United States Patent [19]

Mackin

[11] **3,786,712**

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[54] **SAWMILL LOG INDEXING DEVICE**

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[73] Assignee: **Greenleaf Holdings Limited,** Vancouver, British Columbia, Canada

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[21] Appl. No.: **267,209**

Related U.S. Application Data

[63] Continuation of Ser. No. 6,349, Jan. 28, 1970, abandoned.

[30] **Foreign Application Priority Data**

Jan. 29, 1969 Canada 41441

[52] **U.S. Cl.** **83/708,** 83/712, 269/54.3, 83/425.3, 83/435.1

[51] **Int. Cl.** **B27b 7/04,** B27b 29/08

[58] **Field of Search** 83/708, 712, 425.3, 425.4, 83/404.4, 435.1; 269/54.3

[56] **References Cited**

UNITED STATES PATENTS

2,673,581	3/1954	Dornath et al.	83/708
2,803,272	8/1957	Crosby	83/404.4

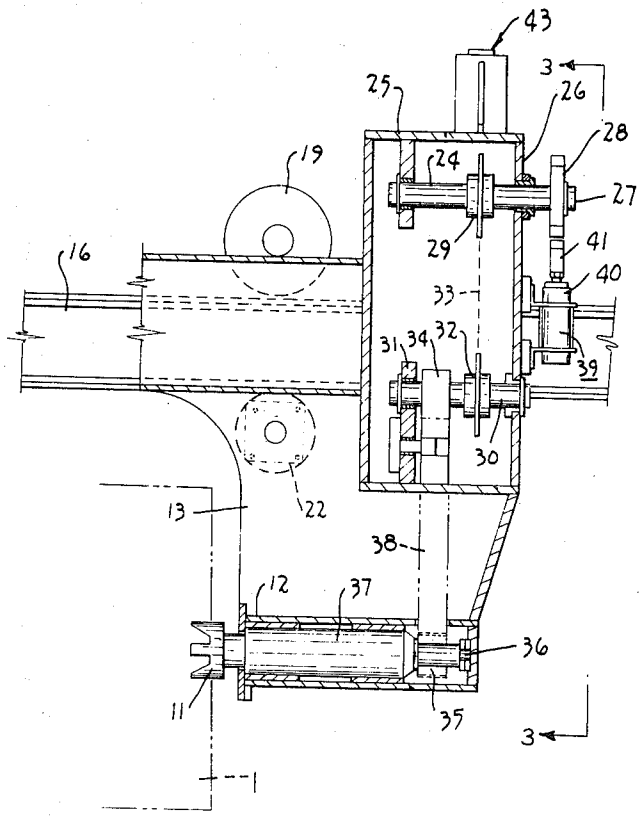
Primary Examiner—Donald R. Schran

Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

An indexing mechanism for use in a log sawmill which is mounted on the log carriage remote from the log mounting chucks. The indexing device enables the operator to position the log accurately for cutting and to rotate the log for subsequent cuts. The device is remote from the mounting chucks so that it can be protected from mechanical damage and so that it can be dimensioned to provide extremely accurate indexing.

