March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 1

Fig. 1.

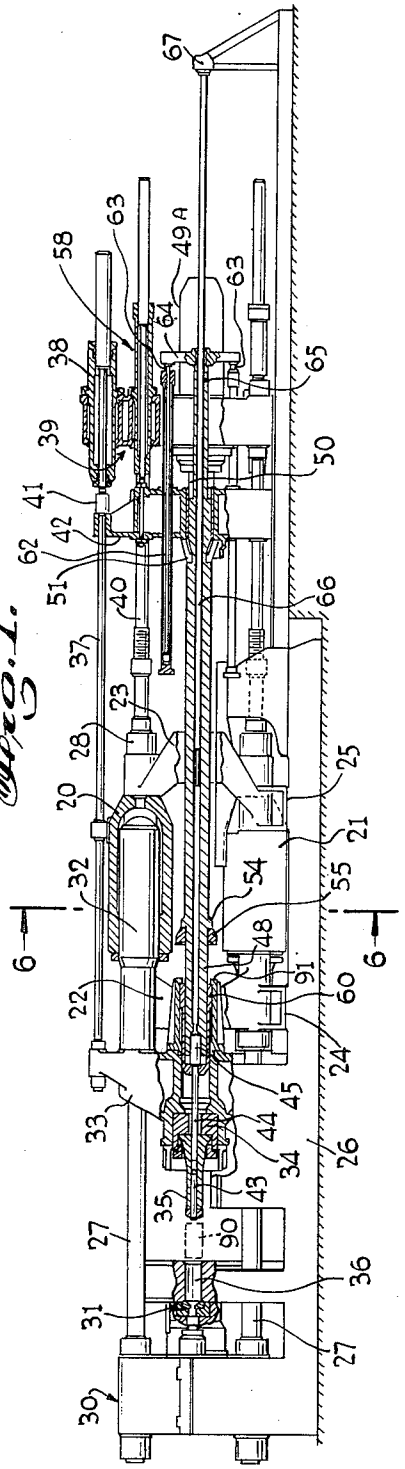
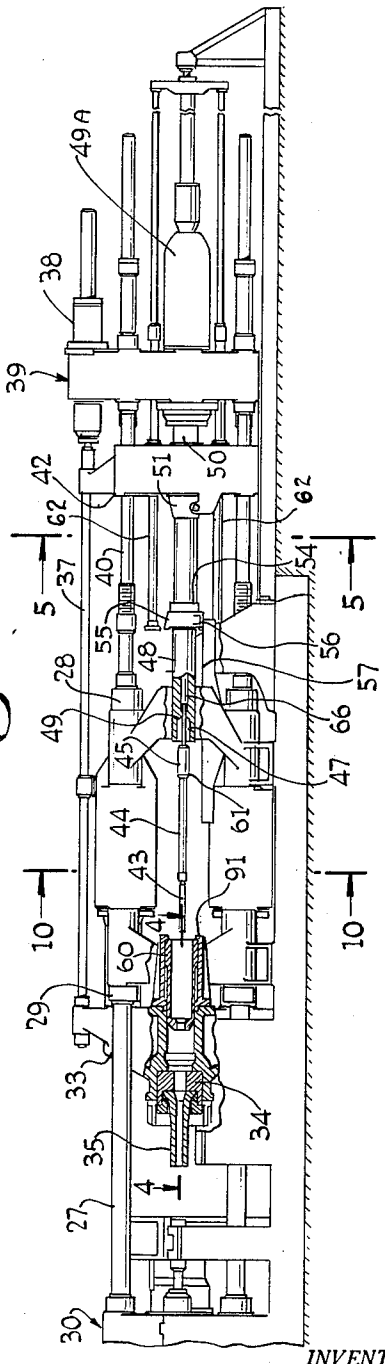


Fig. 2.



INVENTOR.
HUGO LORANT

BY

Hammond & Littell
ATTORNEYS

March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 2

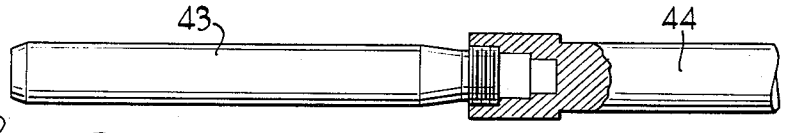


Fig. 3.

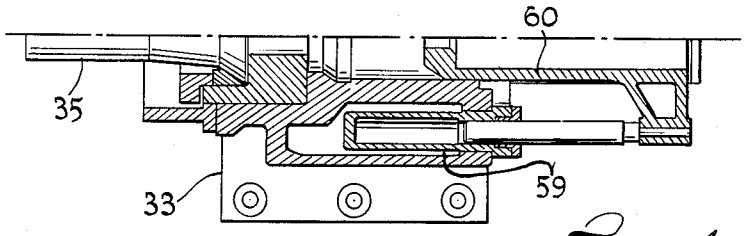


Fig. 4.

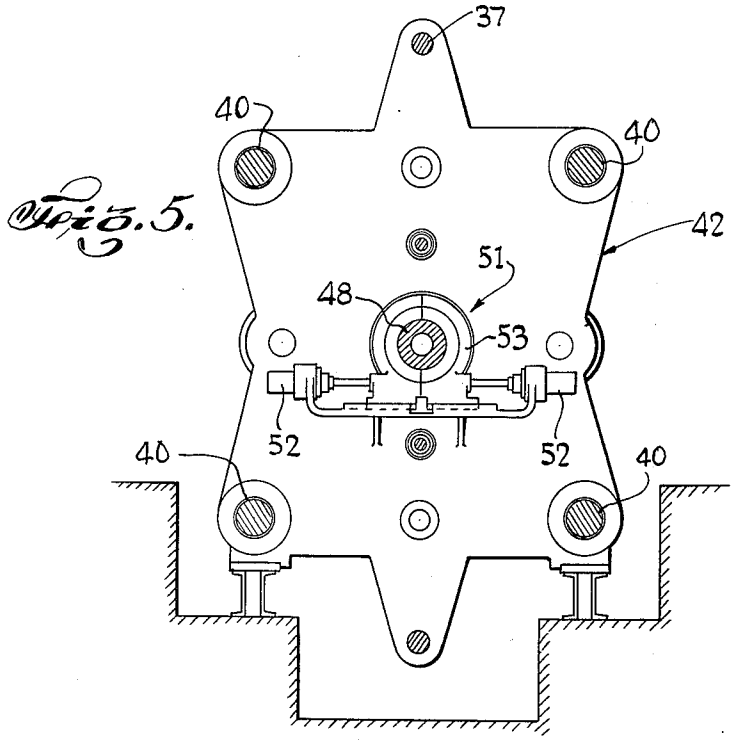


Fig. 5.

