Jan. 19, 1960 E. L. SCHWENK 2,921,549

HOLDING FIXTURE FOR SPIN-FORMING BLANKS

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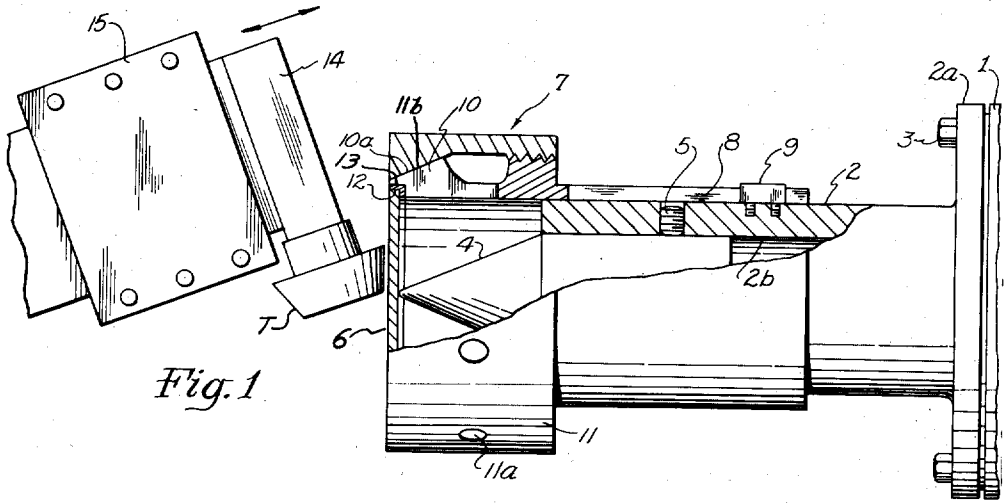


Fig. 1

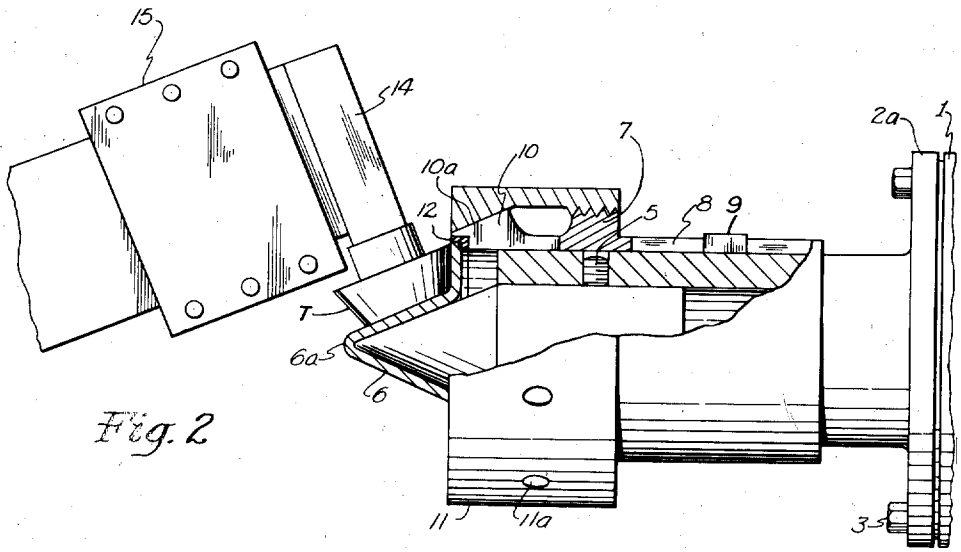


Fig. 2

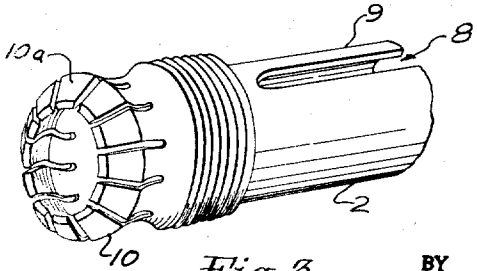


Fig. 3

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HOLDING FIXTURE FOR SPIN-FORMING BLANKS

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This invention relates to the art of metal spinning and particularly contemplates an improved fixture for facilitating the rapid and economical spin-forming of hollow-shaped articles from blanks.