7 Claims, 5 Drawing Figures



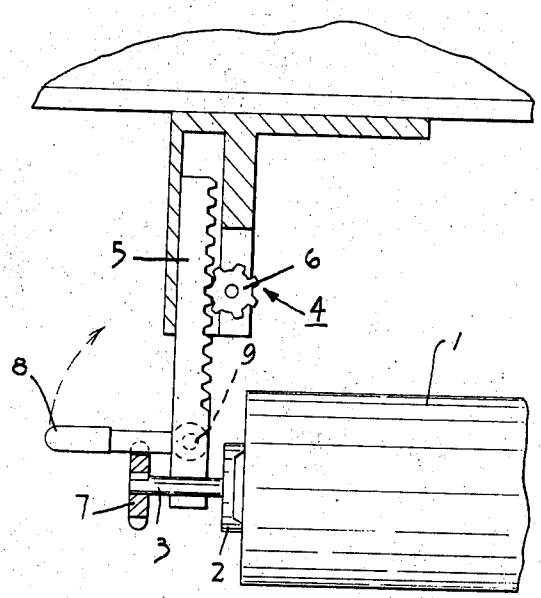


FIG. 1
PRIOR ART

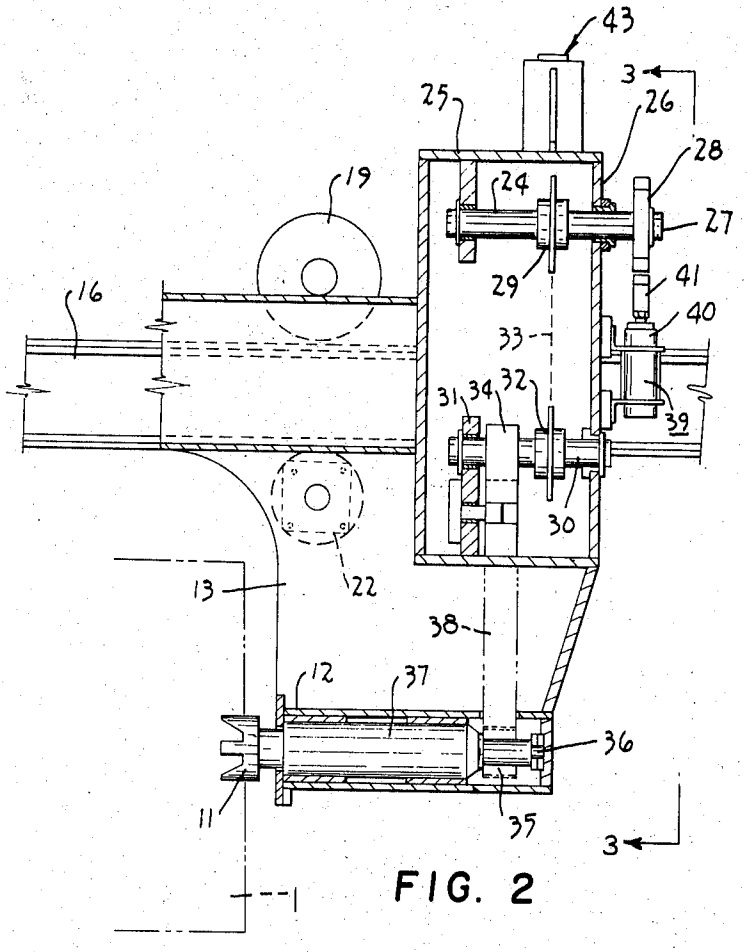

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FIG. 2

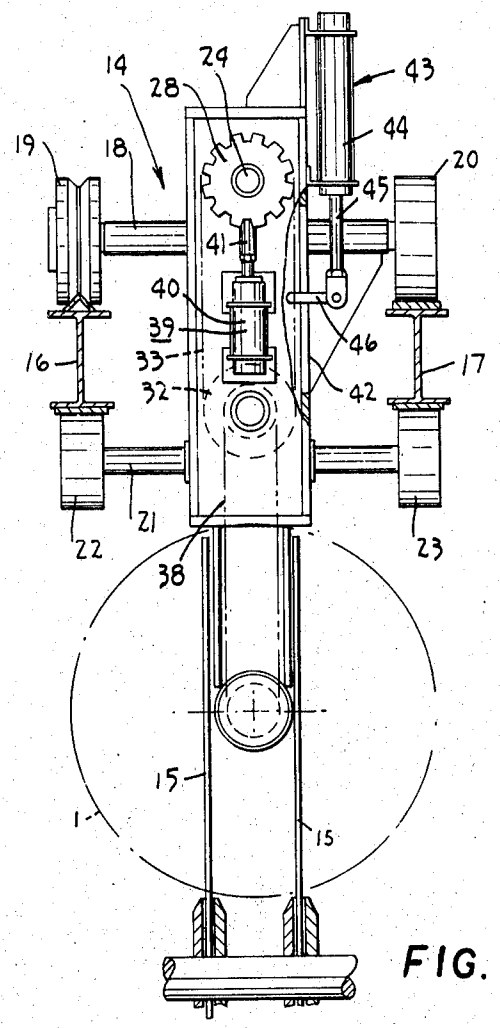


FIG. 3

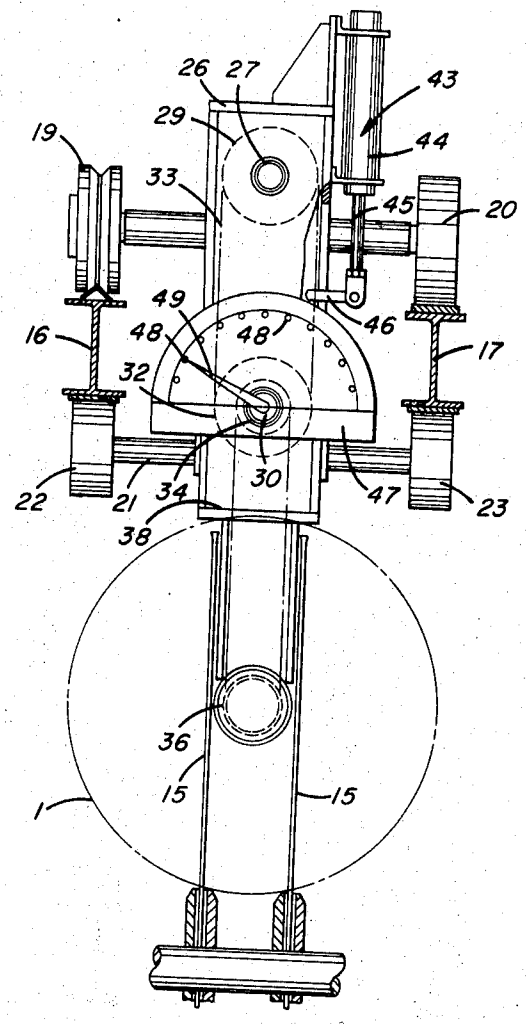

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FIG. 4

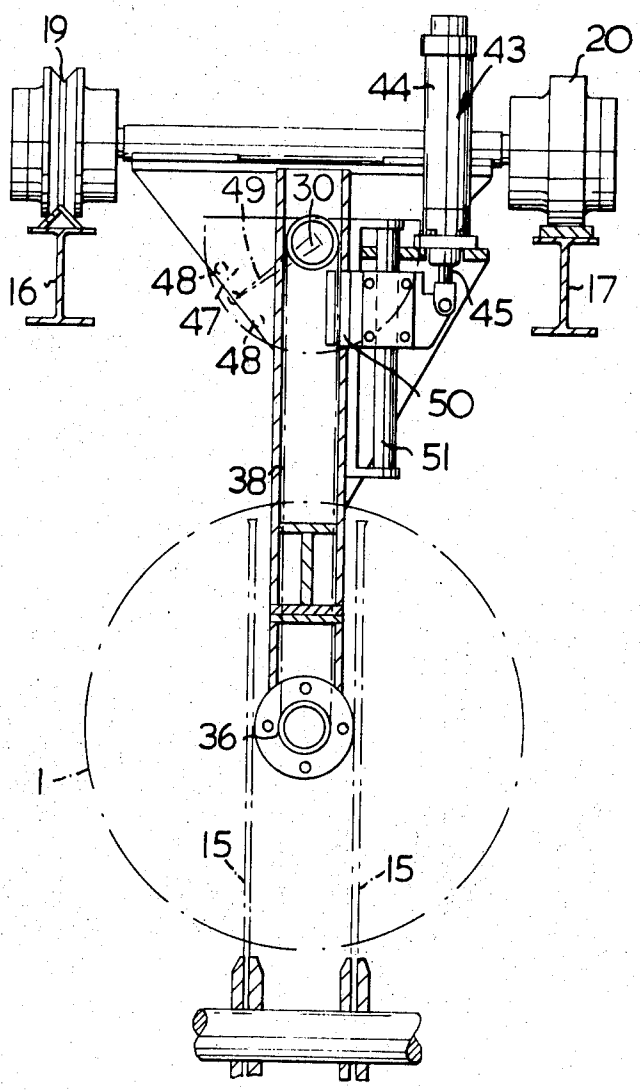


FIG. 5

SAWMILL LOG INDEXING DEVICE

This is a continuation, of application Ser. No. 6,349, filed Jan. 28, 1970 now abandoned.

This invention relates to an improved sawmill and more particularly to an improved log indexing mechanism.

Sawmills employing a sliding carriage having adjustable holding means whereby logs of various diameters may be inserted and moved with the carriage through a sawing unit are well known to the art.

