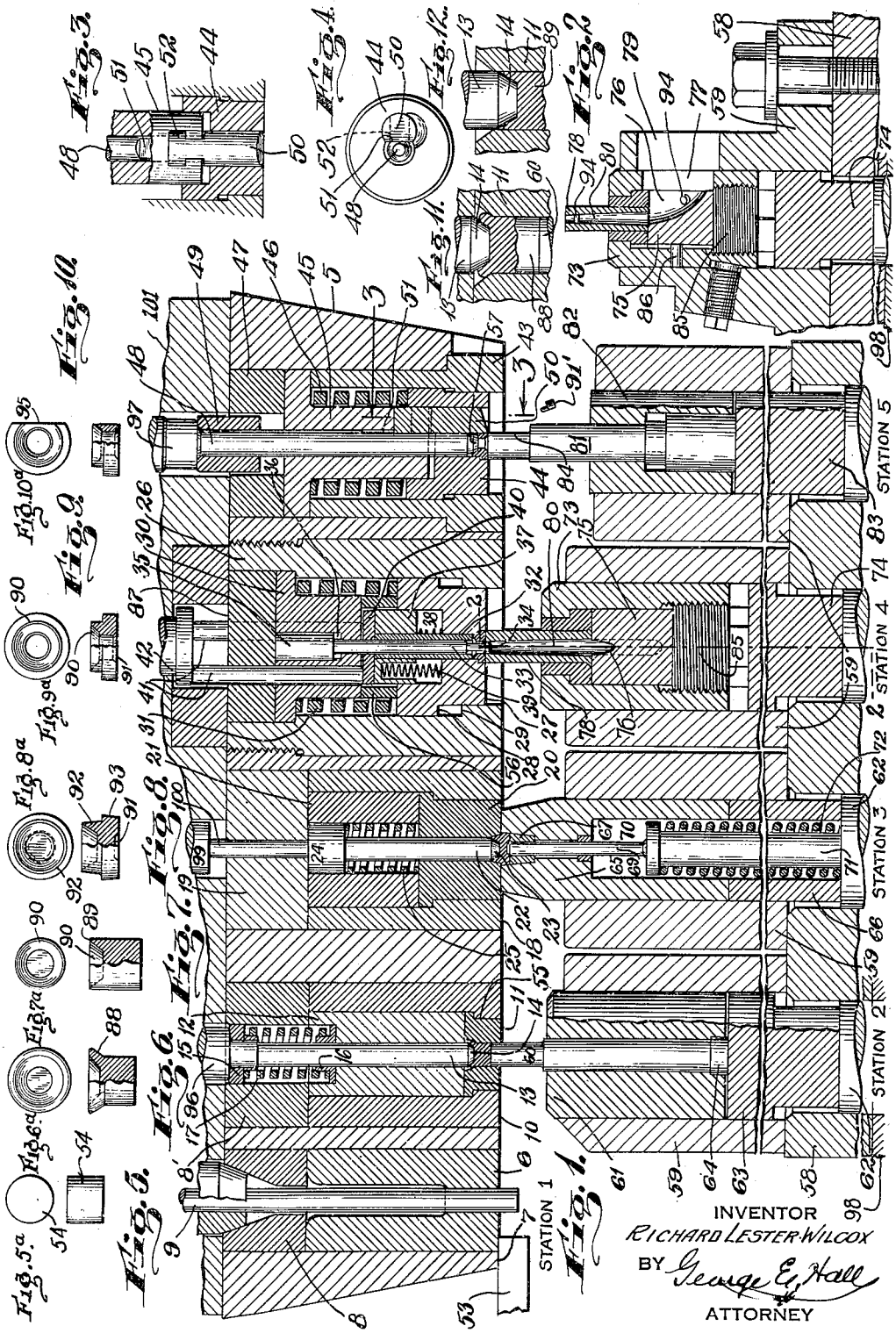
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MEANS AND METHOD OF MAKING NUT BLANKS

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MEANS AND METHOD OF MAKING NUT BLANKS

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This invention relates to new and improved means and method for making nut blanks.

It is the object of this invention, among other things, to automatically produce at high speed, with the minimum number of operations and with the minimum loss of material, a nut blank or the like from a wire length.

