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PRESSES FOR MAKING WORKPIECES TAPERING IN LONGITUDINAL DIRECTION

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Fig. 2

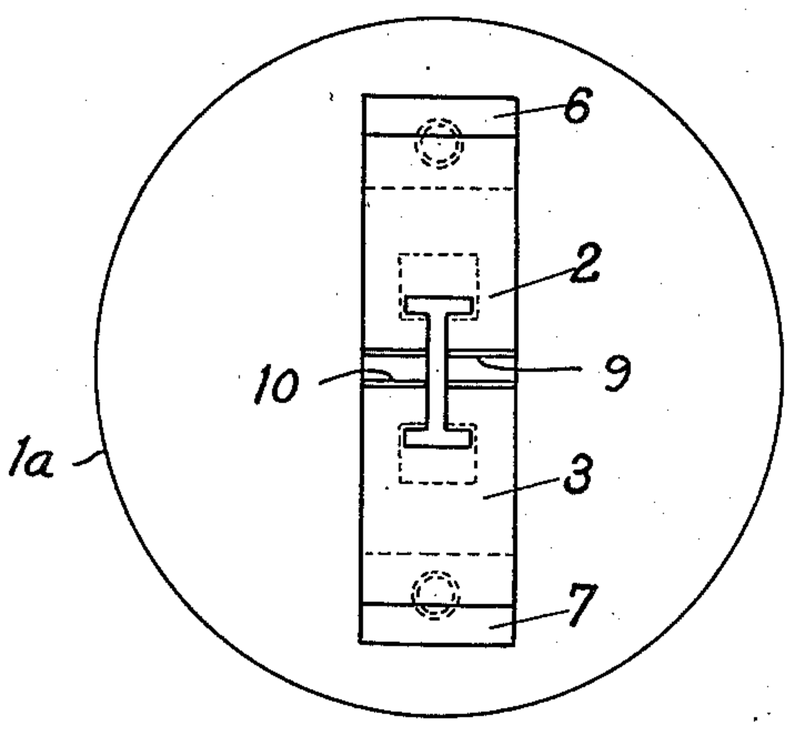
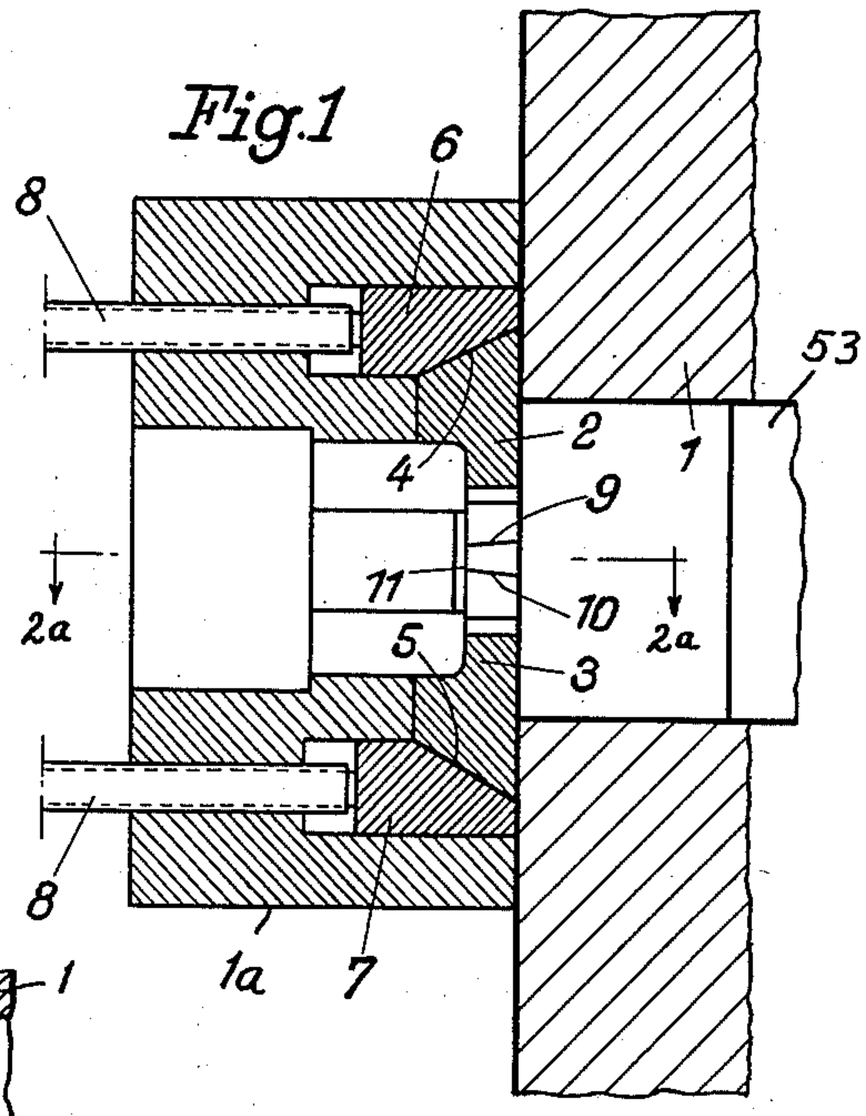


