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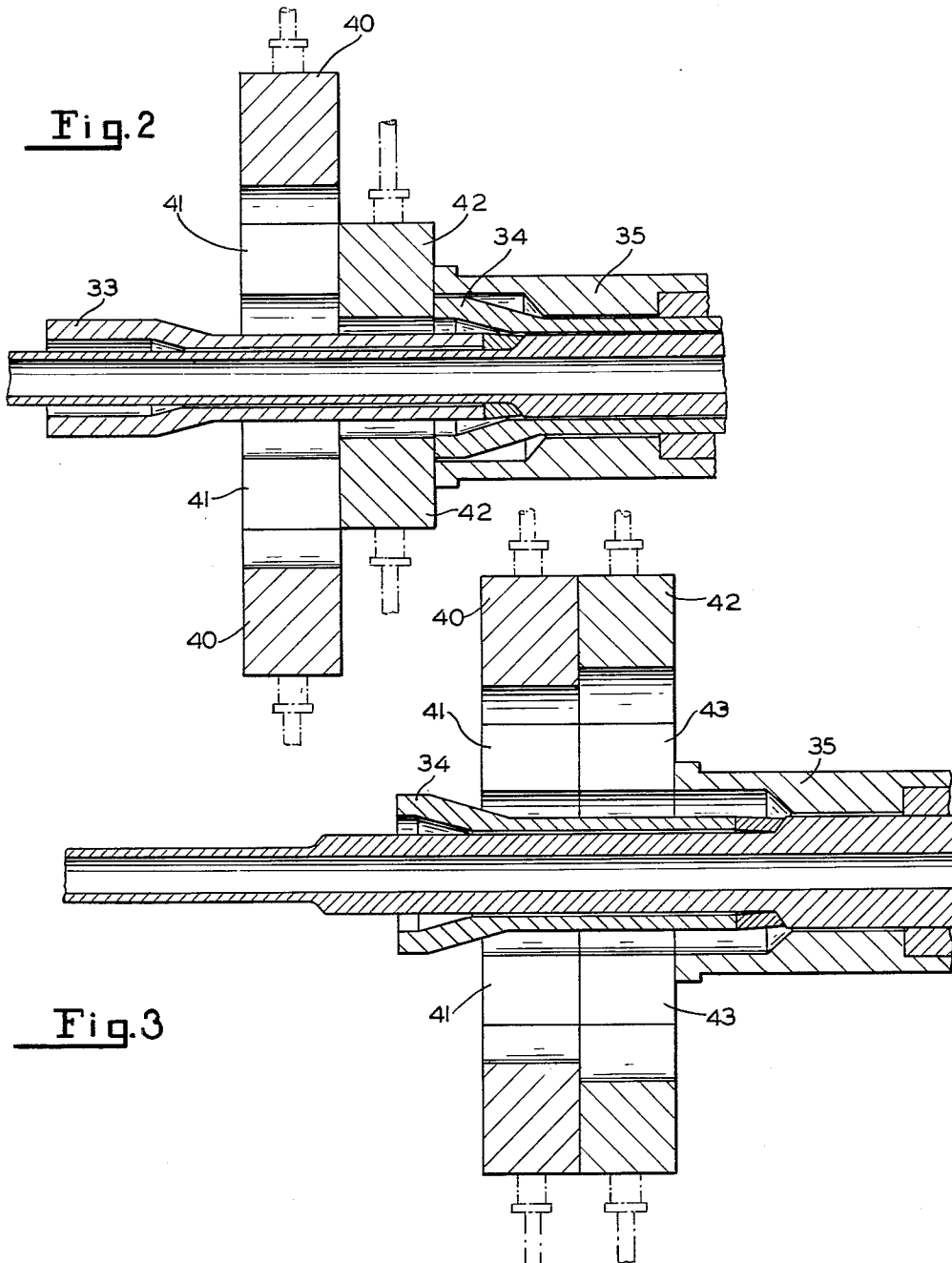
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DIE LOCKING ARRANGEMENT FOR EXTRUSION PRESSES