INVENTOR.
HUGO LORANT

BY

Hammond & Littell

ATTORNEYS

March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 3

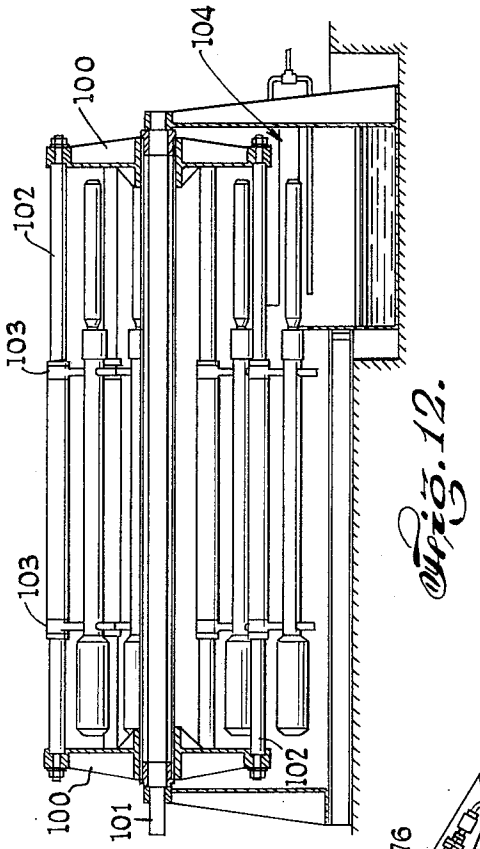


Fig. 12.

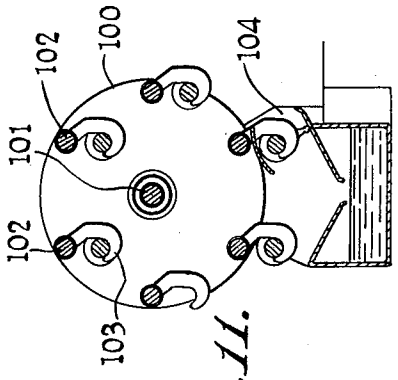


Fig. 11.

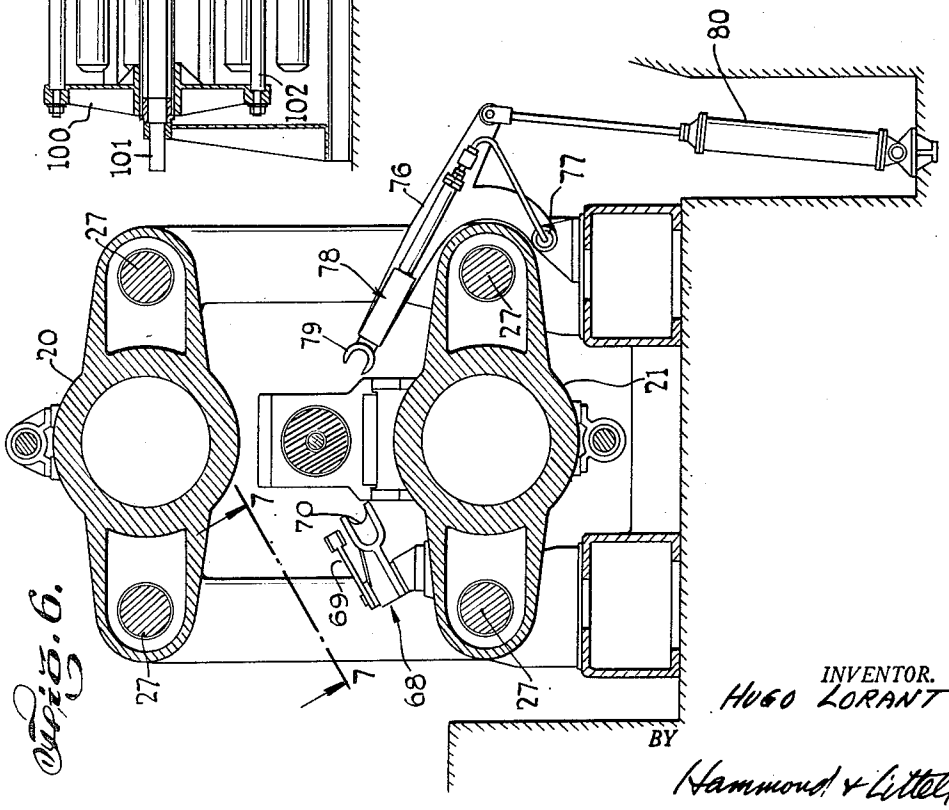


Fig. 6.

INVENTOR.
HUGO LORANT

BY

Hammond & Littell
ATTORNEYS

March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 4

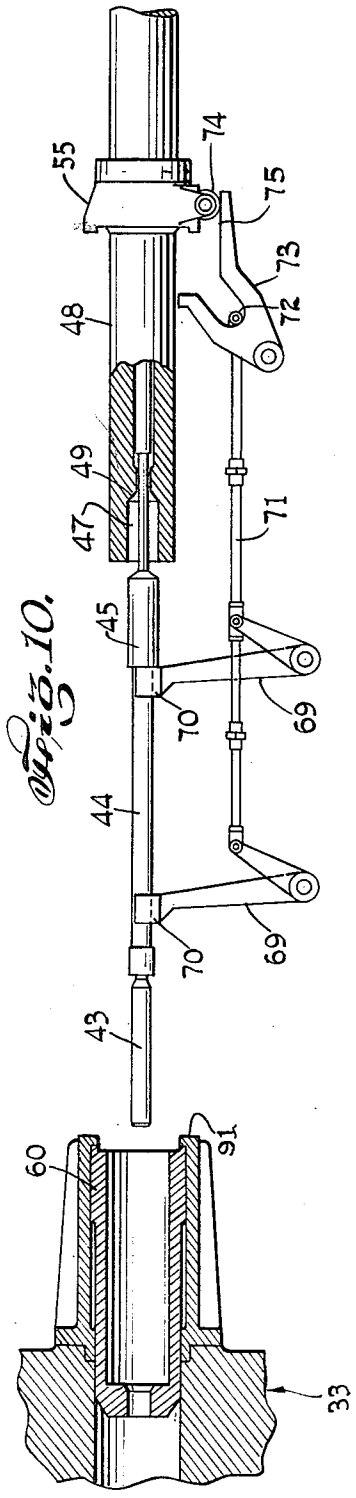


Fig. 10.