Fig. 1



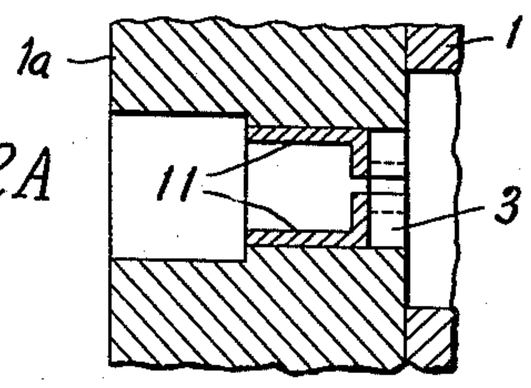


Fig. 2A

Fig. 3

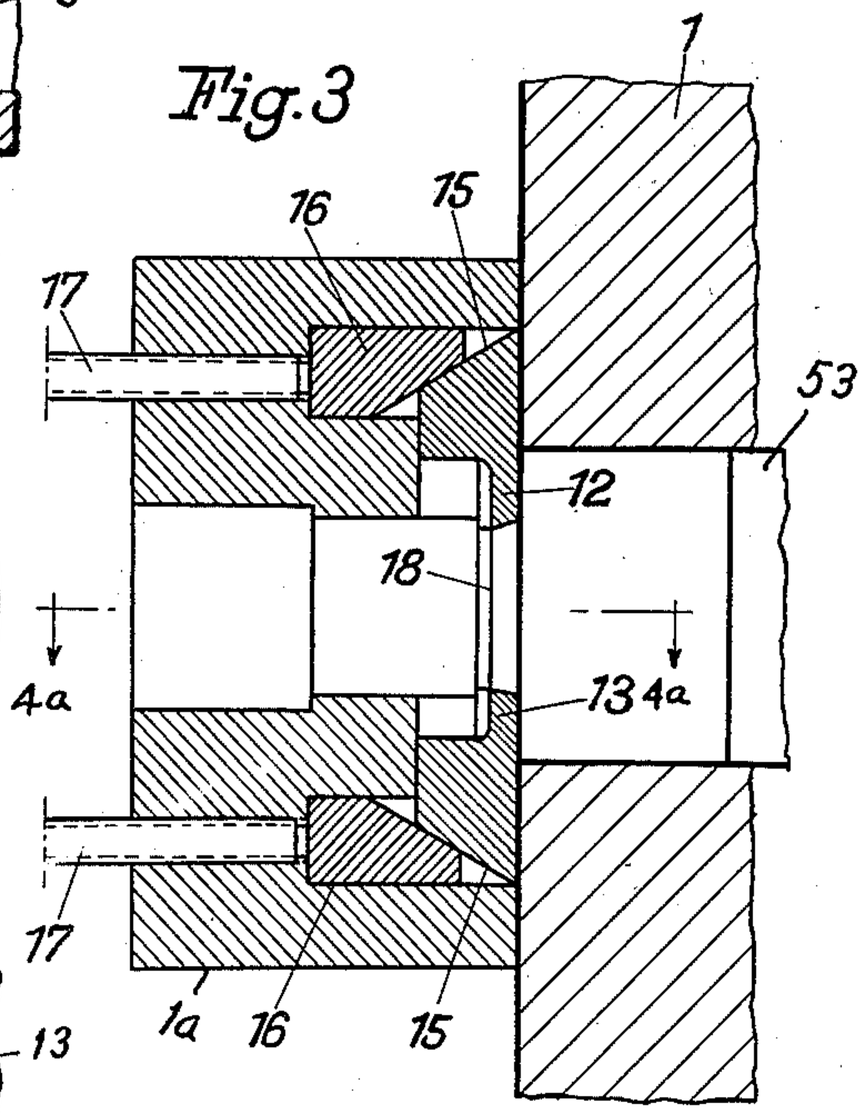
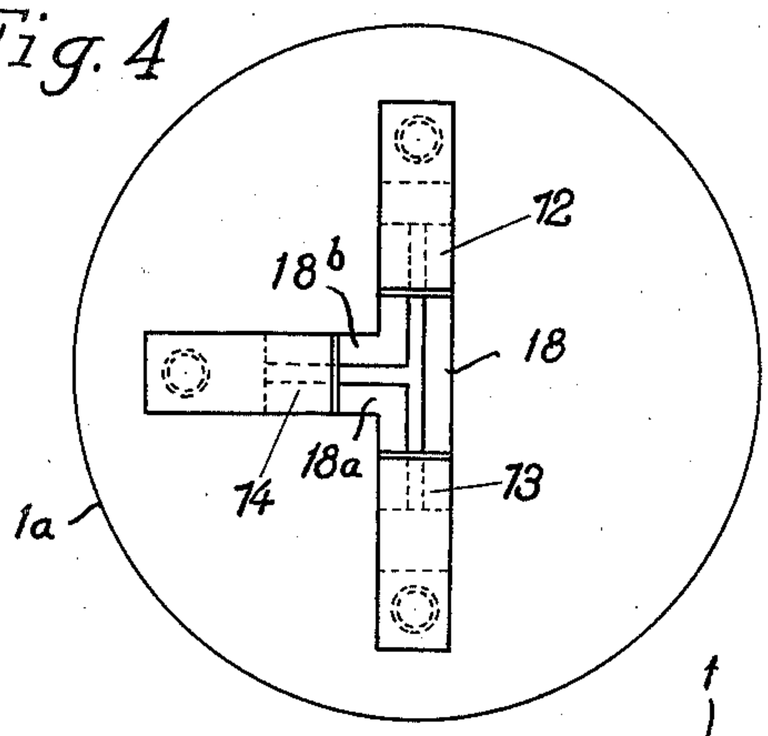


