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[54] **TONGS FOR USE IN A MULTI-STAGE FORGING PRESS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **294/90;** 248/316 B; 294/110 R; 403/327

[51] **Int. Cl.** **B66c 1/66**

[58] **Field of Search**... 294/90, 110 R, 87.24, 110 A; 248/316 B; 403/327

[56] **References Cited**

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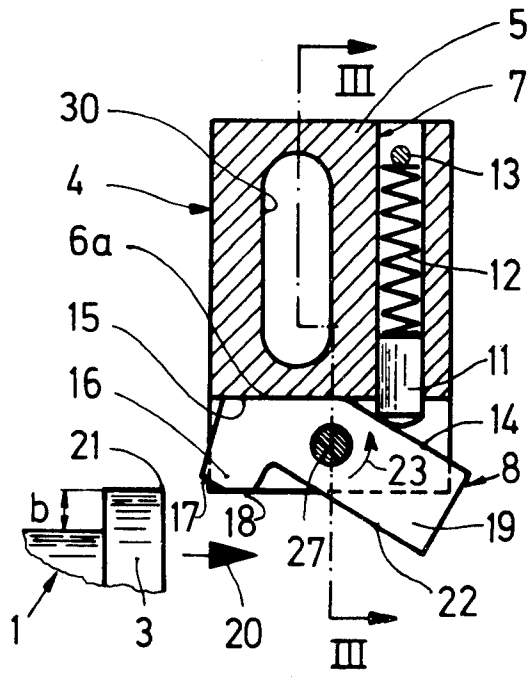
[57] **ABSTRACT**

This invention relates to tongs for use in a multi-stage forging press in which a forging having a collar projecting at right angles to the axis of the press and which is downstream relative to the direction of ejection from the press is to be automatically transported by the tongs. The present invention provides an arrangement for protecting the collar of the forging during transportation thereof.

