Nov. 18, 1969 J. S. BOZEK 3,478,563

APPARATUS FOR REDRAWING AND WALL IRONING CONTAINERS

Filed Nov. 27, 1967

FIG.1

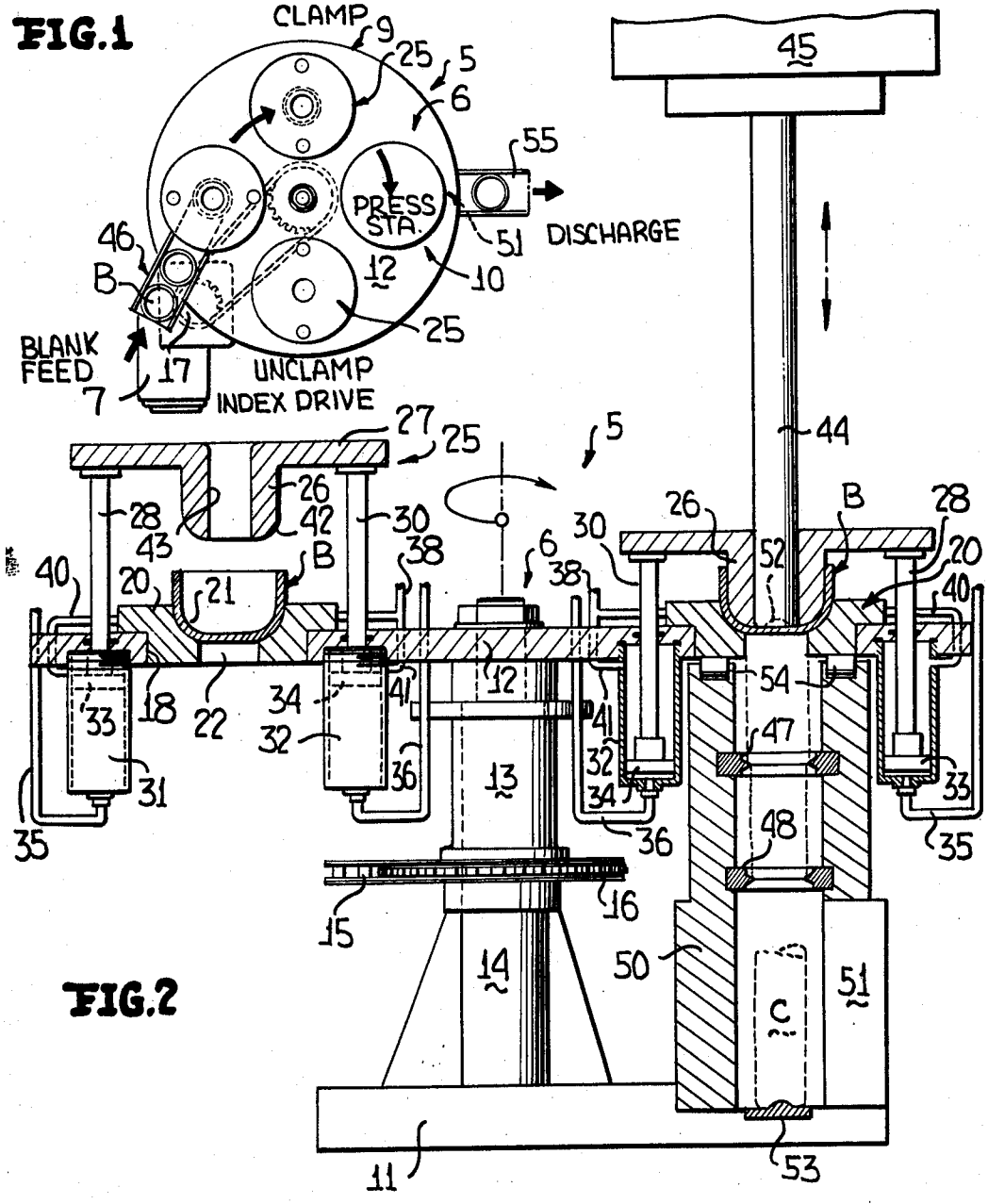

FIG.2

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United States Patent Office 3,478,563 Patented Nov. 18, 1969

