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E. S. CORNELL, JR

2,229,639

METHOD OF PRODUCING ANNULI

Filed Oct. 22, 1938

Fig. 1.

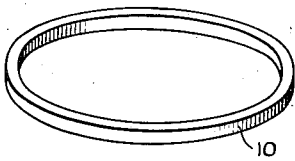


Fig. 2.

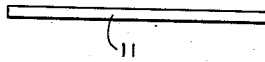


Fig. 3.

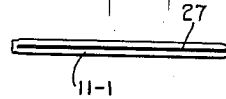


Fig. 4.

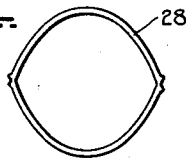


Fig. 5.

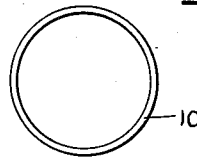


Fig. 6.

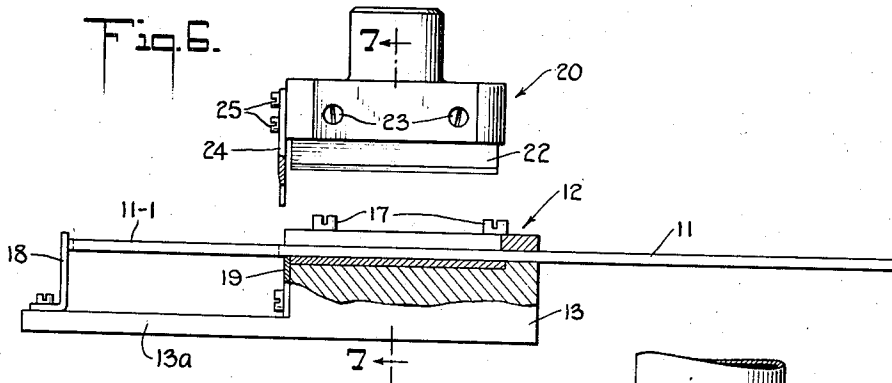


Fig. 7.

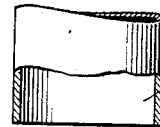
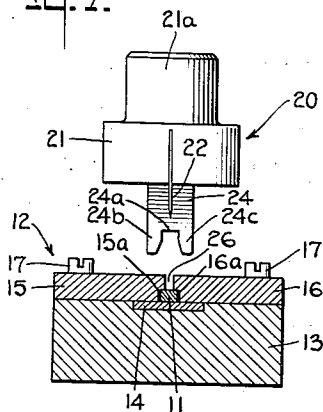
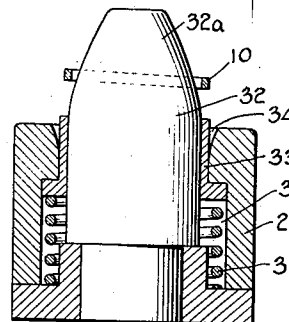


Fig. 8.



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2,229,639

METHOD OF PRODUCING ANNULI

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Application October 22, 1938, Serial No. 236,461

3 Claims. (Cl. 29—156)

This invention relates to a method of producing annuli.

In particular, the method is directed to the production of an annulus from a relatively short length of strip material, and to the production of annuli sequentially from a continuous length of strip material.

The method is especially advantageous for the production of solder annuli as used to considerable extent in the sweat jointing of copper pipe and fittings by the plumbing trade.

An object of the invention, therefore, is the production of an annulus from a relatively short strip of material of the nature of solder and the production of annuli sequentially from a continuous length of strip material of the nature of solder.

An object is to accomplish such production with a minimum number of operations and with the assurance of desired predetermined configuration for the resulting product.

In the drawing:

Fig. 1 represents a perspective view of an annulus produced pursuant to the present method.

Fig. 2 represents a fragmentary top plan view of a continuous length of strip material employed as the raw material of the method.

Fig. 3 represents a top plan view of a single relatively short length of strip material at an intermediate stage in the production of a single annulus.

Fig. 4 represents a top plan view of the partly processed length of Fig. 3 at a subsequent intermediate stage of processing.

Fig. 5 represents a top plan view of a completed annulus, the product of the present method.

