Nov. 14, 1933. G. GORTON 1,935,555

ENGRAVING MACHINE CUTTER

Filed March 5, 1931

Fig. 1.

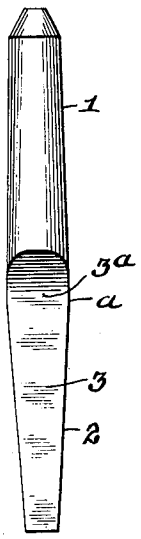


Fig. 2.

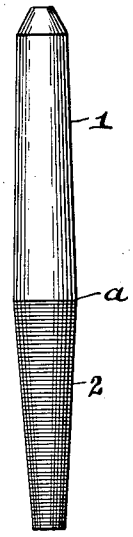


Fig. 3.

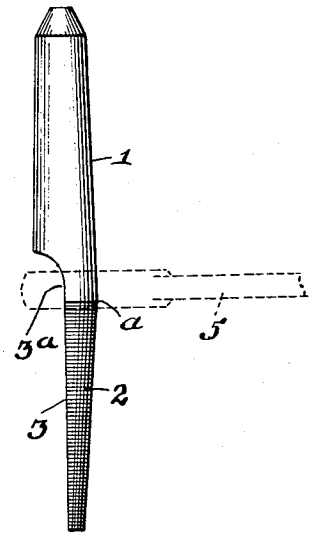


Fig. 5.

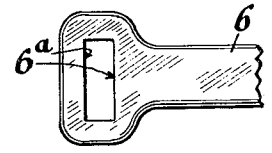
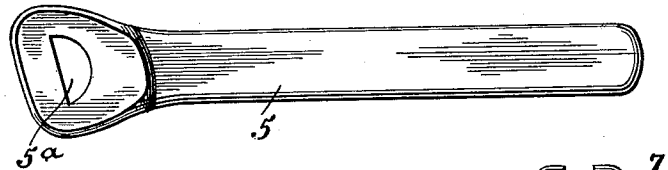


Fig. 4.



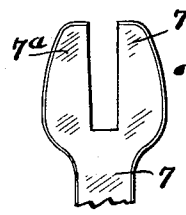


Fig. 6.

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ENGRAVING MACHINE CUTTER

George Gorton, Racine, Wis.

Application March 5, 1931. Serial No. 520,431

1 Claim. (Cl. 29—103)

This invention relates to engraving machine cutters; and the objects and nature of the invention will be understood by those skilled in the art in light of the following explanations of the accompanying drawing that illustrates the preferred mechanical expression or embodiment of my invention from among other possible forms and modifications within the spirit and scope thereof.

An object of the invention is to improve rotary cutters of the single lip type for so-called engraving machines, die sinking machines, and the like, employed for engraving or cutting designs, indicia, letters, etc. in or on stamps, molds, dies, etc. as distinguished from the ordinary milling machine cutters which must comply with different conditions and requirements than engraving machine cutters, with the ends in view of reducing the cost of production, and of producing an engraving machine cutter to overcome certain defects in the engraving machine cutters now in general use, and of increased strength and durability, with a cutting or working end of increased length, and capable of being more easily applied and removed.

A further object of the invention is to produce a single lip rotary cutter for engraving machines, of improved shape and form, to overcome certain disadvantages and difficulties incidental to the form and construction of the engraving machine cutters now in common use, and to avoid the necessity of employing the objectionable pairs of opposite wrench faces on the exteriors of the central portions above the bases of the cutting ends of such old cutters.

With the foregoing and other objects in view, my invention consists of a rotary cutter for engraving machines, of new and improved form and structure as more fully and particularly described and specified hereinafter.

Referring to the accompanying drawing, forming part hereof:—

Fig. 1 shows a form of my improved cutter in side elevation on an enlarged scale, looking at the flat of the cutting end of the cutter.

Fig. 2 shows the cutter in elevation from the opposite side, showing the convex side of the cutting end.

Fig. 3 is a side elevation of the cutter showing the flat cutting end thereof in edge elevation, dotted lines showing a wrench on the upper wrench receiving portion of said cutting end.