This invention is illustrated as applied to the production of nut blanks of the so-called D-type, wherein the blank is substantially cylindrical, with one or more diameters, and with one or more flat sides, that are substantially parallel with the axis of the opening in the nut, the flat side being preferably, although not necessarily formed upon a portion thereof having a diameter larger than the minimum, and whereby such portion is semi-cylindrical.

In the means and method herein disclosed, a portion of a wire length, cylindrical in cross section, is cut therefrom and successively presented to a plurality of stations, at each of which an operation is performed thereon and by reason thereof the nut blank in its completed form is produced.

As the means and method for threading the nut blank are old and well known, such means are not shown or described herein. If desired, however, the nut blank may be transferred to a nut threading machine for the threading operation.

To these and other ends, my invention consists of the means and method for making a nut blank, as hereinafter described, and more particularly pointed out in the claims, reference being made to the drawing, which illustrates a preferred form of the invention, and wherein like numerals of reference indicate like parts in the several figures;

Figure 1 is a fragmentary sectional view of the improved means, the blanks in process being shown at some of the stations;

Figure 2 is an enlarged fragmentary sectional view of one of the punch holders and adjacent parts, taken generally upon line 2—2 of Figure 1.

Figure 3 is an enlarged view of the knife and a fragmentary sectional view of some adjacent parts, taken generally upon line 3—3 of Figure 1;

Figure 4 is a detail view of the die and associated knife;

Figure 5 is a view of the cut-off portion of the wire length and from which the completed nut blank is formed; Fig. 5ª is an end view thereof.

Figures 6 to 9, inclusive, are views of the blank in process after several successive operations thereon, some of these blanks being shown partly in section; Figures 6ª, 7ª, and 8ª and 9ª are end views respectively of the blank as severally shown in Figures 6 to 9 inclusive.

Figure 10 is a view of the nut blank in its completed form, partly in section.

Figure 10ª is an end view thereof; Figure 11 is an enlarged fragmentary sectional view of the punch and die mechanism at station 2, with a portion of a blank positioned therein; and Figure 12 is a similar view with the punch and blank in different relative positions.

The means herein disclosed are preferably, although not necessarily, mounted in a header or upsetting machine, wherein a die block 5 is fixed in the body or frame 101 of the header or the like, as is usual, and having a gate or slide 98 that in the conventional header moves toward and away from the die block and carrying thereon a plurality of punches and like tools.

In the die block 5 are a plurality of tools, the shape and function of which vary at the several stations, serially designated station 1 to station 5, inclusive.

At station 1 is a cut-off die 6, the outer end of which is substantially flush with the face 7 of the die block 5, and the rear face of which engages a backing block 8, and through which passes a wire length 9. A cut-off knife 53, actuated in a well known manner, severs that portion of the wire length 9 that projects in front of the die block face 7, and producing a cylindrical piece 54, from which the completed nut blank is formed.

At station 2 is a bushing 10, backing block 8', die 11, and between the rear end thereof and the backing block 8' is a sleeve 12 guiding a reciprocating punch 13, actuated in part by a knockout rod 96. The pressure end 14 of this punch is preferably shaped as the frustum of a cone and the opposite end is fixed in a collar 15, between which and the collar 16 is a spring 17.

In the formation of the nut blank herein shown, the punch end 14 is shaped to conform generally with the shape of the recess in the end of the blank, in this case, the frustum of a cone, but within this invention it may have other shapes. The die 11 has a circular opening therethrough, with the walls 55 at the inner end flaring outwardly.

At station 3 is a bushing 18, a backing block 19 and die 20, between which and the block 19 is a sleeve 21. Movably mounted in these parts is a punch 22, the outer end 23 being formed substantially, but not necessarily, in the shape of a frustum of a cone, as is the end 14 of the

punch 13. Between the punch collar 24 and the die 20 is a spring 25. A knockout rod 99, through the pin 100, actuates the punch 22 in one direction.

At station 4 a bushing 26 is threaded into the die block 5 and movably mounted therein is a die 27, its movement in one direction being limited by the engagement of the shoulders 28 and 29. Concentric with the die 27 is a backing block 87, and a bushing 30, and between a shoulder on the latter and die 27 is a spring 31. A punch quill 32 forms a guide for the piercing punch 33, the outer end 34 thereof having a cross section substantially the same as the opening through the nut blank. The head 35 of punch 33 is movable within a recess 36 in the bushing 30. A member 37, within a recess 38 in the die 27 is moved in one direction by a plurality of springs 39, spaced about its axis and provides a support for the inner end of the punch quill 32. Surrounding the punch 33, between the bushing 30 and member 37, is a pressure plate 40. Between a knockout rod 42, actuated in the usual manner, and the pressure plate 40, are one or more pins 41. A stop ring 56 limits the spacing between the die 27 and bushing 30.