Fig. 4



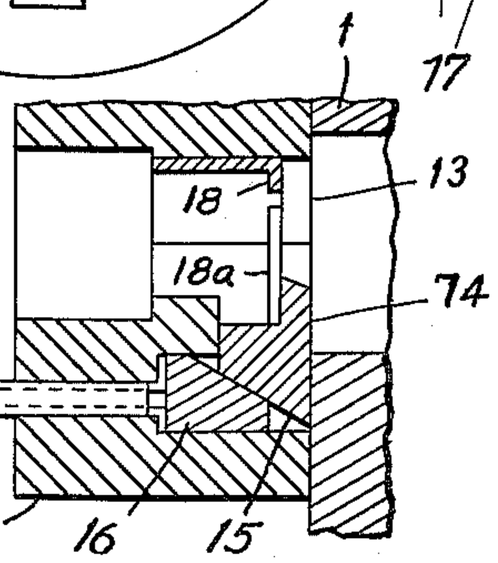


Fig. 4A

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Fig. 5

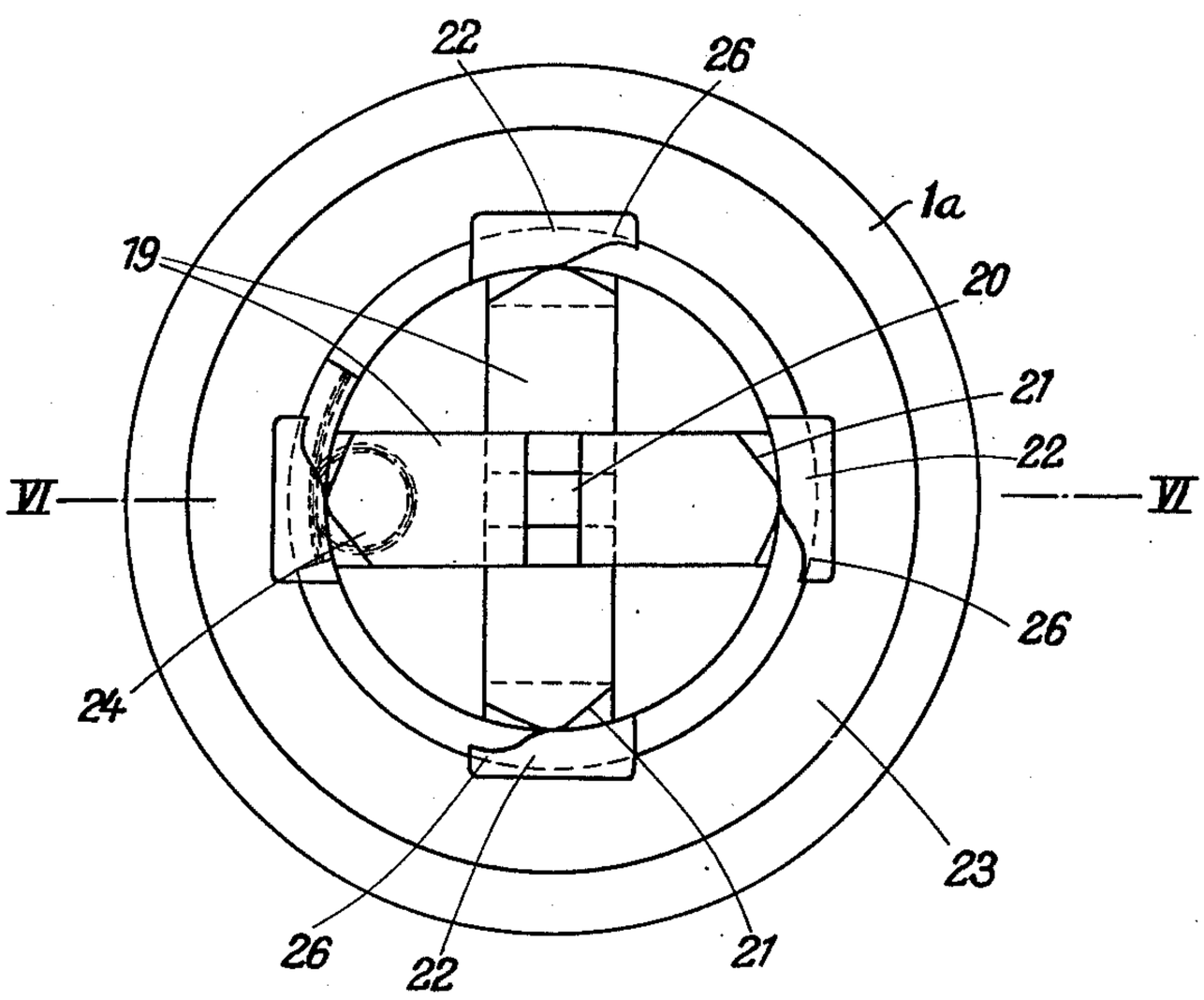
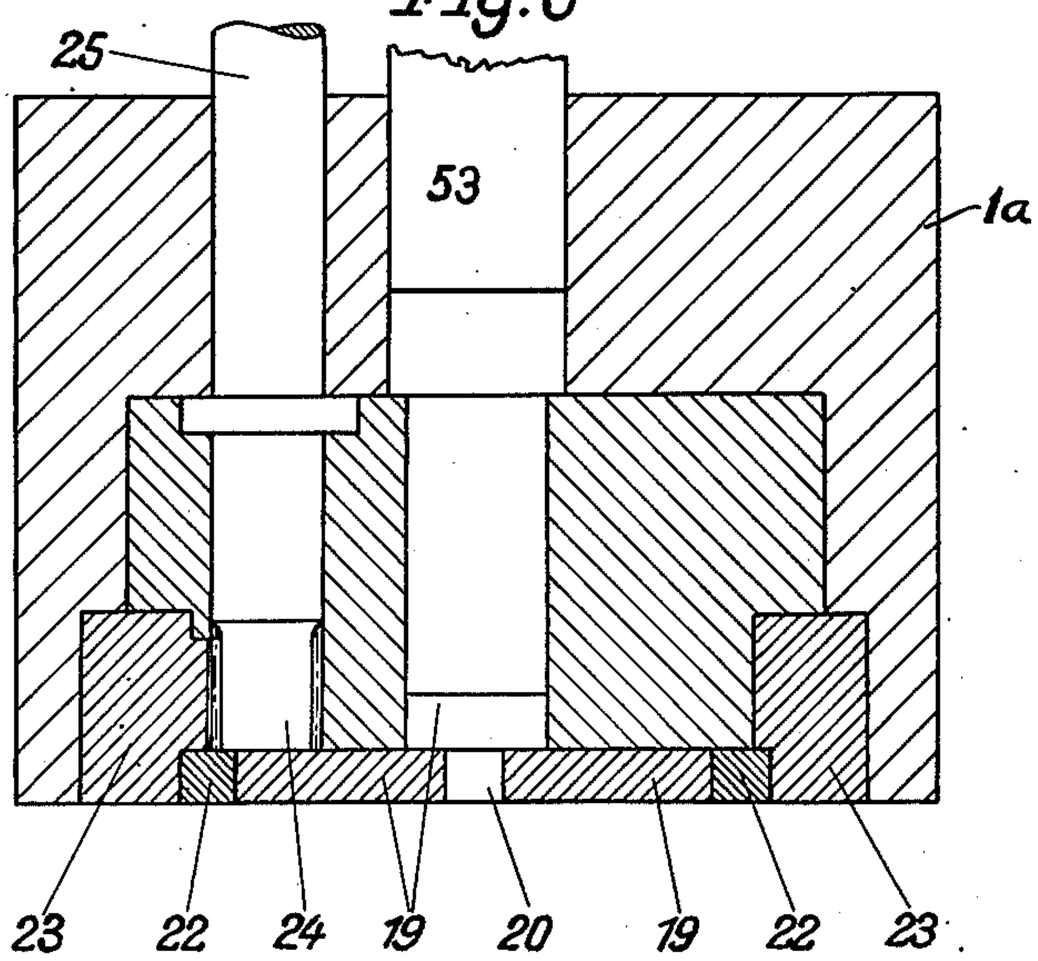