Raw timber is seldom, if ever, uniform in structure and if a single saw cut is made there is a marked tendency for the stock to twist or bend as the internal compressional or tensional forces are released; this phenomena is known as "Timber bind" which is much more prevalent in hardwood species. The sawing unit is, therefore, normally a double saw unit to minimize "Timber bind," or bowing of the wood on one side. The saw blades are laterally spaced and vertical and may be fixed relative to each other or adjustable. It is also known to provide chucking means whereby a log may be centered longitudinally in the chucks and held in place by application of pressure on the chucks for movement through the saw unit, as opposed to laying a log on a carriage bed for sawing.

Dornath et al in U.S. Pat. No. 2,673,581 issued Mar. 30, 1954, describe such a chucking means which is adapted to be indexed at predetermined angles so that the bark may be removed from an entire log without the necessity of releasing the chucks between successive saw cuts so that the log may be turned. This indexing system comprises a pair of longitudinally disposed chucks each adapted to rotate in its respective support member which in turn forms part of a sliding carriage, means to apply pressure to one of the chucks whereby the distance between the chucks can be altered to accommodate various length logs and hold them securely, a circular template having a plurality of radial slots disposed at 45° intervals around the circumference attached to the outer end of the chuck which does not include the pressure means, and a manually operated dog, attached to the chuck support for engaging in a selected radial slot to retain the chucks in a selected position. As previously indicated, the sawing operation causes considerable "Timber bind" despite efforts to keep the effect to a minimum. The timber bind results in a considerable torque being applied to the chucks and thus to the indexing template and locking dog. Consequently these components must, of necessity, be made in relatively massive proportions and as a practical matter the indexing template cannot be less than about 8 inches diameter. As the entire template assembly must pass between the saw blades, it is obvious that the Dornath et al. device can only be used on large timber and the discard or cant is no smaller than about 8 inches in diameter. Because of the massive nature of the template and the torque, which results in considerable wear in the slots and on the dog, the indexing can only be relatively coarse or inaccurate and cannot be adapted to position a log to make the most advantageous use of the timber. All logs contain irregularities such as knots and splits but by careful attention to the cutting angles, many of the blemishes can be eliminated or minimised. Further, the accuracy and life of the Dornath indexer is reduced due to its location at the chuck where it rapidly becomes covered with sawmill debris, sawdust and the like. The probability of accidental damage is very high.

It is, therefore, an object of the present invention to provide an improved indexing means for a sawmill which overcomes the above-noted disadvantages of the prior art.

Other objects and advantages will become apparent in the following detailed description of the invention particularly when taken in conjunction with the accompanying drawings which are illustrative, but not limiting, of the present invention and in which:

FIG. 1 is a vertical sectional view of an indexer according to the prior art.

FIG. 2 is a vertical sectional view of an indexer according to the present invention; and

FIG. 3 is a vertical sectional view taken on the plane of section 3—3 of FIG. 2 and includes a view of the saw blades.

FIG. 4 is a vertical sectional view, similar to FIG. 3, of an alternative embodiment.

FIG. 5 is a vertical sectional view of a further alternative embodiment.

Turning first to FIG. 1, there is shown an indexer according to the prior art. A log 1 is centered and held in compression by horizontally opposed chucks. The pressure applying means and its associated chuck are not shown. The illustrated chuck 2 is mounted on a shaft 3 passing through a vertical support 4 which includes a rack 5 and pinion 6 log lifting mechanism. The outer end of shaft 3 is provided with a circular indexing template 7 having 45° spaced circumferential slots into which a dog 8, pivotally connected by a pin 9 to support 4, may be selectively inserted.

In the present invention, referring to FIGS. 2 and 3 a log 1 is centered and held in chucks 11, only one of which is shown, in a similar manner to the prior art. The chuck 11 is free to rotate in sleeve 12 mounted in support 13. The support 13 is part of the complete log carriage 14 which transports the log past the saw blades 15 in conventional manner. The carriage 14 is normally suspended above the saw blades 15 on a pair of track beams 16 and 17. The carriage is provided with an upper transverse shaft 18 and associated trunnion wheels 19 and 20 which run on tracks 16 and 17 respectively. A lower transverse shaft 21 is provided with wheels 22 and 23 which run in contact with the undersides of tracks 16 and 17 to provide vertical stability for the carriage. Wheel 19 is grooved to accommodate a flange on track 16 to provide lateral stability. It will be appreciated that a similar wheel system is provided at the other end of the carriage (not shown).