Fig. 4 is an enlarged plan view of a form of wrench for twisting or "wringing" the cutters into and from the tapered socket in the cutter holding and driving rotary spindle of the engraving machine.

Fig. 5 is a plan, partially broken away, of another form of wrench.

Fig. 6 is a plan, partially broken away of still another form of wrench.

The rotary cutters now approximately universally employed in engraving machines, for doing the work hereinbefore mentioned, are formed with an exterior approximately cylindrical enlargement located about midway the length of the cutter between and axially alined with the tapered shank of the cutter and the tapered flat side cutting or working end of the cutter, and this center enlargement is of much greater exterior diameter than the maximum diameters of the bases of the axially alined cutting and shank ends of the one-piece cutter so that abrupt exterior annular radial shoulders of substantial length are formed at the ends of the enlargement where the bases or large ends of the shank and cutting ends merge thereinto. This central exterior enlargement is formed with exterior diametrically opposite wrench flats to receive the jaws of a spanner or bifurcated wrench by which the cutter is rotated or axially oscillated when being forced into and from the tapered socket of the engraving machine rotary spindle.

These cutters are cut down from cylindrical steel stock or blanks that throughout their lengths are of a diameter at least equal to the diameter of the central exterior enlargement of the finished cutter, and hence the surplus metal removed and wasted is approximately equal to the metal remaining in the finished cutter and much time is consumed in thus machining the stock and in finishing the article. After machining the article to produce the center enlargement and tapered ends, the cutting end, at least, of the article must be subjected to a hardening and tempering process, which is rendered difficult and uncertain as to satisfactory results by reason of the excessive amount of material at the enlarged center of the article. The formation of the wrench flats in the enlarged central portion, necessitates a separate operation. The cutter so formed with an enlarged central portion, renders the finished article weak and liable to fracture where the tapered shank joins into the abrupt shoulder formed by the enlargement end. The abrupt shoulders formed by the ends of the center enlargement, render it difficult and expensive to grind the tapers and flats, and also necessitate a relatively short cutting end and flat and limit the distance the tapered shank

can enter the tapered socket of the rotary cutter spindle. These very small engraving cutters having slightly tapered shanks, are seated in the tapered sockets of the rotary cutter spindles, by simply "wringing" or rotating and forcing them in by a small spanner wrench fitting the wrench faces of the cutter enlargement, and it is more or less difficult to fit and hold the wrench on such enlargement and faces. In the course of a few months the spindle taper is worn several thousands of an inch too large for the cutter shank and as a result the shank enters too far into the socket and the abrupt shoulder of the cutter enlargement abuts the spindle end, leaving the cutter shank loose in the spindle. The machine user consequently complains that the cutters are too small, or the tapers are not correct. It is then necessary to return the spindle to the factory where the ends of the spindle are ground off, or a new spindle furnished.

The problem was to overcome the foregoing, and other difficulties that I have discovered in the manufacture and use of these old cutters in general use, and to this end and as a successful solution of this problem, I have produced an engraving machine cutter, the preferred example of which is illustrated by the accompanying drawing, wherein the single rod or elongated bar or piece of steel, or other suitable material, is shaped to form, in longitudinal alignment, a tapered shank 1, and a single-lip cutting end 2, that is ground to form the flat side 3. The shank and the cutting end make up the entire cutter as the cutting end starts where the shank stops without exterior wrench faces or shoulders except such as formed by the flat side.