Fig. 6



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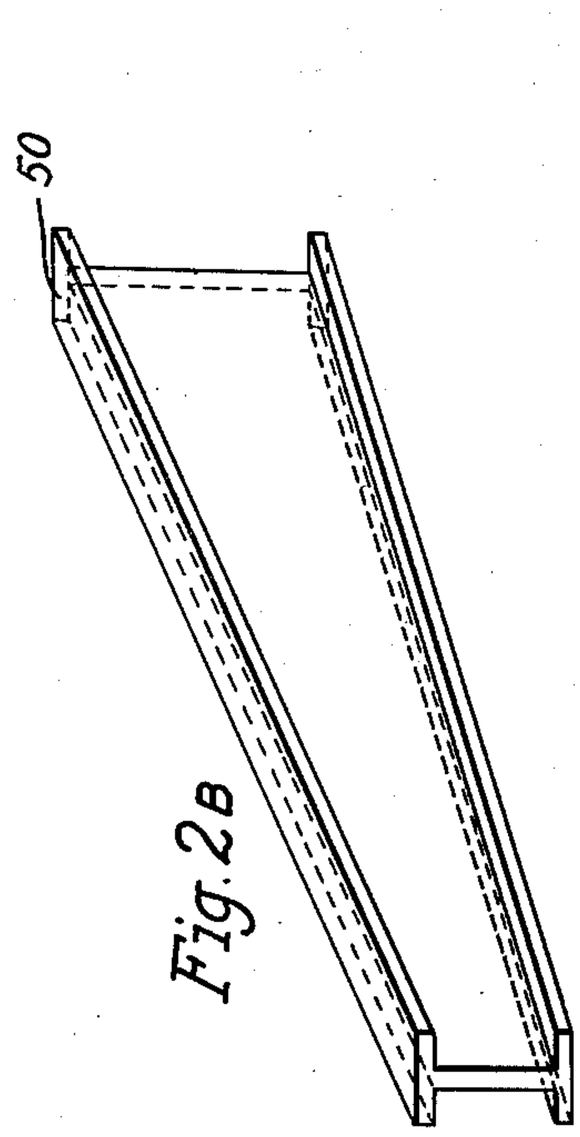