In contrast to the prior art, a horizontal shaft 24 is rotatably mounted on carriage 14 remote from chuck 11 in support 25 and end plate 26, and, at the outer end 27 thereof, an indexing template 28 is attached. This template may take several forms depending on the accuracy or degree of rotation required. In the embodiment shown in FIGS. 2 and 3, the circular template 28 has radial slots spaced at 30° angles around the circumference. The slots may be straight sided but are preferably tapered, in order to minimize the effect of wear and retain accuracy. A sprocket 29 is axially and rigidly mounted on upper shaft 24 intermediate support 25 and face plate 26. A horizontal lower intermediate shaft 30 is rotatably mounted between support 31 and end plate 26 and provided with an axially and rigidly mounted sprocket 32, in vertical alignment with

sprocket 29. Sprockets 29 and 32 are interconnected by a chain or similar belt 33. Also mounted on shaft 30, intermediate support 31 and sprocket 32, there is a toothed pulley or the like 34. This pulley 34 is connected to a similar pulley 35 at the outer end 36 of the shaft 37 of chuck 11, by means of a tooth belt 38. Thus as template 28 is rotated the motion is transmitted to chuck 11 and the log 1 is rotated. The number of teeth on sprockets 29 and 32 and pulleys 34 and 35 may, of course, be varied independently, as may their diameters so that any desired gearing ratio is achieved. By suitable selection of gearing the degree of rotation of log 1 may be controlled very accurately. It will, of course, be appreciated that a preferred embodiment of the transmission system has been described and numerous modifications are possible. For example, in certain circumstances shaft 30 could be omitted and sprocket 32 mounted directly on end 36 of shaft 37, however, this would entail a much larger pulley 35 which would detract from the ability of the equipment to handle small sizes of lumber.

Also mounted on the end plate 26, is a template locking means 39 which may be of several designs. In the embodiment shown in FIGS. 2 and 3 locking means 39 comprises a hydraulic cylinder 40 which actuates a locking pin 41, shown withdrawn in FIG. 2, which engages in a selected slot in template 28, as shown in FIG. 3. The pin 41 may be tapered or straight depending upon the degree of accuracy required. Alternatively, the locking means 39 may be a solenoid switch, a pneumatic cylinder or a manually operated lever.

Mounted on the carriage side plate 42, an automatic means 43 to rotate template 28 may be provided. In the embodiment shown in FIGS. 2 and 3, this means comprises a hydraulic cylinder 44 and a piston 45, operatively connected by a connecting bar 46 to the chain belt 33. The extent of the rotation possible is merely a function of the stroke of the cylinder 44, pitch diameter of the sprockets and centre distance of the sprockets. By suitable arrangement, rotation in excess of 180° is possible. It will be appreciated that the automatic means 43 is an optional feature as manual rotation may be employed, and also that the automatic means may take several forms as by a pneumatic cylinder, electric motor drive or solenoid valve.

In operation, a sawmill including the present invention as hereinbefore described employs the following sequence of steps; a selected hardwood or softwood log 1 which may vary in diameter from about 4 inches to about 30 inches and vary in length from about 8 feet to about 14 feet or more is lifted by a conventioal hoisting means into position between chucks 11, centered in known manner and then gripped by the chucks with applied pressure. Locking means 39 is actuated to disengage pin 41 (FIG. 2), and rotating means 43 is activated to rotate the log 1 to the most advantageous position for sawing so that the maximum yield is obtained and defects in the sawn lumber reduced to a minimum. Locking means 39 is then actuated in the reverse direction to extend pin 41 into engagement with template 28 (FIG. 3) thereby fixing the position of the log 1 with respect to the saw blades 15. The circular saw blades 15 are rotated, and the carriage 14 is then advanced along tracks 16 and 17 so that the log 1 comes into sawing contact with the blades 15. When the sawing operation is completed along the length of the log, the carriage motion is reversed and the carriage is returned to its starting position. Locking means 39 is then actuated to withdraw pin 41, rotating means 43 is actuated so that piston 45 continues its stroke, thereby rotating the indexing template and, in turn, the log by the desired amount. When the log has been turned through a predetermined angle which may be between about 15° and 90° although these angles are not critical, the rotating means 43 is stopped and the locking pin 41 is reinserted. The next pass through the saws is then commenced.