3,478,563

APPARATUS FOR REDRAWING AND WALL IRONING CONTAINERS

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Filed Nov. 27, 1967, Ser. No. 685,835
Int. Cl. B21d 22/28, 43/05
U.S. Cl. 72—349 11 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure is directed to an apparatus for redrawing and wall ironing cup-shaped metallic articles to produce containers or the like, and is particularly directed to a turret-like mechanism which at one station includes pneumatically actuated means for clamping a cup-shaped blank to a redraw die carried by a turret of the apparatus. The turret is indexed to bring the clamped article in alignment with a punch to one side of the turret and a plurality of wall ironing dies at an opposite side thereof. As the punch descends it is guided through the clamping means and progressively redraws and wall irons the cup-shaped blank to a tubular container or similar articles.

It is conventional to form containers or similar tubular articles by first blanking circular discs from aluminum or similar metallic material. The circular discs are formed to a cup-shaped configuration either after or simultaneously with the blanking operation, and the cup-shaped blanks are thereafter redrawn and wall ironed by progressively forcing the blanks through a plurality of female redraw and wall ironing dies, generally by means of a reciprocating punch.

These conventional operations when performed separately or in various combinations are generally relatively slow despite the high speed of the punch press because of the necessity of employing multiple transfer devices between, for example, the blanking and cupping stations, the cupping and redrawing stations, etc.

There is on the other hand a similar deficiency in totally combining all of the latter-noted operations due to the slow speed of the press punch caused by the necessarily long stroke of the punch required to, for example, cup, redraw and wall iron a blank in a single operation.

Heretofore most attempts to produce commercially practical tubular articles have met with little success, particularly conventional mechanisms utilizing a long stroke press, because the speed of production was directly dependent upon the necessarily slow speed of the moving punch. If the redrawing and wall ironing operations were combined in a single step a cup-shaped blank was generally positioned atop a redraw die and the press actuated to move the punch in a direction forcing the blank through the redraw and succeeding wall ironing dies. During the necessary long stroke and slow movement of the punch no further operations are performed and thus the speed of production is directly dependent upon the speed of reciprocation of the press punch. Furthermore, difficulties have been continually encountered in maintaining each blank properly aligned relative to the dies and the punch axis which in many cases resulted in commercially unacceptable containers.

A primary object of this invention is, therefore, to avoid the above-noted and other disadvantages of conventional apparatuses by providing a novel redrawing and wall ironing apparatus which includes means for clamping a cup-shaped blank at a first station of a turret mechanism during the redrawing and wall ironing of another cup-shaped blank at a second station whereby the time between forming successive articles is dependent solely upon the speed of indexing a clamped article to the punching station, thereby materially increasing the speed of production as compared to conventional machines.

A further object of this invention is to provide a novel redrawing and wall ironing apparatus wherein a plurality of redraw dies and clamping means are carried by a turret whereas but a single set of wall ironing dies are positioned immovably at the punching station, thereby reducing the cost normally associated with conventional apparatuses in which each redraw die is associated with an individual set of wall ironing dies.

Still a further object of this invention is to provide a novel apparatus of the type heretofore set forth wherein the clamping means additionally includes means for accurately alinging each cup-shaped blank with its axis in alignment with the axes of the redraw and wall ironing dies, and means are further provided in conjunction with each clamping means for guiding the press punch during its working stroke.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter, and the several views illustrated in the accompanying drawing.

In the drawing:

FIGURE 1 is a highly schematic top plan view of a novel apparatus for redrawing and wall ironing cup-shaped blanks in accordance with this invention, and illustrates a plurality of redraw dies carried by a turret movable between a loading station and a forming station.

FIGURE 2 is an enlarged side elevational view partly in section of the apparatus of FIGURE 1, and more clearly illustrates the manner in which each cup-shaped blank is clamped to an associated redraw die at a first station during which time a previously clamped blank is redrawn and wall ironed.

An apparatus for redrawing and wall ironing cup-shaped blanks B is schematically illustrated in FIGURE 1 of the drawing, and is generally designated by the reference numeral **5**. The apparatus **5** includes a conveying mechanism or turret **6** which is rotated in a clockwise direction as viewed in FIGURE 1 by a conventional indexing mechanism **7**. The turret **6** is indexed from a loading station **8** to a dwell station **9** and then to a forming and unloading station **10**.