6 Claims, 5 Drawing Figures



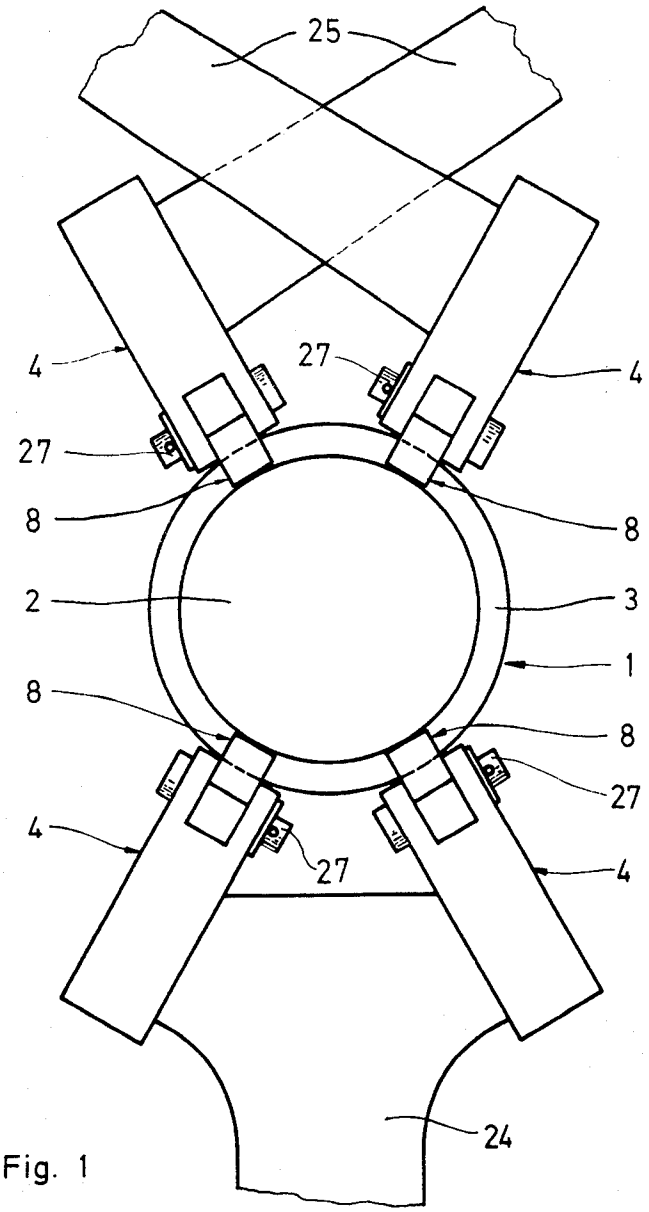


Fig. 1

Fig. 2

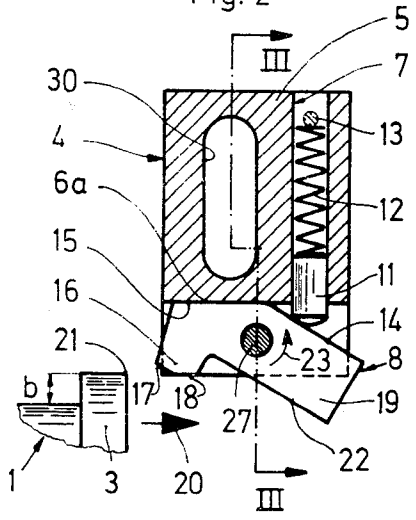


Fig. 3

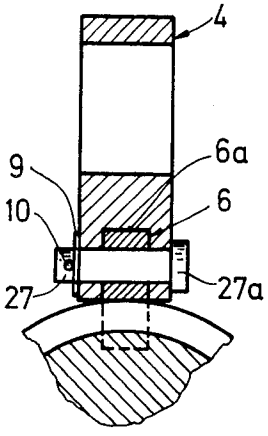


Fig. 4

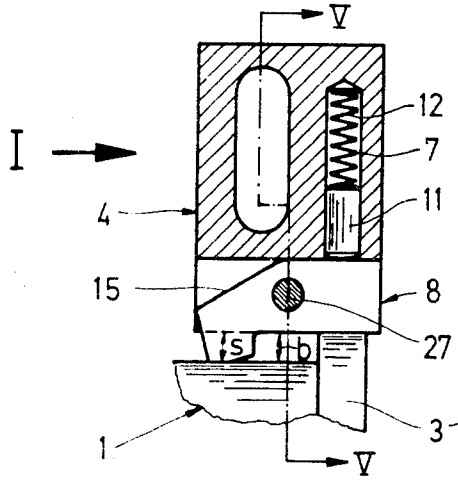
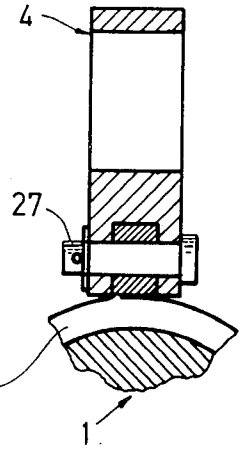


Fig. 5



TONGS FOR USE IN A MULTI-STAGE FORGING PRESS

BACKGROUND OF THE INVENTION

The present invention relates to tongs for use in a multi-stage forging press, and more especially to tongs for use in a press in which a forging having a collar projecting at right angles to the axis of the press and downstream relative to the direction of ejection is automatically transported by at least three co-operating tong jaws which grip a forging issuing from the press die and convey it to the next press station. At least one jaw of the tongs is under elastic pre-stress for reliable gripping of the forging.

In mass production on automatic multi-stage forging presses, the forgings are, as is known, conveyed by special transport tongs from one working station to the next. This transport sequence requires unusually precise co-operation of the individual jaws of the tongs and secure gripping, holding and release of the forgings. On the one hand the individual working positions of the forgings must be adhered to very precisely. On the other hand modern forging presses work with high frequencies and for example eject up to **120** articles per minute depending on the shaping process and on the size of the articles to be manufactured.

These problems are particularly delicate if the forgings to be transported possess a radially outward-projecting, relatively narrow collar in the region of one end face. The tongs must grip the forging in such a case, on the outer-most cylindrical surface or circumference of the collar. It happens relatively frequently that, because of the unequal weight distribution, the article tilts or shifts during the transport sequence and hence interferes with, or interrupts, the production sequence.

The requirement for exact positioning of the articles by the transport tongs is understandably extremely severe in the case of multi-stage forging presses and it is evident that even the slightest deviations from the intended position can lead to waste or even to damage of the tools.

