Jan. 22, 1957 G. P. KRAUSE 2,778,495

EXTRUSION PRESS

Filed March 9, 1953 3 Sheets-Sheet 1

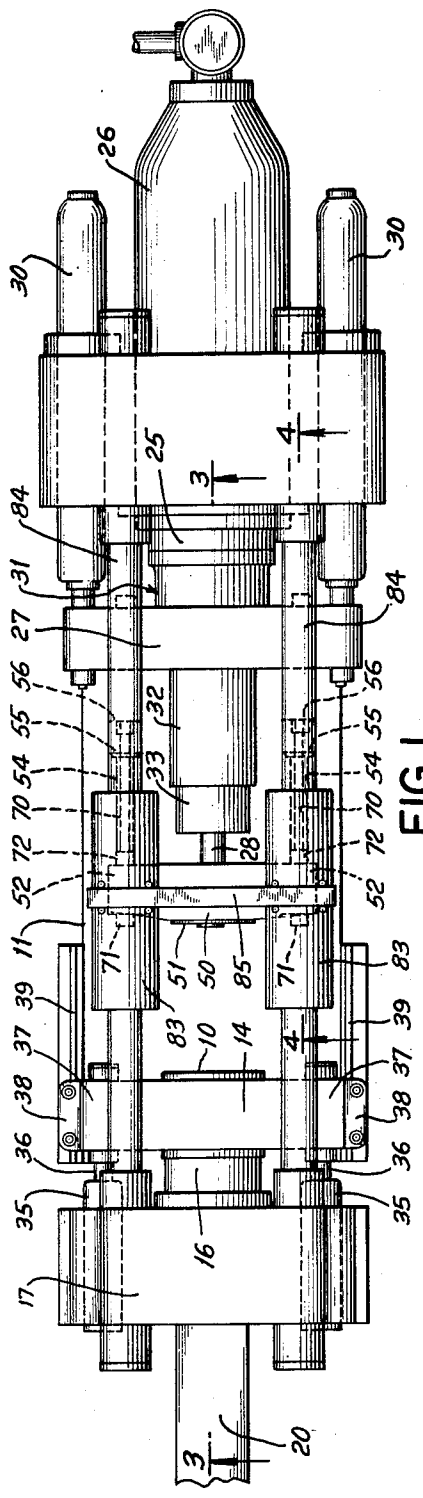


FIG. 1

