Nov. 26, 1935. W. G. COSTIN ET AL 2,022,076

FABRICATION OF NUT BLANKS

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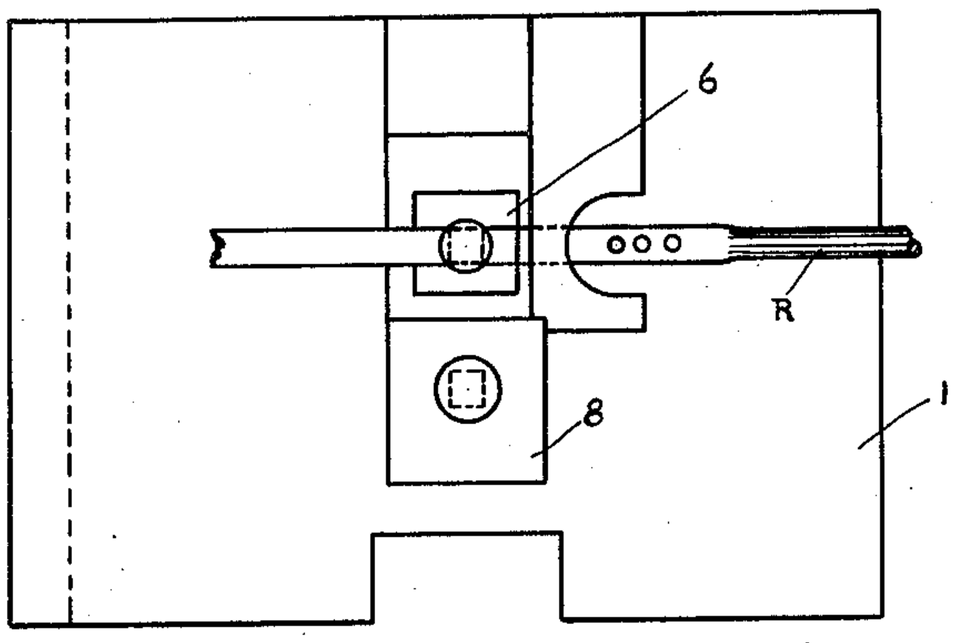