At station 5 is a sleeve 43, within which a die 44 is movably mounted. Concentric therewith is a sleeve 45, the flanged head of which engages the sleeve 43, and between which and the die 44 is a spring 46. Between the head of the sleeve 45 and the rear face of the die block 5 is a backing block 47. Slidable in the die 44 and sleeve 45 is a pin 48, having a centering tip 57 at its outer end and a collar 49 or the like at the inner end thereof which is engaged by the knockout rod 97. Mounted in the sleeve 45 and slidable in the die 44, upon one side of the center thereof, is a knife 50, the inner face of which is substantially flush with the flat face 51 of the pin 48. One method of mounting the knife 50 is shown in Figure 3, wherein the knife 50 is provided with a T-head 52, which projects into a T-slot in the sleeve 45. Other means, of course, may be used as seems desirable.

Upon the reciprocating gate are tools, which cooperate at the several stations with those in the die block and above described, to perform an operation upon the blank, such operations progressively shaping the blank to its final form.

Upon the face of the gate 98, of any conventional form, is a plate or the like 58, upon which are adjustably mounted a plurality of punch holders 59 of like conventional form.

At station 2 a punch 60 is mounted in a bushing 61, within a punch holder 59. The diameter of the outer end of this punch is substantially the same as that of the opening in the die 11, into which it is projected. As is usual with this type of mechanism, the relative position of the punch is varied through a backing block 63 by an adjustable plug 62 adjustable endwise through wedge mechanism or the like. The punch 60 is preferably provided with a head 64, one face of which is in substantial engagement with the backing block 63 and is thus held against endwise movement within the bushing 61.

At station 3 a punch 65 is mounted in a punch holder 59, and between which and the backing plug 62 is a backing block 66. In the outer end of punch 65 is a recess, the walls of which are slightly tapered, and in the bottom thereof is a member 67, preferably of hardened material, the outer face of which is spaced inwardly from the outer face of the punch 65. That portion of the recess between the face of the punch 65 and the member 67 is the same as the larger portion of the finished nut and wherein it is shaped.

Movable within punch 65 and member 67 is a pin 69, the inner end of which engages the head of spring rod 71, which is movable within the recess 70 and encircled by a coil spring 72.

At station 4 a bushing 73 is mounted in a punch holder 59, in which is a punch 78, between which and the backing block 74 is an adjustably secured member 75, on one side of which is a recess 76, having a curved wall opposite a slot 77 in the bushing 73, which likewise registers with an opening 79 in the punch holder (Figure 2). Through punch 78 is an opening 80 which registers with the recess 76.

At station 5 a punch 81 is held within a bushing 82 mounted in a punch holder 59, one end of which engages the backing block 83. The outer end of the punch 81 is reduced substantially to the outside diameter of the finished nut, with one side 84 flattened substantially parallel with the punch axis.

The bushing 73 is secured against movement by a screw 85 and the member 75 against rotation by a dowel pin 86 or the like, which projects into a slot in said member and insures registering of the recess 76 with slot 77.

