

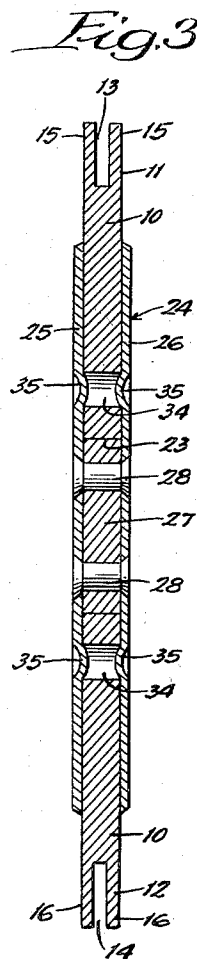
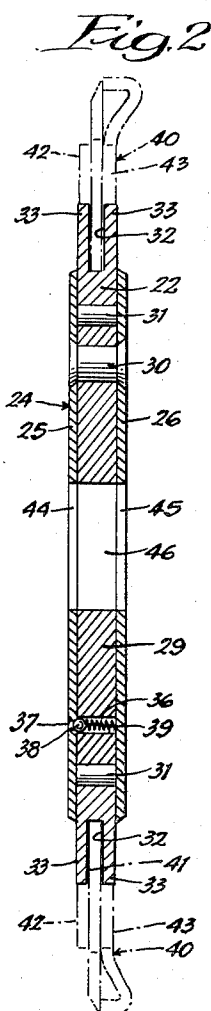
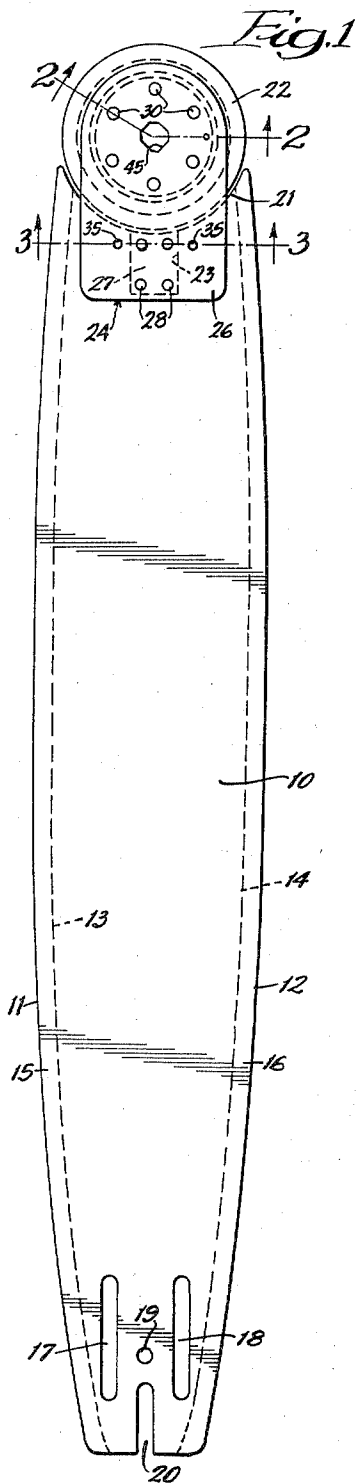
June 2, 1959

A. W. MALL

2,888,964

REMOVABLE ROLLER BEARING GUIDE

Original Filed Dec. 6, 1955



INVENTOR:

Arthur William Mall,

BY

Dawson, Sifton & Graham,
ATTORNEYS.

1

2,888,964

REMOVABLE ROLLER BEARING GUIDE

Arthur William Mall, Flossmoor, Ill., assignor, by mesne assignments, to Remington Arms Company, Inc., Bridgeport, Conn., a corporation of Delaware

Continuation of application Serial No. 551,397, December 6, 1955. This application May 5, 1958, Serial No. 733,793

7 Claims. (Cl. 143—32)

This invention relates to a chain saw assembly, and more particularly to a removable and replaceable roller bearing guide or nose for the end of the guide bar of a power-driven chain saw.

The present application is a continuation of copending application Serial No. 551,397, filed December 6, 1955, now abandoned.

