Oct. 1, 1940. G. O. RICHMOND 2,216,628

TOOL FOR CUTTING GEARS

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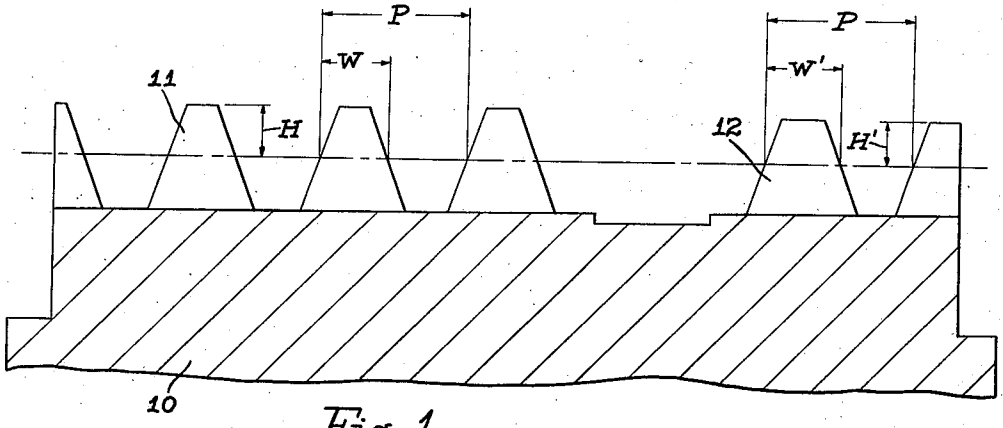


Fig. 1

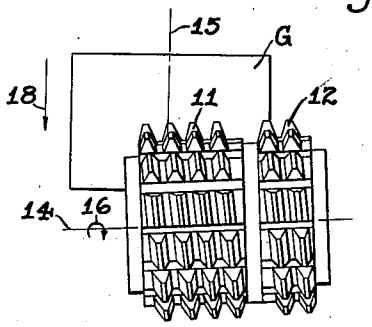


Fig. 2

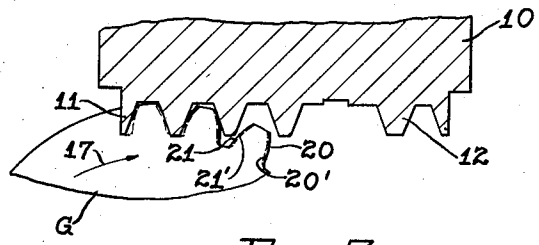


Fig. 3

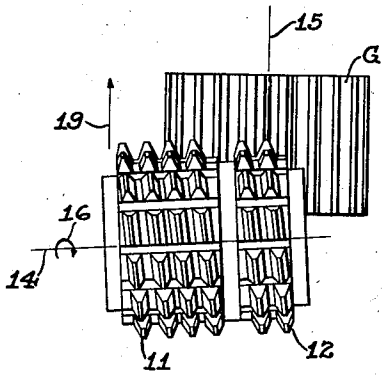


Fig. 4

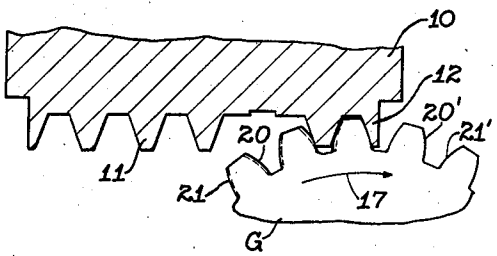


Fig. 5

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TOOL FOR CUTTING GEARS

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2 Claims (Cl. 29—103)

The present invention relates to hobs for and to a method of hobbing gears and particularly to hobs for and a method of hobbing spur and helical gears.

The primary object of the invention is to permit cutting gears of high quality with a relatively cheap investment in cutting tools. In accordance with this object, it is a further purpose of the invention to provide a hob which can be used for both rough and finish cutting of gears and which will have a comparatively long life.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In carrying out the invention, a hob is used that has roughing teeth formed along a part of its length and finishing teeth formed along the remaining part. In the preferred embodiment of the invention, the roughing teeth are formed at one end of the hob and the finishing teeth at the other, and the two sets of teeth are separated by a space that definitely designates the ending of the roughing section and the beginning of the finishing section. The pitch of the helical rows of the roughing teeth is made the same as the pitch of the helical rows of the finishing teeth, but the roughing teeth are made somewhat thinner than the finishing teeth so that some stock will be left on the sides of the teeth of the gear blank after the roughing operation to be removed in the finishing cut. The roughing teeth are also preferably made somewhat higher than the finishing teeth to cut somewhat deeper so that the finishing teeth will not cut in the bottoms of the tooth spaces of the gear blank but only on the sides thereof and thereby a smoother finish may be obtained in the finishing cut.

In use, the roughing section of the hob is first positioned in engagement with the gear blank to be cut and the hob and blank are rotated on their respective axes while a relative feed movement is produced between the hob and the blank in the direction of the blank axis. When the hob has been fed across the face of the blank, the hob is adjusted axially to bring the finishing section into operative position and then the direction of feed is reversed and the hob is fed back across the face of the blank while the hob and blank rotate in the same directions as during roughing. When the hob has returned to starting position, then, the gear will have been both roughed and finished. Preferably the feed during roughing is effected at a much faster rate than during finishing so that high production can be obtained while still securing smooth finish.

