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CHAIN SAW MACHINE

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Fig. 1.

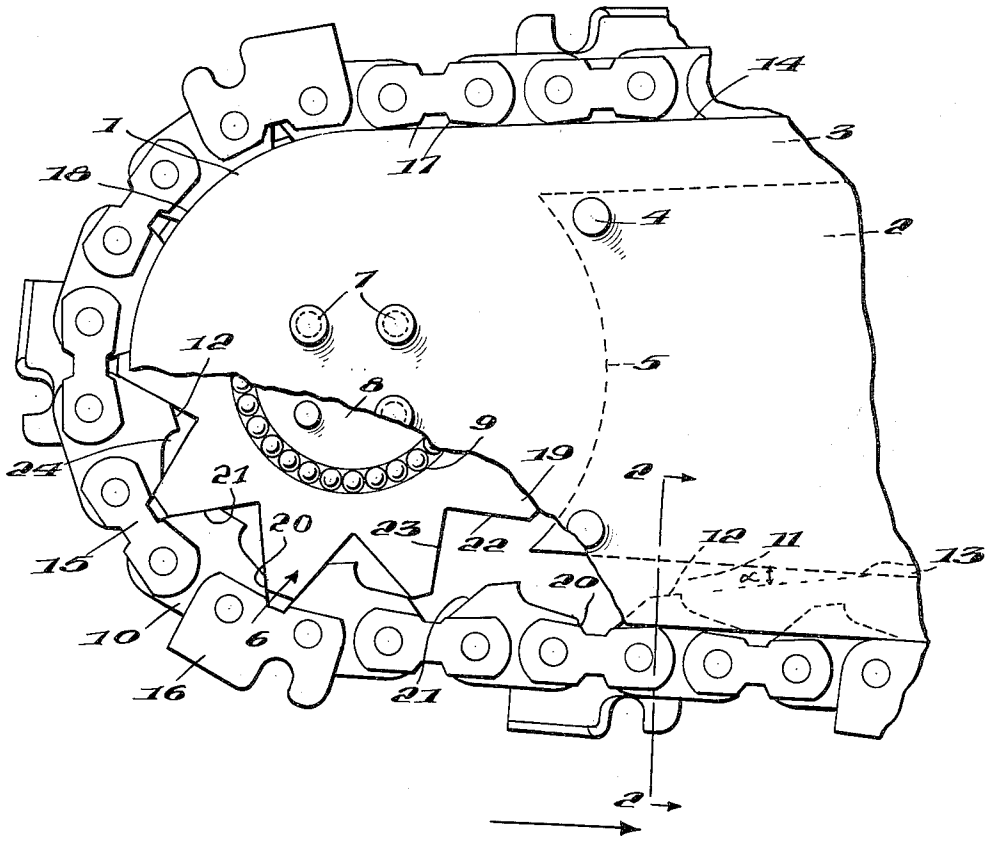
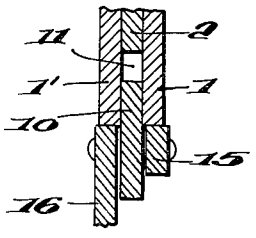


Fig. 2.



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CHAIN SAW MACHINE

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This invention relates to a chain saw machine of the grooved guide bar type provided with improved sprocket idler and saw chain means for supporting the chain as it passes around the free end of the guide bar.

In general, chain saw machines are of the grooved guide bar or the ribbed guide bar type. In a grooved guide bar machine, projecting foot portions of the center links of the saw chain extend into, and are guided within, a peripheral slot or groove in the guide bar. In a ribbed guide bar machine, the chain is supported and guided upon a peripheral rib on the guide bar that extends between foot portions of outer links of the saw chain. In both types of machines, friction between, and wear of, the cooperating surfaces of the chain and guide bar may be reduced by supporting the chain—during semi-circular end travel—by idler means of the wheel or sprocket type journalled at the free end of the guide bar. The smooth-periphery wheel type idler presents certain drawbacks, such as slippage between the foot surfaces of the supporting links and the peripheral surface of the wheel (particularly when rotation of the wheel is impaired), and improper support (and resultant vibration and chattering of the machine) when the supporting surfaces of either the chain or the wheel are worn or damaged during use. Sprocket type idlers present the drawback that sawdust and foreign particles are collected between the sprocket teeth and adversely affect support of the chain by the idler. Since many machines are presently designed for "end cut" operation, the support of the chain on either wheel or sprocket type idlers is of considerable importance. One advantage of the grooved guide bar machine is that the guide bar side plates provide lateral guidance of the chain as it travels about the idler. An example of a grooved guide bar machine provided with a sprocket idler and with side plates is presented by the U.S. patent to Smith No. 2,316,997 of April 20, 1943.

To further reduce wear of the saw chain, it is conventional in the art to effect shifting of load between distinct sets of supporting surfaces on the chain as it commences semi-circular travel around either the free or the drive sprocket ends of the guide bar. In some cases, the load is transferred from one set of wear surfaces on given links to other wear surfaces on the same links. In other cases, complete or partial load is transferred from supporting surfaces on certain sets of links to supporting surfaces on other sets of links (i.e., from the inner links to the outer links and vice versa, depending on the type of machine). In such machines designed for the transfer of load between distinct wear surfaces, consideration must be given to the provision of proper chain support without increasing friction between the elements or imparting vibration or instability to the chain saw operation.