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3 Sheets-Sheet 2



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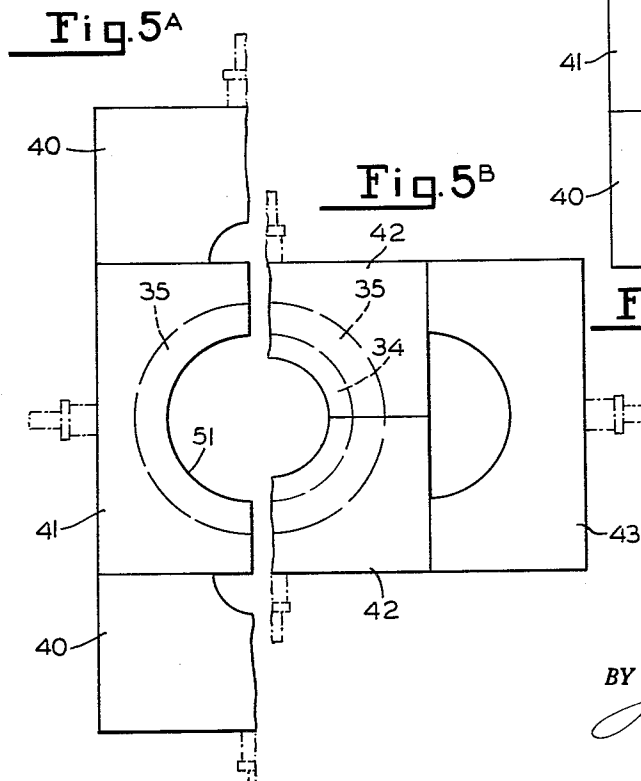
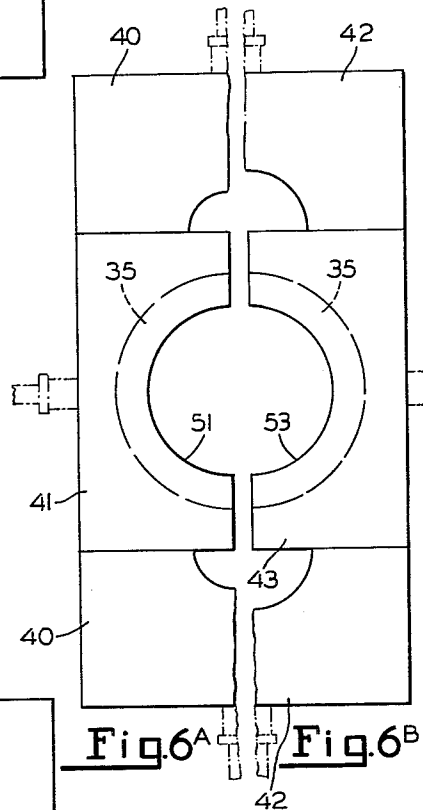
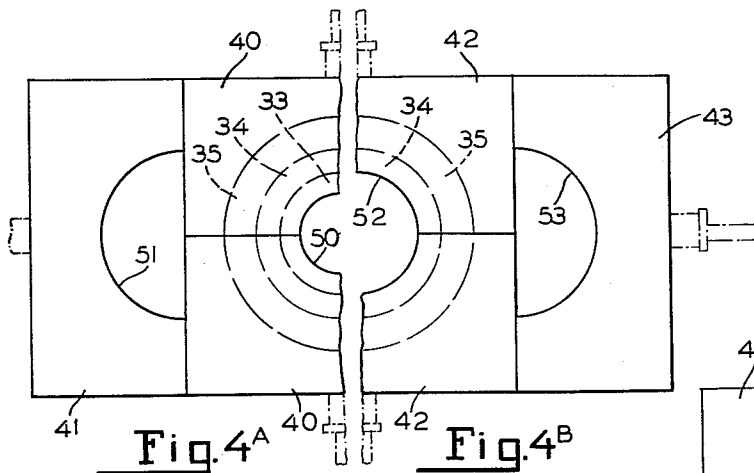
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DIE LOCKING ARRANGEMENT FOR EXTRUSION PRESSES

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DIE LOCKING ARRANGEMENT FOR EXTRUSION PRESSES

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6 Claims. (Cl. 207—3)

This invention relates to the design and arrangement of dies and die locking plates in extrusion presses. More particularly, the invention relates to the method wherein a single extrusion is subjected successively to the action of a plurality of dies of different formation. Thus, for example, it may be desired to extrude a tubular member having successively different outside diameters along its length. To achieve this result it has heretofore been necessary to interrupt the continuous extrusion of such member for a substantial length of time while the dies were changed for a change in outside diameter. Such extended interruption was not only time consuming but frequently also necessitated an additional heating of the billet.

It is therefore one of the principal objects of this invention to provide an arrangement of dies of different formation, together with die locking means, which will permit rapid change of die position so that the entire extrusion can be effected with a single heating of the billet.