Fig. 2B

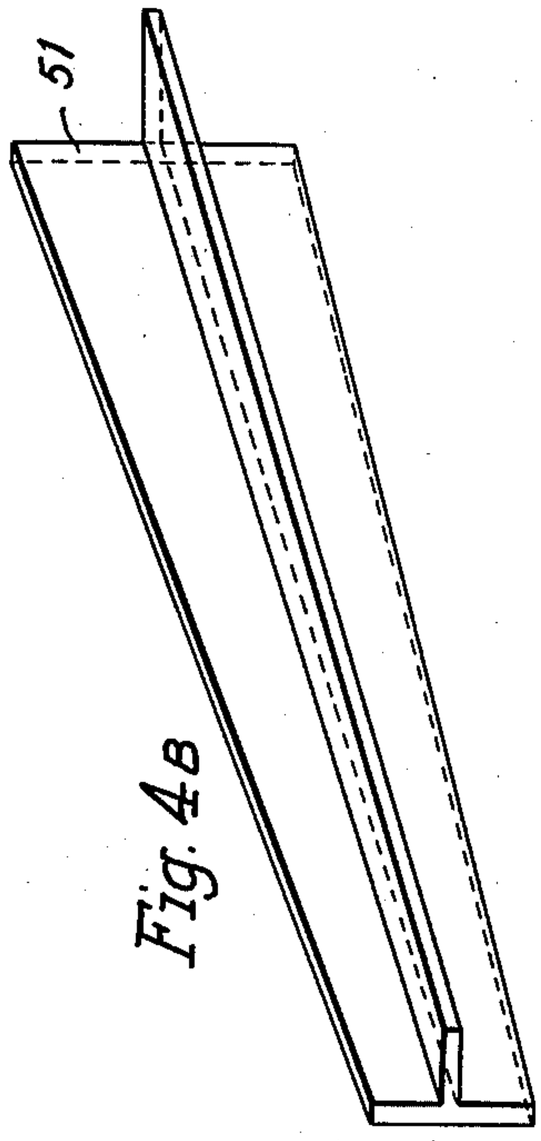

Fig. 4B

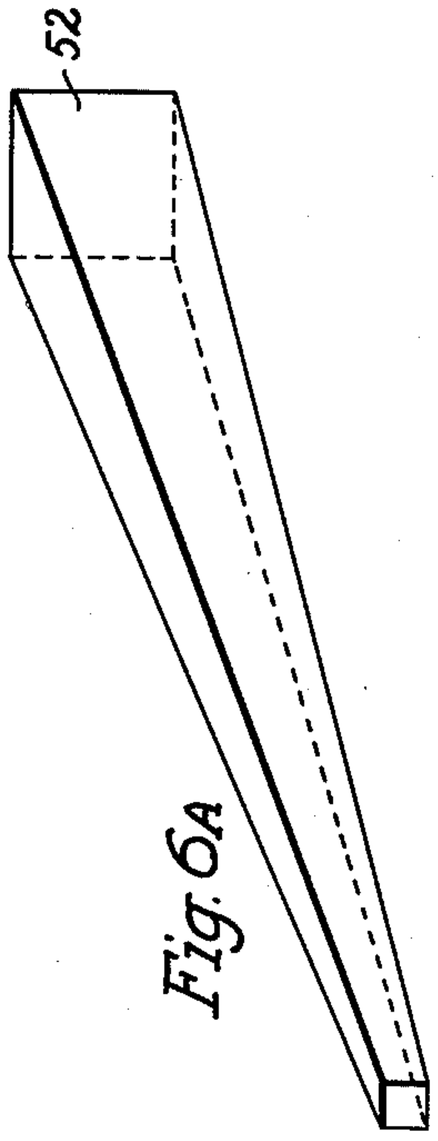

Fig. 6A

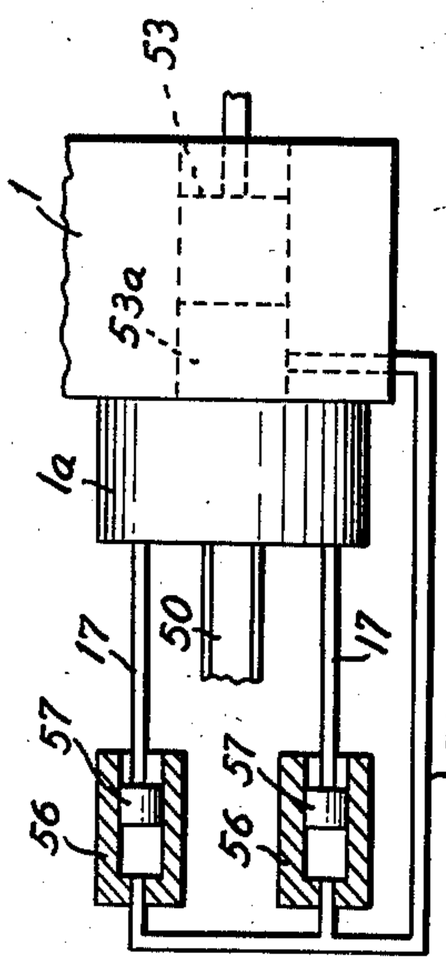

Fig. 7

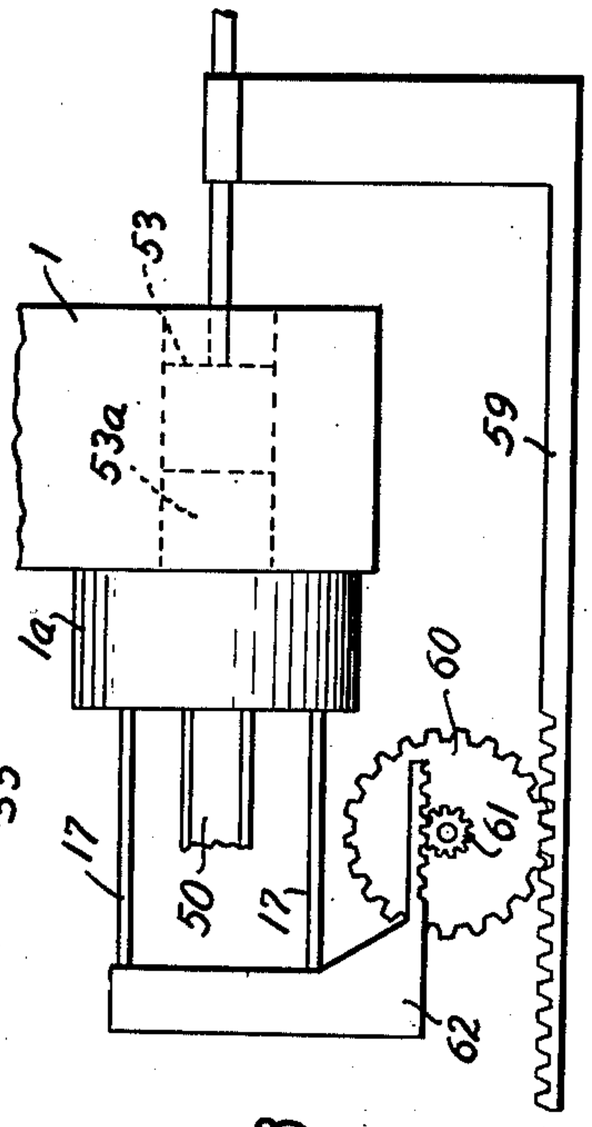

Fig. 8

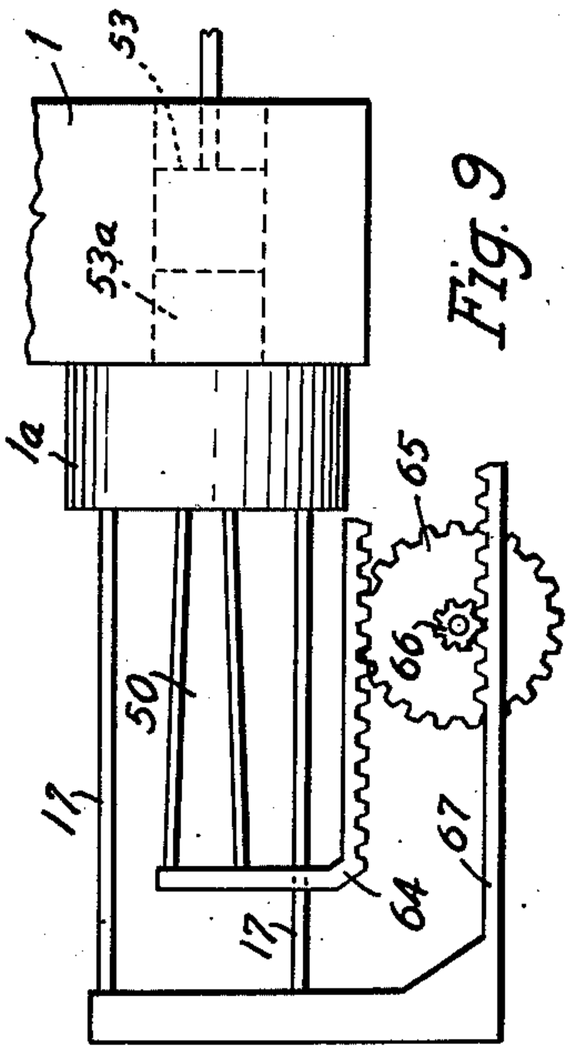

Fig. 9

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PRESS FOR MAKING WORKPIECES TAPERING IN LONGITUDINAL DIRECTION

Wilhelm Mänken and Otto Uhlmann, Waren, near Berlin, Germany; vested in the Alien Property Custodian

Application June 25, 1940, Serial No. 342,400
In Germany November 15, 1938

10 Claims. (Cl. 18—12)

This invention relates to presses and more particularly to so-called extrusion presses serving for the production of work-pieces such as I-beams, T-bars and the like having a profile tapering in the longitudinal direction of pressing.

It is known to produce work-pieces having a profile tapering in longitudinal direction by means of presses of the aforementioned kind including conical mandrils connected with the press-plunger, said mandrils moving during the operation of pressing through a fixed die of uniform cross-section. Although with known processes of this kind there may be produced work-pieces having angular profiles with the parts thereof varying both in thickness as well as in length, it is not possible to make work-pieces of a T, I, U or similar profile of varying length in addition to varying thickness of the web and of the flanges of the profile.