It will be appreciated that the remote indexing system may be completely enclosed to prevent ingress of dust and saw debris, if desired. The actual template employed can vary depending on the degree of accuracy required, although it has been found that in practice, indexing at 15° angles is sufficiently precise for most operations. The system is entirely flexible and offers the advantage that the log may be rotated to the most advantageous position for cutting before any indexing is commenced as will be described in more detail hereinafter. Furthermore, it is a simple matter to change the template 28 if different angles are required, which is not possible with the indexing systems of the prior art. In the prior art the template bears the entire torque load of the chucks and in view of the relatively massive dimensions required, the number of slots is limited to a maximum of eight evenly spaced around the periphery.

In the embodiment shown in FIG. 4, the template 28 and locking means 39 are entirely superceded by a quadrant and dry reed switch system which permits infinite variable indexing and automation of the entire unit. A quadrant 47 is rigidly mounted on the frame 26 at the position of the intermediate shaft 30, carrying any desired number of dry reed switches 48. If the number of switches 48 is increased sufficiently substantially infinite variable indexing may be effected. Switches 48 are mounted on the arc of the quadrant 47 to coincide with the travel described by the sensing tip of a pointer 49, and preferably the switches 48 are interconnected in pairs 90° apart, for reasons to be explained hereinafter. In a manner well known in the electrical art, a selected switch 48 may be activated and the pointer automatically rotated in the direction required to line up with that switch. Movement of the pointer occurs as a result of hydraulic fluid being directed under pressure to the appropriate end of the cylinder thus causing rod 45 and link 46 to move linearly in the appropriate direction. The pointer 49, shaft 30 and sprockets 29 and 36 are thus rotated to the desired position by the movement of belts 33 and 38. When pointer 49 exactly coincides with the desired reed switch 48 the solenoid hydraulic control valve in the hydraulic system closes and all movement is stopped in the desired selected position. The hydraulic system is locked in neutral. Preferably a hydraulic locking valve (not shown) is installed in the hydraulic circuit to prevent creep or movement in the cylinder 44 and thus maintain positive indexing.

In operation a sawmill employing the embodiment of FIG. 4 may be operated as follows: a log 1 is loaded into a loading cradle, centred and clamped between the chucks in known manner. The cradle arms are then lowered to enable the log to be rotated. The sawyer operator then manually overrides the solenoid control valve in the hydraulic system so that the log may be rotated through about 200°, allowing for some overlap, for visual inspection and an accurate determination of

the most advantageous sawing position for grade recovery of the resulting lumber. When the selected position is reached the operator activates the automatic system by activating an appropriate reed switch. The control system pointer **49** is moved by rotation of shaft **30** driven by the hydraulic system until the pointer accurately coincides with the switch **48** and the hydraulic system locks in place. The saw carriage is then activated and the log **1** moves through the saws, and is returned preparatory to a second sawing operation. If it is desired to turn the log through 90° for the second cut, which is the usual and preferred procedure, the operator merely activates a turn control switch which automatically deactivates the first reed switch and activates the second reed switch **48** which is interconnected with the previously activated reed switch. As previously indicated the reed switches are interconnected in pairs 90° apart so that rotation between this angle may be automatically accomplished. When the second reed switch is activated the pointer is rotated to this second switch and deenergizes the appropriate solenoid control valve in the hydraulic system stopping movement of rod **45** and link **46.** The log is turned as before and is automatically locked in position for the second cut. It will, of course, be appreciated that the reed switches may be interconnected in pairs at any desired angle not necessarily at 90°. If it is desired to change the sawing plane by an angle not included in the automatic interconnection, the sawyer manually overrides the solenoid control valve, as in the preliminary set up of the log, selects the desired position and then resets the automatic locking system. Thus complete flexibility and control of indexing may be achieved. For safety and convenience, it is preferred to include limit switches in the system so that the turning and indexing steps may only be effected when the saw carriage is in the cradle loading position. This precaution precludes the possibility of accidental rotation during the sawing movement.

