United States Patent [19]

Widera

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[54] **METHOD AND APPARATUS FOR LOCATING STOCK IN FORMING DIES**

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[52] **U.S. Cl.** **72/345**, 72/361, 72/427

[51] **Int. Cl.** **B21d 45/00**

[58] **Field of Search** 72/345, 352, 353, 72/354, 357, 360, 361, 374, 376, 377, 412, 427, 344; 29/159.3, 168

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[57] **ABSTRACT**

Knockout pins in the opposed dies are employed to receive and index the stock between and in spaced relation to the dies, after which the dies are closed upon the work while overriding the knockout pins. For forming a symmetrical workpiece a single knockout pin is disposed centrally of each die and is provided with a conical protrusion centrally thereof registering with a corresponding central conical depression in the stock.

6 Claims, 4 Drawing Figures

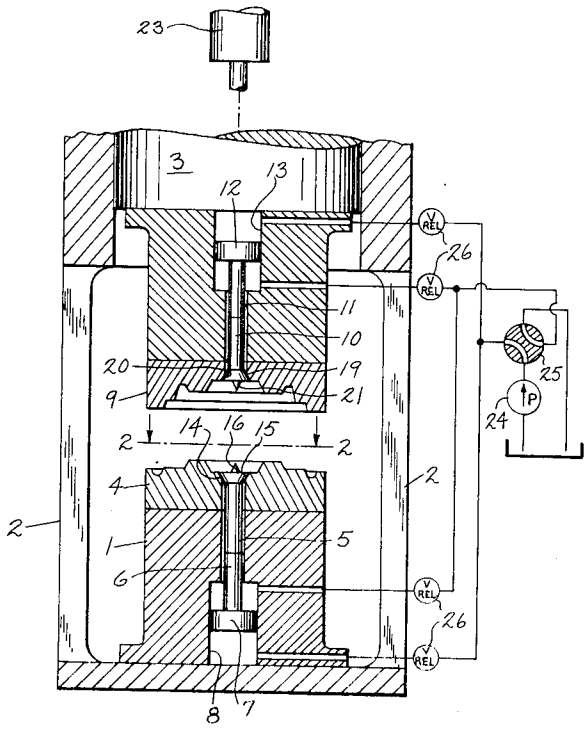


Fig. 1

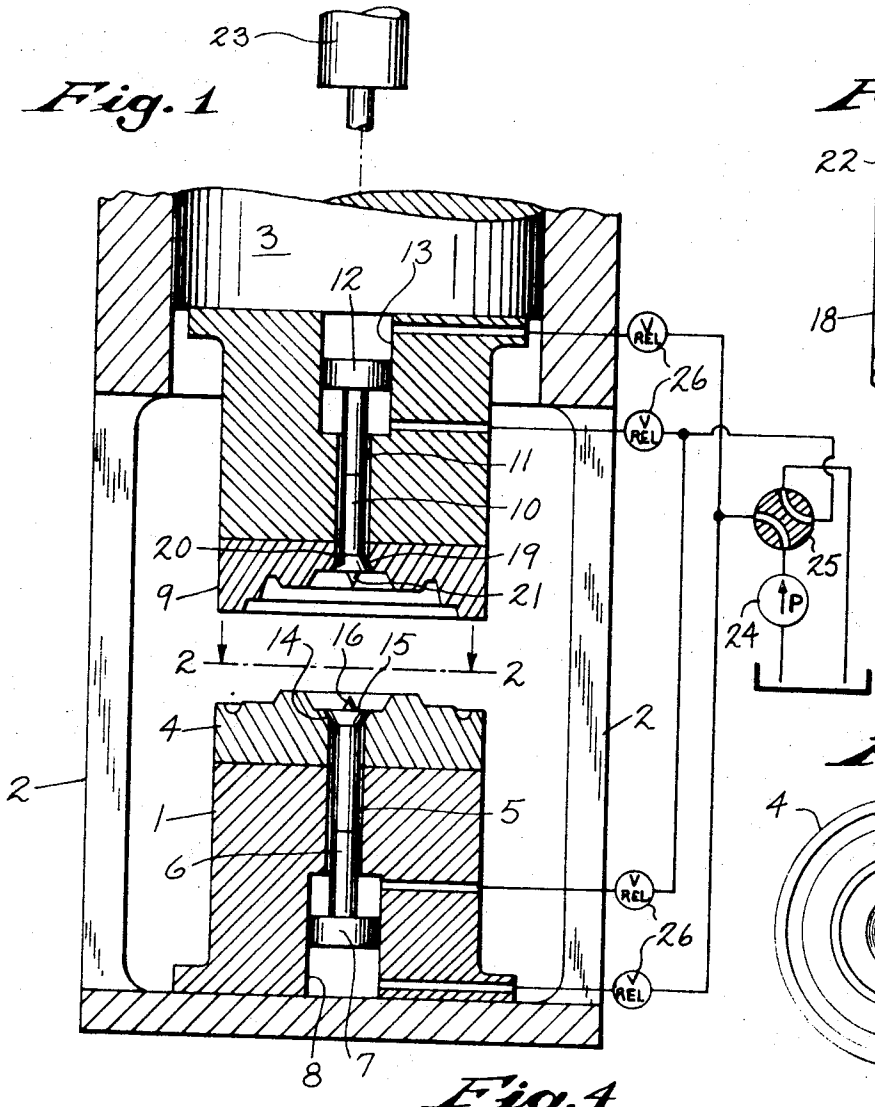


Fig. 3

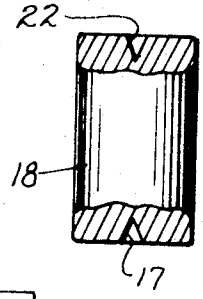


Fig. 2

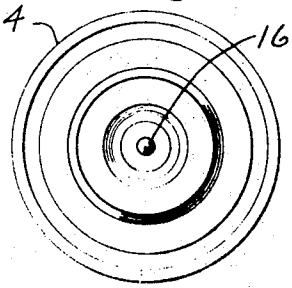
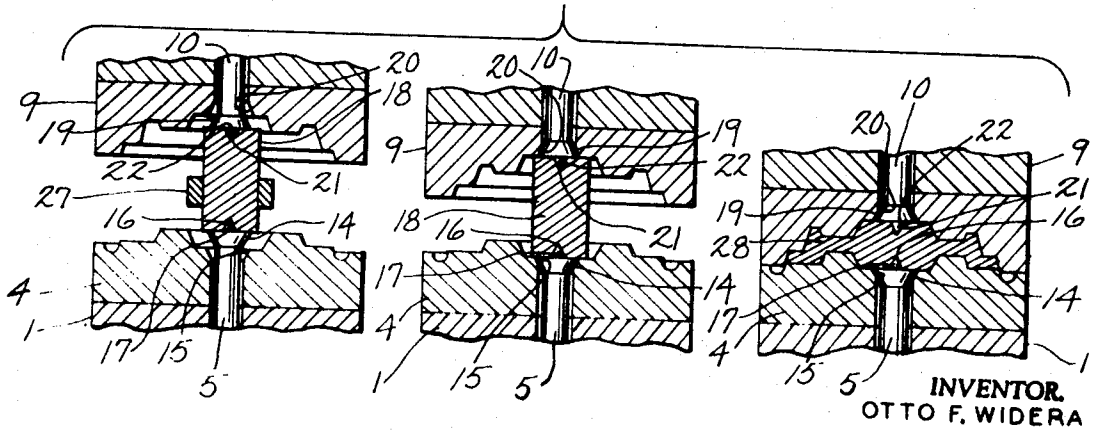


Fig. 4



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METHOD AND APPARATUS FOR LOCATING STOCK IN FORMING DIES

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for locating stock in forming dies as employed in contour forging in which an even flow of the metal during closing of the dies is required.