In operation, the rod 9 is fed through the die 6 by any well known means until the end thereof advances in front of the face 7 of the die block 5 a predetermined distance, determined by a stop or other device. The cut-off knife 53, moved in a well known manner, severs the projecting portion of the rod, which now becomes a cylindrical blank (Figure 5). This blank is then carried by transfer means into register with the tools at station 2. As the gate moves toward the die block, the punch 60 pushes the blank into the opening in the die 11 and the inner end thereof, during its advance, engages the then stationary end 14 of the punch 13. Such engagement causes the metal of the blank, during the further advance thereof into the die, to flow outwardly at said inner end, toward the flaring walls 55, and simultaneously indenting or recessing the blank, which is now shaped, as shown in Figure 6. As the punch 60 is withdrawn, punch 13 is advanced by the knockout rod 96, returning the blank through and out of the die 11. While being returned through the die, the outwardly flaring walls of the blank are drawn inwardly to substantially its original outside uniform diameter and at the same time, due to the tapered punch end 14, thins the walls 88 of the recess at the outer ends, as at 89, the recess 90 is deepened, and the blank lengthened. The shape of the blank after this operation is shown in Figure 7. It is thereafter transferred into line with the tools at station 3. At this time the pin 69 which is projected beyond the face of punch 65 by spring 72, engages the blank and moves it out of the transfer mechanism into the recess of the die 20 against punch 22, and in advance of the punch 65. This permits the transfer mechanism to clear the punch 65 as it advances. At this operation, the exterior of the blank is reshaped, the portion 92 thereof being formed in the recess in the die with the portion 93 being formed in the recess in the punch 65. As so formed, the portion 92 is of less diameter than the portion 93. The exterior walls of both portions may be substantially parallel with the axis of the blank or tapered. Other shapes may be provided, for which the die and punch will be suitably formed.

With the walls of the inner portions 92 and 93 slightly flaring, the flow of the metal at this station is without strain upon the tools.

The member 67 in punch 65 provides a hardened surface to receive the upsetting pressure that otherwise might break the punch. As punch 65 is withdrawn, knockout pin 69 ejects the blank therefrom and knockout pin 22 ejects the blank from the die 20. The blank is now carried by transfer mechanism to station 4, where it is pushed out of the transfer mechanism by the punch 78 and into a recess in the face of the die 27, which yields against the tension of the spring 31 until it engages the stop ring 56. The recess in the face of the die 27 is substantially the same as the exterior shape of the blank as it leaves station 3. When the parts are in the position described, the punch 33, with its head 35 in contact with the backing block 87, is in a fixed position, when punch 78 pushes the blank, in the form shown in Figure 8, into the recess of die 27, and then with the blank pushing the die 27, compressing the spring 31, over the end of the piercing punch, thus piercing a hole in the blank by the then stationary punch 33. The slugs 94 formed by this operation escape through the opening 80, recess 76, slot 77 and opening 79, into a receptacle conveniently arranged to receive them.

As the punch 78 is withdrawn the blank remains between the end thereof and the die 27 until the face of die 27 is substantially flush with the face 7 of the die block 5, at which time the shoulders 28 and 29 are in contact with each other. Thereafter, the punch 78 continues its withdrawal movement and the knockout rod actuates the quill 32 and the blank is ejected from the recess in the die 27 and is received by and carried to station 5 by the transfer mechanism. At this station the blank is ejected from the transfer mechanism into the recess in die 44 by the punch 81.

The blank is supported by the punch 81 and the pin 48, the outer end of which projects into the recess in the blank. As the movement of the punch 81 continues, a portion of the larger diameter of the blank is sheared off by the knife 50 as the blank passes the cutting edge thereof. During this shearing operation the tip 84 of the punch 81 forms an anvil for the shearing knife. The sheared portion 91' of the blank 91 drops out into a receptacle conveniently arranged to receive it. After being sheared the blank has a substantially flat face 95, as shown in Figure 10a.

The wall left on the blank, after the severed portion or portions, is removed, may be substantially straight, as shown, or any other suitable shape, as may seem desirable. Such wall is nonconforming, that is, does not conform to the shape of the remaining portion of the blank from which the severed portion is removed. More than one side of the blank may be cut away within this invention.

Thus, by the invention disclosed, nut blanks of the D-nut type are made at relatively high speed and with the minimum loss of material, this loss being the portion of the blank removed by the piercing punch and that portion that is taken off by the shearing knife.

Within the scope of the appended claims, minor changes and alterations may be made within the invention herein disclosed.

What I claim is:

1. The method of producing a nut blank, or the like, from a solid piece by forming a recess in one end thereof by pressure and at the same time expanding the exterior of the blank adjacent thereto, then restoring the exterior of the blank to its original cylindrical form and deepening the recess, thereafter upsetting the blank without eliminating the recess, and piercing a hole therethrough, these several steps being continuous and simultaneously performed on separate blanks in the same machine.

2. The method of producing a nut blank, or the like, from a solid piece by forming a recess in one end thereof by pressure and at the same time expanding the exterior of the blank adjacent thereto, then restoring the exterior of the blank to its original cylindrical form and deepening the recess, upsetting the blank without eliminating the recess, piercing a hole therethrough, and severing a portion of the exterior of the blank and thereby producing a nonconforming portion, these several steps being continuous and simultaneously performed on separate blanks in the same machine.