The further embodiment shown in FIG. **5** is a further refinement of the embodiment shown in FIG. **4.** In FIG. **5,** the upper shaft **27** and its associated belt **33** have been eliminated and the hydraulic cylinder **44** is operatively connected via piston **45** and a clamping means **50** sliding in a guide **51** to the drive belt **38.** This reduces the total height of the indexing mechanism and simplifies the operating mechanism (for convenience shaft **21** and trunnions **22** and **23** have been omitted from FIG. **5**). In operation, the embodiment in FIG. **5** is similar to that in FIG. **4.** The log is centered and rotated to obtain the most advantageous sawing position. Pointer **49** moves to active switch **48** and activates the automatic hydraulic system **43** whereby piston **44** causes movement up or down of piston **45** which is attached to clamping means **50.** Clamping means **50** slides up or down in guide **51,** and causes rotation of belt **38.** After the first cut the other switch **48** is activated and rotation is effected as in the embodiment of FIG. **4.**

The minimum size of log which can be retained or handled by the indexer of the prior art is limited to about 8 inches diameter as the entire template must pass between the saw blades, whereas the present invention permits logs of 4–5 inches diameter to be retained or handled, as only the chucks have to pass between the saw blades. The size of the chucks employed is solely dependent on the weight of the logs to be handled, and bears no critical relation to the diameter of the logs. Clearly, hardwoods are heavier than softwoods per unit volume and may require heavier chucking arrangements to accommodate them. The present invention is particularly suitable for use in a hardwood sawmill although it may, of course, be employed to advantage in the processing of softwood lumber. It will also be appreciated that the indexing means is small, relatively cheap and easy to install on any size of sawmill. It may be employed on large permanent mills and also on light portable mills.

I claim:

1. Apparatus suitable for carrying a log through a pair of adjustable saw blades which cut said log longitudinally into lumber, the apparatus comprising;

a carriage with a plurality of wheels adapted to ride along at least one rail, the carriage being reciprocally movable to convey said log through said saw blades;

support means connected to the carriage;

a pair of chucks rotatably mounted in the support means and operable to support said log by engagement substantially centrally of each end thereof, one of the chucks being secured to one end of a chuck shaft that can be driven to rotate the chuck and the log;

positioning means operatively coupled to said one end of the chuck shaft so that the log can be rotated, while chucked, to an initial selected index position that allows the maximum lumber recovery from the log being sawed, the positioning means including a shaft rotatably mounted in the support means remote from said chuck shaft, and having a free outer end thereof, further including non-extensible chain drive means for coupling said shafts together, said chain drive means being adapted to be driven to rotate the chuck and the log;

indexing means secured to the free end of one of the shafts, the indexing means having a plurality of index positions thereon in co-ordinated pairs spaced 90° apart to enable rotation of 90° from the initial selected index position; and

locking means that are actuatable to effect holding the positioning means fixed at said initial selected index position and the co-ordinated index position.

2. The apparatus of claim **1,** wherein the indexing means comprises a circular template having said index positions thereon defined by a series of radially disposed slots on the periphery thereof, and wherein said locking means includes a reciprocally movable pin means of a shape complemental to said slots, the pin means being engageable in the slots to positively lock said positioning means in position.

3. The apparatus of claim **1,** wherein automatically actuatable drive means are operatively coupled to said chain drive means, the automatically actuatable drive means being responsive to a signal provided by a sawyer to effect movement of the chain drive means and simultaneously therewith rotation of the log carried by the two chucks.

4. The apparatus of claim **1,** wherein said chain drive means is operatively coupled to a piston and cylinder combination, said combination being actuatable to cause reciprocal movement of the piston with such movement simultaneously effecting rotational movement of said chuck shaft and the log being carried by the rotatable chucks.

5. The apparatus of claim 2, wherein said support means comprises an enclosure which serves to rotatably mount and house said shafts; the enclosure being rigidly connected to said carriage as an integral part thereof, and functioning, in use, as a shield-like deterrent, to sawdust and wood chips which could tend to clog the slots in said indexing template.

6. The apparatus of claim 5, wherein the indexing template is secured to the end of said shaft remote from the chuck shaft, the radially disposed slots being tapered to a narrow inner end, the tapered slots facilitating improved accuracy in positioning.

7. The apparatus of claim 1, wherein each of the plurality of index positions has an axis, each axis extending through a common center, with adjacent axes enclosing an angle 45° therebetween.

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