The improved chain machine of the present invention

was developed to avoid the drawbacks of the prior art and to present an apparatus of simple, durable, inexpensive construction that provides extremely stable cutting operation.

The object of the present invention is to provide an improved chain saw machine of the sprocket-idler grooved-guide-bar type characterized in that the saw chain is supported, during semi-circular end travel, solely by the cooperation between distinct supporting surfaces adjacent the forward and rear ends of the center links with corresponding surfaces on the sprocket idler teeth.

Another object of the invention is to provide a chain saw machine of the sprocket-idler, grooved-guide-bar type that is designed to afford spaces in the bottoms of the grooves between the sprocket teeth when the chain is supported solely by the cooperation between longitudinally spaced supporting surfaces on the ends of the center links of the chain with the extremities of the sprocket teeth.

A more specific object of the invention is to provide a sprocket-idler, grooved-guide-bar machine the saw chain of which includes center links that extend into the guide bar groove, said center links being provided at their forward and rear ends with supporting surfaces and at their lower foot portions intermediate said supporting surfaces with an inclined surface that defines a transverse forwardly-directed edge for removing saw dust and the like from the guide bar groove.

According to the present invention, each saw chain center link (which, at the drive end of the guide bar, serves as a driving link driven by a drive sprocket) is provided at its forward and rear ends with supporting surfaces adjacent the pivotal connection of the center links with the outer links. During semi-circular travel of the chain relative to the guide bar, the chain is supported solely by the cooperation between these supporting surfaces on the center links with the extremities of the sprocket teeth. Owing to the support of the center links adjacent their pivotal connections to the outer links, greater stability is imparted to the chain during end travel than would be achieved if the supporting surfaces were provided adjacent the foot of the center links. Furthermore, the foot portion of each center link intermediate the supporting surfaces may be provided with a concavity that defines a particle-receiving space in the bottom of the groove between sprocket teeth during end travel of the chain. Also the foot surface of each center link may be inclined to define a transverse edge for removing particles from the guide bar groove. Damage to, or wear of, the center link foot portions during use has no deleterious effect on the cooperation between the sprocket and the chain during end travel of the chain. Owing to their location, the supporting surfaces of the center links are protected against damage.

Other objects and advantages of the invention will become apparent from a study of the following specification when considered in conjunction with the accompanying drawing, in which:

FIG. 1 is a partly sectioned elevational view of the free end of the chain saw machine; and

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1.

Referring now to the drawing, the chain saw machine

includes a guide bar consisting of a pair of side plates 1 and 1' secured to opposite sides of center plate 2 by rivets 4 or similar securing means. The transverse dimension of the center plate is less than that of the side plates so that grooves 3 are defined between the longitudinal edge portions of the side plates. At its free end, center plate 2 contains concave recess 5 that defines an opening between the free ends of the side plates for receiving idler sprocket 6. The idler sprocket is journalled on bearing plate 8 that is secured between the side plates by rivets 7. Ball bearings 9 or the like are provided for reducing friction.

A saw chain is slidably mounted upon the guide bar and consists of center or drive links 10 that are pivotally connected with outer side and cutter links 15 and 16, respectively. Center links 10 are continuously guided between side plates 1 and 1' as the chain travels around the guide bar. At the driving end of the guide bar, the chain is driven by the cooperation of teeth on a drive sprocket (not shown) with the links.

During longitudinal travel of the saw chain relative to the guide bar, the chain is supported solely by the sliding cooperation between the lower surfaces of outer links 15 and 16 with longitudinal surfaces 14 of the side plates. Center links 10 extend into groove 3 (for guiding between the side plates) and are spaced from the groove bottom surface 13 by space 11.

The lower portion of each of the center links 10 is provided at its forward and rear ends with inclined supporting surfaces 20 and 21, respectively. During semi-circular travel of the chain around the free end of the guide bar, the chain is supported solely by the cooperation between surfaces 22 and 23 of sprocket teeth 19 with surfaces 20 and 21, respectively, of the center links. It is important to note that during this semi-circular end travel of the chain, the lower surfaces of outer links 15 and 16 are spaced from the curved end surfaces 18 of the side plates. This is accomplished by suitable placement of the axis of rotation of the idler sprocket or by proper selection of the radius of curvature of surfaces 18. Since surfaces 18 are not load bearing surfaces, they may be machined with a relatively low tolerance. The lower portions of center links 10 are guided between the side plates during semi-circular end travel of the chain. To facilitate passage of the saw chain about the free end of the guide bar when the spacing between the outer links and surfaces 18 is relatively small, the lower surfaces 17 of the outer links may be arranged at an obtuse angle as is conventional in the art.