It is a further object of the invention to provide an arrangement whereby a plurality of different dies may be locked in position simultaneously and whereby the dies may be quickly and selectively rendered effective.

It is a further object of this invention to provide a plurality of dies as set forth above wherein each die in effective position has the full force of the extrusion press applied thereto.

Further objects and advantages of this invention will become apparent in the following detailed description thereof.

In the accompanying drawings,

Fig. 1 is a vertical section through a portion of a hydraulic type extrusion press having this invention applied thereto.

Fig. 2 is a partial view similar to Fig. 1 showing the dies and die locking plates in a second operating position.

Fig. 3 is a partial view similar to Figs. 1 and 2 showing the dies and die locking plates in a third operating position.

Figs. 4A and 4B are graphic representations of the relative positions of the front and rear die locking plates, respectively, and the associated dies which they hold in the initial position shown in Fig. 1.

Figs. 5A and 5B are graphic representations similar to Figs. 4A and 4B showing the parts in the second position illustrated in Fig. 2.

Figs. 6A and 6B are graphic representations similar to Figs. 4A, 4B, 5A, 5B showing the parts in the third position illustrated in Fig. 3.

Referring to Fig. 1 of the drawings, there is shown a portion of a hydraulic type extrusion press modified to embody the present invention. In such press, a plunger or stem 10 operated under high pressure from a hydraulic source (not shown) is forced into a container 11 which holds a billet 12 heated to a temperature to permit it to be extruded under the pressure of the plunger. At the discharge end of the container there is positioned the die mechanism within a die holder 15, and the die mecha-

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nism and its holder are locked in position between the front platen or support member 16 and the container 11 by a die lock indicated generally at 18. The metal extruded through the die mechanism passes through the central opening 20 of the die arrangement and front platen to a receiving platform (not shown). Where the extruded form is to be tubular, the plunger 10 accommodates a mandrel 22 of smaller diameter than the innermost die opening so that the metal will be extruded between the mandrel and innermost die in the form of a tube 25.

A conventional extrusion of uniform outside configuration presents no special problem, but it is frequently desired to obtain an extrusion having different outside shapes along predetermined portions of its length. To achieve the latter result it has heretofore been necessary not only to retract the locking plates from their positions between the die holder and the front platen, but also to remove the die completely and substitute another die, before shifting the locking plates into their operating positions again. This procedure was time consuming and resulted also in cooling of the billet in the container so that a new heating was required. By this invention, a multiplicity of different shaped dies may be employed, and the substitution of one die for a succeeding die accomplished quickly with minimum loss of time so that a new heating of the billet is not required.

The invention comprises two essential elements not heretofore employed. They are: (1) the positioning in the die carrier of a plurality of dies of different shapes concentrically arranged, and (2) the provision of a plurality of sets of locking plates having openings of different sizes for coaction with the respective dies. The invention is illustrated herein in connection with the extrusion of tubular members of constant inside diameter but having various outside diameters along its length. It will be apparent, however, from the following description that the invention is capable of use for the production of other types of extrusion, solid or hollow, having any desired outside shapes along its length.

As shown, three concentric dies are employed, although it will be apparent that the invention is applicable generally to any number of dies. The innermost die 30 has a diameter larger than the diameter of the mandrel so that a tubular extrusion 25 of predetermined thickness is obtained as the plunger moves into the container. Surrounding the innermost die 30 is an intermediate die 31 so that if the innermost die is removed from its operative position the extruded tube will have an increased outer diameter. Finally, an outside die 32 is provided surrounding the intermediate die, so that if the innermost and intermediate dies are removed from their operative positions, the extruded tube will have a still larger outside diameter. Such an extrusion may represent, for example, a gun casing. Die supports 33, 34 and 35 assist in holding the dies in place.

In order that the innermost die may be rendered ineffective after a predetermined length of tube has been extruded, the following construction and operation of the die locking means are employed. Instead of a single set of locking plates being employed, there is utilized a plurality of sets of locking plates; in the case shown, two sets, hereinafter referred to as the front set and the rear set. Each set comprises four movable plates. The front set comprises a pair of vertically movable plates 40 having a central opening 50 of predetermined size, and a pair of horizontally movable plates 41 (see Fig. 4A which shows only the left hand plate) having a central opening 51 of predetermined size. The rear set of plates also comprises a set of vertically movable plates 42, having a central opening 52 and a pair of horizontally movable plates 43 (see Fig. 4B which shows only the right hand plate) having a central opening 53.

