageously connected in known manner to a piston which is displaceable in a cylinder, to each end of which is connected a supply line for the hydraulic means, e. g. oil. By means of optical indicator devices, the position of the saw blades can be adjusted accurately. If a graduated scale is used it is possible to make allowance, for each width of plank, for the dimensions by which the wood shrinks as it dries.

Pumps, motors, pistons, etc. may be used as hydraulic power means, operating means, and control means. Common casings are particularly suitable for the pump and the motor.

The hydraulic device according to the invention can be used as it is, for example for the standardisation of circular saws, various modifications of which can be made up from individual units on the prefabricated system. For this purpose it is advisable to produce and stock so many structural units for the circular saw that all possibilities for setting the saw-blade hub, such as hand setting, mechanical setting, and hydraulic setting, can be combined, as required, with all possible drives of the feed rollers, such as mechanical drive and hydraulic drive.

An embodiment of a multi-blade circular saw according to the invention is hereinafter described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic illustration of the mechanisms for setting the saw-blade hub and for driving the feed rollers, and

Figure 2 shows the mechanism for intercepting the swinging upper feed-rollers.

A lower feed-roller 1 is connected to a shaft 2 by means of keys, springs or pins, not illustrated, and is secured against rotation and displacement. The shaft rests in flanged bearings 3 and 4 on the frame 5 of the saw,

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Outside the bearing 4, sprockets 6 and 8 are rigidly mounted on the shaft 2. The sprocket 6 is driven from a hydraulic motor 47, for example by means of a chain 7, while the sprocket 8 drives the remaining feed rollers and feed chains by means of another chain (not illustrated).

A group of circular saw blades 13, 14 and 15 are rigidly mounted by means of a hub 12 on a shaft 10. A hub 16 which is adjustable on the shaft 10, carries a second group of circular saw blades 17, 18 and 19. The necessary torque is transmitted to the hubs 12 and 16 by means of the key 11. The shaft 10 can run in ball bearings which rest in flanged bearings 20 and 21. The bearing in the flange 21 is constructed as a fixed bearing and is rigidly connected to the saw frame member 22. The flanged bearing 20 is removable, so that the saw blades can be changed, and is mounted in a removable bearing housing 23 in the frame member 24. If necessary, yet a third bearing position may be provided in order to improve the bearing arrangement of the saw shaft. The frame members 5, 22 and 24 may be made in one piece. Outside the bearing 21 is located a set of V-belt pulleys 26 for driving the saw-shaft 10.

An arm 28, having a bearing 27, engages the displaceable hub 16 and is mounted at the other end on the rod 29 of a piston 31, which can be reciprocated in a cylinder 30. The flange 32 of the cylinder 30 is rigidly mounted, by means of bolts which are not illustrated, on a housing portion 33 which is provided with a bore 34 for the passage of the piston rod 29. Two pipes 35 and 36 lead from the cylinder 30, one on the left-hand end of the cylinder and the other on the right-hand end. Both pipes are connected to a rotary distributor control valve 37 which can be moved by means of a hand lever 38 into various operating positions so that the pipes 35, 36 can be opened and closed as desired. In the drawing, the lever 38 is shown in the operating position marked O midway between the operating positions I and II.

Two other pipes 39 and 40, for example, 6-8 mm. internal diameter, which can be shut off by means of valves 41 and 42 respectively, lead from the control valve 37 to two T-unions 43 and 44 which are in two pipe lines 45 and 46 having an internal diameter of for example 19-20 mm. These pipelines connect a hydraulic pump 51 to the hydraulic rotary motor 47, on the shaft 48 of which is mounted a sprocket 49 over which runs the chain 7 which drives the feed roller 1. At the other end, the pipelines 45, 46 lead to a distributor housing 50 of the pump 51, which can be regulated by means of a hand lever 52. The pump 51 is connected by means of a coupling 53 to an electric motor 54, of for example 3 H. P.; it could also have a drive derived directly or indirectly from the saw shaft. Motor 54, pump 51 and hydraulic motor 47 are mounted on a common base plate 55 beneath which a container 56 for the hydraulic medium is provided below the pump 51. A pump intake 57, which leads to the distributor housing 50, reaches into the container.

The infinitely variable pump 51 is controlled so that the oil is under pressure either in the pipe 45 or in the pipe 46 and in either case is under suction in the other pipe. The hydraulic motor 47 is preferably infinitely variable. Its direction of rotation depends on the direction in which the oil circulates, that is to say on the delivery direction of the pump 51.