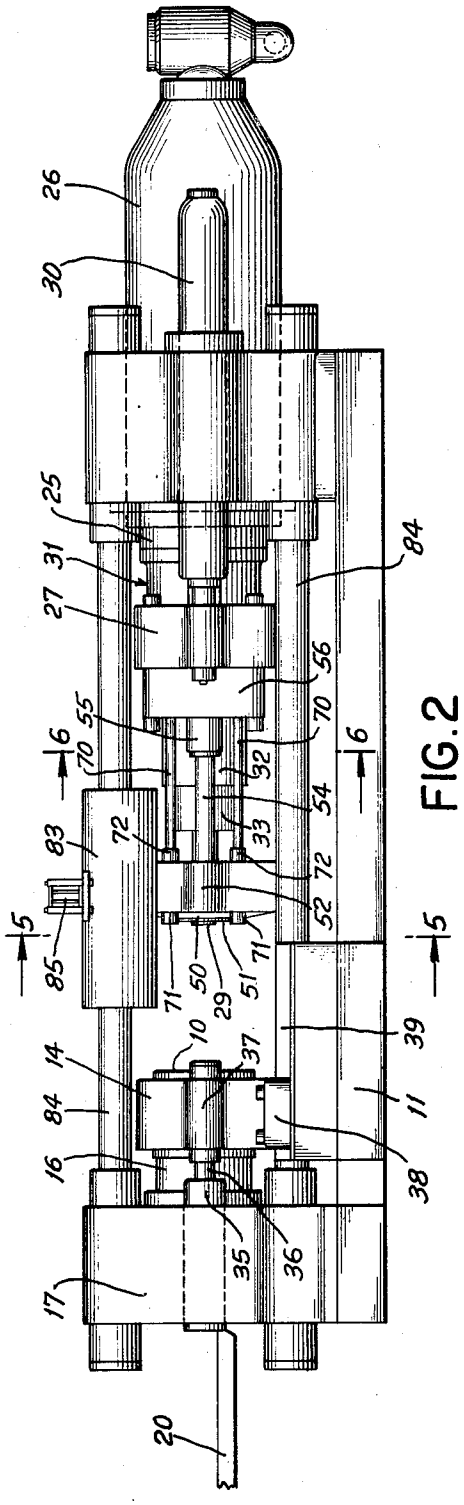


FIG. 2

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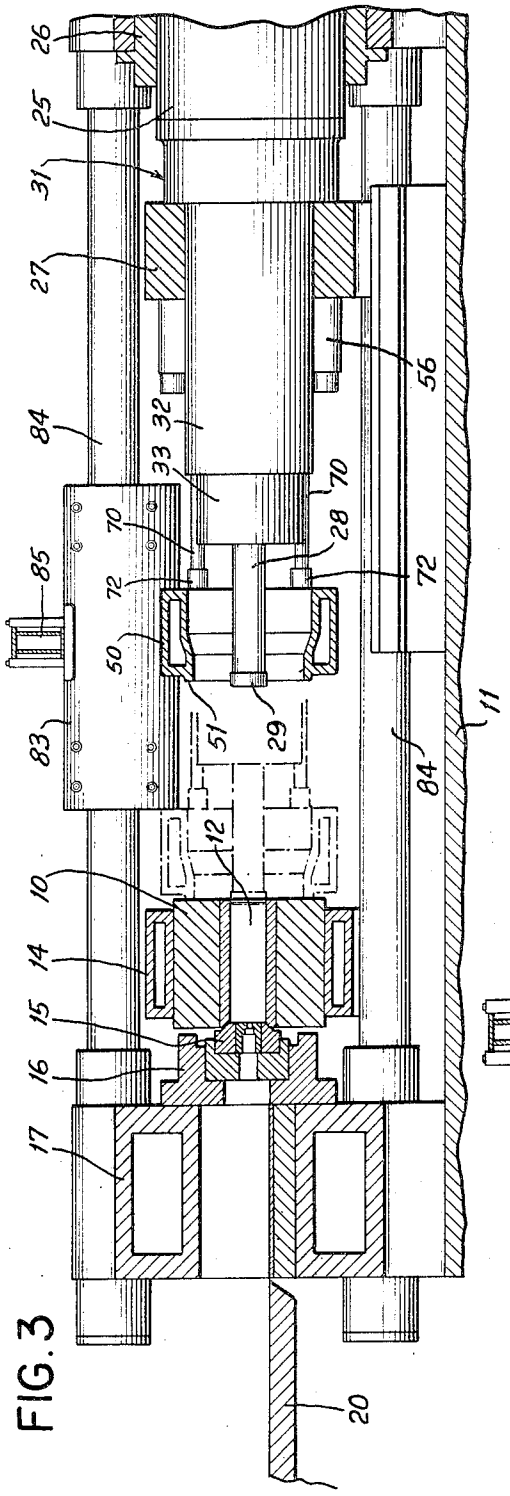


