

Aug. 9, 1938.

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2,126,476

HOLLOW MILL

Filed Feb. 9, 1937

Fig. 1.

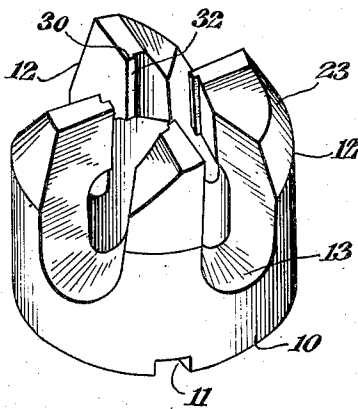


Fig. 4.

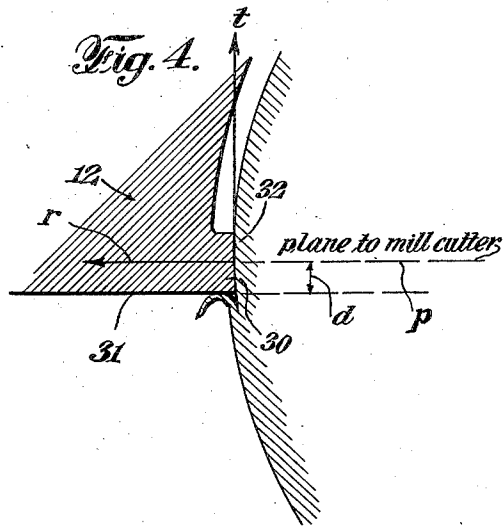


Fig. 2.

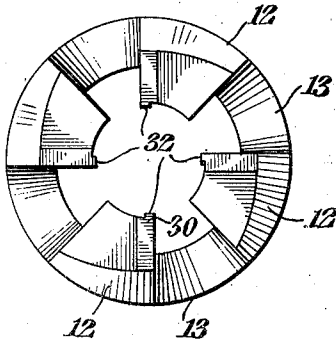


Fig. 3.

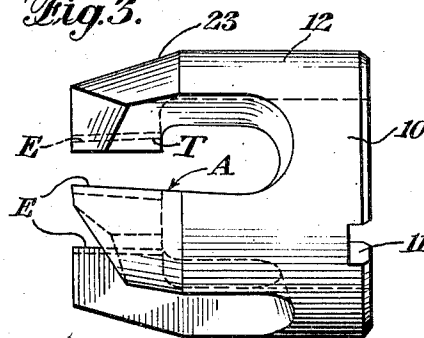
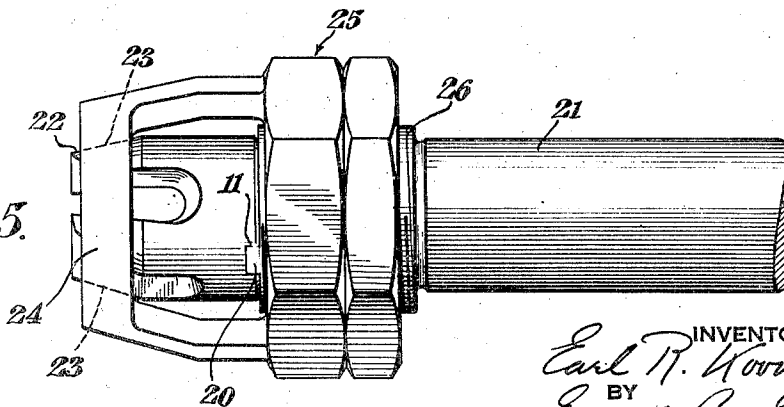


Fig. 5.



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2,126,476

HOLLOW MILL

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Application February 9, 1937, Serial No. 124,799

2 Claims. (Cl. 29—103)

This invention relates to tools and more particularly to improvements in adjustable hollow mills of the prong type.

The object of the invention is to provide a hollow mill having a sharp, self-clearing cutting action which gives a smooth, accurate finish to the cut while at the same time preserving the cutting edge and rendering the tool durable in use.

A further object is to provide a tool of improved character which can be mounted in the same holders and used in the same manner by the machinist as prior art tools are mounted and used.

Further objects of the invention are to provide a tool of simple construction and manufacture as readily as prior art tools, and to obtain other advantages and results as well as novel arrangements and combinations of parts, which will appear more fully as the description progresses and as study is given to the disclosure of the invention herein.