Preferably the length of the roughing section of the hob is two or more times the length of the finishing section. In this way, the burden of cutting on the roughing and finishing sections can be equalized and the life of the hob prolonged. It is not necessary to sharpen the hob, then, whenever some of the roughing teeth become dulled. The hob is simply shifted to bring another part of the roughing section of the hob into operative position and the hob can continue to be used without sharpening until all of the teeth of the roughing section as well as the teeth of the finishing section of the hob have become dull. This means that the hob can be used to cut many more gears per sharpen than if the roughing and finishing sections of the hob were of equal length.

In the drawing:

Fig. 1 is a fragmentary axial section, taken on an enlarged scale, and illustrating a hob made according to one embodiment of this invention;

Fig. 2 is a plan view of this hob in engagement with a spur gear blank and showing the positions of the hob and blank at the beginning of the roughing operation;

Fig. 3 is a fragmentary view taken at right angles to the view of Fig. 2; and

Figs. 4 and 5 are views corresponding to Figs. 2 and 3, respectively, and showing the positions of hob and blank toward the end of the finishing operation.

The hob, which is designated as a whole at 10, comprises a roughing section 11 and a finishing section 12. The two sections of the hob are formed by gashing and relieving a worm thread to provide cutting teeth. The pitch P of the roughing section of the hob is made equal to the pitch P of the finishing section of the hob, but the width W of the roughing teeth is less than the width W' of the finishing teeth. Thus stock will be left on the sides of the teeth of the gear blank after the roughing operation which can be removed in the finishing cut. Preferably the height H of the roughing teeth is greater than the height of the finishing teeth as already described, so that the roughing teeth will cut deeper than the finishing teeth and the finishing teeth need do no bottom cutting during the finishing operation. The roughing teeth are preferably made of the same pressure angle as the finishing teeth so that the cuts taken by the roughing teeth will be parallel to those taken

by the finishing teeth and the amount of stock to be removed in the finishing operation will be uniform from root to top of the gear tooth profiles.

Preferably, also, the roughing section of the hob will be made two or more times the length of the finishing section so that, as described above, when one part of the roughing section is dulled, the hob can still be used without sharpening, by positioning the hob so that another part of the roughing section of the hob will do the cutting. In the illustrated embodiment of the invention the roughing section of the hob comprises four convolutions of thread and the finishing section two. This is merely illustrative of the invention, however. In practice usually the hob is made with not less than six convolutions of roughing teeth and three convolutions of finishing teeth.

In use, in the cutting of a spur gear, the hob is first positioned, as shown in Figs. 2 and 3 with the roughing section 11 in operative relation to the gear blank G to be cut. The hob and blank are then rotated on their respective axes 14 and 15 in timed relation, as denoted by the arrows 16 and 17, respectively, and simultaneously a relative feed movement is produced between the hob and blank in the direction of the blank axis. In the drawing, this feed movement is shown as imparted to the blank and the arrow 18 denoted the direction of this feed movement during roughing.

In the roughing operation, teeth of the roughing section of the hob rough out the tooth spaces of the gear blank. In Figs. 3 and 5, the opposite sides of the tooth spaces produced at the end of the roughing operation are denoted at 20 and 21, respectively, and the dotted lines 20' and 21', respectively, denote the locations of the finished tooth surfaces.

When the hob has been fed relatively across the full face width of the blank, the hob is shifted axially to bring the finishing section 12 of the hob into operative position and then the direction of feed is reversed. The hob and blank continue to rotate in the directions of the arrows 16 and 17, respectively, but the feed now is in the direction of the arrow 19. In the finishing operation, the stock left on the teeth of the gear blank after the roughing cut, is removed and the final finished tooth surfaces 20' and 21' are produced. When the gear has returned to its initial position, in the feed movement, the gear will have been completed.

As above stated, the feed during roughing is preferably effected at a faster rate than during finishing because smoothness of the tooth surfaces produced is the principal aim of the finishing operation whereas rapid removal of stock is the chief object during roughing.

While the invention has been illustrated in connection with a particular embodiment thereof, it will be understood that the invention is capable of still further modification and this application is intended to cover any variations, uses, or adaptations of the invention and including such departures from the present disclosure as come within known or customary practice in the gear art and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A hob having a roughing portion and a finishing portion which follows said roughing portion, each portion being in the form of a helical thread which is gashed and relieved to provide a plurality of cutting teeth which extend for more than one convolution around the periphery of the hob, the cutting teeth of the roughing portion being of less thickness than the cutting teeth of the finishing portion, and the cutting teeth of the finishing portion being identical with one another in shape.

2. A hob having a roughing portion and a finishing portion, both portions being in the form of a helical thread which is gashed and relieved to provide cutting teeth and which is of the same pitch throughout the length of the hob and the cutting teeth of the roughing portion being of less thickness than the cutting teeth of the finishing portion, the length of the roughing portion being a multiple of the length of the finishing portion.

GEORGE O. RICHMOND.