In the modern methods of felling and bucking timber, a technique called "plunge cutting" has been developed. Plunge cutting is carried out with a power-driven chain saw by pushing the front end of the guide bar, which is traversed by the moving chain, directly into the timber. In such an operation, the chain saw in effect bores its way centrally into the timber and ultimately passes there-through. Thereafter, the bar may be moved laterally in either direction to complete the severing thereof. This technique has been developed to avoid the problem of pinching, which occurs when a timber is cut through from one side toward the other.

Plunge cutting operations of this type cause tremendous forces to be developed between the moving chain and the end of the stationary guide bar. These frictional forces create heat, excessively wear both the chain and end of the bar (particularly the latter), and necessitate a substantial power input to the saw even though the chain moves at a relatively low lineal velocity. One of the particular difficulties is that the guide bar wears quickly and must be frequently replaced, and before a bar can be used the end thereof must be specially hardened so that it will be relatively resistant to wear.

It is not broadly new in the chain saw art to equip a guide bar at the outer or free end thereof with a removable and replaceable nose having a rotatable sheave mounted on bearings to make the rotation thereof substantially frictionless and to pass the chain about the sheave. However, for the most part, all proposals to provide a structure of this type—and those that have been actually tried—are generally unreliable and have not been accepted commercially. One reason is that during a plunge cutting operation the nose and sheave carried by a guide bar are often subjected to severe twisting forces which may sprain or otherwise damage the connection between the removable nose and the bar and, if the sheave is composed of a pair of connected disks, such forces may be of sufficient magnitude to separate those disks and thereby ruin the nose assembly. Since a chain saw is controlled and manipulated only from its rear end during a plunge cutting operation, it is necessary that the bar and nose connection, and the several parts including the sheave and bearing construction, be capable of withstanding lateral, vertical and rearward forces, as well as twisting forces, without distortion, dislocation or deformation.

It is accordingly an object of this invention to provide such an assembly. Another object of the invention is to provide a detachable nose than can be quickly and easily mounted and removed from the end of a chain saw guide bar, preferably without the use of tools ex-

2

cept perhaps for a hammer that may be used to knock the nose from position on the bar. Still another object is in the provision of a removable nose or guide of the character described which carries a one-piece rotatable sheave that furnishes a track for the saw chain, whereby there is a substantial reduction in the frictional forces acting between the chain and guide bar at the outer end of the bar.

A problem that has been present in prior art structures wherein sheaves have been provided at the outer end of a guide bar is that the plates or supports for the rotatable sheave eventually yield and spread, thereby resulting in an unstable mounting for the rotatable sheave. A further object of this invention is in the provision of a guide or nose having a one-piece rotatable roller or sheave, and wherein the structural assembly is such that the frictional and other forces do not cause spreading of the support plates or deformation of the sheave itself.

Yet a further object of the invention is to provide a removable and replaceable guide characterized by having the advantageous features set forth above, and in which a sheave is rotatably carried between support plates on bearings, and wherein the guide, while it can be snapped into place on the guide bar and readily removed therefrom, has a stable anchorage to the bar so that the torque and other forces present will be ineffective to dislodge it during use. Additional objects and advantages will become apparent as the specification develops.

An embodiment of the invention is illustrated in the accompanying drawing, in which—

Figure 1 is a side view in elevation of a chain saw guide bar with the removable guide in position thereon;

Figure 2 is a transverse sectional view taken through the guide along the line 2—2 of Figure 1, and in which the chain that travels about the rotatable sheave is shown in phantom; and

Figure 3 is a transverse sectional view taken along the line 3—3 of Figure 1.

Figure 1 discloses in detail a guide bar or plate that is designated generally with the numeral 10 and, as is apparent from that showing, is elongated and has a slight curvature along the longitudinal edges 11 and 12 thereof. The guide bar along the edges 11 and 12 is provided with tracks or grooves designated by numerals 13 and 14. As is seen most clearly in Figure 3, the grooves 13 and 14 along the respective edges 11 and 12 are defined by grooving or slotting those edges so that in effect rail members 15 along the edge 11, and rail members 16 along the edge 12, are provided.