FIG. 3

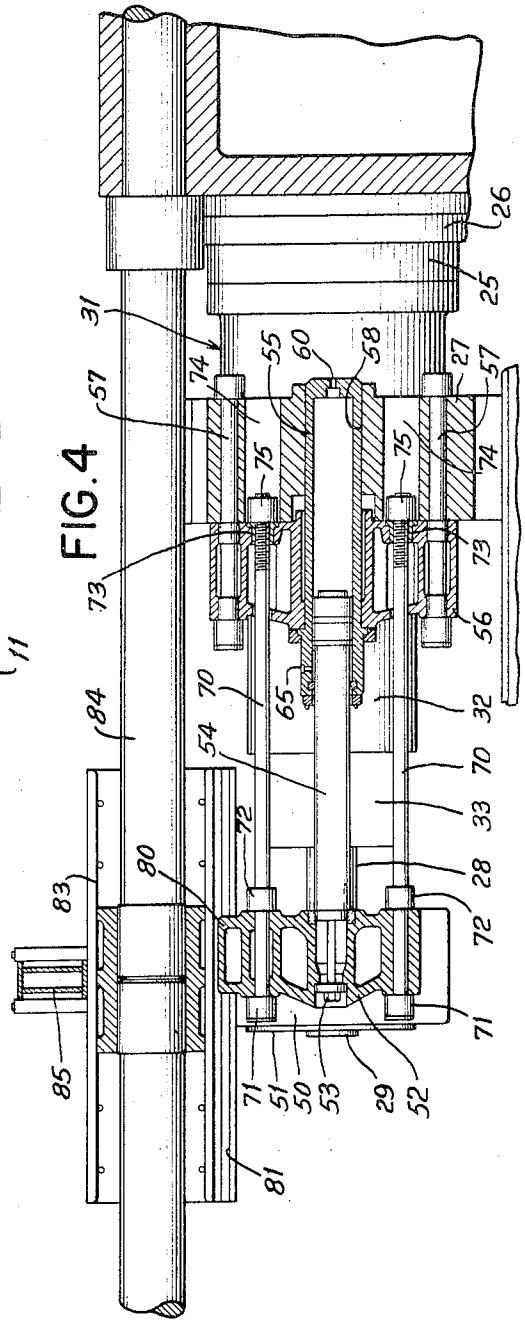


FIG. 4

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FIG.5

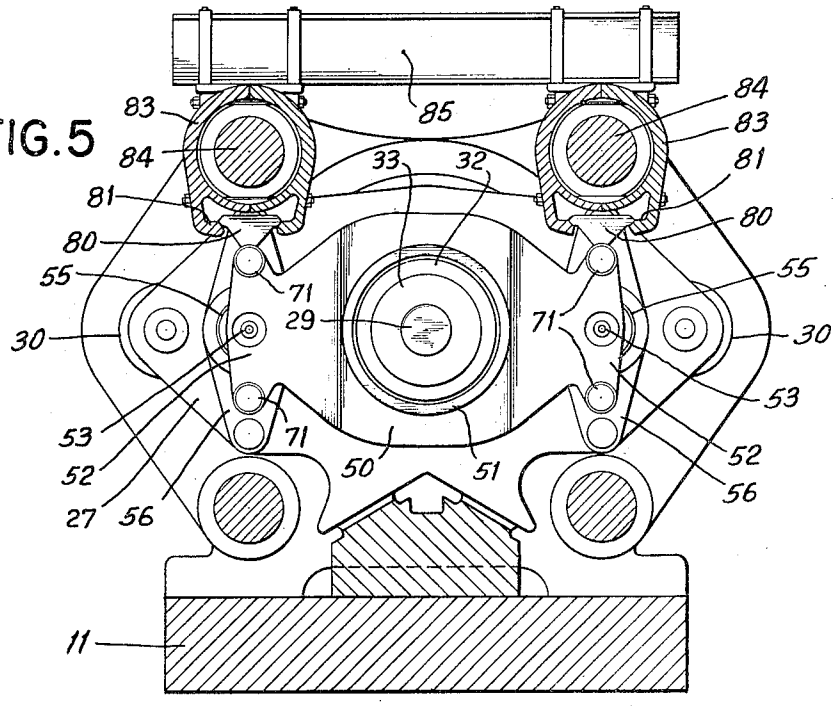
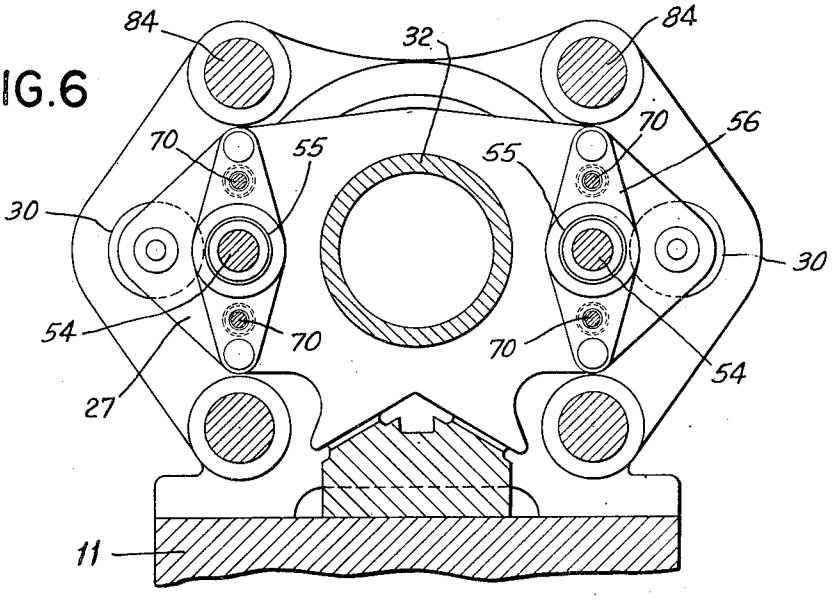