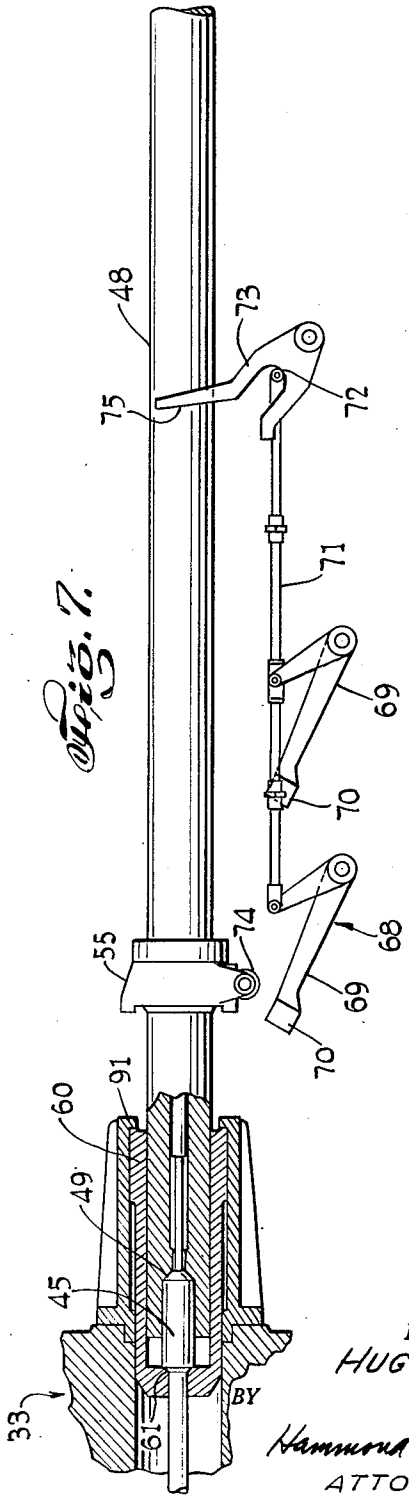


Fig. 17.

INVENTOR.
HUGO LORANT
BY
Hammond & Littell
ATTORNEYS

March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 5

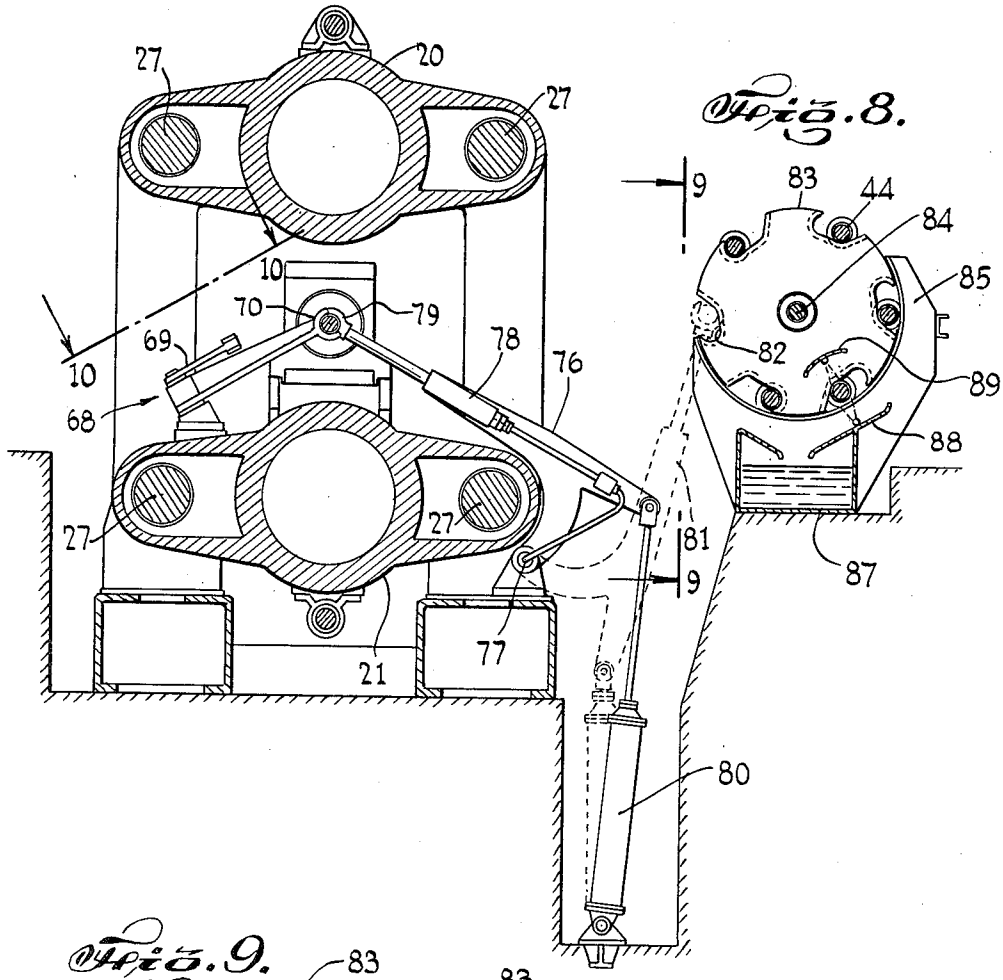


Fig. 8.

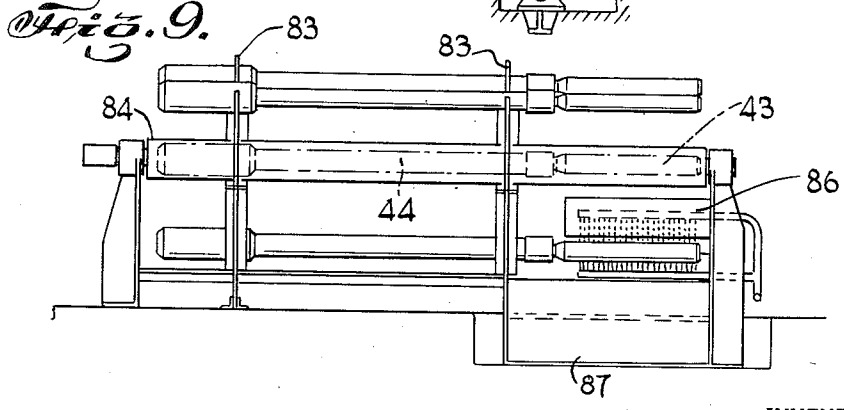


Fig. 9.

INVENTOR.
HUGO LORANT

BY

Hammond & Littell
ATTORNEYS

March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 6

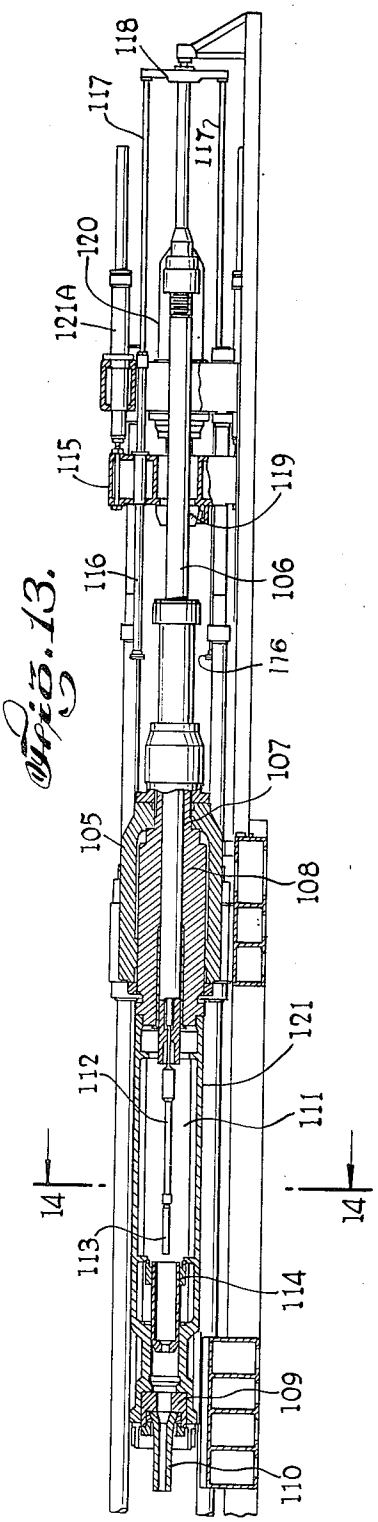


Fig. 13.