According to the present invention there is provided tongs for use in a multi-stage forging press in which. A forging having a collar projecting at right angles to the axis of the press and which is downstream relative to the direction of ejection from the press is to be automatically transported by the tongs. The tongs comprise at least the three cooperating tong jaws for gripping and transporting a forging ejected from the press. Each tong jaw includes a lever on its end face which grips a forging. The lever has first and second arms arranged at an angle to each other and is pivotable between an open position and a gripping position about an axis at right angles to the direction of ejection. The lever is effective to pivot to the gripping position when the arm remote from the press is contacted by the forging being transported. The position of the pivotal axis and the dimensions of the lever are such that the arm remote from the press is adapted to engage the circumference of the collar when the lever is in its operative gripping position while the arm nearest the press engages a surface of the forging behind the collar.

This construction of the transport tongs results in the fact that the forging is not only grasped on the circumference of the collar but also on the base body which is radially somewhat set back, and can hence be transported securely and so as to retain its intended position.

In a specific embodiment the angle-lever is carried in a slit located on the end face of the jaw of the tongs and possesses, on its side which faces the bottom of the slit, two stop faces which are arranged at an angle to one another. One of the stop faces on the side of the die rests against the bottom of the slit in the position of the tongs prior to gripping and the other of the stop faces rests against the bottom of the said slit in the gripping position of the tongs.

The arm of the angle-lever on the side of the die possesses a gripping face which is parallel to the gripping face of the other arm, and both gripping faces can be matched to the circumference of the forging.

BRIEF DESCRIPTION OF DRAWINGS

An illustrative embodiment of the invention will now be described with reference to the accompanying drawings, in which:

FIG. **1** is a schematic front view of one form of tongs equipped with two pairs of jaws;

FIG. **2** is a representation in cross-section of a jaw of tongs in the position of the tongs prior to gripping.

FIG. **3** is a section along a line III—III in FIG. **2**,

FIG. **4** is a representation in section similar to FIG. **2** but shows the jaw of the tongs in its gripping position, and

FIG. **5** is a section along line V—V in FIG. **4**.

DESCRIPTION OF SPECIFIC EMBODIMENTS

FIG. **1** shows a forging **1** in its entirety, which can be used, for example, as a vehicle hub and possesses a cylindrical base body **2** and a collar **3** projecting radially outwards theerefrom. The collar **3** is on the end section of the forging **1** which faces away from the die, as is shown for instance in FIGS. **2** and **4**.

FIG. **1** shows the tongs in their gripping position corresponding to a side view in the direction of the arrow I in FIG. **4**. The two lower jaws **4** are rigidly fixed to a gripping member **24**. The upper pair of jaws is elastically pre-tensioned via arms **25** which cross in a scissors-like manner and via a spiral spring which is not shown.

The construction of the jaws **4** of the tongs can be seen from FIGS. **2** to **5**. According to FIGS. **2** and **3** the jaw **4** of the tongs has a substantially parallel epipoid-shaped base member **5** provided with a slit **6** which is open towards the bottom and a through-bore **7** which opens into this slit. A slot **30** serves to attach the jaw of the tongs in an adjustable manner to the corresponding arm of the tongs.

The general construction of the tongs according to FIG. **1** is not of importance for a comprehension of the present invention and can furthermore be assumed to be known to anyone skilled in the art. In order to understand thee mode of operation of the tongs shown it merely remains to be mentioned that both pairs of jaws are mounted on a carriage and reciprocate on this between two working stations. The lower pair of jaws is arranged in a rigid manner and the upper pair of jaws is under the elastic stress of a spring. Consequently the article issuing from the die can be pushed, against the spring pressure mentioned, between the pairs of jaws which are waiting ready.

An angle-lever **8** is carried in a pivotal manner in the slit **6**, by means of an axle **27**. The axle **27** is provided

with a head 27a and is secured on the side opposite the head 27a by means of a washer 9 and a split pin 10.

A cylindrical pin 11 which can slide axially is located in the through-bore 7. A spiral spring 12 is supported, on the side opposite the pin 11, on a heavy tensioning pin 13. Accordingly, spring 12 constantly holds the cylindrical pin 11 in contact with the face of the angle-lever 8 which points toward it and thereby presses the angle-lever 8 into the position shown in FIG. 2.