The guide bar 10 tapers toward its inner or rear end which is provided with a pair of elongated slots 17 and 18 that have an aperture 19 position therebetween, and that has also a slot 20. The slots 17, 18 and 20, as well as the aperture 19, are used in securing the bar 10 to the clutch assembly of an engine which provides the power for the chain saw. So far, the guide bar described may be substantially conventional, and for this reason no further explanation thereof will be set forth.

The front or free end of the guide bar 10 has an arcuate configuration, and more particularly is concave, as is shown at 21. The arc of the concavity 21 corresponds with the curvature of a rotatable pulley or sheave 22 which is received within the concavity with sufficient clearance to permit free rotation of that sheave. Also, as may be seen in both Figures 1 and 3, a channel or slot 23 that is rectangular in configuration is formed in the guide bar 10, and it extends centrally thereof along the longitudinal axis of the bar and opens into the concavity 21. Thus, at the front end of the guide bar are a pair of arcuate front wall portions which slope rearwardly and inwardly from the front ends of tracks 15 and 16 and which terminate at the mouth of central recess or slot 23. The guide bar 10 also tapers slightly toward the

outer or concave end 21 thereof, and may have either greater or less width than that found at the rear end of the bar. In the specific illustration, the width is slightly greater.

The removable nose or guide is designated generally with the numeral 24, and as well as having a rotatable sheave 22 includes a pair of plates 25 and 26 that are spaced apart and that have a spacer element 27 positioned therebetween to which the plates are secured rigidly by rivets 28 or by any other suitable means. The plates 25 and 26 have arcuate front ends, and interposed between those ends is a stationary race 29 that is rigidly secured to the plates by a plurality of rivets 30, or by some other comparable securing arrangement such as by welds. Thus, the plates 25 and 26 are rigidly secured to the spacer 27 and to an inner race 29.

The roller or sheave 22 is rotatably received between the plates 25 and 26, and is ring-shaped so as to enclose the inner race 29. Interposed between the sheave and race are a plurality of bearings 31 that provide a substantially frictionless mounting for the sheave. The sheave has a slot or channel 32 that extends circumferentially thereabout and has the same cross-sectional width as the slots 13 and 14 in the guide bar 10. The channel 32 is defined by track segments 33 that correspond to the tracks 15 and 16 of the guide bar, and are in alignment therewith when the removable guide is in position on the guide bar. The over-all thickness of the sheave 22 is substantially that of the guide bar 10.

The guide bar 10 on each side of the recess 23 thereof is provided with at least one aperture or opening 34 therethrough. Alignable with the openings 34 are dimples or depressed areas 35 formed in the plates 25 and 26. The spacing between the plates is such that they may be telescoped over the guide bar 10, as shown in Figures 1 and 3, until the depressed areas or detents 35 snap into the openings 34 to hold the nose or guide in place. The spacer 27 is dimensioned to snugly fit within the recess 23 in the guide bar so that relatively firm anchorage of the snap-on guide is afforded when it is positioned upon the guide bar.

Preferably, means are provided to lubricate the roller bearings 31, and such means may comprise (as is seen most clearly in Figure 2) an opening 36 through the inner race 29 that communicates with a small aperture 37 in the support plate 25. Normally closing the aperture 37 is a ball 38 that is biased into closing engagement therewith by a coil spring 39. A lubricant is ejected into the bore or passage 36 through the inner race by simply placing a grease gun against the aperture 37. The force of the grease being expelled from the grease gun will push the ball 38 against the biasing action of the coil spring so as to open the passage 36 and permit grease to enter the same. Rotation of the sheave 22 will cause the grease to migrate into the annular channel 15 in which the bearings 31 are mounted and thereby into contact with those bearings.

The assembly is adapted for use with a saw chain that is shown by broken lines in Figure 2, and is designated with the numeral 40. The chain 40 has an inner link 41 secured to outer links 42 and 43. It is apparent from Figure 2 that the outer links 42 and 43 ride on the rails 33 of the sheave 22, and therefore will also ride on the rails 15 and 16 of the guide bar 10. At the same time, the inner links 41 slidably pass through the channels 13 and 14 of the guide bar and are slidable into and out of the channel 32 of the sheave. The saw chain has such a characteristic that the kerf cut thereby is slightly wider than the distance from outer face to outer face of the plates 25 and 26 so that those plates may pass freely through the kerf, as then will the entire nose structure and guide bar 10.

