United States Patent [19]

Ory

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[54] **FORGING MACHINE**

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[52] **U.S. Cl.** **72/237**, 72/248, 72/250

[51] **Int. Cl.** **B21b 31/20**

[58] **Field of Search** 72/237, 238, 250, 72/248; 76/108

[56] **References Cited**

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[57] **ABSTRACT**

Machine for forging a bar between two rolls, each roll having a single constraint groove located between two flanges destined to turn between said corresponding bearings, each flange on one side of the groove turning while being in contact with the corresponding flange of the other roll situated on the same side of the groove, said housings being oriented so that the entry axes of the roll journals are perpendicular with each other.

2 Claims, 6 Drawing Figures

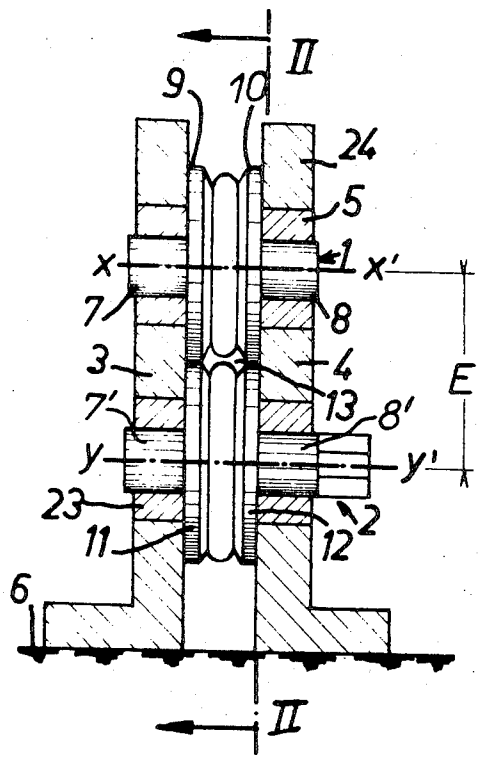


FIG. 1

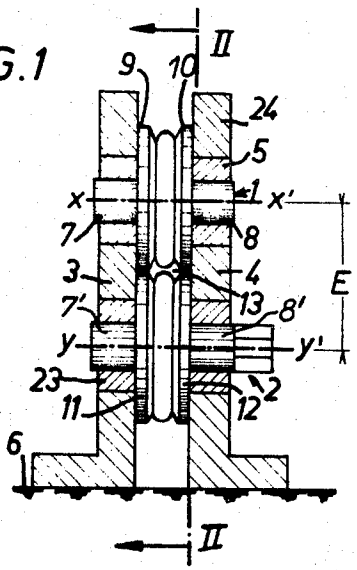


FIG. 2

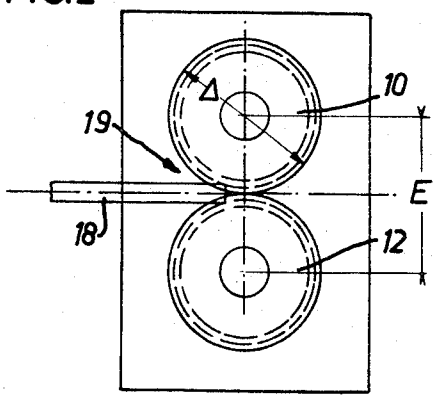


FIG. 4

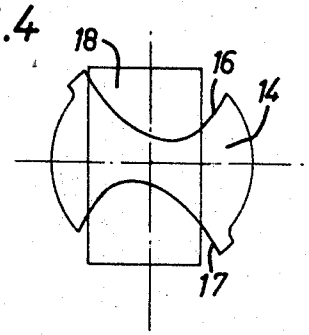


FIG. 5

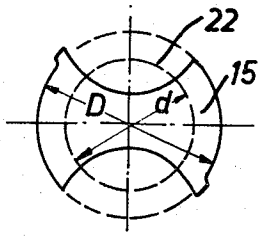


FIG. 3

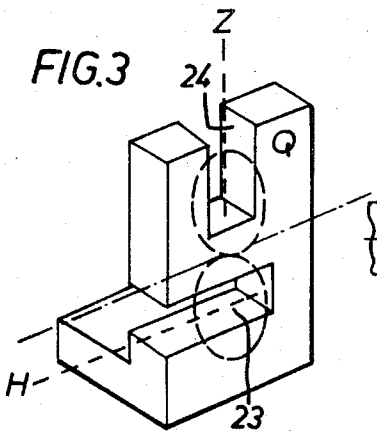
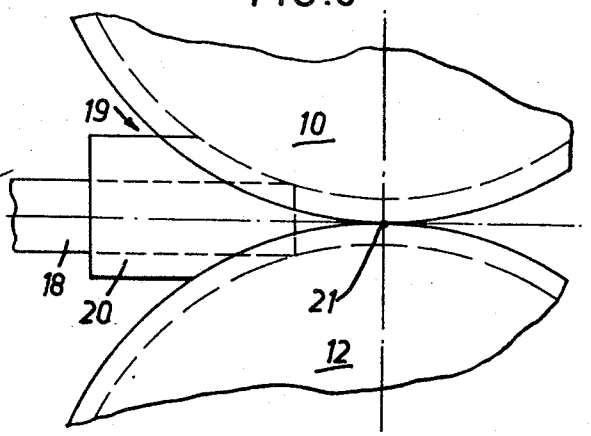


FIG. 6



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FORGING MACHINE

The present invention relates to a forging machine and, more particularly, it relates to a rotary forging machine in which the profile to be forged is rolled through a groove formed between four flanges which roll, in pairs, on top of each other.

