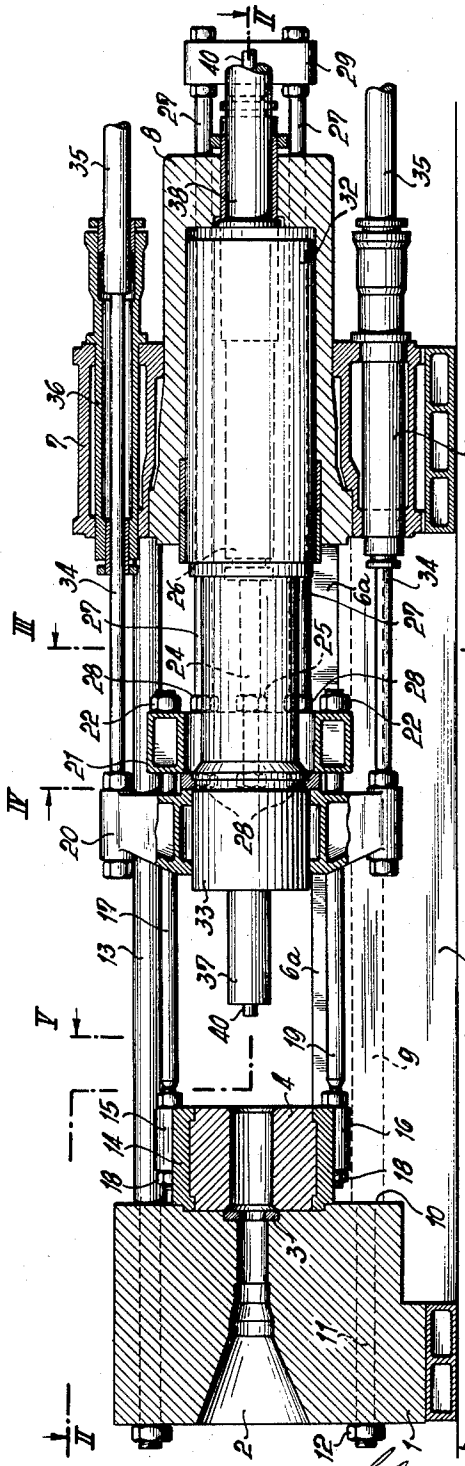
April 19, 1960 P. BILLEN ET AL 2,933,184

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Filed Nov. 27, 1957 6 Sheets-Sheet 1

FIG. 1



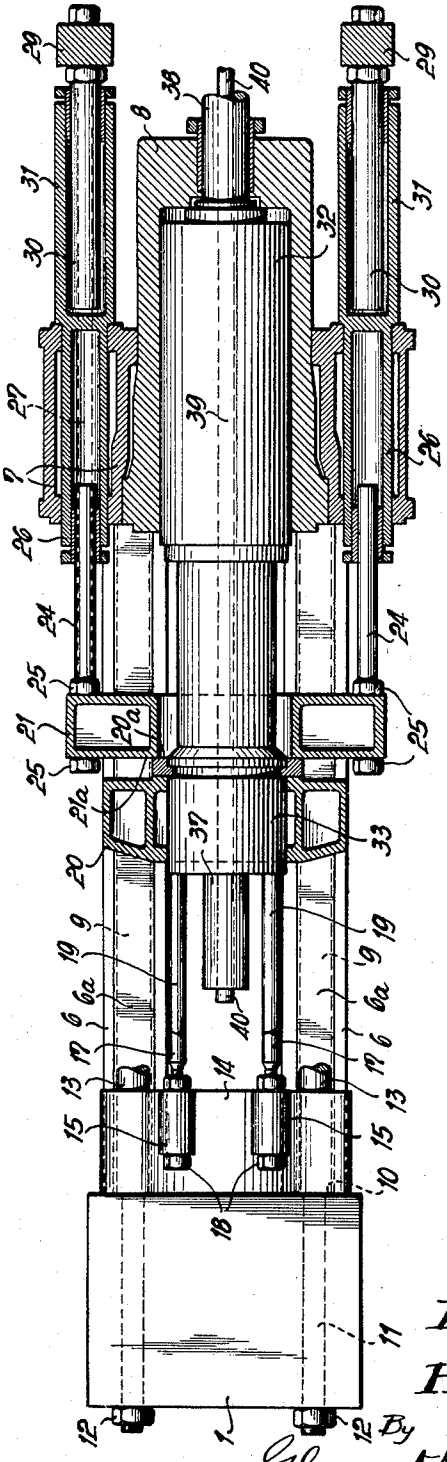
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Filed Nov. 27, 1957 6 Sheets-Sheet 2

