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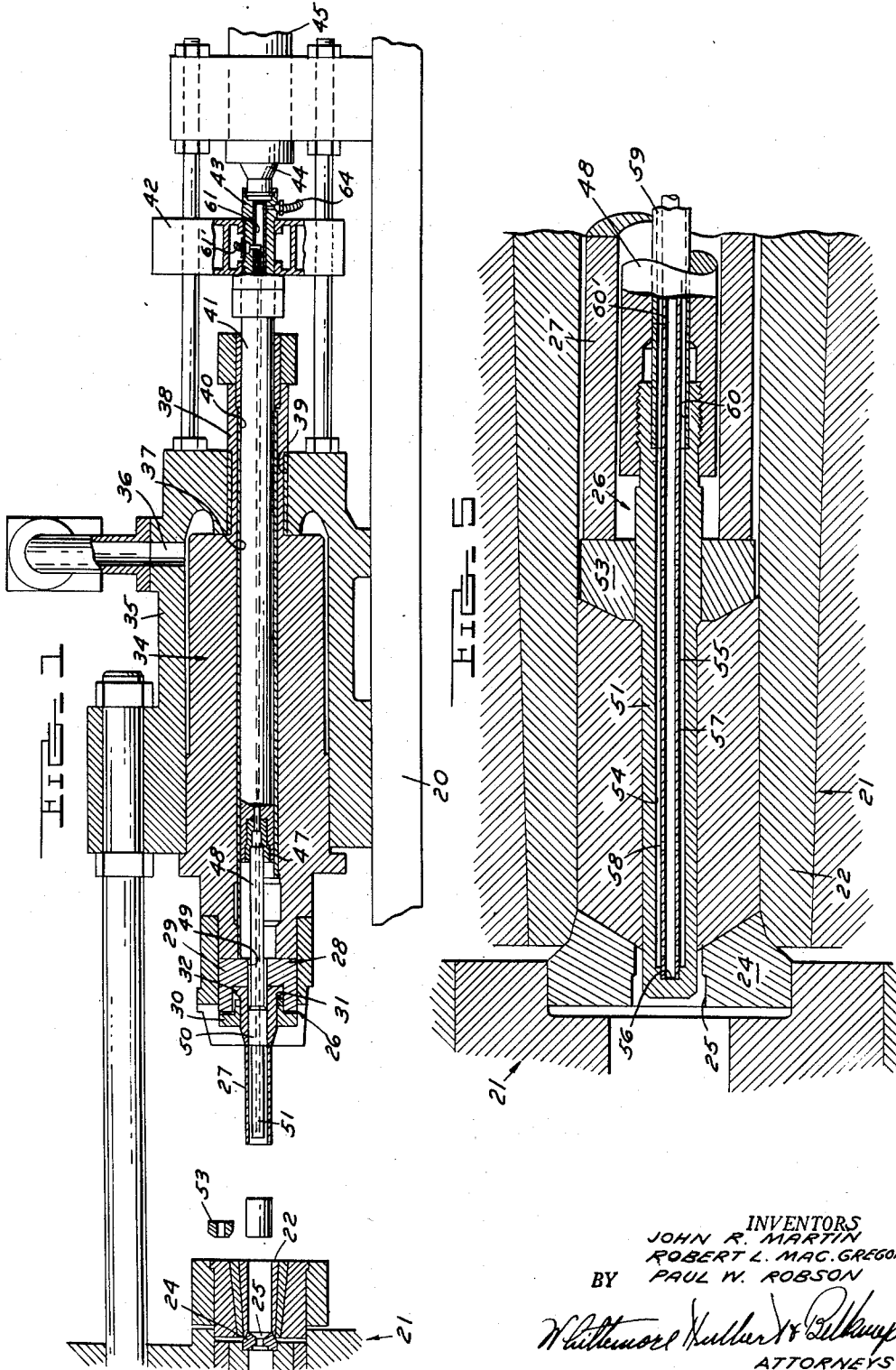
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EXTRUSION PRESS HAVING MANDREL COOLING MEANS