Fig. 6 illustrates apparatus carrying out a step in the method which converts the strip material of Fig. 2 to the individual lengths of Fig. 3.

Fig. 7 represents a vertical section taken on the line 7—7, Fig. 6.

Fig. 8 illustrates apparatus carrying out the final step in the method which converts the article of Fig. 4 to the finished product of Fig. 5.

Referring to the drawing: the annulus indicated by the reference character 10 in Figs. 1 and 5 represents the finished product resulting from the method here disclosed. It is formed from a material capable of being worked and fused cold under the influence of pressure, and may be a solder annulus or a gasket of material having essentially similar characteristics.

The present method contemplates the production of annuli sequentially from a continuous length of material of the stated type, usually a metal such as lead, or an alloy such as solder. It may be equally applied to the production of a single annulus from a single relatively short blank of the ductile material. As will be noted

from the drawing, the blank is of substantially uniform width and thickness throughout its length.

Where a continuous length of strip is employed as the raw material, the method may comprise generally the steps of severing individual relatively short lengths from the continuous length while slitting each of the so severed short lengths along its length to locations adjacent but short of the ends thereof; expanding each of the so slit short lengths to approximately the form of an annulus; and finally subjecting each of the so slit short lengths to the action of pressure within an annular die to flow the irregularities into the desired annular configuration.

As will be noted from the drawing, the continuous length of strip is substantially uniform, throughout its length, in width and thickness. Thus, the cubical contents of successive strip lengths of equal length are equal.

Where single blanks are utilized, the same steps of slitting, expanding, and forming are applied to each blank.

According to preferred practice, a continuous length 11 of the strip material, see Figs. 2 and 6, is passed through a jig, as at 12, and the particular portion of the strip being acted upon is firmly held thereby during the severing and slitting operation.

The jig 12, see Figs. 6 and 7, preferably comprises a bed 13 provided with a soft metal inlay strip 14 extending along the length of its upper surface approximately centrally thereof.

The two clamp pieces 15 and 16 are adjustably secured, as by means of screws 17, to the upper surface of the bed 13, falling short of meeting above the inlay strip 14 by a short distance. The clamp pieces 15 and 16 may each be rabbeted along the bottom edge of those lateral sides thereof which are adjacent each other when the clamp pieces are in place, see the rabbet grooves 15a and 16a, respectively, Fig. 7. Such rabbet grooves 15a and 16a cooperate to form a receiving passage of dimension such that the strip 11 may slip easily therethrough while being practically completely supported. The bed 13 may have an extension 13a of reduced height, such extension carrying an abutment post 18 adjacent its free end. A shear strip 19 may be secured, as by means of screws, to that end wall of bed 13 which lies adjacent the extension 13a. The distance between shear strip 19 and abutment post 18 defines the length of an individual length or blank 11—1 of the strip material 11.

A slitting and severing head 20 is provided for cooperation with the jig 12 in the severing of individual lengths 11—1 from the continuous strip 11, and for, simultaneously therewith, slitting such individual lengths. The cutting head 20 may comprise a body portion 21 provided with a

handle 21a for affording manual manipulation with respect to the jig 12.

A longitudinal blade 22 is affixed in the body portion 21a, as by means of the set screws 23, and extends lengthwise substantially centrally thereof. A shear blade 24 is adjustably secured at one end of the body portion 21, as by means of screws 25. The shear blade preferably has a cutting edge 24a defined between two depending guards 24b and 24c.

The clamp pieces 15 and 16 of the jig 12 are spaced sufficiently far apart, see 26, to admit the longitudinal blade 22 easily in the slitting of the strip 11 and to, in effect, provide a guideway therefor. Manipulation of the head 20 relative to the jig 12 will effect severing of a predetermined and already slit length 11-1 of strip by means of the shear blade 24, and will, simultaneously, slit a second length of the strip 11 which lies on the bed 13. The slit will be accurately located because of the guideway 26 provided for the longitudinal blade 22, and because of the firm holding of the strip on the bed 13 by the clamp pieces 15 and 16.