FIG. 2



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April 19, 1960 P. BILLEN ET AL 2,933,184

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Filed Nov. 27, 1957 6 Sheets-Sheet 3

FIG. 3

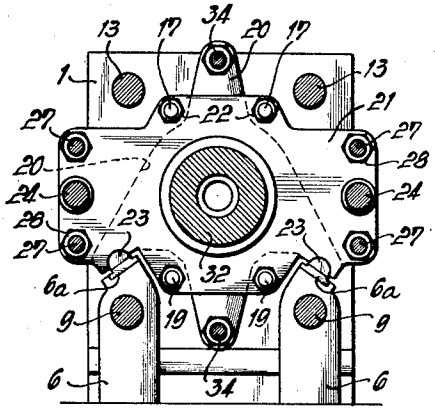


FIG. 4

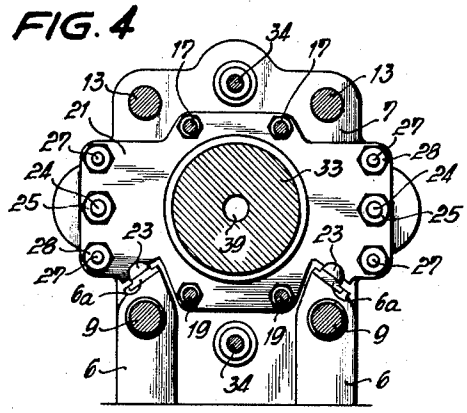
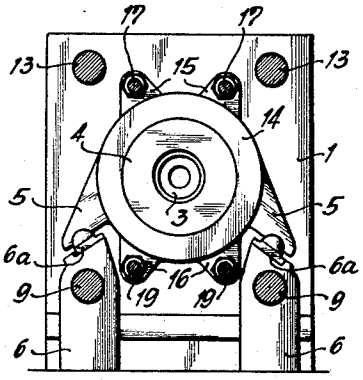


FIG. 5



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Filed Nov. 27, 1957 6 Sheets-Sheet 4

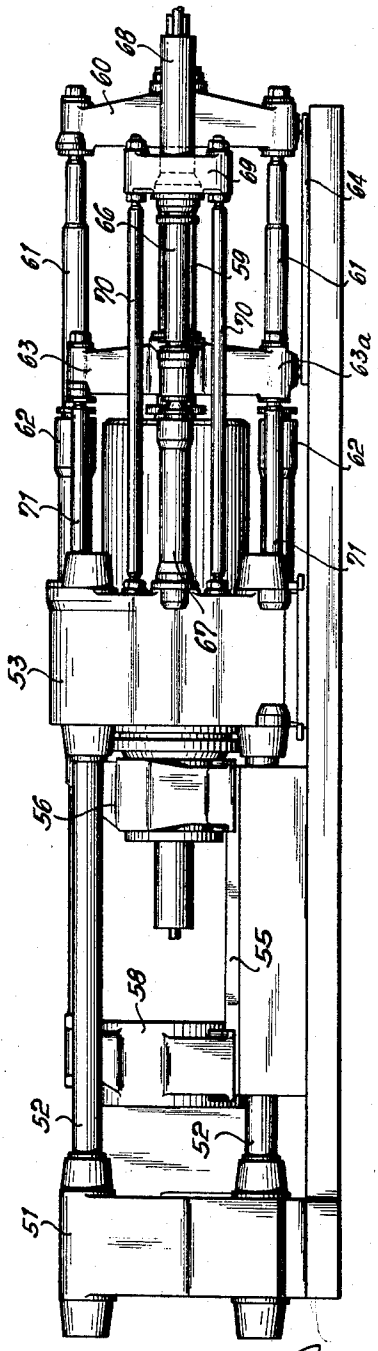


FIG. 6

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April 19, 1960 P. BILLEN ET AL 2,933,184