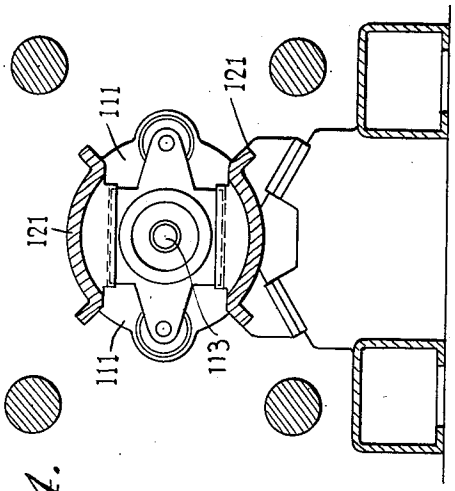


Fig. 14.

INVENTOR.
HUGO LORANT

BY

Hammond & Littell
ATTORNEYS

March 16, 1954 H. LORANT 2,672,234

EXTRUSION PRESS

Filed April 24, 1948 7 Sheets-Sheet 7

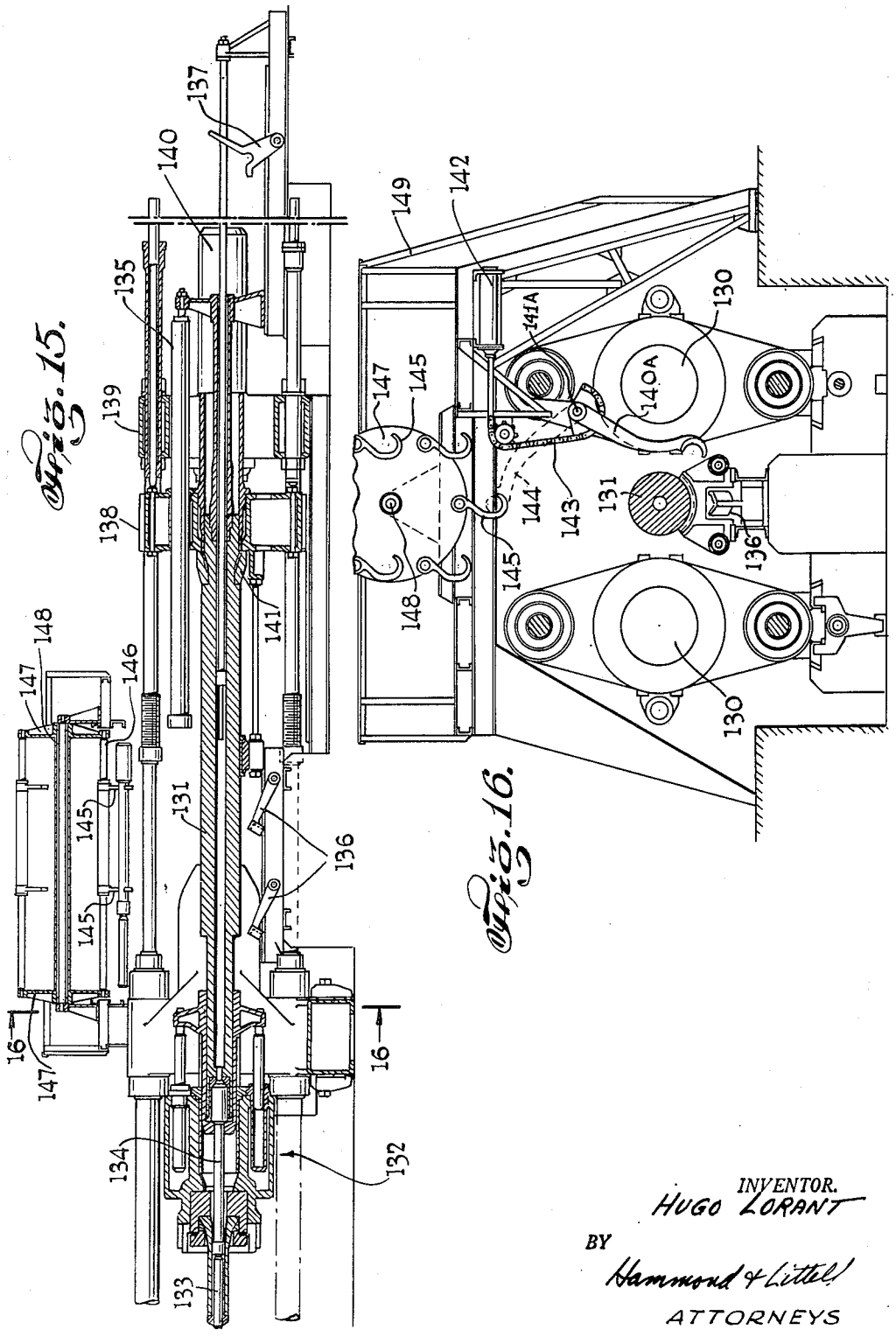


Fig. 15.

Fig. 16.

INVENTOR.
HUGO LORANT

BY
Hammond & Littell
ATTORNEYS

Patented Mar. 16, 1954

2,672,234

UNITED STATES PATENT OFFICE

2,672,234

EXTRUSION PRESS

Hugo Lorant, New York, N. Y.

Application April 24, 1948, Serial No. 23,124

3 Claims. (Cl. 207—3)

1

This invention relates to an extrusion press or the like used in the extrusion of tubes and the forming of hollow shapes, said press having a mandrel, and particularly to an arrangement whereby said mandrel may be easily changed and cooled so that the press can achieve increased production when extruding metal tubes at relatively high temperatures.

In the conventional extrusion press, a billet is placed into a billet container or bore by an extrusion stem. A mandrel is located within the extrusion stem, said mandrel being employed to pierce the billet and also being used in conjunction with the extrusion operation, the mandrel and extrusion stem being appropriately operated by hydraulic cylinders. In the operation of such a press when extruding materials such as steel, the mandrel becomes very hot and must be cooled because otherwise the life of the mandrel will be extremely short and the operation of the press uneconomical. One of the difficulties involved is that the time required to cool the mandrel considerably reduces the output of the press if a single mandrel is used for consecutive operations. In prior practice, the cooling time frequently is much longer than the actual operation time of the extrusion press.