The face of the angle-lever 8 which points towards the bottom 6*a* of the slit 6 possesses two stop faces 14 and 15 located at an angle to one another. The side of the angle-lever 8 opposite the faces 14 and 15 has a cut-out portion which in cross-section is practically rectangular. consequently, a projection 16 is produced at the left-hand lower end of the angle-lever. Projection 16 has two faces 17 and 18 which are at an angle to one another.

FIG. 2 shows the jaw 4 of the tongs in an open position prior to gripping, in which the tongs thus stand in front of the die and await the ejection of the forging. The position of the axle 27 and the dimensions of the angle-lever 8 are so chosen that in this open position prior to gripping, according to FIG. 2, the face 18 is flush with the lower edge (not numbered) of the jaws of the tongs and right-hand lower corner 19 of the angle-lever projects beyond the lower edge of the jaw 4. In this open position prior to gripping, the stop face 15 rests against the bottom of the slit 6. In this embodiment, the maximum height of pivoting, marked s in FIG. 4, of the projection 16 thus corresponds to the height b of the collar of the forging.

When the forging is ejected from the die (not shown) in the direction of the arrow 20 and while the jaws 4 are in the open position, the front edge 21 of the collar 3 encounters the inclined face 22 of the angle-lever 8. Thus angle-lever 8 tilts in the direction of the arrow 23 to a gripping position where the face 14 of the angle-lever is thus caused to rest against the bottom of the slit 6 while overcoming the counter acting force of the return spring 12, the face 17 of the projection 16 of the angle-lever then rests against the cylindrical circumference of the base body 2. Hence, the jaw 4 of the tongs is in its gripping position, which is illustrated in FIG. 4. In this gripping position the forging 1 is thus held by each angle-lever 8 both on the circumference of the collar and on the circumference of the base body 2 and an undesired shift of the forging thereby reliably excluded.

With regard to the arrangement and size of the angle-lever 8, the pivoting height *s* must correspond at least to the height *b* of the collar so that the collar 3 can pass freely under the projection 16 of the angle-lever when the forging is pushed out of the die. The faces 15 and 18 on the one hand, and the faces 14,17 and 22 on the other, are respectively parallel to one another in this specific embodiment.

The two stop faces 17 and 22 of the angle-lever can be matched to the doming or curvature of the corresponding circumferential faces of the forging 1.

The bore 7 which serves as a bearing for the pin 12 could for example also (as is indicated in FIG. 4) be constructed as a blind bore. The heavy tensioning pin 13 is then of course no longer necessary.

We claim:

1. In a multi-stage forging press in which a forging having a collar projecting at right angles to the axis of the press and which is downstream relative to the direction of the ejection from the press is to be automatically transported by tongs, said tongs comprising:
   a. a plurality of cooperating tong jaws for gripping and transporting a forging ejected from the press,
   b. each tong jaw including a lever pivotably mounted at the jaw end face where the forging is gripped,
   c. said lever having first and second arms arranged at an angle with respect to each other,
   d. said lever being pivotable between an open position and a gripping position about an axis at right angles to said direction of ejection,
   e. the lever being effective to pivot to the gripping position when the arm remote from the press is contacted by the forging being transported,
   f. the position of the pivotal axis and the dimensions of the lever being effective to cause the arm remote from the press to engage the circumference of the collar and to cause the arm nearest the collar to engage a surface of the forging behind the collar.

2. Tongs as defined in claim 1 wherein
there are at least three cooperating tong jaws.

3. Tongs as defined in claim 1 wherein
each of the arms includes a gripping surface,
said gripping surface being parallel with respect to each other.

4. Tongs as defined in claim 1 wherein
the arm nearest the collar includes a gripping surface which is disposed on said arm to pivot by an amount corresponding to at least the height of the collar of the forging.

5. Tongs as defined in claim 1 wherein
each lever is carried in a slit located on the end face of each associated jaw,
each said lever being provided with line stops arranged at an angle with respect to each other so that one stop engages the bottom of the slit in an open position of the tongs and the other stop engages the bottom of the slit in the gripping position of the tongs.

6. Tongs as defined in claim 1 wherein
at least one of the tong jaws is under elastic prestress to enhance gripping of the forging.

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