Our present invention has for its general object to devise a press for producing work-pieces having profiles varying to a far greater extent than had been possible to produce with presses of known construction.

According to our invention we propose to use for this purpose a die composed of a plurality of parts which are caused to move apart during operation of the press. Preferably this motion of the parts of the die is effected by action of the operating pressure. Moreover, the interior surfaces of the movable parts of the die may conically enlarge towards the press-plunger, thus facilitating the motion of said parts away from each other by action of the operating pressure. However, said movable parts of the die may also be actuated by means of suitable operating organs.

The movable parts of the die are provided on the outer side thereof with wedge-shaped surfaces which on their part co-operate with wedge-members of suitable conformation. These wedge-members are adapted to move in dependence from the velocity of the pressing motion, that is the speed of the press, for instance by means of spindles.

The actuating organs for said wedge-members may be driven and properly controlled in suitable manner either by the profile of the work-piece during being discharged from the press or also by the press-plunger.

In some cases it will be necessary to further provide in the rear of the movable parts of the aforesaid die an additional fixed die in order to mark the gap between said movable parts when the parts have moved apart during operation of the press, to such an extent as not to serve for the production of the final profile to be imparted to the work-piece.

In case portions of the profile produced by means of said additional fixed die shall likewise be of a conformation tapering in longitudinal direction, it will be necessary to provide a two-part construction also for this fixed die and to mount the two parts of the latter movably with respect to each other.

Preferably the organs serving to impart motion to the movable die parts are constructed in such a manner that one or several pairs of movable die-parts co-operate at their outer ends, that is at the ends away from the hole in the die, with fitting members provided with curve-shaped recesses. These fitting members are mounted within a wheel-rim having an internal gear and may be rotated with said wheel-rim by means of a spindle, the rotation being effected to such an extent that the movable die-parts will slide in said recesses, whereby the hole in the die will be enlarged in conformity with the shape of the curve of said recesses during the operation of the press, with the result that a lengthwise tapering profile is imparted to the work-piece in longitudinal direction of pressing thereof.

In the accompanying drawings which form part of this specification we have represented some examples of construction of our new press. In the drawings, Fig. 1 is a section through the dies of a construction producing a work-piece with an I-profile in longitudinal direction, Fig. 2 a view of the die with movable parts, as seen in the direction of pressing, Fig. 2A is a sectional view taken along line 2A—2A in Fig. 1, Fig. 2B is a perspective view of an I-beam section made with the apparatus shown in Figs. 1 and 2, Fig. 3 a section through the dies constructed to produce a work-piece with a T-profile in longitudinal direction, Fig. 4 a view of the movable die, as seen in the direction of pressing, Fig. 4A is a sectional view taken along line 4A—4A in Fig. 3, Fig. 4B is a perspective view of a T-bar section made with the apparatus shown in Figs. 3 and 4, Fig. 5 a plan-view of a further construction of the die, as seen in the direction of pressing, and Fig. 6 a section along line VI—VI of Fig. 5, Fig. 6A is a perspective view of a pyramidal bar made with the apparatus shown in Figs. 5 and 6. Fig. 7 is a schematic view wherein the die operating means is controlled by the pressure in the press, Fig. 8 is a similar view wherein the die operating means is controlled by the motion of the press, and Fig. 9 is another view wherein the die operating means is controlled by the motion of the work-piece.

Referring more particularly to the drawings, in Figs. 1 and 2 the receptacle for the material to be worked in the press is designated by the reference numeral 1, while the parts of the die which are movable transversely to the direction of pressing are designated by the numerals 2 and 3. The parts 2 and 3 of the die are of wedge-shaped conformation on their outer surface, as indicated in Fig. 1 at 4 and 5, in order to co-operate with wedges 6 and 7 of a conformation corresponding to that of said outer surfaces of said die-parts. The die-parts 2, 3 and the wedge members 6, 7 are mounted in the immovable holder 1*a*. The wedges 6 and 7 may be actuated by means of suitable operating organs, such as for instance spindles 8, as shown in Fig. 1. Motion of the die-parts 2 and 3 in direction away from each other is facilitated by the fact that their interior surfaces 9 and 10 are of a divergent conformation, enlarging in direction towards the press-plunger. The spindles 8 actuating the wedges 6 and 7 are preferably driven and controlled by the profile of the work-piece 50 where it is being discharged from the press or also by the motion of the press-plunger 53.

The pressure exerted onto the spindles 8 by way of the wedges 6 and 7 may be varied by properly altering the inclination of the wedge-shaped outer surfaces of the die-parts 2 and 3. In order to insure proper working of the press, care should be taken that no excessive pressures are exerted onto the spindles 8. In the rear of the die-parts 2 and 3 there is further provided the aforementioned additional fixed die which masks part of the gap between the die-parts. Fixed die 11 is rigidly mounted in immovable holder 1*a*, and is dimensioned to provide the final maximum size of the work after dies 2, 3 have moved apart therebeyond.

The press shown in Figs. 3 and 4 serving for the production of a work-piece 51 with a T-profile is constructed similarly to the press shown in Figs. 1 and 2. In Figs. 3 and 4 the receptacle for the material to be worked by the press is designated by the reference numeral 1, the press plunger is designated by 53, while 12, 13 and 14 are die-parts mounted movably in transverse direction to the direction of pressing.