Figs. 1, 2 and 3, show a form of my cutter enlarged to possibly two or three times actual cutter full size, and this is the form I prefer for the cutters of my invention having cutting ends for coarse or heavy work. In this cutter the cutting end 2, is substantially shorter than the shank 1, and tapers or reduces from the middle portion of the length of the tool or cutter to the working point of the cutting end. In other words, the exterior over all maximum diameter of the cutter or tool does not exceed the diameter of the base of the shank 1, i. e. the maximum diameter of shank 1, which maximum diameter in Figs. 1 to 3, is located at the transverse plane *a*, located a substantial distance closer to the cutting point of cutter end 2, than to the reduced end or tip of shank 1. In this particular form, the large end or base of the longer taper 1, namely; the shank, meets the base of the shorter taper 2, namely; the cutting end, so that in this particular cutter form, the steel rod forming the cutter tapers or reduces towards its opposite ends from the transverse plane *a*, where the cutter is of maximum strength and exterior diameter, and where the bases of the oppositely tapered ends meet without an intervening enlargement or other metal length. This formation enables me to extend the flat side 3, of the cutting end 2 longitudinally of the cutter along the meeting or merging bases of the shank and cutting end and a substantial distance into the shank 1, to form the flat side extension 3*a*, that extends from and beyond the large end or base of cutting end 2, and across and beyond the center of the overall length of the complete cutter, as well as longitudinally along and beyond the maximum diameter portion of the cutter. In forming the flat side 3, 3*a*, of the cutter, approximately one half the thickness or diameter of the cutter is ground away. By thus extending the flat side of the cutting end across the center of the cutter and along the base portion of the shank, I provide a wrench flat or face 3*a*, at the portion of the cutter of maximum strength and diameter, and also, in this example, increase the effective length of the cutting end. I am thus enabled to avoid the extra operation and added expense involved in forming the cutter with the small opposite side flats or depressions heretofore necessary to receive the small spanner wrenches by which the old cutters were forced into and from the spindle sockets. With these small cutters and the necessarily small wrenches, particularly when poorly illuminated, it was exceedingly difficult to locate the pair of flats and apply the wrench in the proper direction and at the proper angle and fit and hold the same thereon. I can utilize this single wide wrench face or flat 3*a*, in forcing and rotating my cutter into and from the spindle socket, by slipping a socket wrench over the cutting point of the cutter and upwardly thereon to its seat on the face 3*a*, or by slipping the jaws of an open end socket wrench radially onto the tool to straddle the same at its portion of maximum thickness that includes wrench face 3*a*.

For this purpose, I can employ a flat lever wrench such as 5, having a transverse hole or socket 5*a*, of approximately the transverse shape and dimensions of the cutter above the transverse plane *a*, i. e. at the wrench flat portion 3*a*.

Also, a flat lever wrench, such as 6, can be employed having a transverse socket or hole oblong in form with straight edges 6*a*, either of which will fit on and across the flat portion 3*a*, the oblong hole being of a size to permit free passage of the cutting end 2, up to flat 3*a*.

Also, a flat lever wrench such as 7, can be employed, having a slightly tapered socket open at one end to form a pair of parallel spaced jaws 7*a* to radially straddle the central portion of the cutter that includes flat 3*a*, with the wrench handle extending radially therefrom.

In production, this cutter of Figs. 1 to 3, requires only approximately one-half the amount of steel and about one-third the labor costs, as the old cutter of corresponding length and size in the production of which one-half of the blank or stock is wasted, all because, in my cutter, the bases of the shank and cutting ends merge together about midway the length of the cutter without the formation of exterior shoulders or abutments with the maximum exterior diameter of the cutter not exceeding the maximum diameter of either end. This peculiar formation of the cutter enables me to harden and temper the cutter with more uniform desirable results, and the production of better and stronger cutters and a substantial reduction in the percentage of defective articles, and eliminates the weak point in the old cutters, all with a resulting very substantial reduction in the cost of production.

The peculiar formation of my cutter without exterior annular abutments or shoulders and with its maximum exterior diameter not greater than the maximum diameters of the shank and cutting ends of the tool, enables me to provide a tapered shank of full length that will enter the rotary spindle socket a greater distance than is possible with the old form of cutter, and also enables me to produce the cutter with a cutting end having its flat side of substantially greater length than that of the old cutter and hence of

substantially longer working or operative life than the old cutter. In the old cutter, this flat faced end can extend only from the point of the cutter to the adjacent abrupt shouldered end of the exterior longitudinal center enlargement which separates the base of the tapered shank from the base of the tapered cutting end. Whereas in my cutter, I have extended the ground-down flat face 3, at 3*a*, longitudinally toward the small end of the shank and along the central portion of the tool where it is of greatest strength and diameter and across the base portion of the tapered shank 1, thereby substantially increasing the effective cutting length of the cutting end 2, of the tool over the corresponding portion of the old cutter of corresponding over all length.