The plates 25 and 26 may be provided, respectively, with openings 44 and 45 therethrough that align with a central opening 46 formed in the inner race 29. These

openings are adapted to have secured therein a handle assembly (not shown) for guiding the outer end of the chain saw, but it will be apparent that such a handle cannot be used during plunge cut operations.

The nose 25 may be positioned on the guide bar 10 simply by aligning the spacer 27 with the recess 23, and by then pushing the nose and guide bar together until the bosses or depressed portions 35 slip into the openings 34. Removal is accomplished by moving the guide bar and nose in opposite longitudinal directions with respect to each other. Since a relatively tight fit is present between the opposing surfaces of the plates 25 and 26 and the guide bar 10 and between the parallel lateral edges of the spacer 27 and the longitudinal edges of the slot 23, removal of the nose is most readily accomplished by striking one of the plates 25 or 26 thereof to drive the nose off of the guide bar.

It is noted in Figure 2 that the saw chain rides on the wheel or sheave 22, and the links do not then overlap or ride along the sides of the sheave. Therefore, all of the longitudinal or rearward forces that develop during a plunge cut operation, when the front of the sheave 22 and chain carried thereon are pushed into a timber, are transferred along the plane of the wheel to the bearings 31, to the inner race 29 and thence to the plates 25 and 26 which apply those forces through the spacer 27 to the guide bar 10. It will be noted that the transverse rear edge of the rectangular spacer 27 abuts the transverse edge of recess 23 when the nose is in place. Since plates 25 and 26 are securely fixed to both the spacer and the inner race 29, rearward displacement of the nose in response to the severe forces arising during plunge cutting is effectively and positively prevented.

Unlike composite sheaves formed from two connected disks, the one-piece sheave 22 will not tend to separate or shear into planar sections during plunge cutting, partly because of its integral construction and partly because of its short radial dimensions and the proximity of the coupling of side plates 25 and 26 to the sheave's periphery. In other words, the effective lever arm which lies along an extension of the longitudinal axis of the guide bar 10 is relatively short, that lever arm extending radially between the forwardly disposed rivets 30 and the front periphery of the sheave, with the result that the torque developed thereat is small and does not tend to cause separation of rails 33 of the sheave.

For the same reasons the plates 25 and 26 will not tend to separate during plunge cutting operations. The circumferential series of connecting rivets 30 extend through the nose adjacent the periphery of the inner race 29 and are spaced closer to the circumferential channel 32 of the sheave than to the axis of rotation of that sheave. Thus, the substantial area circumscribed by the annular arrangement of connecting rivets plus the proximity of those rivets to the rotatable sheave provide effective resistance against any twisting or lateral forces which might otherwise tend to separate the spaced plates.

In plunge cutting, forces may develop which tend to bend, twist, or otherwise displace the entire nose assembly away from the longitudinal axis of the guide bar. However, in the structure of the present invention such forces are effectively resisted by the rigid connection between the rear portion of plates 25 and 26 and the spacer 27, by the snug frictional engagement between the lateral edges of the spacer and the longitudinal edges of the guide bar recess, and by the substantial surface engagement between the opposing rear surfaces of the plates and the surface portions of the guide bar disposed between the longitudinal edges of the recess and the front portions of rails 15 and 16. Therefore, spacer 27 cooperates or coacts with both the side plates 26, 27 and the guide bar 10 to hold the plates in surface contact with the bar and to maintain the guide nose and guide bar in firmly connected and axially aligned condition.

It will be noted that the entire guide nose assembly is compact, and that the inner race and bearings are sub-

stantially sealed in by the plates 25 and 26 and by the outer race or sheave 22. Thus, it is difficult for dust and other grit to enter the guide and to cause abrasion between the moving parts thereof.