EXTRUSION PRESS

Filed Nov. 27, 1957 6 Sheets-Sheet 5

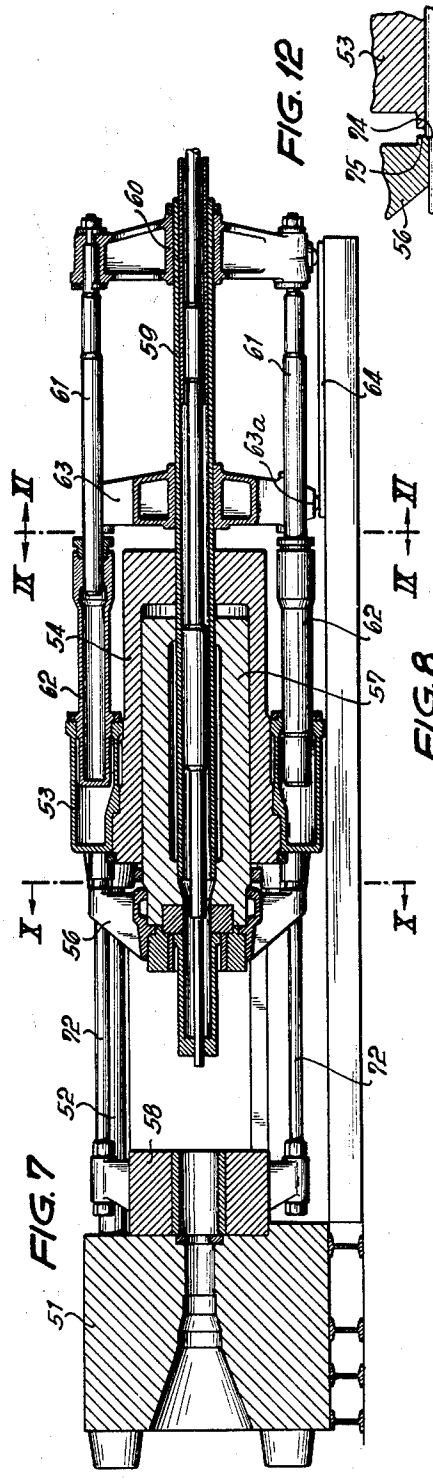


FIG. 7

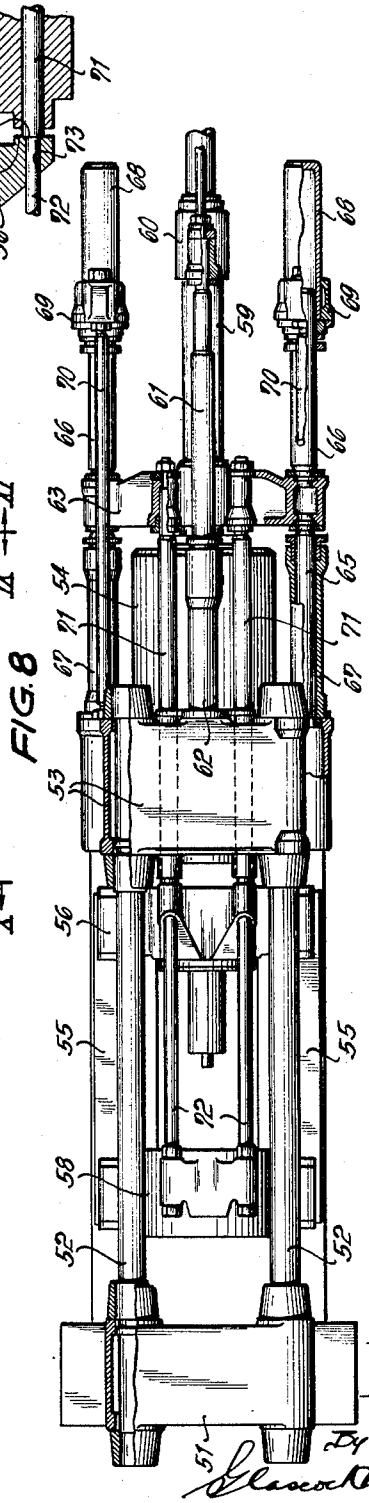


FIG. 8

FIG. 12

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April 19, 1960 P. BILLEN ET AL 2,933,184