Fig. II

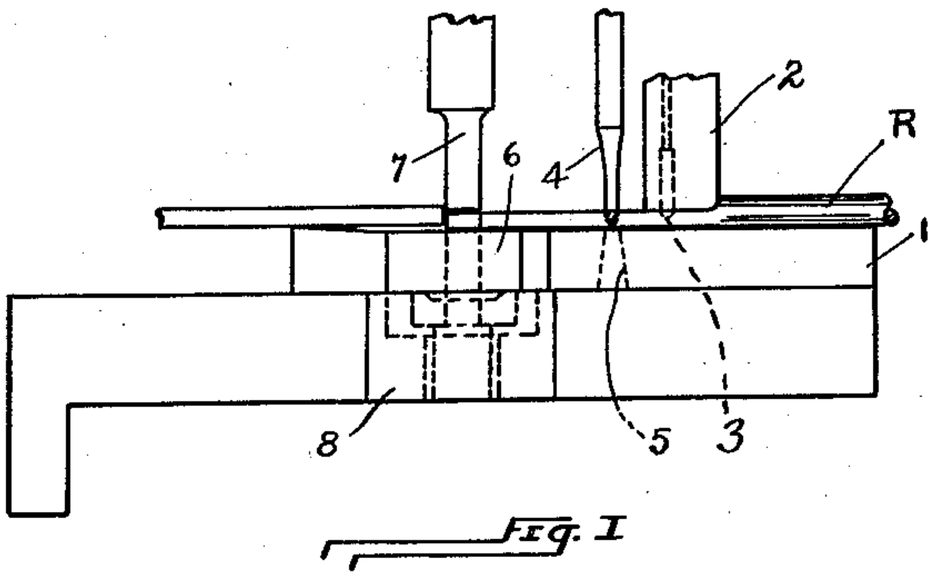


Fig. I

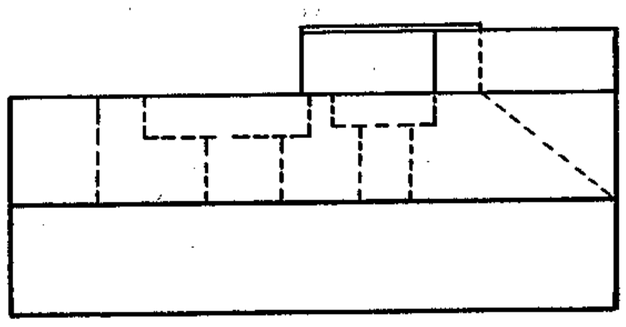

Fig. III

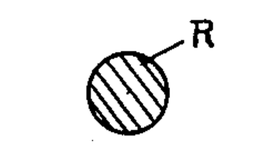

Fig. IV

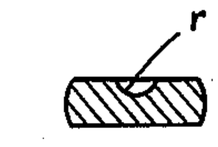


Fig. V


Fig. VI


Fig. VII

Fig. VIII

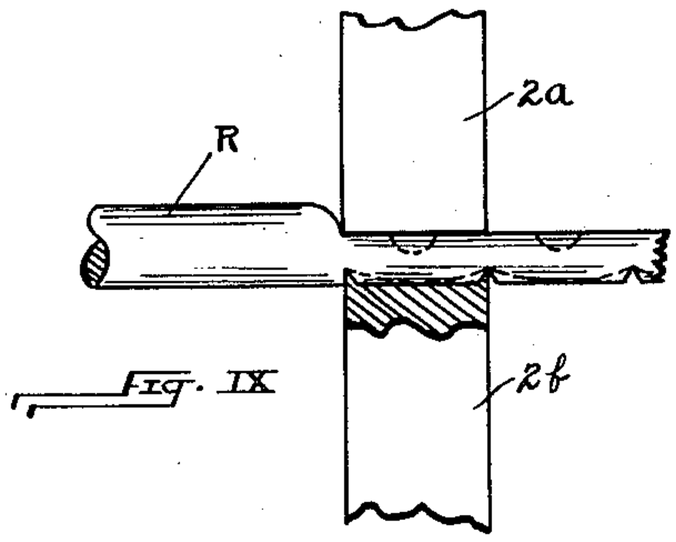


Fig. IX




Fig. X

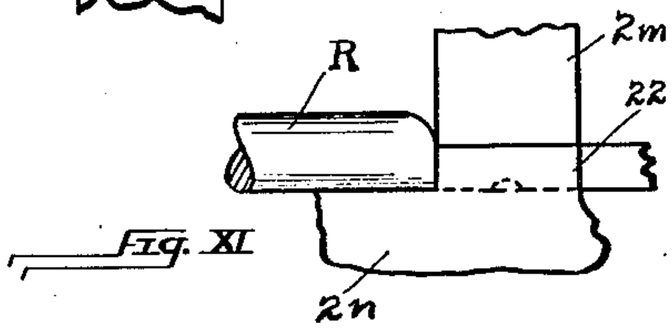


Fig. XI

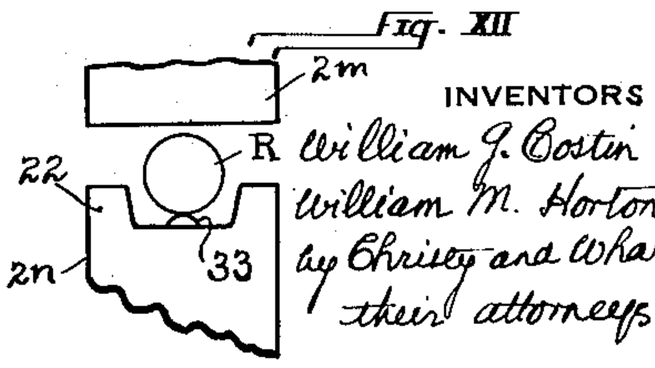


Fig. XII

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## FABRICATION OF NUT BLANKS

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Application June 1, 1935, Serial No. 24,500

1 Claim. (Cl. 10—86)

This invention relates to the fabrication of nut blanks and consists in a method that may be practiced with economy.

In the accompanying drawing Fig. I is a view in side elevation of a machine in the operation of which the method of the invention may be performed; Fig. II is a view in plan and Fig. III a view in end elevation of the bed of the machine, and illustrates somewhat diagrammatically the development of a succession of nut blanks from a length of rod, according to the method of this invention; Figs. IV–VIII are views in transverse section of the work at successive points in the progress of operation; Fig. IX, corresponding to Fig. I, illustrates a permissible variation; Fig. X is a fragmentary view in end elevation and illustrates a further variation; Figs. XI and XII are views in side and end elevation illustrative of yet another variation in machine structure and operation.