The outer surfaces 15 of the parts 12, 13 and 14 are likewise wedge-shaped in order to cooperate with the wedges 16 actuated by the spindles 17. In the rear of the die-parts 12, 13 and 14, there is again used fixed dies 18, 18*a* and 18*b* rigidly mounted in immovable holder 1*a* for masking part of the gap between the movable die-parts for the above stated purpose.

In the construction of the press shown in Figs. 5 and 6 the movable die-parts 19 form at their inner ends 20 the hole in the die. By action of the work-piece 52, while being discharged from the press the die-parts 19, will be pressed at their outer ends against fitting members 22 mounted within a wheel-rim 23 with an internal gear. A pinion 24 on a spindle 25 is in mesh with the teeth of said internal gear. The wheel-rim 23 may be rotated by means of the spindle 25 through such an angle that the ends 21 of the die-parts 19 will slide in the curved recesses of the fitting members 22, for which purpose the ends 21 are of a conformation similar to that of the recesses 26. By this the parts 19 will move apart during the operation of the press and the work-piece 52 will be given a frustro-pyramidal profile. Preferably motion of the die-parts is effected and controlled by the motion of the press plunger 53, or in some other suitable way.

Fig. 7 is a schematic view of a die press assembly wherein the die operating means 3 are controlled by the pressure within chamber 53*a*. In this embodiment of the invention, one end of a pipe 55 communicates with the interior of the chamber 53 and the other end of said pipe is forked. Each forked end of the pipe communicates with a cylinder 56 in which a piston 57 is mounted for reciprocation, said piston 57 being fixedly secured on the end of rod 17 which in turn actuates wedges 7 and die parts or operating means 3 to control the size of the die opening. The pressure exerted upon the material within chamber 53*a* is transmitted to the cylinders 56 by way of pipe 55 to thereby actuate the members which control the size of the die opening.

Fig. 8 is a similar schematic view but, in this instance, the die operating means is controlled by the motion of the press. The mechanism for performing this function comprises any suitable means such as a rack 59, one end of which is secured to the piston 53 and the other end of which meshes with the teeth in a pinion 60. A second pinion 61 is integral with the pinion 60, and a rack 62 is adapted to mesh with this second pinion. Rack 62 is secured to the ends of rods 17 previously described. It can be seen by observing Fig. 8 that movement to the left of piston 53 will produce a proportional movement to the right of the rods 17, resulting in the parts 3 moving toward each other. In other words, the farther piston 53 moves to the left, the smaller in size will be the die opening.

Fig. 9 shows still another form of the invention wherein the die operating means are controlled by the motion of work-piece 50 while being extended. As the work-piece 50 is expelled from the die press, the leading end of the work-piece engages the upstanding leg of a rack 64, said rack member having a toothed engagement with a gear 65. Integral with this gear is a piston 66 which meshes with a rack 67 and this rack is secured to the rods 17. It is thus seen that the movement of the work-piece 50 to the left will produce a proportional movement to the right of the rods 17 to correspondingly actuate the members 3 which control the size of the die opening.

We claim:

1. In a press for making a work-piece tapered in the direction of pressing, a die comprising a plurality of relatively movable die parts, adjustable abutment means for engaging said die parts selectively to hold said die parts in any one of a plurality of relative positions, operating means for adjusting said adjustable abutment means whereby to allow the workpiece to move said movable die parts.

2. The combination claimed in claim 1, said operating means being controlled by the operating pressure of the press.

3. The combination claimed in claim 1, said movable die parts and said abutment means having cooperating wedge-shaped working surfaces.

4. The combination claimed in claim 1, said die parts and said abutment means having cooperating wedge-shaped surfaces, said operating means being responsive to the motion of the press.

5. The combination claimed in claim 1, said die parts and said abutment means having co-

operating wedge-shaped working surfaces, said operating means being controlled by the motion of the work-piece during discharge of the work-piece from the press.

6. The combination claimed in claim 1, said press including a press plunger, said die parts and said abutment means having cooperating wedge-shaped surfaces, said operating means being controlled by the motion of the press plunger.

7. In a press for making a work-piece tapered in the direction of pressing, a die comprising a plurality of movable parts, adjustable means holding said die parts selectively in any one of a plurality of relative positions, a press plunger for pressing the work-piece through said die parts in one direction, the inner surfaces of said die parts being tapered in the driving direction of said press plunger, and a fixed die mounted in the rear of said movable die parts whereby to mask a portion of the gap between said die parts after said die parts have moved apart a predetermined distance.

8. The combination claimed in claim 1, said adjustable abutment means comprising cam members operatively engaging the outer surfaces of said die parts.

9. The combination claimed in claim 1, said adjustable abutment means comprising cam members operatively engaging the outer surfaces of said die parts and annular means on which said cam means are rigidly mounted, and means rotatively mounting said annular means.

10. The combination claimed in claim 1, said adjustable abutment means including an annular member, a plurality of cam elements on said annular member for engaging, respectively, the movable die parts, means mounting said annular member for rotation, and a ring gear element on said annular means, said operating means including a spindle and a pinion on said spindle engaging said ring gear element whereby, when said spindle is rotated, the cam elements are moved across the cooperating surfaces on said movable die parts.

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