EXTRUSION PRESS

Filed Nov. 27, 1957 6 Sheets-Sheet 6

FIG. 9

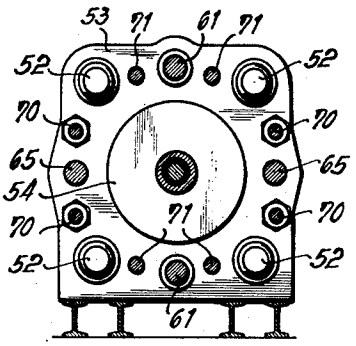


FIG. 10

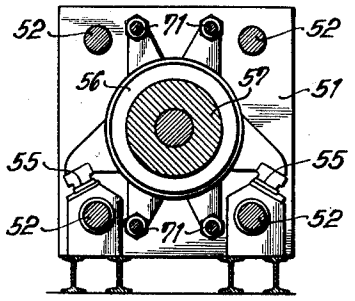
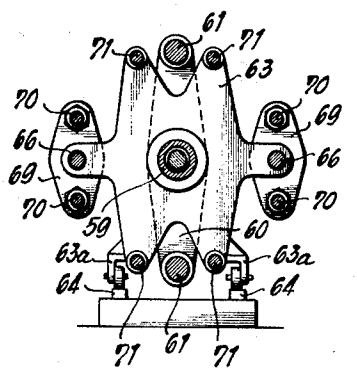


FIG. 11



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United States Patent Office 2,933,184 Patented Apr. 19, 1960

2,933,184

EXTRUSION PRESS

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Application November 27, 1957, Serial No. 699,223

Claims priority, application Germany November 28, 1956

4 Claims. (Cl. 207—3)

In presses for the extrusion of hollow products, having a displaceable container and a cross-head carrying the press ram, together with a piercing mandrel, the container must be mounted exactly centrally upon the die-holder and the stationary abutment or counter-holder, in order that the piercing of the billet by the mandrel may be accurately central. Otherwise the production of a uniform extruded product is not possible. The axis of the container must therefore coincide exactly, during the piercing and during extrusion, with the extrusion axis of the press, and particularly with the axis of the mandrel. The guiding ribs or ledges generally provided for the container usually do not suffice for the requisite centering, even when they are new and still unworn. Therefore it frequently happens that the container is not mounted exactly centrally upon the die-holder, so that the piercing mandrel meets the billet eccentrically.

The object of this invention is to provide an exactly central introduction of the container into its operative position, and for this purpose use is made of the fact that the press ram or press plunger and the die or die-holder can in all presses be accurately centered in relation to one another.

The invention consists in the feature that the container is rigidly connected with a sliding cross-bar arranged behind the cross-head, and that the cross-head and the sliding cross-bar have adjusting surfaces that can be pressed against one another for the purpose of straightening the position of the sliding cross-bar. In this way, the container can be accurately adjusted to the cross-head before reaching the extrusion position.

For this purpose the cross-head will preferably be so placed that the adjusting surface of the sliding cross-bar comes into contact with the adjusting surface of the cross-head only just before the sliding cross-bar and the container reach the extrusion position. The alignment may be effected in a position in which the container is located only a few millimeters in front of the extrusion position. Upon the still untraversed sliding distance, of a length of only a few millimeters, no appreciable transverse displacement of the container is any longer to be feared. Even if complete certainty is desired with respect to this short path, it is possible to advance the cross-head and the container together, with the sliding cross-bar, so that then, even on this short travel, the alignment of the sliding cross-bar, together with the container, in relation to the cross-head, is reliably maintained.