FIG.6



United States Patent Office 2,778,495 Patented Jan. 22, 1957

2,778,495

EXTRUSION PRESS

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Application March 9, 1953, Serial No. 341,163

4 Claims. (Cl. 207—9)

This invention relates to extrusion presses. In such presses, a container having an opening therethrough for supporting a billet therein is positioned in close engagement with a cooperating die, and an extrusion stem actuated by a ram enters the container opening to force the billet material through the die under high pressure. Since the stem must stop short of the die, some unextruded portion of the billet remains at the end of the ram stroke and normally must be cut off the extruded material when the ram has been withdrawn. For this reason the container is often movably mounted to permit it to be moved away from the die so that a cutting tool may be employed to sever the unextruded material or butt of the billet. Such movement of the container away from the die is also desirable when the die is to be inspected or lubricated.

For effecting such movement of the container there is employed a pair of hydraulic cylinders mounted on a fixed part of the press and having pistons operating in the cylinders and connected to the container. A source of fluid pressure connected to the cylinders operates the pistons to move the container away from the die. The pistons are double-acting so that the same hydraulic cylinders which move the container away from the die are also relied upon to move the container into firm engagement with the die to effect sealing. It sometimes happened, however, that the pistons in the respective cylinders moved unequally under load because of differences in friction, or different packing conditions, to cause cocking of the container with consequent sticking and failure to effect the necessary degree of sealing between the container and the die. Furthermore, as larger extrusion presses were built, the size of the cylinders had to be increased so that they were very difficult to accommodate in the press.

It is therefore the principal object of this invention to provide means for effecting sealing between the movable container and the die which will be free of the danger of sticking and hence loss of proper sealing.

It is a further object of the invention to provide adequate sealing between the container and the die without the necessity of unduly enlarging the container moving cylinders as the press capacity is increased.

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

In the accompanying drawings,

Fig. 1 is a plan view of an extrusion press having my invention applied thereto.

Fig. 2 is a side elevation of the extrusion press illustrated in Fig. 1.

Fig. 3 is a section on an enlarged scale, taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is a section on a still larger scale, taken substantially on the line 4—4 of Fig. 1.

Fig. 5 is a section taken substantially on the line 5—5 of Fig. 2, the scale being the same as in Fig. 4.

Fig. 6 is a section taken substantially on the line 6—6 of Fig. 2, the scale being the same as in Figs. 4 and 5.