Various means can be used to cool mandrels such as air, oil, water, etc. Air cooling has advantages, particularly in its simplicity, but requires a longer time than the other cooling methods. Oil has certain handling difficulties and the time required for cooling is still relatively long. It is not possible to use water on high heat resisting steel mandrels because the mandrel would crack due to the sudden temperature change when water impinges thereon.

Various attempts have been made to overcome the above difficulties but a satisfactory solution has not been found. It has been proposed to remove the mandrel from the extrusion press and insert a new one in the extrusion stem but usually the mandrel is screwed into the mandrel holder so that the exchange of the mandrel by disengaging it from its holder is impracticable. This is because the threaded connection is difficult to disengage because of the high temperatures and pressure to which it was subjected during extrusion. Other types of joints allowing easy disengagement are not satisfactory because the space within the bore of the extrusion stem is limited and a joint of sufficient strength could not be provided.

Mandrels attached to a solid stem have been used for the extrusion of light metal from a

2

billet, wherein a bayonet joint is provided for manual exchange of the mandrel. Such a removal, however, requires considerable time and the mandrel is not movable relative to the extrusion stem itself and thus cannot be retracted rapidly following extrusion. In such a case, the metal being extruded or shaped may shrink upon the mandrel and thus make it difficult to remove the mandrel therefrom. It is thus apparent that in high temperature extrusion, particularly of steel, it is of extreme importance to solve the problem of cooling the mandrel with the smallest possible loss in machine operating time.

One of the objects of the invention is to provide an arrangement wherein the mandrels may be changed and cooled without unduly losing operating time of the press.

Another of the objects of the invention is to provide an improved mandrel holding and operating arrangement.

One of the features of the invention is to provide an arrangement whereby a mandrel means, including a mandrel and a mandrel holder, can be easily removed from the extrusion stem to a zone outside of the actual operating zone of the press where the mandrel can be cooled or changed. A plurality of mandrels can be carried in a cooling support so that there will always be available a cooled mandrel to replace the previously used hot mandrel, said cooling support being adapted to receive the hot mandrel and carry the same to a cooling zone. The connection between the mandrel holding means and mandrel is constructed so as to be quickly and automatically disconnectable from the other operating parts of the press. The disengageable connection is located toward the rear of the extrusion stem, or remote from the operating zone of the press, so that it will not enter therein and thus will not be subjected to the high temperatures adjacent the extrusion stem. As mentioned previously, according to this invention, the mandrel means comprises a mandrel and mandrel holder which can be changed as a unit.

In one aspect of the invention, a mechanical means can be provided for receiving, transferring, and moving the mandrels to and from the extrusion stem, the mandrel being conveyed to a cooling zone outside of the press operating zone. It is of course apparent that the quickly detachable mandrel means arrangement can be employed in a press wherein the mandrel and mandrel holder are removed manually from the operating zone.

The main operating cylinders for operating the

movable cross head carrying and forcing the extrusion stem into the billet container can take the form of a pair of main hydraulic cylinders spaced on either side of the center of the press so that the mandrel means is reciprocable therebetween.

In an alternate arrangement of the movable cross head and extrusion stem operating means, a single main operating cylinder is located on the center line of the press, with a bore therethrough for the passage of the operating parts. The single cylinder is longitudinally spaced from the movable cross head so as to allow the mandrel holder and mandrel to be removed laterally between the cross head and cylinder.

The mandrel means is reciprocable within a bore in the extrusion stem by a piercer stem assembly, the mandrel means being disengageably connectable with the piercer stem. A plurality of piercer cylinders located on either side of the press axis or a single piercer cylinder can be used for the purpose of reciprocating the piercer stem.

In one aspect of the invention, a shifting cylinder arrangement is used in conjunction with the piercer cylinder for controlling movement of the piercer stem, the piercer cross head to which the piercer cylinder means is connected being connectable to the piercer stem by means of a clutch. The piercer cylinders are relatively large as compared to the shifting cylinders so as to provide the desired power for performing the piercing operation, it not being necessary that the hydraulic cylinders used merely for shifting the mandrel means toward and away from the operating zone be the same size as the piercer cylinders. Upon completion of the relatively short piercing stroke by the piercer cylinders, the piercer stem can be disconnected from the movable piercer cross head and piercer cylinders and the shifting cylinder means used to withdraw the piercer stem independently of the piercer cylinders to a position where the mandrel holding means conveniently can be removed from the piercer stem.

In the automatic removal of the mandrel holder and mandrel, means can be provided to automatically support the mandrel holder as it is ejected or disconnected from the piercer stem. A transfer mechanism then can be operated to pick up the mandrel means and move the same to a cooling location. The same mandrel transfer mechanism can pick up a cooled mandrel means and return the same for connection with the piercer stem. During the time employed for changing mandrels, the extruded tube can be cut off and the die in the container can be prepared for the next cycle. It thus becomes apparent that the changing of mandrels can be done automatically and without difficulty in the present invention so that little time will be lost in the operation of the machine.

In one form of the invention, an arrangement can be provided for automatically moving the mandrel rearwardly relative to the billet as soon as the pressure on the piercer cylinder is released, thus preventing shrinking of the billet on the mandrel. The arrangement for automatically removing the mandrel means also can serve to insure that the mandrel holder is firmly held in the piercer stem. In a preferred form of the invention, the aforementioned automatic holding means includes a yieldable hydraulic cylinder means holding a slidable member to the rear or away from the extrusion stem.

As the piercer stem with the mandrel means is moved toward the extrusion stem, the slidable member will be contacted and moved therewith against said yieldable means as the mandrel is carried into the extrusion stem bore. The hydraulic means restraining movement of the slidable member can be replaced by a spring means. Upon release of pressure on the piercer cylinder, the yieldable means will withdraw the mandrel into the extrusion stem and thus retract the mandrel out of the billet or material upon which an extrusion or pressing operation has been performed.

These and other objects, features and advantages of the invention will become apparent from the following description and drawings, which are merely exemplary.

In the drawings:

Figure 1 is an elevation partially in section with the mandrel located in the extrusion stem before the stem has been advanced toward the billet container.

Figure 2 is an elevation generally similar to Figure 1 but with the mandrel retracted from the extrusion stem and in position for removal.

Figure 3 is an enlarged view of the mandrel means including the mandrel and a portion of the mandrel holder.

Figure 4 is an enlarged fragmentary view partially taken along the line 4—4 of Figure 2 showing the sliding member and its retracting means.

Figure 5 is a sectional view taken along the line 5—5 of Figure 2 showing details of the piercer stem clutch.

Figure 6 is a sectional view taken approximately along the line 6—6 of Figure 1 showing one form of mandrel removing apparatus for removing a mandrel from the press.