The formation of my cutter, with a full length tapered shank that is not obstructed at its base by an exterior annular or other abrupt shoulder or enlargement, even though the flat 3, is at 3*a*, extended longitudinally into the base of the shank, avoids the difficulty incidental to the old cutters, where the spindle sockets become worn, namely; the resulting looseness of the old shanks in such worn sockets. With my cutters, as the spindle sockets become worn, the cutters can be forced increasing distances into such sockets to secure the desired tight fit, say up to approximately an increased distance of an eighth of an inch or possibly more. The life of the cutter spindle is hence lengthened.

My cutter is not only more durable and of greater strength than the old cutter, but can be employed for engraving in crowded quarters and in restricted areas, where the old cutter can not be used because of its excessive center enlargement and relatively short cutting end. Also my cutter formation enables me to employ simple inexpensive means for and method of grinding the tapers which substantially reduces the cost of production as compared to the costs of producing the old cutter of corresponding length and size.

Where fine and light cutter work is required, more delicate cutting or engraving work than can be performed by the cutting end of the cutter of Figs. 1–3, when its point is sharpened, the manufacturer of my cutter, will in the process of producing the cutter of Figs. 1–3, preferably before the hardening and tempering treatment, by grinding or otherwise, reduce the transverse dimensions, or width and taper of the cutting end 2, so that when said reduced tapered end is ground down to produce the flat side 3, which extends at 3*a*, into the shank, the cutting end and its flat side will be sufficiently narrow and reduced in width including its point, to produce the narrow or fine cutters and do the fine work required, when the point has been sharpened by the user to meet his requirements. These small or fine work cutters, are produced from the standard cutters of Figs. 1–3, merely by grinding down the cutting ends thereof to the taper and width required, so that the upper base portion of the cutting end below plane *a*, and below where the cutting end base meets and merges into the shank base, will contract downwardly with a longitudinal annular bevel or taper without producing a weakened neck or portion. This form of my cutter having the single-lip cutting end of reduced width, is also without the objectionable pairs of tangential exterior wrench flats on the shank or on any portion of the cutter intervening between the bases of the shank and cutting end and also without objectionable annular shoulders on the shank or such intervening portion.

Also, where a very heavy duty cutter of my invention is required having a wide nosed square pointed cutting end for routing out considerable areas, the cutter can be of, but not exceeding, the diameter of the base of shank from transverse plane *a*, to the point of the cutting end, ground down to semi-cylindrical form to provide the flat side that extends longitudinally of the shank base into the shank, all as hereinbefore described, but in this form the flat side will be of uniform width throughout its length.

In all of these forms of my invention, the manufacturer produces the rotary single lip cutters in the blank forms approximately as shown and described, and the user or machine operator grinds the points of the single-lip or flat side cutting ends according to the work to be formed or according to his own desires, to produce conical flat, angular points, or square pointed cutters, etc. or if he so desires and is equipped for so doing, the user may grind the single lip to produce the reduced width or edge taper of the flat side thereof, as hereinbefore described.

The disclosure hereof is illustrative for purposes of explanation and not for limiting and restrictive purposes except where required by the following claim when construed as broadly as permitted by the prior art.

What I claim is:—

An engraving machine rotary cutter consisting of a conical shank of uninterrupted longitudinal taper from its base of maximum exterior diameter, and a single lip cutting end projecting longitudinally directly from said base, said cutter having a longitudinal flat side throughout the length of said cutting end and extended longitudinally of said tapered shank a substantial distance into and along said shank, said extended portion of said flat side providing the wrench face of the cutter, whereby said cutter is adapted to receive a complementary wrench to operatively fit said wrench face and the base portion of said shank and longitudinally and rotatively force said tapered shank into and from the engraving machine cutter spindle socket.

GEORGE GORTON.