In the production of nut blanks it is common practice to begin with steel rod rolled to rectangular shape and approximately to the size and cross-section of the completed blank. The rod of such rectangular cross-section is shaped from an ordinary round or oval rod, by rolling in a special mill, and is a relatively expensive material. The operation of developing nut blanks from such a specially rolled rod of rectangular cross-section consists in subjecting the rod to a succession of particular pressing and cutting operations that include perforating, shearing, crowning, and trimming. In the common practice here alluded to, not only is the initial material, the rectangular rod, a relatively expensive material; it is a material that presents difficulties in the further fabrication of the nut blank. It does not always lend itself perfectly to the pressing and cutting instrumentalities. The rod cannot in the nature of the case be perfectly formed; the rectangle of the cross-section is not always sufficiently true; there is not perfect straightness of the rod longitudinally; and the results of such irregularities are inequalities in the stresses exerted upon the shaping instrumentalities, the consequently frequent failures of the shaping instrumentalities, and imperfection in the blanks produced.

The practice of our invention begins with the ordinary rod of round or oval cross-section, as it comes from the ordinary rod mill. We do not require, nor desire, a specially shaped rod. Accordingly, this first feature of our invention affords the saving of the extra expense otherwise involved in the provision of a specially rolled rectangular rod. Our operations are such that minor variations in size and shape and straightness of the rod are permissible. We shape the round rod as we proceed. In so doing, we eliminate such small irregularities of size and shape as may be present; and we do this without heavy wear and tear upon the shaping instrumentalities.

Specifically, we begin with an ordinary rolled rod of round or oval contour such as is sufficiently illustrated in Figs. I and IV. The initial rod is shown at R, on the right in Fig. I, and in cross-section in Fig. IV. This rod is advanced upon an anvil-block 1 having a plane and horizontally extending face, and the advance is intermittent, step by step, through uniform and predetermined intervals. The so advancing rod comes first beneath a vertically reciprocable die 2 having an essentially plane and horizontally extending nether face. The forward feed of the rod is coordinated to the reciprocation of the die; the range of die reciprocation is predetermined, and the power suffices to crush the rod R locally to an incipient blank of definite and (within permissible tolerance) predetermined thickness. Referring still to the drawing, the rod R is upon anvil 1 and beneath die 2 reduced locally and through a unit of length from the cross-section of Fig. IV to that of Fig. V. In this flattening, it will be perceived that the metal is unconfined laterally, but spreads freely; and in that freedom to spread provision is found for small irregularities in the size of the rod. The result of the action of die 2 is an intermediate product (Fig. V) that is of constant and predetermined thickness, but of permissibly varying breadth. And variation in breadth is a matter that is, as hereinafter will appear, within reasonable limits, insignificant.

In this flattening step it will be perceived that, simultaneously throughout its extent, a fractional unit in the length of the rod is brought to the intermediate shape, Fig. V.

In this machine the organization is such that the range of step-by-step advance of the rod is (with mechanical allowances) one half the extent of the face of die 2; and (making a down-

ward stroke with each pause in the advance of the rod) the die 2 impinges twice on each successive unit in the longitudinal extent of the rod. The die 2 is advantageously equipped with a protuberance 3, so situated that in the second impingement upon each sucsessive unit it sinks a re-entrant recess *r* in the flattened face of the rod, and incidentally effects some spread laterally of the substance of which the rod is composed. Such recessing of the blank is illustrated in Fig. V. In consequence of this, a somewhat smaller rod will afford a nut blank of adequate size—a feature, however, of small significance in the case of the square nut blank, whose production here is illustrated. It is a feature of greater and very substantial significance in the production of blanks for hexagonal nuts.

The flattening of the rod beneath die 2 is, it will be perceived, an essentially different operation from the progressive rolling of a rod to rectangular cross-section, as is done in the production of the material that constituted the initial material for the old practice as characterized above.

The first feature of the method of the present invention is the flattening beneath a die of the forward end of an ordinary rolled rod throughout successive units in its length, step by step, from its forward end rearwardly. And in such flattening the rod may be shaped with a succession of re-entrant recesses in its face.

The so flattened forward end of the rod, in the step-by-step advance described, comes intermittently to rest upon anvil 1 beneath a punching die 4, and beneath this die (operating when the rod is at rest) and through a co-operating orifice 5 in the anvil block 1 a succession of holes H is punched. The blank is thus brought locally to the cross-sectional shape shown in Fig. VI. The step-by-step advance of the rod through a predetermined and constant interval affords the equal and proper spacing of the succession of holes H.