The present invention is particularly adapted for use in the fabrication of ogive or cone-shaped components having relatively sharp cone angles such as are encountered in the manufacture of fuzes and shaped charges. Because of the virtual absence of any "land" portion on the closed end of such shaped objects, conventional spinning techniques cannot be employed as will later be made apparent, and it is therefore generally necessary to devise highly specialized machines or employ draw-press techniques in their manufacture. The present invention obviates the need for special machinery by providing an extremely cheap and versatile instrument which can be applied to an ordinary lathe or other type of machine tool having a rotating arbor.

It is therefore an object of this invention to provide a spinning fixture which is readily applicable to a conventional type of lathe or other machine tool and which will permit the rapid spinning of hollow forms from blanks.

Another object of this invention is to provide a spinning fixture which is designed to produce substantially cone-shaped forms having a very sharp cone or vertex angle.

Other uses and advantages of the invention will become apparent upon reference to the specification and drawings in which,

Fig. 1 is a view partly in section showing the fixture with a blank mounted preparatory to a spinning operation;

Fig. 2 is a view similar to Fig. 1 but showing the blank after it has been spun to a completed form, and

Fig. 3 is an isometric view showing one form of the work holding means which may be employed with the spinning fixture of this invention.

In general, the invention contemplates a fixture having a forming die and a work-holding member which drivingly secures the work blank to the rotating arbor of a machine tool in a manner such that the entire surface of the blank exclusive of the peripheral portion may be subjected to the forming action of the die and forming tool. Such holding action occurs at a position remote from the center of the blank and continues during the entire shaping of the blank.

In the drawings, reference numeral **1** represents the head stock of a lathe or the power-driven rotating arbor of any conventional machine tool. A die holder **2** having a fastening flange **2***a* is suitably secured to the head stock **1** by means of any suitable fastener such as is indicated by the bolts **3**. The die holder as indicated in the drawings comprises a guidepost the bore portion **2***b* of which is adapted to receive and securely retain an interchangeable forming die **4**.

The forming die may be secured within the sleeve portion of the die holder **2** by suitable set screws such as

5. The forming die shown in the drawings is suitable for forming hollow-shaped articles such as cones as indicated by the member **6** in Fig. 2. In connection with the manufacture of fuzes and shaped charges it is often desirable for the cone to have a relatively sharp apex or vertical angle **6***a*. For reasons that will become apparent, the fixture according to the present invention is especially suited for spinning shapes having cone angles of any desired degree of sharpness.

In order to securely hold the blank **6** during a spinning operation a work-holding member which may be in the form of a collet or chuck **7** is provided which is drivingly and slidably engaged with the sleeve portion of the die holder **2**. The collet or chuck **7** is generally cylindrical in shape and is machined to have a close sliding fit on the outer circumference of the die holder **2**. The collet may be provided with a longitudinal slot **8** which is adapted to cooperate with a key **9** fastened to the die holder **2**. In the form shown in the drawings the front end of the collet **7** is splined and is properly machined and heat-treated to provide a plurality of peripheral spring fingers **10**. As is more clearly shown in Fig. 3, the peripheral nose portion of the collet is suitably tapered as indicated to provide a clamping surface **10***a*. A clamping ring **11** having a similar inner tapered face **11***b* cooperably engageable with the referred-to tapered surface **10***a* is threadingly engaged with the collect **7** as indicated in the drawings. The inner bore of the collar is suitably machined as indicated at **13** to provide a shoulder or seat for snugly accommodating the blank **6**. In order to provide for blanks having different diameters and thicknesses, interchangeable inserts such as **12** may be seated in the shoulder **13** as shown.