Figure 7 is an enlarged fragmentary view taken approximately along the line 7—7 of Figure 6 showing one form of mandrel removing support means.

Figure 8 is a generally similar to Figure 6 with the piercer stem and mandrel means withdrawn and the latter in readiness to be transferred to the cooling apparatus.

Figure 9 is a view of one form of rotatable member on which the mandrel means can be cooled, said view being taken approximately along the line 9—9 of Figure 8.

Figure 10 is an enlarged fragmentary view taken approximately along the line 10—10 of Figure 8.

Figure 11 is an end view of a modified form of a rotatable means for supporting the mandrels during the cooling thereof.

Figure 12 is a side elevation looking toward the right in Figure 11.

Figure 13 is a fragmentary longitudinal elevation partially in section of an extrusion press having a single main cylinder instead of the two main cylinders of Figure 1.

Figure 14 is a sectional view taken along the line 14—14 of Figure 13.

Figure 15 is a fragmentary longitudinal elevation, partially in section, of another modification of the main cylinder arrangement.

Figure 16 is a sectional view taken approximately along the line 16—16 of Figure 15.

The invention first will be described in conjunction with an extrusion press having a pair of main extrusion stem operating cylinders, located on either side of the center line of the press. The upper main cylinder 20 and lower

main cylinder 21 can be mounted on a pair of uprights 22 and 23, said uprights being supported at 24 and 25 on the main bed 26 of the press. Each of the cylinders can have laterally extending lugs (not shown) for carrying the main tie rods 27, said tie rods passing through lateral lugs of upright supports 22 and 23. The tie rods can have nuts 28 and 29 (Figure 2) at either end between the uprights so as to connect the latter with the main cylinders to a conventional platen 30 carrying an extrusion die arrangement shown generally at 31.

The main cylinders have rams 32 connected to the movable main cross head 33, the movable cross head 33 carrying a tool holder 34 and extrusion stem 35. The extrusion stem 35 cooperates with the billet container bore 36 in a conventional manner.

A pair of pull back rods 37 are connected to the movable main cross head 33 for the purpose of retracting said movable cross head, said pull back rods 37 being operable by the pull back cylinder assembly 38 arranged in the stationary cylinder cross head 39. There preferably are two pull back rods, one being located on either side of the center line of the machine. Extensions 40 of the main tie rods 27 connect stationary cylinder cross head 39 to the main parts of the press. Pull back rods 37 are provided with adjustable nuts 41 which cooperate with the movable piercer cylinder cross head 42 for the purpose of moving the piercing apparatus during certain movements of other parts of the press as will be described hereafter.

In conventional extrusion presses, the piercing apparatus includes a mandrel which can be forced into a billet located in the billet container 36. The mandrel means of the present invention includes mandrel 43 (Figs. 1, 2 and 3) and mandrel holder 44. The mandrel and holder are adapted to be reciprocated in a bore in extrusion stem 35. The mandrel may, for example, be screw-threadedly engaged in mandrel holder 44 (Fig. 3). Mandrel holder 44 has an enlarged end 45 which fits snugly into a cooperating bore 47 (Fig. 2) of the piercer stem 48 so that the rear face of the mandrel holder is engaged by shoulder 49 of piercer stem 48.

The piercer stem is arranged to be moved in the piercing operation by a pair of piercer cylinders 49A carried by the stationary cylinder cross head 39. The piercer cylinder rams 50 are connected to the movable piercer cross head 42, which in turn is connected to piercer stem 48 through a clutch 51. One piercer cylinder and one ram are visible in Figure 1, the other cylinder and ram being visible in Figure 2.

Clutch 51 can have two small cylinders 52, 52 (Fig. 5) for the purpose of engaging and disengaging clutch elements 53 with respect to piercer stem 48. When the clutch 51 is engaged and the piercer cylinders 49A energized, the mandrel will be forcibly moved forward because the action of the piercer cylinders 49A will be transmitted to the mandrel means through rams 50, movable piercer cross head 42, clutch 51 and the enlarged head 45 of mandrel holder 44.

Piercer stem 48 can be provided, if desired, with a shoulder 54 engaging a disc 55 which can be used to apply the force of the piercer cylinders to the extrusion stem through the movable cross head 33. The disc 55 may have a flat lower surface 56 (Fig. 2) which is slidable upon the horizontal guide bracket 57 serving to support the piercer stem 48 when the forward end thereof is not supported in elements carried by the movable cross head 33.

When the mandrel has to be withdrawn immediately after extrusion and upon release of pressure in the piercer cylinders, a retracting device may be provided for moving the mandrel from an extended position relative to the extrusion stem to the position shown in Figure 1. Such a retracting device may comprise a pair of hydraulic cylinders 59 (Fig. 4) actuating a sliding member 60 (Figs. 1, 2 and 4), said sliding member 60 being guided in the movable cross head 33 and being suitably supplied with fluid so as to urge the slidable member 60 rearwardly or to the right (Fig. 4). It is evident, of course, that springs or other means may be used instead of the hydraulic arrangement seen in Figure 4. The force exerted by retracting cylinders 59 is transmitted to the mandrel holder 44 through sliding member 60 and shoulder 61 of the enlarged portion 45 of the mandrel holder (Fig. 2). It thus is apparent that following the piercing operation and release of pressure in the piercing cylinders 49A, the mandrel 43 will be withdrawn into the position shown in Figure 1 relative to the extrusion stem 35. Thus the difficulties involved in having the metal being extruded shrunk onto the mandrel can be avoided.

Pull back cylinder assemblies 58 may be provided, said assemblies being connected to the movable piercer cross head 42 for the purpose of withdrawing the movable piercer cross head.

In order to complete withdrawal of the mandrel means, the piercer stem 48 is moved to the position shown in Figure 2 by means of the double acting shifting cylinders 62 which are rigidly mounted in the movable piercer cross head 42. Shifting cylinder rams 63 are connected to shifting cylinder cross head 64, said cross head being attached to an extension 65 of the piercer stem 48. Upon disengagement of the clutch 51, it can be seen that the piercer stem 48 may be moved rearwardly relative to the movable piercer cross head 42. Upon release of the clutch 51, actuation of the shifting cylinders 62 will move the piercer stem, mandrel holder and mandrel to the position shown in Figure 2. It is thus possible to carry out the relatively long shifting movement of the piercer stem independently of the piercer cylinders 49A to a point where the mandrel means can be exchanged. In this manner, the stroke of the piercer cylinder rams can be made short as in a conventional tube press. The shifting cylinders 62 obviously do not have to be as large as the piercer cylinders 49A since they serve only for moving piercer stem 48.

As the piercer stem 48 is moved rearwardly to the position shown in Figure 2, the mandrel means will be carried along therewith because the enlarged portion 45 has been pushed into tight engagement with the piercer stem, both due to the engagement between shoulder 61 and sliding member 60, and the forces created during the piercing operation.