In the first step of operation, the front set of plates has two plates 40 in effective position, the opening 50 in said plates being smaller than the outside diameter of the innermost die support 33. These plates 40 are in effective position to prevent outward ejection of the innermost die 30. The other two plates 41 of the front set are held in ineffective position outside the limits of the effective plates 40 (see Fig. 4A). At this time, the rear set of plates comprises two plates 42 in effective position, in which position the opening 52 therein is large enough to permit the innermost die 30 and its support 33 to pass therethrough, but small enough to prevent outward ejection of the intermediate die 31 and the outermost die 32. The other two plates 43 of the rear set are held in ineffective position outside the limits of the effective plates 42 (see Fig. 4B). Under these conditions a tube will be extruded having the outside diameter of the innermost die opening.

In the second step of operation, when it is desired to change the shape of the outside of the extrusion (in this case, to enlarge the outside diameter), the effective plates 40 of the front set are moved outwardly to ineffective positions as shown in Fig. 5A to permit the heretofore ineffective plates 41 to be moved inwardly to effective position. The latter plates have an opening 51 large enough to permit the innermost die 30 and its support 33 to be ejected therethrough by the pressure of the metal behind the die. The effective plates 42 of the rear set hold the intermediate die 31 and its support 34 against ejection, and the extrusion will now have an outside shape determined by this intermediate die 31.

In the third step of operation, the effective plates 42 of the rear set are moved to ineffective positions and the heretofore ineffective plates 43 of the rear set are moved into effective position. The plates of both the front and rear sets which are now effective each have an opening 51 and 53 large enough to permit the intermediate die 31 and its support 34 to pass therethrough, so that the intermediate die will be ejected by the pressure of the metal being extruded from the container. The openings in the effective plates 41 and 43 of the front and rear sets are small enough to prevent ejection of the outside die 32, its support 35 and carrier 15 from their positions. The extrusion will now assume the outside shape determined by the outside die.

The plates of each set may be connected by connections 60 to pistons 61 operating in hydraulic cylinders 62 and operated by controls (not shown).

It will be noted that in every operating position, regardless of which die is effective, the full force of the extrusion pressure may be applied to said die because it is held firmly between the platen 16 and the container 11.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. In an extrusion press for extruding multi-shaped articles, said press having a container for the heated metal to be extruded, die mechanism coacting with the discharge end of the container, a plunger for forcing the metal out the container and through the die mechanism, a support member and locking means interposed between the support member and the die mechanism for locking the die mechanism in operating position, the improvement which

consists in said die mechanism comprising a plurality of dies of different outer contour, said locking means comprising a plurality of pairs of plates selectively movable to effective and ineffective positions toward and away from the extrusion axis, said plurality of pairs of plates at all times filling the space between the support member and the die mechanism regardless of which pair of plates is in effective position whereby the full force of the press may be applied to the die which is in effective position and the pairs of plates may be rapidly moved to effective and ineffective positions, each pair when in effective position confining an opening therethrough, the openings of the respective pairs of plates varying corresponding to the contours of the extruded metal and the respective dies.

2. In an extrusion press for extruding multi-shaped articles, said press having a container for the heated metal to be extruded, die mechanism coacting with the discharge end of the container, a plunger for forcing the metal out of the container and through the die mechanism, a front platen, and locking means interposed between the front platen and the die mechanism for locking the die mechanism in operating position, the improvement which consists in said die mechanism comprising a plurality of dies of progressively increasing outer contour, said locking means comprising a plurality of pairs of plates, and means for selectively moving the plates of each pair to effective and ineffective positions toward and away from the extrusion axis, said plurality of pairs of plates at all times filling the space between the support member and the die mechanism regardless of which pair of plates is in effective position whereby the full force of the press may be applied to the die which is in effective position and the pairs of plates may be rapidly moved to effective and ineffective positions, each pair when in effective position confining an opening therethrough, the openings of the respective pairs of plates varying in size corresponding to the contours of the extruded metal and the respective dies.

3. A device as specified in claim 2, in which the plurality of dies are concentric.

4. A device as specified in claim 2, in which the plurality of dies are concentric and of progressively increasing diameters.

5. A device as specified in claim 2, in which the locking means comprises a plurality of sets of plates, each set comprising a plurality of pairs of plates.

6. A device as specified in claim 2, in which the plurality of dies are concentric and of progressively increasing diameters, and the locking means comprises a plurality of sets of plates, each set comprising a plurality of pairs of plates.

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