Referring to the drawings, there are shown standard

elements of an extrusion press. A container 10 is arranged in a container holder 14 slidably mounted for axial movement on a frame or base 11. The container has an axially extending cavity or opening 12 therethrough (see Fig. 3), in which the billet to be extruded is positioned. At the inner, or discharge, end of opening 12, there is positioned a die means 15 through which the material of the billet is to be pressed. The die is supported in die holder means 16 on a platen 17, a run-out table 20 being arranged for the extruded material.

To extrude the material through the die, there is provided a main ram 25 (see Fig. 3), adapted to be operated out of a main cylinder 26 by fluid pressure supplied from an accumulator (not shown). Attached to the ram 25 is an extension or distance piece generally indicated at 31 which has portions 32, 33 of reduced diameters. The distance piece 31 is connected to a main crosshead 27 movable with the ram, the cross-head being slidably supported on the frame 11. The ram actuates, through distance piece 31, an extrusion stem or plunger 28 (see Fig. 3) adapted to enter the opening 12 of the container, and a pressing disc 29 on the stem forces the material of the billet through the die. When the extrusion stem has reached the end of its stroke a predetermined distance short of the die, fluid pressure is admitted to return cylinders 30 to move the main ram 25 back into its cylinder 26.

The container is now moved away from the die so that the unextruded part of the billet (the butt) may be severed from the extruded part. For moving the container there are provided lateral cylinders 35 whose pistons 36 are connected to lateral extensions 37 on the container holder 14. These extensions are slidably supported on the main frame 11 by shoes 38 sliding on rails 39. The pistons 36 are double-acting, so that upon the admission of fluid pressure to the other side of the pistons, the container is moved toward the die.

As stated in the introduction hereto, in prior machines the above described mechanism for moving the container was also the mechanism relied upon for effecting adequate sealing between the container and the die. Firm engagement between the container and the die was, however, frequently not accomplished because the difference in frictional resistance to movement at the two sides, sometimes caused by different packing conditions, resulted in unequal movement of the pistons 36 under load and caused cocking of the container with consequent sticking. Furthermore, the required size of the cylinders 35 caused an undesirable increase in the lateral dimensions of the press. In presses of high capacity, on the order of 20,000 tons or more, the size of the cylinders necessary to develop adequate sealing pressure became extremely large.

By the present invention, such defects in sealing between the container and the die, as well as structural difficulties, are avoided by utilizing the cylinders 35 for moving the container but not substantially relying on these cylinders for sealing, and utilizing a force independent of the forces developed by cylinders 35 to effect the actual sealing. At the same time, the independent force may be applied closer to the container opening 12 to reduce the tendency to twist the container out of axial alignment. Forces developed by cylinders 35 may contribute to the sealing effect but will merely be of a secondary nature.

The independent sealing system indicated above is provided by a contacting member or cross-head 50, having a face 51 adapted to engage the front face of container 10. The contacting member is provided with lateral extensions 52 to which are connected at 53 the forward ends of pistons 54 operating in cylinders 55 which, in turn, are mounted in cross-heads 56 fixed by rods 57 to the movable cross-head 27 of the main ram 25, the cylinders 55 extending into openings 58 in crosshead 27.

Fluid under pressure, such as the accumulator pressure, may be supplied to cylinders 55 through openings 60 to maintain the contacting cross-head 50 under pressure. The length of the forward stroke of contacting cross-head 50 relative to cross-heads 56 is determined by rods 70 fixed to contacting cross-head 50 at their forward ends by nuts 71, 72. Each rod 70 is slideably guided in its cross-head 56 through a bushing 73 and has a nut 75 adjustably attached to its rear end. These nuts 75 are arranged to engage the rear faces of bushings 73 so as to limit the forward movement of contacting cross-head 50 relative to cross-heads 56. Until this limiting position (Fig. 4) is reached, the pistons 54 which actuate contacting cross-head 50 move against no significant load, the main cross-head 27 being in its withdrawn position, and therefore there is nothing that would cause the cross-head 50 to twist out of axial alignment during such movement. The parts are in the limiting position of Fig. 4 before the container is engaged, and the nuts 71, 72 on rods 70 allow perfect alignment of contacting cross-head 50 with the axis of the press so that the sealing force will be applied to the container in the desired direction.