The intermediate product, i. e. the length or blank 11-1, resulting from the slitting and severing operation, is illustrated per se in Fig. 3. It will be noted that the slit 27 extends substantially centrally longitudinally of the individual length or blank to locations adjacent but short of the ends thereof. Preferably, as is clear from the drawing, particularly Fig. 3, the slit 27 extends to locations adjacent, but substantially equally short of the ends thereof, thus providing end portions which are similar. The exact length of the slit 27 may be determined in the individual case by experiment. There should be sufficient material left between the ends of the slit and the ends of the length to provide for adequate filling out of the annulus in the subsequent forming operation.

The two longitudinal portions of the slit blank 11-1 of Fig. 3 are subjected to opposite outwardly directed forces, respectively, to produce the approximate annularly configured intermediate product 28 of Fig. 4. The forces may be applied manually or by any suitable mechanical means.

For completing formation of the final product, indicated at 10 in Figs. 1 and 5, the intermediate product 28 of Fig. 4 is subjected to forming pressure within the enclosing confines of a die to flow irregularities of configuration into the symmetry of a perfect annulus.

As illustrated in Fig. 8, the die may comprise an open mouthed die box 29 having an internal recess 30 in which a coil spring is mounted. A tapered mandrel 32 is positioned substantially centrally of the recess 30 and extends upwardly and out of the mouth of the die box 29, defining, together with the walls of the die box, an annular forming chamber. The mandrel 32 is encircled by a plunger 33, normally held in raised position within the aforementioned forming chamber by the action of the spring 31. The mouth of the forming chamber may flare outwardly, as at 34, in providing a gradual approach for the rough intermediate product 28 into the annular forming chamber proper.

The intermediate product 28 is slipped over the snub nosed end 32a of the mandrel 32 and seats on the upper end of the plunger 33. A punch 35 having a tubular end of annular configuration, similar to that of the plunger 33, is forced down over the mandrel 32, carrying the

intermediate product 28 downwardly into the annular forming recess of the die. Thus, the intermediate product is subjected to forming pressure substantially uniformly about its periphery. Upon withdrawal of the punch 35, the plunger 33 will rise by the upward urge of spring 31, carrying the completely formed annulus 10, as the final product of this method, upwardly, out of the die, for removal for use or for storage.

Where a single pre-cut length of strip is used as the raw material in the process, the step of severing may be eliminated, but the remaining steps of the process remain the same.

Whereas this invention has been described with respect to preferred practice it is to be definitely understood that changes may be freely made therein without departing from the spirit of the invention as set forth herein and in the claims that follow.

I claim:

1. A method of producing an annulus from a blank of material of the nature of solder, said blank being substantially rectilinear and having substantially uniform thickness and substantially uniform width throughout its length, which comprises slitting the blank along its length substantially centrally of its width to locations adjacent but substantially equally short of its ends, respectively; opening out the thus slit blank into approximately annular form; and flowing the metal projections and irregularities of said approximate annular form into substantially perfect annular form by subjecting the thus opened out strip to pressure within the enclosing confines of an annular die.

2. A method of producing annuli of substantially uniform configuration and of substantially uniform cubical content substantially without waste from a material of the nature of solder which comprises successively severing individual lengths of equal length from a continuous strip of said material, said strip having substantially uniform thickness and substantially uniform width throughout its length; slitting said lengths of strip along their lengths substantially centrally of their widths to locations adjacent but substantially equally short of their ends, respectively; opening out the thus slit lengths to approximately annular form; and flowing the metal projections and irregularities of said approximate annular form into substantially perfect annular form by subjecting the thus opened out lengths to pressure within the completely enclosing confines of annular die means.

3. A method of producing an annulus from a material of the nature of solder which comprises preparing a substantially rectilinear blank of said material, said blank having substantially uniform thickness and uniform width throughout its length; slitting the said blank along its length substantially centrally of its width to locations adjacent, but substantially equally short of its ends, respectively; opening out the thus slit blank into rough and approximate annular formation; and pressing the thus opened out blank along a divergently tapered mandrel, in the direction of its divergence, into the enclosing confines of an annular die by pressure exerted substantially equally about the periphery of said blank and in the direction of movement thereof for flowing the metal projections and irregularities of said approximate annular form into substantially perfect annular formation.