The organization of the machine is such that the blank comes to punching position beneath die 4 with the re-entrant recesses *r* centered beneath it. The punching operation, therefore, displacing less metal, is performed with less expenditure of power, and the quality of scrap here produced is diminished.

From the flattened and perforated rod the nut blanks are sheared. It is a known refinement of such machinery that the punching and cutting instrumentalities may be combined into a single pair of compound instrumentalities, in whose stroke first perforation and then cutting are performed; but, so far as concerns method, the two steps of perforating and cutting are successive; and in this presentation we have, for the sake of simplicity, shown two pairs of successively acting instrumentalities—one for perforating, the other for cutting. An orificed shearing die 6 is mounted on the machine bed and a reciprocating shear punch 7 co-operates with the orificed die 6 to effect shearing. Again, the organization of the instrumentalities is such that the shearing members act upon the continuous length of rod when the rod in the course of its step-by-step advance is at rest; and, with each reciprocation, these instrumentalities cut from the end of the rod a unit length that has previously been flattened and centrally perforated.

The die 6 and the punch 7 may in known manner be so shaped as to serve, not only to shear off a succession of nut blanks from the end of the intermittently advancing rod, but also, by further traverse of shear punch 7, to effect a crowning of the nether face of the severed blank—that is to say, to give to the face of the blank the familiar chamfered form (C, Fig. VII). To such end the orifice in die 6 is a pocket of properly shaped bottom, and the punch 7 becomes a plunger, to crush and shape the severed blank in the bottom of such pocket.

It is a feature of the method of the invention that, because of the bulged and rounded lateral faces of the flattened rod, the crowning of the sheared-off nut blank involves less displacement of metal and is therefore accomplished with less expenditure of power and less wear and tear upon machinery than in the crowning of nut blanks made from a strip previously rolled to rectangular shape.

The crowning of the blank, here shown to be accomplished in sequence upon the shearing step, is a step that may or may not be taken; and, if taken, it may be taken at another point and in another combination in the sequence of operations and in the organization of the machine. In Fig. IX, for example, the dies 2*a* and 2*b* co-operate to flatten the rod, and the die 2*b* is so shaped, and the organization may be understood to be such, that, in addition to flattening, these dies give to each successive flattened unit the desired crowned shape. After the dies 2*a* and 2*b* have closed upon the rod and flattened a unit length and imposed upon its nether face the crowned shape, they recede to allow the rod to advance.

When the severed nut blank has been crowned, the blank by suitable means is advanced to position above an orifice in a trimming die 8. Co-operating with this orifice is a receiprocable die (not shown). Such reciprocable die descends upon the properly placed blank and in known manner shears from the blank the excess metal intentionally provided at the margin of the blank, and brings the blank to accurate size and shape. The trimmed blank is shown in Fig. VIII.

From the trimming die 8 the blank may escape to a suitable receptacle or conveyor.

It is a feature of our invention that, because of the bulged and rounded opposite edges of the unsheared blank, this ultimate trimming step is performed with relatively small wear and tear of machinery. The body of metal that in the trimming operation is cut away from two of the opposite sides of the blank is at the upper edge (where the cut begins) of relatively small thickness; the thickness increases from the upper edge of the blank downwardly, and then decreases again to a minimum. Such a distribution of metal has effect in an easing in the imposition of strain upon the cutting instrumentalities.

It is entirely possible to provide the die 2 with plane-faced and substantially vertically extending skirts, to limit the lateral spread of the metal, and to bring the flattened rod more nearly to the ultimate cross-section of the completed nut blank. This is illustrated in Fig. X, where the die 2*c* is shown to be provided with skirts 21, whose function and effect are manifestly such as has just been indicated. In Figs. XI and XII the skirts 22 are shown to be formed integrally, not with the upper die 2*m*, but with the lower die 2*n*. A like function and effect are produced. We prefer, however, to allow the rod under the flattening pressure to spread laterally without confinement, as first described, and as illustrated in Figs. I and III.

Figs. XI and XII additionally show that, instead of the upper die 2*c*, the lower die 2*n* may be equipped with a recess-producing protuberance 33; and in such case the recess will be formed, not in the upper, but in the lower, surface of the blank. The value and effect described will be present.

We claim as our invention:

The method herein described of forming a nut blank from a rod of rounded contour as it comes from the rolling-mill, which consists in shaping under pressure uniformly and simultaneously exerted throughout its extent a unit portion in the length of the rod between lateral confining walls to a configuration of opposite flattened upper and lower surfaces and opposite flattened lateral surfaces, and perforating and shearing free such flattened portion.

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