3. The step in producing a nut blank, or the like, which consists in forming a recess in one end of a headless blank and expanding the exterior thereof at the same end while in a die and then restoring the exterior shape of the blank and at the same time deepening the recess while in the same die and simultaneously and by separate tools reshaping the exterior of the blank whose exterior was last expanded and restored.

4. The step in producing a nut blank, or the like, which consists in forming a recess in one end of a headless blank and expanding the exterior thereof at the same end while in a die and then restoring the exterior shape of the blank and at the same time deepening the recess while in the same die, the wall around the recess being thicker at its base than at its opposite end and simultaneously and by separate tools reshaping the exterior of the blank whose exterior was last expanded and restored.

5. The method of producing a nut blank, or the like from a solid piece by forming a recess in one end thereof by endwise pressure and simultaneously expanding that portion of the solid piece adjacent to the recess, then by a drawing process reducing such expanded portion so that its shape and size are substantially the same as that of the solid piece before being expanded, and simultaneously deepening the recess, then shaping the exterior of the blank without eliminating the recess whereby to form plural portions of varying diameter, piercing a hole through the blank, and then severing a portion of the exterior of the blank and producing a non-conforming portion, these several steps being continuous and simultaneously performed on separate blanks in the same machine.

6. Mechanism for making a nut blank, or the like, comprising in part a die having an opening therein that flares outwardly at one end; means for projecting a headless blank into the small end of the opening; and means engaged by the inner end of the blank while in the opening to expand said inner end until it substantially fills the flaring portion of the opening, which means will thereafter move the blank in a reverse direction through the opening and discharge same therefrom at the point of entrance and with the same exterior original shape, in combination with a second die spaced from the first mentioned die and a cooperating punch, whereby the exterior of the blank will be reshaped in the second die.

7. Mechanism for making a nut blank, or the like, comprising in part a die having an opening

therein that flares outwardly at one end; means for projecting a headless blank into the small end of the opening; and means engaged by the end of the blank while in the opening to expand the same into said flaring portion of the opening and form a recess therein, which means will thereafter move the blank in a reverse direction through the opening and discharge same therefrom at the point of entrance and with the same exterior original shape, in combination with a second die spaced from the first mentioned die and a cooperating punch, whereby the exterior of the blank will be reshaped in the second die.

8. Mechanism for making a nut blank, or the like, comprising in part a die having an opening therein that flares outwardly at one end; means for projecting a headless blank into the small end of the opening; and means engaged by the end of the blank while in the opening to expand the same into such flaring portion of the opening, which means will thereafter move the blank in a reverse direction through the opening and discharge same at the point of entrance and with the same exterior original shape and a deepened recess, in combination with a second die spaced from the first mentioned die and a cooperating punch, whereby the exterior of the blank will be reshaped in the second die.

9. In mechanism for making a nut blank, or the like, by pressure, comprising a plurality of companion tools at a plurality of independent stations, the tools at one station expanding the blank at one end, reshaping it and forming a recess in such end, at another shaping the exterior thereof, without distorting the recess, at another piercing a hole therein, and at another station cutting off a portion of the blank, all of the parts being so arranged that the operations are performed continuously and simultaneously on a separate blank at each station.

10. In mechanism for making a nut blank, or the like, by pressure, comprising a plurality of companion tools at a plurality of independent stations, the tools at one station expanding one end of the blank and then reducing the expanded portion to the exterior shape of the non-expanded portion, and forming a recess in one end of the blank, at another shaping the exterior thereof, at another piercing a hole therein, and at another station cutting off a portion of the blank, all of the parts being so arranged that an operation is performed on a separate blank at each station.

11. Mechanism for making nut blanks, or the like, comprising in part a rigid die with an opening therethrough of substantially uniform diameter that flares outwardly at its inner end; a punch concentric with said opening, the outer end of which in one of its positions projects into the flaring portion of the opening; means for actuating the punch whereby one end thereof will move through said opening and push a headless blank in advance thereof; and means for moving the punch in the opposite direction and withdrawing the same from the opening, in combination with a second die spaced from the first mentioned die and a cooperating punch, whereby the exterior of the blank will be reshaped in the second die.