The combined advance of the cross-head and the sliding cross-bar upon this last part of their path is facilitated if the displacing forces that can act upon the sliding cross-bar are greater than the retractive forces that can act upon the cross-head. It is then possible, in hydraulic presses, when moving the container into the extrusion position, to let the withdrawal means of the cross-head stand under full load, and for the container, with the sliding cross-bar, to travel into the working position against the force of the retraction means, so that an absolutely firm contact between the cross-head and the sliding cross-bar is obtained, and the alignment of the container is also ensured in the very last part of its sliding movement.

The invention is applicable not merely to horizontal but also to vertical presses; and it is applicable irrespectively of whether the piercing mandrel is mounted rigidly on the press ram or whether it is independently slidable in relation to the press ram.

Two embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 shows in longitudinal sectional elevation a press according to the invention for the extrusion of hollow products;

Figure 2 shows a section on the line II—II in Figure 1;

Figure 3 a section on the line III—IIII in Figure 1;

Figure 4 a section on the line IV—IV in Figure 1;

Figure 5 a section on the line V—V in Figure 1;

Figure 6 shows another embodiment in side elevation;

Figure 7 shows this embodiment in longitudinal sectional elevation;

Figure 8 is a plan view of the same embodiment, some parts being shown in section by a horizontal plane;

Figure 9 shows a section on the line IX—IX in Figure 7;

Figure 10 a section on the line X—X in Figure 7;

Figure 11 a section on the line XI—XI in Figure 7; and

Figure 12 a detail on a larger scale.

The press according to the first embodiment comprises a stationary, bolster abutment or counter-holder **1**, with a cavity **2**, in the neighborhood of which the die **3** is arranged. Against the abutment **1** and the die **3** bears the container **4**, which slides with claws **5** upon two slideways **6***a* on guide bodies **6**. The guide bodies **6** bear at one end against the bolster **1** and at the other end against a mounting **7** on the extrusion cylinder **8** of the press. Through each of the guide bodies passes a tie-rod **9**, which bears in the usual way with a shoulder **10** against the abutment **1**, and penetrates through the latter with a thinner anchoring portion **11**. On the other side of the abutment **1** it is secured with a screw nut **12**. Two further tie-rods **13** connect the upper region of the abutment **1** with the mounting **7** of the extrusion cylinder **8**.

The container **4** is seated in a mounting **14**, which has upper arms **15** and lower arms **16**. To these arms upper container rods **17** and lower container rods **19** are secured by means of nuts **18**. These container rods **17** and **19** pass with clearance through holes bored in the cross-head **20**, and at their right-hand ends (in Figure 1) are secured to the sliding cross-bar **21** by means of nuts **22**. The cross-bar **21** slides in its turn with claws **23** upon the slideways **6***a*, and is rigidly connected with the container-holder **14** by the container rods **17** and **19**. To the sliding cross-bar **21** are secured, by means of nuts **25**, two lateral plungers **24**, which each extend into a cylinder **26**, which is likewise held by the mounting **7** of the extrusion cylinder **8**. Attached to the sliding cross-bar **21** are also two pairs of cross-bar rods **27**, these being fastened by means of nuts **28**. The cross-bar rods **27** pass through apertures in the mounting **7** of the extrusion cylinder **8** right to the rear end of the press (towards the right in Figure 1), where the two cross-bar rods on each side of the press are attached to a vertical end cross-bar **29**.

In the middle of each end cross-bar **29** is attached a plunger **30**, which extends into a cylinder **31** which is likewise held by the mounting **7** of the extrustion cylinder **8**. The forward movement of the sliding cross-bar **21** is therefore effected by introducing liquid under pressure into the cylinders **26**, so that this pressure liquid acts upon the plungers **24**, which are connected fast with the sliding cross-bar **21**. The retraction of the sliding

cross-bar 21 is effected by admitting liquid under pressure into the cylinders 31, so that the pressure acts upon the plungers 30 and pushes the two vertical end cross-bars 29 rearwards, towards the right, so that these end cross bars, through the medium of the cross-bar rods 27, pull the sliding cross-bar 21 towards the right. The cross-head 20 likewise slides with claws upon the guide-ways 6*a*, and carries the front end 33 of the press plunger 32, which moves forward in the extrusion cylinder 8 when liquid under pressure is admitted into the rear end of the extrusion cylinder. The forward displacement of the cross-head 20 is therefore effected by the press plunger 32, whereas its retraction is effected by means of rods 34, which at their ends each carry a retraction plunger 35, which extends into a retraction cylinder 36, which is likewise carried by the mounting 7 of the extrusion cylinder 8. Upon the admission of liquid under pressure into the retraction cylinders 36 the cross-head 20 is therefore drawn back towards the right by means of the rods 34.