Reference is now made to FIGURE 2 of the drawing which illustrates the apparatus **5** as including a support **11** forming a base for the turret **6**. The turret **6** includes a platform **12** secured to a member **13** mounted for rotation upon a post **14** in a conventional manner. The member **13** carries a sprocket **15** about which is entrained a drive chain **16**. The chain **16** is turn entrained about a drive sprocket **17** of the indexing mechanism **7**, as shown in FIGURE 1. Thus, upon the rotation of the sprocket **17** in a clockwise direction the platform **12** is rotated in a similar direction through the chain **16** and the sprocket **15**.

A plurality of circular pockets **18** are formed in the platform **12** at 12 o'clock, 3 o'clock, 6 o'clock and 9 o'clock (FIGURE 1). Each pocket **18** receives a flanged redraw die **20** having an annular inner surface **21** complementarily contoured to an outer surface portion (unnumbered) of the cup-shaped blanks B. The surface **21** terminates at a cylindrical bore **22**.

Clamping means **25** are also associated with each of the redraw dies **20** to accurately position each blank B within its associated redraw die **20**. The clamping means **25** are identical and each includes a generally tubular

clamping body **26** having a flange **27** at diametrically opposite sides of which are secured piston rods **28, 30**. The rods **28, 30** pass through sealed bores (unnumbered) formed in the platform **12** and are received in cylinders **31, 32**, respectively. In the unclamped or upper position of the clamping body **26** each piston **33, 34** associated with the respective cylinders **31, 32** is urged to an uppermost position by a fluid medium introduced into the respective cylinders **31, 32** from a source of high pressure, such as compressed air, through conduits **35, 36** in a manner readily apparent from FIGURE 2 of the drawing. Valves (not shown) are preferably arranged in the conduits **35, 36** such that the conduits **35, 36** can be vented to atmosphere at the same time that conduits **38** are placed in fluid communication with the same source of high pressure fluid. The high pressure fluid in the conduits **38** is conducted into the cylinders **31, 32** above the pistons **33, 34** via conduits **40, 41** to urge the pistons **33, 34** and the associated rods **28, 30** in a downward direction thus firmly clamping each blank B to its associated redraw die **20**, in the manner clearly illustrated in the right-hand portion of FIGURE 2. It is to be particularly noted that in the clamped position an outer annular surface portion **42** of the tubular body **26** matingly engages an inner surface (unnumbered) of the blank B thus accurately aligning the axis of the latter with the axis of its associated redraw bore **22** and an inner cylindrical surface **43** which forms a guide for a punch **44** of a conventional punch press **45**.

Conventional means (not shown) are provided for opening each clamping mechanism **25** just prior to approaching the loading station **8** at which time conventional conveying and feeding means **46** deposit each of the blanks B in an associated one of the redraw dies **20**. Thereafter the clamping mechanism **25** is actuated to its closed position in the manner heretofore described prior to reaching the forming station **10**.

At the forming station **10** the turret **6** is indexed to and stopped at a position at which the axis of the associated redraw die **20** is in alignment with the axis of the punch **44** and the axes of a plurality of female wall ironing dies **47, 48** supported by a generally tubular column **50** having a side discharge opening **51**. Though only a pair of wall ironing dies **47, 48** are illustrated in FIGURE 2, it is to be understood that more or less than this number may be provided with the diameters thereof progressively decreasing in size in a downward direction to effect the wall ironing of each blank B after being redrawn through the bore **22** of each die **20** in a conventional manner to form a tubular container or similar cup-shaped article C. The container C may be additionally bottom-paneled if desired by providing the punch **44** with a downwardly opening concave end face **52** corresponding in configuration to a bottom paneling die **53** such that upon the punch **44** reaching the bottom of its stroke the complementary surfaces of the elements **52, 53** bottom-panel each container C in a conventional manner.

After each forming operation the punch **44** is retracted and the indexing mechanism **7** actuates to continue the rotation of the turret **6**, it being noted that the post **50** is provided with anti-friction bearing means **54** in the form of a plurality of roller bearings engaging the lower surface of the platform **12**. The bearings **54** thereby not only faciliate the rotation of the platform **12** relative to the post **50**, but also lend support to the platform **12** against the downward force of the punch **44** during each forming operation.

During the retraction of the punch **44** each redrawn and wall ironed container C can, of course, be discharged by suitable conventional means (not shown) outwardly of the discharge opening **51** to a conventional storage or finishing area via a chute **55**.