In contour forging of a symmetrical workpiece if the same is not centered accurately in the dies the metal flows unevenly during closing of the dies with the result that some parts of the dies may have an overfill with excessive flash and other parts may not be filled out properly.

This problem becomes more acute in forging operations employing automatic feeders which transfer the stock into the position for forging and transfer the forged workpiece from such position.

Attempts to locate the stock in position for forging have usually employed some indexing means associated with the lower die upon which the stock is placed. This becomes most difficult when the stock is quite different in shape from the final forged shape, requiring a substantial flow of hot metal during a single stroke of the forging dies.

SUMMARY OF THE INVENTION

The present invention provides a method and apparatus for automatically locating a stock piece between a set of dies and holding the piece indexed during the forming stroke of the dies.

In carrying out the invention the stock piece is first disposed by suitable transfer mechanism between the open dies, after which the opposite knockout pins are moved toward each other to engage the piece and center or index the same with relation to the dies.

After the transfer mechanism is retracted, leaving the stock piece suspended between the dies by the knockout pins, the dies are closed upon the stock piece, overriding the knockout pins until the dies engage the stock piece, and thereafter forming the stock piece to the contour of the dies.

After the forming of the piece has been completed the dies are opened while the knockout pins continue to engage the piece and serve to raise the same to a suspended position between the dies where the transfer mechanism can grip the piece and remove it upon release by retraction of the knockout pins.

Each knockout pin has a conical protrusion on its face which registers with a complemental conical recess in the stock piece to effect the desired centering and indexing of the stock piece relative to the dies.

In essence the method involves use of the knockout pins to receive the heated stock piece from transfer mechanism, then index and deliver it to the dies, holding the piece centered throughout the forming thereof, and thereafter to remove the piece from the dies and deliver the piece to transfer mechanism. The method is applicable to forging operations where only one die moves and the other is fixed and also to operations where both dies move in which latter case some variation in sequence and/or overlap in the movements of the dies and knockout pins may occur as desired.

Where the workpiece is circularly symmetrical a single central knockout pin may be employed for each die with the knockout pins axially aligned in the direction of die movement and with the indexing protrusions similarly centrally and axially aligned, in which case the indexing recesses in the stock piece will be disposed centrally on the axis of the piece.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawings somewhat schematically illustrate the steps of the method constituting the best mode of carrying out the invention presently contemplated by the inventor.

In the drawings:

FIG. 1 is a generally vertical sectional schematic illustration of a forming press for carrying out the invention;

FIG. 2 is a generally transverse sectional schematic illustration taken on line 2—2 of FIG. 1;

FIG. 3 is a side elevation of a cylindrical stock piece with the end portions sectioned to show the indexing recesses therein; and

FIG. 4 is a schematic showing of successive positions of the parts in carrying out the invention commencing with the initial locating of a stockpiece between the open dies by a transfer mechanism and ending with the final forming of the workpiece between the dies.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings the forging press is preferably hydraulically operated and has a lower stationary bolster 1 with upstanding side posts or frame members 2 between which the ram 3 moves vertically toward and away from the bolster preferably by means of a suitable hydraulic power cylinder 23.

The lower fixed die 4 is supported on the bolster 1 and has a central knockout pin 5 carried by the piston rod 6 and piston 7 operative in a power cylinder 8 beneath the die.

The upper movable die 9 is secured to the arm 3 and faces the die 4 to cooperate therewith in forming a hot workpiece. The die 9 has a central knockout pin 10 carried by the piston rod 11 and piston 12 operative in a power cylinder 13 above the die.

The head of knockout pin 5 presents a downwardly facing frusto-conical shoulder 14 which fits into a corresponding complementary central recess 15 in die 4 when the piston 7 and rod 6 are lowered. The upper face of the head of knockout pin 5 has a generally conical axial protrusion 16 for indexing with an axial complementary recess 17 in the corresponding end of a cylindrical stock piece 18.