The front end 33 of the press plunger 32 carries in the usual manner the press ram 37. On the rear end of the press plunger 32 is mounted an extension 38, which extends out of the extrusion cylinder 8. A longitudinal bore 39, which extends through the press ram 37, the press plunger 32, 33, and the rear end extension 38 of the press plunger 32, accommodates the mandrel 40, which can be moved to and fro from the right in the axial direction of the press in a known manner which is not illustrated or further described. The means serving for this movement may for instance consist of a piston which is reciprocated in a stationary hydraulic cylinder.

The cross-head 20 rigidly connected with the press plunger 32 is reliably guided straight, that is, always at right angles to the extrusion axis, since the press plunger 32 is always accurately guided in and by the extrusion cylinder 8, and more particularly by means of its rear extension 38. This invention therefore employs the cross-head 20 for the adjustment or alignment of the container 4 before the extrusion begins. This is effected by retracting the cross-head 20, that is to say, moving it towards the right through a few millimeters, relatively to the position shown in the drawing. The sliding cross-bar 21 is then moved to the left by means of the plungers 24 into contact with the cross-head 20, where it bears with its adjusting surface 21*a* against a corresponding adjusting surface 20*a* of the cross-head. When the sliding cross-bar 21 has in this way been constrained to assume a position which is exactly perpendicular to the extrusion axis, then the container 4 is also correctly adjusted, since it is rigidly connected by the four container rods 17 and 19 with the sliding cross-bar 21. It is therefore not possible for the axis of the container 4 to be inclined at all to the extrusion axis.

If the press plunger 32 together with the cross-head 20, and the sliding cross-bar 21 together with the container 4, are now collectively advanced through the remaining distance of a few millimeters, the exactly central position of the sliding cross-bar 21, with the container 4, is ensured. In order that with this advance the contact at the rectifying surfaces 20*a* and 21*a* may be maintained, the sliding cross-bar 21 is pushed forward with a force which is greater than the force that tends to push the press plunger 32 back, that is, towards the right, together with the cross-beam 20. This is attained by the fact that the cross-sectional area of the two plungers 24 that tend to advance the sliding cross-bar 21, with the container 4, is made somewhat greater than the effective cross-sectional area of the two retracting plungers 35, which seek to move the press plunger 35 rearwards. The full extrusion pressure may therefore be admitted to the retracting cylinders 36 to act upon the retracting plungers 35, since the force thereby produced is overcome by the greater thrust that is exerted by the pressure liquid in the cylinders 31 upon the plungers 24 of the sliding cross-bar 21.

It is thus ensured that the container 4 will be exactly concentric with the die 3 and the abutment 1; and since the mandrel 40 is firmly guided in the press ram 37 and in the press plunger 32 it is now also ensured that the mandrel 40, as it advances, will also be exactly concentric with the bore of the receiver 4, and, after it has pierced a billet located in the bore of the receiver 4, will enter exactly centrally into the die 3. If the mandrel 40 is exactly central in relation to the die 3, then, during the extrusion of the billet by means of the press ram 37, a tube is extruded which is of exactly the same wall thickness on all sides.

The constructional example illustrated in Figures 6 to 12 is distinguished from the first embodiment, illustrated in Figures 1 to 5, by the fact that the sliding cross-bar, which in the first embodiment is arranged between the cross-head 20 and the extrusion cylinder 8, is now transferred to a position behind the extrusion cylinder. For the purpose of providing an adjusting surface against which the sliding cross-bar can be supported relatively to the cross-head, the sliding cross-bar is provided with rods which extend in a forward direction right into the neighborhood of the cross-head. This is illustrated in Figures 6 to 12. In the absence of special indications to the contrary in the following description, the construction in Figures 6 to 12 corresponds to that already described in connection with the first embodiment.