Referring to the accompanying drawing in which like numerals of reference indicate similar parts throughout the several views;

Fig. 1 is a perspective view of a mill embodying my invention;

Fig. 2 is an end view of the mill looking toward the free ends of the prongs thereof;

Fig. 3 is a side view of the mill shown in Fig. 1;

Fig. 4 is a diagrammatic sectional view illustrating the cutting action; and

Fig. 5 is a side view of the mill in its adjusting holder.

In the specific embodiment of the invention illustrated in said drawing, the reference numeral 10 has been applied to designate the base portion of the mill, said base portion being in the form of an annulus, the lower surface of which, except for a diametric keyway 11, is in a plane normal to the axis of the annulus. Extending from the opposite side of said annulus from the said plane side thereof and in substantially the same general direction as the axis, are a plurality of prongs 12 symmetrically arranged with respect to each other around the axis, and here shown as, but not restricted to, four in number. The construction is such that the prongs are separated successively one from another by spaces or flutes 13 and such that, in the specific showing, the prongs are in opposed pairs.

In use the mill is positioned in a holder as shown in Fig. 5 with keyway 11 engaged by key

20 at the end of the holder shank 21 and with the outer bevels 22 of the mill prongs engaged by the corresponding conical surface 23 of the ring 24 of the holder-cap 25. As the holder-cap 25 is drawn back on the shank by turning on threads 26, the prongs 12 are engaged and supported rigidly against outward yielding by ring 24 and may be adjusted by turning the holder cap 25 further back on the shank threads so as to flex the prongs inward.

The back taper T of the cutting edges E of the mill is thus somewhat increased by this adjustment. Initially, this taper T is made very slight, preferably less than one eighth of an inch per foot so that the cutting will be distributed over a correspondingly long section of the cutting edges E and so that the increase of the taper by the adjustment will not result in excessive angularity.

At the same time the cutting edges E may either be in an axial plane (for brass and the like) or may incline forward at an angle A to such plane. For steel and the like this angle A would be about 10°.

In the cutting operation it is vital to avoid chattering of the tool and scoring of the work in all adjustments and with any metal. To give a clear, clean cut under all conditions the cutting edge E is formed as the edge of a prong ridge 30 and preferably with a slight advance d relative to an axial plane p parallel to the leading face 31 of the prong 12. The ridge 30 projects slightly inward from the leading edge of the land formed by the prong, and is of limited extent, circumferentially being about .035" for brass to about twice as much for steel.

These cutting ridges 30 peripherally engage the part to be milled against the ridge faces 32 so as to center the work accurately with relation to the mill, and at the same time these ridge faces 32 localize the radial component r of the cutting reaction at the front of each land. The radial stress r is thus applied most efficiently to resist the tendency of the tangential cutting reaction t to twist the prong (counter-clockwise, Fig. 2) and dig the cutting edge deeper into the work. Such tendency if unresisted is likely to be cumulative in that the resultant twist in turn causes an increase in the twisting force by augmenting the cutting action. Under favorable conditions and unless counter-acted, such forces cause torsional vibrations and chattering of the tool and result in scoring of the work.

In the mill structure of this invention each ridge 30 reacts with the work to superpose a

counter torsion on the corresponding prong, this reaction resulting from the centering contact of the ridge faces 32 with the work. The prongs are, therefore, precisely and snugly held
5 against the ring 24 without twisting or chattering and within an accurately centered clean cutting action, avoiding all scoring of the work. The taper T may be made very small so as to be desirably restricted below one fourth of an
10 inch per foot even in contracted adjusted position, this slight taper also contributing to the smoothness and cleanness of the cut in distributing the cutting action over a longer length of the cutting edge.

13 I claim:

1. A hollow mill comprising an integral hollow
body portion annular around an axis, a series of
axially extending resilient adjustable prongs
separated by intervening spaces or flutes, a cut-
20 ting ridge extending in generally axial direction

along the leading edge of each of said prongs, each of said ridges having a leading cutting edge and a following surface limited in width so as to be circumferentially terminated well in advance of the center of the corresponding prong
5 to localize the components of radial reaction of the work on the prongs to lines closely adjacent to the cutting edges of the corresponding ridges so as to create a counter torsion on each respective prong opposite in direction to the twist im-
10 posed by the tangential component of the cutting action on said prong, and a holder cap having a portion engaging said prongs to radially adjust them.

2. A hollow mill as set forth in claim 1 in
15 which the cutting ridges are formed with a slight back taper not exceeding one-eighth of an inch per foot.

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