If necessary, remote-control members may engage the operating lever 52 of the pump 51. The hydraulic motor 47 could also be coupled direct to the feed rollers.

In the drawing, the operating lever 38 is in the position O at which the control valve 37 is closed. In the position I or II, oil is forced into the pipe 35 or 36. In the first case the piston 31 is displaced towards the right and in the second towards the left. The hub 16 with the saw blades 17, 18, 19 is moved accordingly. In the setting device it would also be possible for the piston to

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be stationary and the cylinder displaceable. In this case, the saw-shaft may conveniently be constructed as a stationary piston and the saw-blade hub as an adjustable cylinder. The control lever 38 can only be brought into the position O, by means of a fine adjustment device not illustrated, if the saw-guide bushing is in a standard position. The valves 41 and 42 which are in the pipelines 39 and 40 of, for example, 6 to 8 mm. internal diameter, make it possible to regulate the rate of setting the piston 30.

If the control valve 37 is set to shut off the pipes 35 and 36 to the setting piston 31, then the whole of the pressure oil is available to the hydraulic motor 47 for driving the loaded feed-roller. If the feed drive is running idle, the valve 37 is set at I or II, the setting piston 31 being actuated accordingly. The idle-running resistance of the feed circuit is then so great that the oil flows into the hub-setting circuit under such a pressure that the hub is set with full power.

In the device illustrated in Figure 2 for controlling the displacement of the swinging upper feed-roller 70, pipes 60 and 61 branch off from the pipes 45 and 46 leading to the hydraulic motor 47, and can be connected at will to pipes 64 or 65 by means of a control valve 62 having an operating lever 63. If the lever 63 is in the position I, fluid under pressure flows through the pipe 65 into the chamber of a cylinder 66. When the control valve 62 closes the pipe 64 simultaneously, no oil flows out of the cylinder chamber. In the position II the pipe 65 is cut off, while the oil can flow out of the cylinder chamber through the pipe 64. In the central position O of the lever 63 the control valve shuts off all the pipelines.

In position I of the control valve 62 a piston 67 in the cylinder 66 is raised upwards, while in position II it sinks downwards, and in the central position O it retains its position. The piston head is rigidly connected to a housing 68 which is slidable in the cylinder 66 and in which a piston 69 is located. The piston 69 is connected to a rod which widens out at the end to form a fork or loop. In this fork is mounted the upper roller 70 which can be swung about a fixed pivot 71 by means of an arm 72 indicated in its extreme and central positions by chain lines.

The upper roller 70 must be adjustable according to the given thickness of board, and this is done by moving the lever 63 into the positions I or II. As the upper roller 70 drops it comes into contact with the fork of the rod of the piston 69, the piston exerts pressure on oil inside the housing 68 and forces it through bores 76 into an outer chamber of the housing 68 onto a tight sliding bush 75, so that the spring 77 is tensioned. Initially the oil in the housing 68 is slightly restricted by the bores 76, and as the piston 69 descends the cross-sectional area of oil flow becomes smaller as a result of the bores 76 being successively closed by the piston.

The cylinder 66 is pivotally mounted in a bearing 74, for example by means of a journal 73 which is shown displaced through 90°. Accordingly the pipes 64 and 65 must also be movable and this can be achieved by means of flexible metal tubing.

I claim:

A circular saw comprising a frame, a shaft rotably mounted on said frame, means for driving said shaft, a hub keyed to said shaft and slidable thereon, saw blades fixed radially to said hub, feed rollers for conveying a workpiece to said blades, a hydraulic pump, hydraulically operated means to drive said feed rollers, a first hydraulic circuit connecting said roller driving means to said pump, hydraulically operated means for shifting said blade-carrying hub along said shaft, a second hydraulic circuit connecting said hub shifting means to said first hydraulic circuit, and a single control valve having an opened and a closed position located in said second hydraulic circuit, said second hydraulic circuit being dimensioned in such a

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manner by selecting the internal diameter of its pipes that the idle running resistance of the roller driving means during intervals between sawing operations is sufficient to allow the said hub shifting means to be operated with such single control valve in its open position.

2,397,106
2,411,623
2,507,644
2,640,513

5

References Cited in the file of this patent

UNITED STATES PATENTS

454,133

2,320,659 Saklin ----- June 1, 1943

6

Haller ----- Mar. 26, 1946
Jaques ----- Nov. 26, 1946
Peters ----- May 16, 1950
Watson et al. ----- June 2, 1953

FOREIGN PATENTS

Germany ----- Dec. 30, 1927