12. Mechanism for making nut blanks, or the like, comprising in part a rigid die with an opening therethrough of substantially uniform diameter that flares outwardly at its inner end; a punch concentric with said opening, the outer end of which in one of its positions projects into the flaring portion of the opening; means for actuating the punch whereby one end thereof will move through said opening and push a headless blank in advance thereof; and resilient means for moving the punch in the opposite direction and withdrawing the same from the opening and simultaneously and by separate tools reshaping the exterior of the blank whose exterior was last expanded and restored.

13. Mechanism for making nut blanks, or the like, comprising in part a fixed bushing, or the like; a die movable therein having an opening therethrough, a concentric recess in the outer end thereof of the same configuration as a portion of the blank, and a larger recess in the rear end thereof; a quill movable within the opening in the die; means for positively imparting movement to the quill in one direction, comprising in part one or more pins and a knockout member engaged thereby; a piercing punch movable in said quill for piercing a hole in the blank; and resilient means for moving the die whereby its front face may be in a predetermined position and the recess in the outer end of the die ready to receive a blank.

14. Mechanism for making nut blanks, or the like, comprising in part a movable die; a piercing punch movable therein; a punch having an opening therethrough mounted so as to move toward and away from the die; a holding member for the punch having means for deflecting the slug cut from the blanks by the piercing punch out of the path of the tools.

15. Mechanism for making nut blanks, or the like, comprising in part a movable die; a piercing punch movable therein; a punch having an opening therethrough, mounted so as to move toward and away from the die; and a holding member for the punch having a recess therein with a wall for deflecting the slug cut from the blank by the piercing punch out of the path of the tools.

16. Mechanism for making nut blanks, or the like, comprising in part a movably mounted die having an opening therethrough and a recess in one end thereof concentric therewith, a separably mounted knife, with the cutting edge thereof substantially flush with the face of the die and extending in part across the recess, the combination therewith of a punch movably mounted within the die; and a companion punch movable axially toward and away therefrom.

17. The step in producing a nut blank, or the like, which consists in forming a recess in one end of a headless blank and expanding the exterior thereof at the same end and then restoring the exterior shape of the blank and at the same time deepening the recess, said expanding and restoring being accomplished while the blank is moved in opposite directions in the same die and simultaneously and by separate tools reshaping the exterior of the blank whose exterior was last expanded and restored.

18. The step in producing a recess in one end of a nut blank, which consists in moving a headless blank into a die and by pressure forming a recess in one end of less than the predetermined depth and then moving the blank in the die, in the reverse direction, and at the same time deepening the recess to its full depth and simultaneously and by separate tools reshaping the exterior of the blank whose exterior was last expanded and restored.

19. The step in producing a nut blank, or the like, which consists in forming a recess in one end of a headless blank and expanding the exterior thereof at the same end and then restoring the

exterior shape of the blank and at the same time deepening the recess, all in the same die and while the blank is moving in opposite directions therein.

20. The step in producing a recess in one end of a nut blank, which consists in moving a headless blank into a die and by pressure forming a recess in one end of less than the predetermined depth and then by a drawing process deepening the recess to its full depth while the blank is moving out of the die.

21. The step in producing a recess in one end of a nut blank, which consists in moving a headless blank into a die and by pressure forming a recess in one end of less than the predetermined depth and then by a drawing process deepening the recess to its full depth and thinning the walls of the recess while the blank is moving out of the die.

22. The method of producing a nut blank, or the like, from a solid cylindrical piece, by plural operations performed by separate sets of tools arranged so that an operation is simultaneously performed on a separate blank by each set of tools, and comprising first, expanding one end of the cylindrical piece and at the same time forming a recess in said end, then reforming the exterior of the blank to its original cylindrical shape, then reshaping the exterior of the blank so that it will have plural diameters, then piercing a hole through the blank, and finally removing a portion of the blank and producing a non-conforming surface upon the exterior thereof.

23. In mechanism for performing several steps in the making of a nut blank, or the like, by pressure, comprising a plurality of companion tools at a plurality of independent stations, the tools at one station expanding one end of the blank and then reducing the expanded portion to the exterior shape of the non-expanded portion, and forming a recess in one end of the blank, and at another station reshaping the exterior of the previously formed blank, all of the parts being so arranged that an operation is performed on a separate blank at each station.

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