Thus, cross-head 50 is normally out of contact with the outer face of the container, but contact will be established when the ram cross-head 27 has moved forward a distance such that the extrusion stem 28 has substantially completed its approach stroke, as shown in dash-dotted lines in Fig. 3. The dimensions and adjustment of the parts are such that just prior to the entrance of stem 28 into the container or just prior to the exertion of pressure on the billet the contacting cross-head 50 will engage the outer face of the container. As soon as cross-head 50 engages the outer end of the container the full pressure in cylinders 55 will be exerted on the container through pistons 54 and contacting cross-head 50. As the main ram 25 continues to move forward, the cylinders 55 will move over their pistons 54, displacing fluid into the accumulator. At the same time, bushings 73 will slide along rods 70 until ram 25 has completed the extrusion stroke, the nuts 75 being accommodated in openings 74 of cross-head 27 during such movement. The main ram 25 which actuates the extrusion stem is dimensioned so as to take care of the additional resistance encountered when moving cylinders 55 onto pistons 54 under pressure.

The pistons 54 are double-acting so that by admitting fluid pressure through openings 65 and by connecting openings 60 to exhaust, the contacting cross-head may be moved in the direction away from the container. The contacting cross-head will be taken along, during rearward movement of the main ram cross-head 27, through rods 70 and nuts 75 if the latter are in engagement with the rear faces of bushings 73, or through the pistons 54 if fluid under pressure acts on the return sides of the pistons so that they are held in an inward position in their cylinders. In the position shown in Fig. 2, the double-acting pistons 54 may serve for moving the contacting cross-head 50 towards the main ram cross-head 27 to facilitate exchanging the extrusion stem 28. It will be clear that the stroke of pistons 54 towards the closed ends of their cylinders 55 may be limited in a suitable manner, for example, by the piston ends engaging the closed ends of the cylinders.

The contacting cross-head 50 may be slidably supported by means of shoes 80 sliding on rails or guideways 81 formed at the lower ends of a bracket 83 fixed on tie-rods 84 of the frame, the brackets on opposite sides being firmly connected by a cross-bar 85.

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

1. An extrusion press comprising a frame, die means fixedly positioned with respect to the frame, a container movably mounted on the frame and having an opening therethrough adapted to support a billet, means for moving the container toward the die means to effect abutting engagement between the die means and the inner end of the container for the duration of the extrusion and for moving the container away from the die means when the extrusion is completed, an extrusion stem adapted to enter the outer end of the container opening to force the billet material through the die means, a ram for actuating said stem, operating means for actuating said ram toward and away from said container, sealing means movably connected to said ram and adapted to engage the outer end of said container for forcing the container against the fixed die to effect a tight seal between the die and container, means for moving said sealing means relative to said ram, while the ram is in retracted position, to a position adjacent to but spaced from the outer end of the container, and said means for moving said sealing means including means yieldable under predetermined pressure so that the movement of said ram together with the sealing means connected thereto will move the sealing means into engagement with the outer end of the container to effect sealing engagement under said predetermined pressure throughout the extrusion operation.

2. An extrusion press as specified in claim 1, in which said sealing means comprises a member adapted to contact the container, and the means for actuating said sealing means comprises a group of cylinders, and a group of pistons operating in said cylinders, one of said groups being connected to said ram, and the other group being connected to said contact member.

3. An extrusion press as specified in claim 1, in which said sealing means comprises a member adapted to contact the container, and the means for actuating said sealing means comprises a plurality of cylinders connected to said ram, and a plurality of pistons operating in said cylinders and connected to said contact member.

4. An extrusion press as specified in claim 3, in which means are provided to vary the limit of movement of said pistons and adjust the position of said contact member relative to said pistons so as to vary the degree of movement of said sealing means to effective limiting position and align the contact member with the outer end of said container.

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