The substantial reduction in friction between the saw chain and guide bar that is afforded by the guide assembly enables a chain saw assembly to be operated for substantially greater periods without repair or replacement of parts than the chain saws known in the prior art. Further, it has been found experimentally that the operating speed of the saw chain can be increased many fold through the use of the guide nose without an increase in the power input to the chain saw. For example, in structures presently in use, the chains are operated at a speed of approximately 1,000 feet per minute, and with the structure of the present invention the operating speed can be increased to 3,000 to 4,000 feet per minute. Another comparison in the tremendously improved efficiency of chain saws embodying the present invention may be found in the speed with which a sample log or timber may be severed. As a specific instance, a 10" diameter pine log was severed in approximately four seconds. The fastest speed that such a log has been severed before in racing contests wherein a razor edge bow is used, is six seconds; and such a razor edge bow saw can make only one cut per each sharpening. Another advantage is that the overall cost of the guide nose is less than the cost of rewelding and hardening the outer rounded end of a guide bar after the same has been worn to recondition it for further use.

While in the foregoing specification an embodiment of the invention has been described and set forth in considerable detail for purposes of adequately disclosing the same, it will be apparent to those skilled in the art that numerous changes may be made in those details without departing from the spirit and principles of the invention.

I claim:

1. A guide assembly for saw chains comprising an elongated guide bar, a guide nose removably mounted at the front end of said bar, said nose including a pair of spaced support plates, a spacer interposed between and rigidly secured to said plates adjacent the rear end of said nose, a stationary inner race interposed between and firmly affixed to said plates adjacent the front end of said nose, bearings about the periphery of said race, an annular sheave carried by said bearings and being rotatably received between said plates, said guide bar having a concave front end and having a longitudinally extending recess opening into said concave front end, said spacer being snugly received within said recess and having the lateral edges thereof in frictional contact with the longitudinal edges of said recess, said support plates being disposed in snug surface contact with the portions of said guide bar lateral to said recess.

2. A guide assembly for saw chains comprising an elongated guide bar having tracks along the longitudinal edges thereof, a removable guide nose mounted upon the forward end of said bar, said nose including a pair of spaced support plates, a spacer element interposed between and rigidly secured to said plates adjacent the rear end of said nose, a stationary inner race interposed between and firmly affixed to said plates in front of said

spacer, bearings about the periphery of said race, an annular sheave carried by said bearings and rotatably received between said plates, said guide bar having a concave forward end corresponding in arc characteristics to the curvature of said sheave and having a longitudinally extending recess opening into the concave forward end thereof, said spacer being snugly received within said recess and having parallel lateral edge portions in frictional contact with the longitudinal edges of said recess, said paired support plates having their opposing surfaces in snug frictional contact with the portions of said guide bar disposed between the longitudinal tracks of said bar and the longitudinal edges of said recess.

3. The structure of claim 2 in which said sheave is provided with a continuous peripheral groove for supporting the links of a saw chain, said support plates being secured to said inner race adjacent the periphery thereof and closer to said groove than to the rotational axis of said sheave.

4. The structure of claim 2 in which said sheave is of single piece construction and is provided with a continuous peripheral groove for supporting and guiding the links of a saw chain.

5. In combination, a flat elongated guide bar having a track along the longitudinal edges thereof and having a rear end adapted to be structurally related to a power source, said bar also being provided with a front end having a pair of front wall portions sloping rearwardly and inwardly from the forward ends of said longitudinal edges and terminating inwardly at spaced points between the longitudinal mid-line of said bar and the opposite longitudinal edges thereof, said bar also being provided at its front end with a central recess extending rearwardly from said spaced points, a guide sheave structure having a pair of spaced support plates and a spacer disposed therebetween, said spacer being snugly received within the rearwardly extending central recess of said bar, said bar and support plates being in lateral surface engagement to prevent lateral displacement of said spacer within said recess, a sheave rotatably mounted between said support plates in front of said spacer, and means for frictionally securing said guide sheave structure and said guide bar together.

6. The structure of claim 5 in which the spaced support plates of said guide sheave structure have their inner opposing surfaces in frictional contact with the surface portions of said guide bar between said central recess and said longitudinal track-providing edges.

7. The structure of claim 5 in which said sheave is annular in shape and is provided with a continuous peripheral groove for supporting and guiding the links of a saw chain.

References Cited in the file of this patent

UNITED STATES PATENTS

2,432,567	Forrest	Dec. 16, 1947
2,664,120	Hinkley	Dec. 29, 1953
2,693,206	Anttonen	Nov. 2, 1954
2,728,566	Barnett	Dec. 27, 1955

FOREIGN PATENTS

928,410	France	June 2, 1947
---------	--------	--------------