It is also to be particularly noted that as soon as the punch **44** has been retracted to its home position a cup-shaped blank at the dwell station **9** is at a position to be immediately indexed to the forming station **10** by the turret **6** while at the same time the clamping mechanism **25** at the station at 6 o'clock can be opened prior to being indexed to the loading station **8**. Thus, the sole criterion for the speed at which the blanks B are redrawn and wall ironed is the speed at which the punch **44** can be descended and retracted, it being noted that at all times clamped blanks are available for immediate positioning at the forming station **10** dependent solely upon the speed required for moving the turret **6** from the station **9** to the station **10**. It should also be noted that the pre-blanking and pre-cupping of the blanks B also reduces the stroke of the punch **44** thus automatically increasing the speed of operation of the apparatus **5** as compared to, for example, performing a cupping operation at the forming station **10** in addition to redrawing and wall ironing.

While preferred forms and arrangement of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claimed subject matter.

I claim:

1. Apparatus for redrawing and wall ironing cup-shaped blanks comprising a conveying mechanism, a plurality of redraw dies carried by said conveying mechanism, at least a pair of stations disposed along the path of travel of the conveying mechanism and the redraw dies carried thereby, means at a first of said stations for positioning a cup-shaped blank relative to an associated one of said redraw dies, means at a second of said stations for forcing each cup-shaped blank through its associated redraw die, and at least an additional female die at said second station through which each cup-shaped article is progressively urged by said forcing means.

2. The apparatus as defined in claim **1** wherein said additional female die is immovably positioned at said second station.

3. The apparatus as defined in claim **1** wherein said positioning means includes means for clamping each cup-shaped article to an associated redraw die.

4. The apparatus as defined in claim **1** wherein said additional female die is immovably positioned at said second station, and anti-friction means are positioned between said conveying mechanism and said additional female ie for freely movably supporting said conveying mechanism relative thereto.

5. The apparatus as defined in claim **1** wherein said positioning means includes means for clamping each cup-shaped article to an associated redraw die, said clamping means being pneumatically operated, each clamping means being defined by a generally tubular clamping body having inner and outer surface portions complementarily contoured to the outer surface portions of the forcing means and to the inner surface portion of the cup-shaped blanks respectively, and means for indexing said conveying mechanism to bring axes of the clamping body surface portions into axial alignment with said forcing means and said additional female die.

6. The apparatus as defined in claim **2** wherein said positioning means includes means for clamping each cup-shaped article to an associated redraw die.

7. The apparatus as defined in claim **2** wherein said additional female die is immovably positioned at said second station, and anti-friction means are positioned between said conveying mechanism and said additional female die for freely movably supporting said conveying mechanism relative thereto.

8. The apparatus as defined in claim **2** wherein said positioning means includes means for clamping each cup-shaped article to an associated redraw die, said clamping means being pneumatically operated, each clamping means being defined by a generally tubular clamping body hav-

ing inner and outer surface portions complementarily contoured to the outer surface portions of the cup-shaped blanks respectively, and means for indexing said conveying mechanism to bring axes of the clamping body surface portions into axial alignment with said forcing means and said additional female die.

9. The apparatus as defiined in claim **3** wherein said additional female die is immovably positioned at said second station, and anti-friction means are positioned between said conveying mechanism and said additional female die for freely movably supporting said conveying mechanism relative thereto.

10. The apparatus as defined in claim **3** wherein said positioning means includes means for clamping each cup-shaped article to an associated redraw die, said clamping means being pneumatically operated, each clamping means being defined by a generally tubular clamping body having inner and outer surface portions complementarily contoured to the outer surface portions of the cup-shaped blanks respectively, and means for indexing said conveying mechanism to bring axes of the clamping body surface portions into axial alignment with said forcing means and said additional female die.

11. The apparatus as defined in claim **4** wherein said positioning means includes means for clamping each cup-shaped article to an associated redraw die, said clamping means being pneumatically operated, each clamping means being defined by a generally tubular clamping body having inner and outer surface portions complementarily contoured to the outer surface portions of the cup-shaped blanks respectively, and means for indexing said conveying mechanism to bring axes of the clamping body surface portions into axial alignment with said forcing means and said additional female die.

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U.S. Cl. X.R.

72—361; 405; 421