Here again the abutment or counter-holder 51 is connected by tie-rods 52 with the mounting 53 of the extrusion cylinder 54. The cross-head 56, which carries the front end of the press plunger 57, and the container 58, slide upon two slideways 55. The press plunger 57 has a rear extension 59, which is attached to a retraction cross-bar 60. This retraction cross-bar 60 is equipped with retraction plungers 61, which extend into retraction cylinders 62, and effect the rearward movement of the press plunger 57 when liquid under pressure is admitted into the retraction cylinders 62. Upon the rear extension 59 of the press plunger 57 slides the sliding cross-bar 63, which is furthermore guided by its lower end 63*a* upon a guide rail 64. For the purpose of movement the sliding cross-bar 63 is provided with two sets of plungers 65 and 66. The plungers 65 act on one side of the cross-bar 63 and the plungers 66 act on the other side. The plungers 65 extend into cylinders 67 for retracting the sliding cross-bar 63, while the plungers 66 extend into forward cylinders 68. When liquid under pressure is admitted into the two retraction cylinders 67, the sliding cross-bar 63 is moved back. When on the other hand liquid under pressure is admitted into the forward cylinders 68, the sliding cross-bar 63 is advanced. The forward cylinders 68 are rigidly connected through holding pieces 69 and rods 70 with the mounting 53 of the extrusion cylinder 54. The sliding cross-bar 63 is secured to four cross-bar rods 71, which extend through holes bored in the mounting 53 of the extrusion cylinder, as shown more particularly in Figure 12. Forward extensions 72 of the cross-bar rods 71 are rigidly secured to the container 58. These extensions are of smaller diameter, and pass through holes 73 bored in the crosshead 56. At the transition point from the diameter of the rods 71 to the diameter of the extensions 72 there is therefore a shoulder 74. The shoulders of the four rods 71 collectively form the adjusting surface for the container 58 as they come into contact with a corresponding adjusting surface 75 on the cross-head 56, when the sliding cross-bar 63 is moved forward.

The procedure with this second example of construction is also such that the press plunger 57, with its cross-head 56, is first brought into a position located a few millimeters to the right of the position shown. Thereupon the sliding cross-bar 63, which is rigidly connected by the rods 72, 71 with the container 58, is moved forward until the shoulders 74 strike against the corresponding adjusting

surface 75 of the cross-head 56. The subsequent procedure may then be the same as has been described in connection with the first embodiment.

The plunger cylinders are controlled by cocks connected by piping in the usual way with a hydraulic accumulator and with a waste pipe.

We claim:

1. A press for the extrusion of hollow products, comprising: a piercing mandrel, a cross-head, a press ram carried by the cross-head, a sliding cross-bar arranged behind the cross-head, a longitudinally displaceable container rigidly connected with the sliding cross-bar, an adjusting surface on the cross-head, and an adjusting surface on the sliding cross-bar, these adjusting surfaces being adapted to be pressed together for the purpose of adjusting the sliding cross-bar, and with it the container.

2. An extrusion press as claimed in claim 1, characterised by the feature that the sum of the cross-sectional areas of plungers urging the sliding cross-bar forward is greater than the sum of the effective cross-sectional areas of plungers tending to retract the cross-head, with the result that the forward thrusts that can be caused to act upon the sliding cross-bar are greater than the rearward thrusts that can be caused to act upon the cross-head, so that while the sliding cross-bar pushes the cross-head forward, the adjusting surface of the cross-head is pressed hard against the adjusting surface of the sliding cross-bar.

3. An extrusion press as claimed in claim 1, characterised by the feature that the sliding cross-bar is arranged behind the extrusion cylinder, the press further comprising cross-bar rods, which are guided past or through the extrusion cylinder, shoulders on the said cross-bar rods, near the front ends thereof, the front surfaces of these shoulders constituting the adjusting surface for the cross-head.

4. An extrusion press as claimed in claim 3, characterised by the feature that the cross-bar rods are rigidly connected with the sliding cross-bar, and include integral extensions extending through the cross-head, the other ends of these extensions being rigidly connected with the container.

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