It will be apparent from consideration of the figures that such construction permits rapid loading of the blank **6** in the collet. As indicated in Fig. 1, after the blank is seated in the referred-to shoulder recess **13**, the clamping collar **11** is rotated relative to the collet **7** by means of a spanner wrench engageable in the recesses **11***a*. The resulting clamping action between the tapered surfaces **10***a*—**11***b* causes the collet jaws to firmly grip the periphery of the blank. It will be apparent from Fig. 2 that as the forming tool T draws the blank **6** over the shaping die **4** the assembly comprising the clamping collar **11** and the collet **7** will be displaced longitudinally of the axis of rotation of the arbor as the member **6** is formed without relinquishing the grip between the work holder and the periphery of the blank.

In known existing constructions such as is represented in the patent to Cooperstein 2,069,356, for example, the center piece of the tail stock must be firmly driven against the center of the blank in order to provide sufficient driving torque to the blank during a spinning operation. As a result of such known prior art construction, a definite bite portion must be allowed on the blank adjacent the center, thereby precluding the formation of sharp vertical angles. By providing a peripheral drive for the blank, which drive permits displacement of the blank as it is drawn, applicant's construction leaves the entire face of the blank clear for engagement by the forming tool and consequently there is no limit to the sharpness of the vertical cone angle obtainable.

Because of such feature in which the tail stock of the machine tool is dispensed with, it is apparent from the drawings that the forming tool employed need not be limited in size in order to clear the tail stock. As a result, the forming tool may be made extremely rugged as is desirable in a spinning operation. That is, the forming tool T can extend beyond the center of the blank as indicated in Fig. 1 since there is no encumberance which might interfere with it. The forming tool T according to applicant's construction may be in the form of a rigid

roller mounted on a suitable bearing provided on a holder 14 as shown in Fig. 2. The holder 14 is in turn slidably mounted on a rigid way 15 mounted on the bed of the particular machine tool with which the fixture according to this invention is mounted.

It will be apparent from the above description, that the principles underlying the present invention can take various forms other than the particular embodiment illustrated in the drawings. For example, the guidepost die holder 2, can be made polyhedral in shape so as to slidingly accommodate a like shaped work holder, or a splined type of interengaging surface can be readily utilized. The forming die 4 can be secured within the die holder by any conventional fastening means such as a taper if desired while the specific collet arrangement 10 employed for gripping the blank can be in the form of a conventional jaw-chuck or sliding collet in which case, power-operated clamping means may be employed for speed of operation.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in construction and arrangement within the scope of invention as defined in the appended claims.

What is claimed is:

1. In the art of spin-forming hollow, generally conically-shaped articles from blanks, a fixture adapted to be operatively connected to the rotating arbor of a machine tool for holding and rotating the blank so that the major portion of the surface area of said blank including especially the entire center portion can be spin-formed to a sharp vertical angle with respect to the axis of said article, said fixture comprising a forming die corresponding to the configuration of the article to be formed, means securing said die to said machine tool arbor concentric with the axis of rotation of said arbor for rotation therewith, work-blank holding means mounted concentrically with respect to said arbor and forming die, mechanical means interlocking said work-blank holding means with said arbor in the direction of arbor rotation so that said arbor drives said work-blank holding means, said work-blank holding means having fastening means for clamping the peripheral portion of said blank to said holding means in a position concentric with said forming die and means including said mechanical interlock for permitting displacement of said work-blank holding means relative to said forming die in a direction parallel to the axis of rotation of said arbor in response to pressure of a forming tool against said blank.

2. The invention of claim 1 in which said work-holding means includes a collet for rigidly engaging a peripheral portion of said blank.

3. The invention of claim 2 in which said forming die securing means comprises a guidepost having means for detachably receiving said forming die, and guide means for slidably receiving said work-holding means in a direction parallel to said axis of rotation and for drivingly engaging said work-holding means in the direction of rotation of said arbor.

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