Multiple groove rolls whose journals are mounted in clamping columns are well known. In such systems the leading pass section of a steel rod or bar heated to rolling temperature is successively fed through grooves which are dimensioned so as to progressively reduce the cross-section of said rod or bar and assure the degree of currying required for the quality of the metal. The passes through each groove result in an elongation longitudinally of the rod which corresponds to the constriction which it undergoes.

As the rod is fed through the machine, the rolls of a two-high mill undergo a certain degree of buckling or deflection (the rolls are provided with a certain number of grooves and the distance between journals can be on the order of one meter); this then does not lead to a high degree of cross-sectional precision of the rod as determined by the profile of the grooves. The final cross-section is obtained through successive passes of the billet through the machine and the profile is gradually modified, when for example, a square billet is given a round section. In certain cases, in order to obtain a high degree of precision in the gauging of the rolled rod, the transverse rigidity of the working rolls is assured by means of one or more back up rolls, such as for example in a Sendzimir cold rolling train.

On the contrary, the present invention provides a forging machine comprised of a single groove formed between the flanges of each roll, the distance separating said flanges corresponding merely to the relatively small width of the profile (itself of small size) which is to be obtained on the shaping machine; the opposed flanges turn on top of each other. A curvilinear wedge is provided on each side of the machine base (rod entry side) in order to laterally confine the metal to be jumped, the starting profile being a commercially available round, square or flat profile whose cross-section is substantially that of the resultant grooved profile and having a cross-sectional excess limited to 5 to 15 percent in order to assure proper formation of all the details of said resultant profile.

These and other features of the invention will become apparent through a consideration of the following detailed description taken in conjunction with the attached drawings in which:

FIG. 1 is an isometric view of a forging machine constructed in accordance with features of this invention;

FIG. 2 is a view of FIG. 1 taken along lines II—II;

FIG. 3 is a perspective view of a column base of the machine shown in FIG. 1;

FIGS. 4 and 5 are cross-sections of the rod, before and after edging; and

FIG. 6 is an enlarged view of a detail of FIG. 2.

FIG. 1 shows two rolls 1 and 2 mounted in bearings 5 provided in columns 3 and 4.

Columns 3 and 4 are rigidly secured to a base 6, for example by bolts or other conventional means.

As shown in FIG. 1, two flanges 9 and 10 are located between journals 7 and 8 of roll 1. Flanges 9 and 10 are in contact with flanges 11 and 12, respectively, of roll 2.

The rolls are machined between the flanges so as to form profile 13, with proper constriction of the bar to be produced.

Profile 13 is, for example, that of a drill blank 14 (FIG. 4) or blank 15 (FIG. 5) in which two channels 16 and 17 are formed and which, after torsion, will result in the spiral grooves of a finished drill.

According to this invention, the cross-sectional area of rod 18 (for example rectangular) is 5 to 15 percent greater than that of blank 14 and its leading pass section is fed into the machine at 19 (FIGS. 2 and 6). As represented in FIG. 6, a rectilinear wedge 20 is appropriately secured to each column in order to prevent any part of bar 18 from laterally entering the roll gap 21 located ahead of the point of contact between flanges 10 and 12, adjacent on the same column.

As rod 18 passes through the grooves formed in rolls 1 and 2, it undergoes lateral jumping similar to that which a slug undergoes in a die press or under the action of a drop hammer, whereas the elongation corresponds to the reduction of the initial cross-section. The jumped metal changes, for example, from its rectangular shape 18 to the grooved shape of drill 14, or from round shape 22 having a diameter "d" to grooved profile 15 having a diameter "D."

The gauging of the forged profile being produced is highly precise due to the fact that the flanges on either side of a roll must turn while being precisely positioned upon the flanges of the other roll.

The problem which arises is that of rectifying the rolls once the roots of the grooves have been worn down through repeated forging operations. According to the invention, the dimensions are restored, partly by machining the roots of the grooves, partly by flange-upon-flange lathe turning of the bearings and readjustment of the dimensions of the curvilinear wedges. Since the diameter "Δ" of the flanges decreases each time the rolls are rectified, the invention provides for a column having two orthogonal bearing housings, a housing 23 having a horizontal entry axis H and a housing 24 having a vertical entry axis Z. This arrangement enables distance E (plane Q) separating axes xx' and yy' of respective journals (7 and 8) of roll 1 and (7 and 8) of roll 2 to be adjusted at will as the contacting flange surfaces are adjusted as required in order to comply with the final dimensional requirements of the drill blank profile.

It can be seen that the present invention enables one-pass production of a straight, reamed blank from a commercially available bar or rod obtained, for example, through simple extrusion of a no decarburized high-speed steel billet. The blank need then only be twisted and ground without metal removal, according to the characteristics of the final drill.

I claim:

1. A forging machine comprised of two columns secured to a base, two housings provided in each column for receiving the bearings of two mill rolls, each roll having a single constraint groove located between two flanges destined to turn between said corresponding bearings, each flange on one side of the groove turning while being in contact with the corresponding flange of the other roll situated on the same side of the groove, said housings being oriented so that the axes for adjustment of each of the roll journals are perpendicular with each other and so that the distance separating the two

rolls can be precisely adjusted for any changes in the grooves.

2. Forging machine according to claim 1 wherein there is provided a curvilinear wedge means on each column for the leading pass section of the bar or rod to prevent any part of said bar or rod from entering the roll gap between two adjacent flanges rolling on top of each other, said flanges applying the forging stresses substantially transversely, the entry cross-section of the bar being limited to an excess of 5 to 15 percent in relation to the exit cross-section, said bar consequently undergoing only a slight elongation and being basically compression fed into the groove between the two work rolls.

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