A stripper 66 connected to a stop 67 may be provided for the purpose of stripping or removing the mandrel holder 44 from the piercing stem at an appropriate time and thereby ejecting the mandrel means from the piercer stem. Various means other than the stripper illustrated can be used for removing the mandrel holder from the piercer stem.

When the piercer stem 48 is moved rearwardly, a mandrel support 68 (Figs. 6, 7) is positioned

to receive and support the mandrel holder as it is ejected from the piercer stem. In one form of the invention, the mandrel support 68 may comprise a pair of pivoted arms 69 having saddles 70 at their outer ends adapted to engage the mandrel holder. The mandrel support is shown in its inoperative position in Figures 6 and 7, there being a connecting rod 71 having a roller 72 engageable by mandrel support operating member 73. Roller 74 may be carried by disc 55 (Fig. 7) for the purpose of engaging the surface 75 of the operating member 73.

Upon rearward movement of piercer stem 48 from the position shown in Figure 7 to that shown in Figure 10, the roller 74 will engage surface 75 and rotate the operating member 73 so as to draw the connecting rod 71 to the right at the correct time, thus moving the mandrel support arms 69 to the position shown in Figures 8 and 10 to receive the mandrel holder as it is ejected from the piercer stem. The transfer arm 76 (Fig. 6) has a hydraulic cylinder arrangement 78 thereon operating the tray-like member 79. Upon energization of hydraulic cylinder 78, the tray member 79 will be advanced from the position shown in Figure 6 to that shown in Figure 8 engaging the mandrel means.

The transfer or conveyor apparatus is then ready for operation of the double acting cylinder 80. Operation of cylinder 80 for the purpose of pivoting the transfer arm 76 around 77 from the full lines shown in Figure 8 to the dashed line position 81, will thereby carry the mandrel holder to a point where it can be released into one of the sets of slots or recesses 82 of the rotatable discs 83 (Figs. 8 and 9). The discs 83 may be supported on a shaft 84 which can be intermittently rotated or indexed in any conventional manner. Guide plates 85 serve to keep the mandrel holders 44 in the recesses 82 as the discs 83 rotate. After the mandrel has been transferred to a position where it is ready to be engaged in the slots of the discs 83, hydraulic cylinder 78 may be operated so that tray 79 will move downwardly and will deposit the mandrel holder in a set of empty slots. The discs 83 then are indexed to bring a cool mandrel means into position to be engaged by tray 79 upon operation of the hydraulic cylinder 78.

After engagement of the mandrel means thereby, actuation of cylinder 80 will cause the mandrel means to be carried into the position shown in full lines in Figure 8 where it is engaged by the tray 79 and supporting saddles 70 in front of the path of the piercer stem 48.

Upon forward movement of the piercer stem thereafter, the mandrel holder will be engaged by the piercer stem and carried forward, the enlarged end 45 of the holder entering the bore 47 in the piercer stem. The tray 79 will be retracted at an appropriate time so as not to interfere with the movement of the piercer stem. Retraction of the mandrel supports can be accomplished by roller 74 engaging the operating member 73 and moving mandrel supports 69 out of the way of the piercer stem and related apparatus. Movement of the mandrel supports out of the path of the piercer stem 48 is delayed until after enlarged portion 45 of the mandrel holder has been engaged in the bore of the piercing stem, the relationship of roller 74 and operating member 73 being such as to positively hold the mandrel holder until said engagement takes place.

In the cooling apparatus for the mandrels, there may be any number of stations provided, six being illustrated by way of example. A suitable cooling means at 86 (Fig. 9) for spraying oil or other cooling medium upon the mandrels 43 can be used. Container 87 and spray shields 88 and 89 of any suitable variety can be used for the purpose of collecting the cooling oil or medium.

Describing the operation of the transfer mechanism thus far, when the mandrel and mandrel holder are in a position shown in Figure 2 supported on the mandrel supports 69 (Fig. 8) following a retraction of the piercer stem 48, the hydraulic cylinder arrangement 78 (Figs. 6 and 8) is operated so as to engage the mandrel and transfer a hot mandrel to the mandrel cooling arrangement at the right of Figure 8.

A cool mandrel and mandrel holder is transferred from the mandrel cooling apparatus to a position in front of the piercer stem. The piercer stem then is advanced by means of the shifting cylinders 62 (Fig. 1) the mandrel holder becoming engaged by the piercer stem as the stem moves forward. As the forward movement of the piercer stem is continued, the mandrel supporting apparatus 69 will be withdrawn to the position shown in Figure 7. The piercer stem continues moving forwardly until it reaches the position shown in Figure 1, at which time shoulder 61 of the mandrel holder comes into contact with the forward end of the sliding member 60. Clutch 51 then is engaged so as to connect the movable piercer cross head 42 and piercer cylinders 49A with the piercer stem 48. The movable cross head 33 with the extrusion stem 35 is then energized so as to move the parts toward operative position (Fig. 1), all movable piercing parts, including the movable piercing cross head 42, being carried along through the pull back rods 37 and nuts 41. The billet 90 (indicated by dashed lines, Figure 1) is pushed into the billet container bore 36.

The mandrel 43 then can be advanced by means of the piercer cylinders 49A exerting force through clutch 51 and piercer stem 48. The forward movement of the mandrel means will be carried out against the resistance of cylinders 59 of Figure 4 which are under pressure and will cause the mandrel holder to be tightly pushed into the piercer stem at this point of the operation. It is thus evident that the connection between the mandrel holder and the piercing stem is merely under pressure in both directions so that the mandrel means can be easily engaged and disengaged from the piercer stem 48.

The extrusion then can be carried out in a conventional manner as is well known in the art. The force of the piercing cylinders 49A can be transmitted to the piercing stem 48 alone or can be used in conjunction with the main cylinders 20, 21 by bringing disc 55 into engagement with guide member 91 (Fig. 1) which serves to guide sliding member 60 in its outer position.

Upon completion of the extrusion process, piercing cylinders 49A can be connected to the exhaust which will release pressure therein. This will allow retracting cylinders 59 to cause a rearward movement of the sliding member 60 to withdraw the mandrel therewith from the extruded tube or billet, and will at the same time position the entire movable piercing system to the right (Figs. 1 and 2) to the end of the stroke of the rams of cylinders 59. Thus, the parts will again take the position shown in Figure 1. Following this, clutch 51 is disengaged so that the piercer

stem 48 with the mandrel holder and mandrel can be moved to the right (Figs. 1 and 2) by the shifting cylinders 62. In the latter movement of the parts, the front end of the piercer stem will be withdrawn from the sliding member 60, the forward end of the piercing stem being supported on guide bracket 57 by means of the surface 56 of disc 55. As the piercer stem approaches its rearmost position, the mandrel supports operated by member 73 will be actuated to bring the mandrel supports 69 into a position to hold the mandrel means. At the end of the shifting stroke the mandrel holder 44 will hit the ejecting rod 66 so as to strip the mandrel holder from the piercer stem 48.