Likewise, the head of knockout pin 10 presents an upwardly facing frusto-conical shoulder 19 which fits into a corresponding complementary central recess 20 in die 9 when the pin is fully retracted by piston 12. The lower face of the head of knockout pin 10 has a generally conical axial protrusion 21 for indexing with an axial complementary recess 22 in the corresponding end of cylindrical stock piece 18.

The knockout pins 5 and 10 are shown to be central of the corresponding dies 4 and 9, and are axially aligned with each other so that the protrusions 16 and 21 are opposed to each other at all times.

The ram 3 is actuated by a suitable power cylinder shown schematically at 23 in FIG. 1 and which may be disposed conveniently either above the ram as shown or beneath the bolster 1.

The knockout pins 5 and 10 are operated by their respective power cylinders 8 and 13 which are connected

to a source 24 of hydraulic pressure fluid through customary control valves 25 and pressure relief valves 26 to effect the described knockout pin actuation. Retraction of knockout pin 10 may be effected by air pressure admitted beneath piston 12 in cylinder 13.

In carrying out the invention the transfer mechanism 27 first positions the cylindrical stock piece 18 upright between the open dies 4 and 9, and fluid pressure is then admitted to cylinders 8 and 13 to actuate the pistons therein and close the knockout pins 5 and 10 upon the stock piece. The greater force involved in moving the ram to close the dies upon the stock piece 18 provides an overriding of the knockout pins 5 and 10.

The knockout pins 5 and 10 may be loose in the respective dies and the conical interlock of shoulders 14 and 19 in the corresponding recesses 15 and 20 accurately centers the stock piece 18 in the dies 4 and 9, respectively.

Upon completion of the forming of the piece the cylinder 23 is reversed, raising the ram 3 and permitting the lower knockout pin 5 to raise and lift the finished formed piece 28 from fixed die 4.

The upper knockout pin 10 is actuated to retain the formed piece 28 midway of the dies as the ram 3 continues to rise to open position.

Thereafter the transfer mechanism 27 is caused to grip the formed piece 28 and the knockout pins 5 and 10 are retracted from the piece 28 to release it for removal from between the dies.

The invention thus utilizes the knockout pins for locating the stock piece 18 in the dies and for initial removal of the formed piece 28 from the dies.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. The method of locating a stock piece in a set of forming dies, comprising disposing a stock piece between the open dies, gripping the stock piece by knockout pins extending in alignment loosely through the dies and having interlocking registry means laterally centering the stock piece relative to said pins, initially closing the dies upon said stock piece while overriding said knockout pins and centering the knockout pins and stock piece relative to the dies, and further closing the dies upon the stock piece to complete the forming of a workpiece.

2. The method of claim 1 in which hydraulic actuation of said knockout pin yields under the greater force of said die closing and is continued upon opening of the dies to effect separation of the formed piece from the dies upon retraction of the dies.

3. Apparatus for locating a stock piece in a set of forming dies, comprising a knockout pin loosely mounted in each die, means to actuate said knockout pins to grip the stock piece between the open dies, means to accurately locate the stock piece relative to each said knockout pin, means to close the dies upon the stock piece while so gripped, and means to accurately locate each said knockout pin relative to its die as the latter engages the stock piece.

4. The apparatus of claim 3 in which said knockout pin actuation is effected hydraulically and yields upon closing of the dies to effect overriding of the same whereby upon reopening of the dies after forming of the piece the knockout pins serve to remove the formed piece from the dies.

5. The apparatus of claim 3 in which each knockout pin has a generally conical protrusion on its face to interlock with a corresponding complementary recess in the stock piece.

6. The apparatus of claim 3 in which said last named means comprises a generally frusto-conical head on each knockout pin adapted to fit into a complementary recess in the face of the corresponding die.

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