Several advantages result from the fact that the saw chain is supported solely by surfaces 20 and 21 on the center links during semi-circular end travel about the guide bar. The lowering of the accuracy required in machining side plate curved surfaces 18 has been mentioned above. Secondly, by supporting the chain by surfaces 20 and 21 immediately adjacent the pivotal connections to the outer links, in combination with lateral guiding of the center links by the side plates, greater stability is afforded the chain as it passes around the free end of the guide bar. Thirdly, by supporting the chain solely by surfaces 20 and 21 on the center links during semi-circular end travel, considerable latitude in the configuration of the lower surface of the center links intermediate forward and rear supporting surfaces 20 and 21 is permitted. In this regard, the forward surface of the lower portions of the center links may be provided with concave recesses which, together with the center link foot surface 12, define spaces 24 in the bottoms of the grooves between idler teeth 19 during end travel of the saw chain. Any saw dust, wood chips, or foreign particles which might become temporarily lodged in the grooves between the idler teeth are forced downwardly in the grooves by the center links. As a consequence of space 24, the particles may be contained or compacted in the bottom of the sprocket teeth groove without effecting radial outward displacement of the chain relative to the sprocket, whereby chattering and vibration of the chain is avoided. Furthermore, since the foot surfaces 12 of the center links are not load bearing surfaces, they may be inclined by a rearward angle α relative to the groove bottom surface 13 to provide relatively sharp edges on the center links for cleaning out saw dust, wood chips and the like which might be packed in grooves 3. Since surfaces 12 and the adjacent lower portions of the center links are not engaged by the idler, damage to, or wear of, these surfaces during use will have no deleterious effect on the support of the saw chain as it travels about the guide bar. Also the configuration of the surface of the center links intermediate surfaces 20 and 21 may be specifically designed to obtain best possible chain drive by the driving sprocket.

Still another advantage of the invention resides in the fact that the idler is forced to rotate during travel of the chain about the guide bar, and consequently there is no slipping action between the chain and idler that often occurs with the use of smooth, wheel-type idlers. When a sprocket is used as the idler, it is easy to observe whether or not the idler is moving stiffly and requires inspection and cleaning. On the other hand, when a wheel idler is utilized, it is difficult to ascertain whether or not the idler is operating improperly (to cause relative sliding movement of the chain) since the idler wheel is concealed between the side plates.

While the best form and embodiment of the invention has been illustrated and described, it will be apparent to those skilled in the art that modifications and changes may be made in the apparatus described without deviating from the invention set forth in the following claims.

What is claimed is:

1. A chain saw machine, comprising

(*a*) a guide bar having one end adapted for connection with saw chain drive means and an idler end, the longitudinal edges of said guide bar containing grooves extending the length thereof, the idler end portion of said guide bar including a pair of laterally spaced side plates;

(*b*) an idler sprocket journalled at the idler end of said guide bar intermediate said side plates, said idler sprocket including teeth having at the free extremities thereof generaly inclined forward and rear supporting surfaces; and

(*c*) a saw chain mounted on said guide bar and said idler sprocket for longitudinal and semi-circular end travel relative to said guide bar, said saw chain including pivotally connected center and outer links, said outer links including lower surfaces adapted to engage the peripheral longitudinal surfaces of said guide bar, at least some of said outer links comprising cutter links.

(1) each of said center links having below the pivotal connections thereof to said outer links a lower portion adapted to extend into said guide bar grooves, said lower portion extending below the lower surfaces of each of said outer links a distance less than the depth of said grooves whereby during longitudinal travel of the chain along the bar the chain is supported solely by the cooperation between the lower surfaces of the outer links and the peripheral longitudinal surfaces of said guide bar.

(2) the lower portion of each of said center links also having at the forward and rear edges thereof supporting surfaces adapted for engagement with the rear and forward supporting surfaces of said sprocket teeth, said center link supporting surfaces being adjacent but spaced downwardly from the lower surfaces of said outer links, the foot portions of said center links being of a size and configuration to define

spaces in the bottoms of the grooves between sprocket teeth when the supporting surfaces of the sprocket teeth engage the supporting surfaces on the center links, said sprocket being so journalled between said side plates that the lower portions of the outer links are spaced from the guide bar side plates when the supporting surfaces on the sprocket teeth engage the supporting surfaces on the center links, whereby during semi-circular end travel the saw chain is supported solely by the cooperation between the supporting surfaces on the extremities of the sprocket teeth and the supporting surfaces on the center links.

2. Apparatus as defined in claim 1 wherein the lower extremity of the foot portion of each center link terminates in a surface inclined to the direction of travel

of said chain to define a forwardly directed edge for removing foreign particles from said grooves.

3. Apparatus as defined in claim 2 wherein the supporting surfaces on said center links and the co-engaging surfaces on the sprocket teeth are straight.

References Cited in the file of this patent

UNITED STATES PATENTS

285,651	Newlove	Sept. 25, 1883
596,802	Brown et al.	Jan. 4, 1898
2,316,997	Smith	Apr. 20, 1943
2,924,110	Gudmundsen	Feb. 9, 1960
2,924,254	Smith	Feb. 9, 1960
3,059,491	Hoff et al.	Oct. 23, 1962
3,066,711	Winnlert	Dec. 4, 1962
3,087,350	Reed	Apr. 30, 1963