The mandrel then can be removed as previously described and a cool or new mandrel means automatically placed into position and the operation repeated. While the changing operation takes place, the extruded tube can be cut off from the discard, the die and billet container lubricated, and other necessary operations performed so that no time will be lost.

During the changing of the mandrels, inspection can be made of the condition thereof and in the event it is necessary to replace a defective mandrel, such can be done without affecting production of the press, it merely being necessary to have spare assembled mandrel means available.

The rotatable mandrel holding and cooling device can take various forms. Another example is seen in Figures 11 and 12 wherein discs 100, 100 can be rotatably supported on shaft 101, said discs 100 having rods 102 extending therebetween, with hooks 103 supported thereon at spaced points. The hooks 103 may function in a manner so as to serve the same purpose as the slots 82 of Figure 8 to receive and hold the mandrels. A cooling means is shown at 104 similar to cooling means 86 of Figure 9. It is evident of course that various other transfer mechanisms may be used such as will be described in conjunction with Figures 16 and 17.

Figures 13 and 14 show an arrangement wherein a single central extrusion stem operating cylinder is employed, the central operating cylinder being seen at 105. Piercer stem 106 traverses a bore 107 through ram 108 of the operating cylinder 105. The ram 108 is connected to the movable cross head and tool holder 109 through the open sided connecting member 121, said connecting member having openings 111 on each side thereof. Extrusion stem 110 is located in the end of tool holder 109. The purpose of openings 111 is to allow removal of the mandrel means. A sliding member 114 like sliding member 60 previously described is provided and the mandrel and mandrel holder are held therein in a manner similar to that of Figures 1 and 2.

A movable piercer cross head 115 carries shifting cylinders 116, said shifting cylinder being connected through rods 117 and cross head 118 to the piercing stem for the purpose of completing withdrawing of the piercer stem following operation of the piercer pull back cylinders 121A. A clutch 119 is provided for connecting the piercer stem to the piercer cylinders 120 through the movable piercer cross head 115.

The mandrel and mandrel holder may be removed with any suitable apparatus in a manner similar to that described in the previous modifications, access being gained thereto through openings 111.

A further modification of the device is seen in Figures 15 and 16 wherein the main extrusion

stem operating cylinders 130 are horizontally located on either side of the piercer stem 131. Cylinders 130 are connected in a suitable manner to operate the movable cross head and tool apparatus indicated generally at 132. The mandrel means comprising mandrel 133 and mandrel holder 134 are insertable in the end of the piercer stem 131. When the piercer stem 131 is withdrawn by means of the shifting cylinders 135, the mandrel and mandrel holder will be located over the mandrel supporting arms 136 of the transfer mechanism. Said arms 136 are shown in an inoperative position in Figure 15, but may be moved to an operative position at an appropriate time by operating member 137. The operating member 137 is connected in any suitable manner to the mandrel supports 136.

A movable piercer cross head 138, stationary cylinder cross head 139, piercer cylinders 140, and clutch arrangement 141 are provided for operating the device in a manner similar to the previously described modifications.

When the mandrel holder 134 is supported on mandrel supports 136, the transfer arm 140A (Fig. 16), which is pivoted at 141A, is arranged to be operated by hydraulic cylinder 142 through a flexible chain or other connector arrangement 143. Upon operation of the hydraulic cylinder 142, the transfer arm 140A will be rotated to the dashed line position 144 (Fig. 16) carrying the mandrel means upwardly where it may be picked up by a pair of hooks 145. Hooks 145 are mounted on rods 146 carried between rotatable discs 147, rotatable discs 147 being intermittently rotatable by shaft 148. In the form just described, the mandrel rotating and cooling apparatus is located over the machine and access can be gained thereto by means of the platform 149.

It is apparent that various changes may be made in the details of construction and that various combinations of the features thereof can be used without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

1. In an extrusion press having an extrusion stem and an operating zone with a die and billet container, the combination including a mandrel means, a reciprocable operating stem movable toward and away from said operating zone for moving said mandrel means, said mandrel means being movable relative to said extrusion stem and retractable to the rear thereof away from said operating zone, connecting means between said mandrel means and said operating stem, said connecting means including members tightly fitting but axially engageably and disengageably movable relative to each other, said mandrel means and operating stem being connected and disconnected through said connecting means by axial movement of said mandrel means and operating stem relative to each other, and a stripper within said operating stem fixed in the path of said mandrel means for contacting the same as the mandrel means and operating stem are moved away from said operating zone to cause axial disconnecting movement of said mandrel means and operating stem.

2. In an extrusion press having an extrusion stem and an operating zone with a die and billet container, the combination including a mandrel means, a reciprocable operating stem movable toward and away from said operating zone for moving said mandrel means, reciprocating means connected to said operating stem, said mandrel means being movable relative to said extrusion

stem and retractable to the rear thereof away from said operating zone, connecting means between said mandrel means and said operating stem, said connecting means including members tightly fitting but axially engageably and disengageably movable relative to each other, said mandrel means and operating stem being connected and disconnected through said connecting means by axial movement of said mandrel means and operating stem relative to each other, a stripper within said operating stem fixed in the path of said mandrel means for contacting the same as the mandrel means and operating stem are moved away from said operating zone to cause axial disconnecting movement of said mandrel means and operating stem, and yieldable fluid means continuously energized in a direction to urge said stem and mandrel means away from said operating zone, said reciprocating means overcoming said yieldable fluid means as the operating stem is reciprocated toward the operating zone, the yieldable means effectuating initial withdrawal of said operating stem and mandrel means upon completion of operation of said reciprocating means.

3. In an extrusion press having an extrusion stem and an operating zone with a die and billet container, the combination including a mandrel means, a reciprocable operating stem movable toward and away from said operating zone for moving said mandrel means, reciprocating means connected to said operating stem, said mandrel means being movable relative to said extrusion stem and retractable to the rear thereof away from said operating zone, connecting means between said mandrel means and said operating stem, said connecting means including members tightly fitting but axially engageably and disengageably movable relative to each other, said mandrel means and operating stem being connected and disconnected through said connecting means by axial movement of said mandrel means and operating stem relative to each other, a stripper within said operating stem fixed in the path of said mandrel means for contacting the same as the mandrel means and operating stem are moved away from said operating zone to cause axial disconnecting movement of said mandrel means and operating stem, and slidable means connected to yieldable fluid means continuously energized in a direction to urge said operating stem and mandrel means away from said operating zone, said reciprocating means overcoming said yieldable fluid means as the operating stem is reciprocated toward the operating zone, the yieldable means effectuating initial withdrawal of said operating stem and mandrel means upon release of operating force on said reciprocating means.

HUGO LORANT.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,859,753	Summey	May 12, 1932
1,924,522	Sparks	Aug. 29, 1933
2,298,077	Witter	Oct. 6, 1942

FOREIGN PATENTS

Number	Country	Date
459,266	Germany	Apr. 30, 1928