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2 Sheets-Sheet 1



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FIG. 2

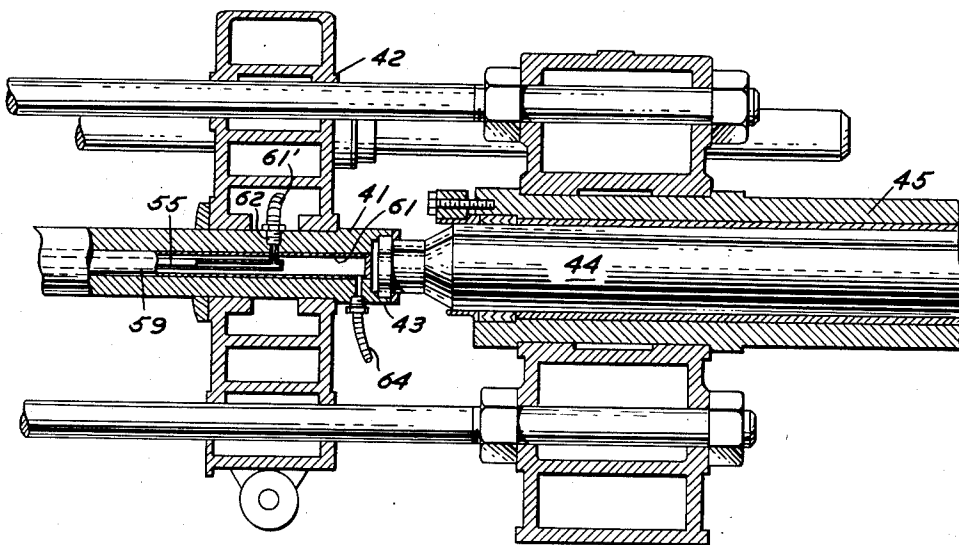


FIG. 4

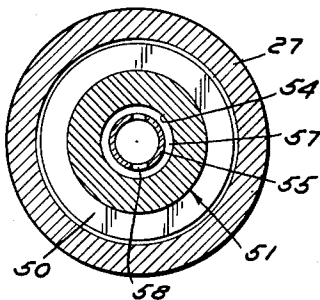
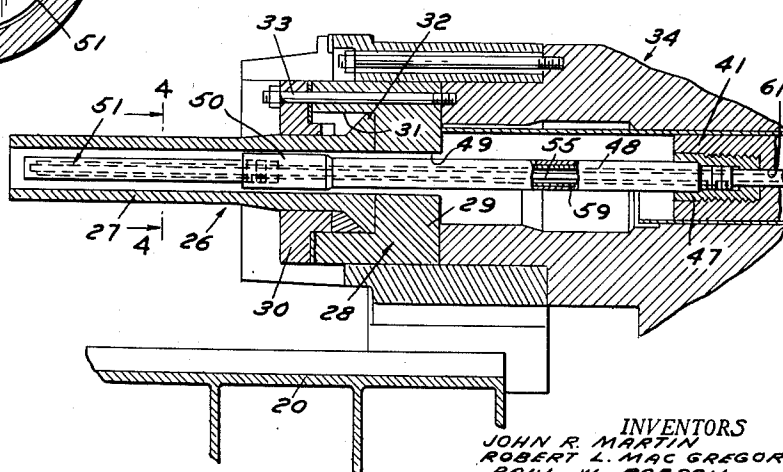


FIG. 3



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EXTRUSION PRESS HAVING MANDREL COOLING MEANS

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Application April 23, 1951, Serial No. 222,448

2 Claims. (Cl. 207—16)

This invention relates generally to extrusion presses and refers more particularly to presses for forming tubing wherein the stock is extruded through a die around a mandrel.

In presses of the above type it is customary to support a billet of preheated stock at the entrant end of the die and to pierce the stock with a mandrel as the latter is advanced to a position within the die opening. After the heated billet is pierced by the mandrel, the stock is extruded through the die opening over the mandrel to form a tube.

As a result of the above operations the piercing mandrel is heated to a relatively high temperature, and it is essential to allow the mandrel to cool before the next billet of stock is pierced by the mandrel. In some instances the cooling time for the piercing mandrel is reduced to some extent by slipping a cooling element over the free end of the mandrel; but in any case, some considerable time is required to cool the piercing mandrel following each operation, and the rate of production from any one press is correspondingly reduced.

With the above in view it is an object of this invention to provide means for maintaining the mandrel relatively cool throughout both the piercing and extruding operations. Thus it is not necessary to provide a cooling phase between successive operations of the press, and hence the rate of production of the press is greatly increased.

It is a further object of this invention to provide a cooling system for the piercing mandrel capable of being readily incorporated in conventional extrusion presses without materially altering the construction of the latter, and also rendering it possible to provide a continuous circulation of cooling medium through the piercing mandrel throughout the movement of the latter.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a fragmentary longitudinal sectional view through a double acting extrusion press embodying the present invention;

Figure 2 is an enlarged sectional view of the inner end of the press shown in Figure 1;

Figure 3 is an enlarged sectional view showing the outer end portion of the press;

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 3; and

Figure 5 is a fragmentary sectional view of the outer end of the press showing the parts in a different position.

The double action extrusion press selected herein for the purpose of illustration is of the type customarily used for extruding seamless tubing from billet stock. The cooling system embodying the features of this invention may be incorporated in the double action extrusion press without appreciably altering the construction of the latter, and accordingly only those parts of the press having a bearing on this invention will be described in detail herein.

With the above in view reference is now made more in detail to the drawings, wherein it will be noted that the numeral 20 designates the frame structure of the press. Suitably supported on the frame structure 20 at the outer end of the press is a container assembly 21 which comprises a container liner 22 in the form of a tube open at opposite ends and positioned with its axis extending horizontally. The outer end of the container

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22 is closed by a die 24 having an opening 25 in axial alignment with the passage through the container liner 22.

As shown particularly in Figures 1, 3 and 5 of the drawings, a tool assembly 26 is supported by the frame structure 20 at the inner end of the container 22. The tool assembly 26 comprises a stem 27 and a holder 28 for the stem. The stem is in the form of a tube having an outside diameter somewhat less than the internal diameter of the container liner 22 and supported by the holder 28 in axial alignment to the inner end of the container liner 22.

The holder 28 comprises a block 29 and a cap 30. The block 29 has a recess 31 in the outer end thereof for receiving an enlargement 32 on the outer end of the stem 27. The cap 30 is centrally apertured to receive the portion of the stem 27 adjacent the enlargement 32, and cooperates with the enlargement to secure the stem in place on the holder 28. In the present instance the cap is secured to the block 28 by studs 33, and these studs also serve to secure the holder 28 to the outer end of a ram 34.

The ram 34 is slidably supported in a cylinder 35 carried by the frame structure 20 of the press and having a port 36 at the inner end which selectively communicates with a source of fluid under pressure and a reservoir not shown herein. It will be noted from Figure 1 that the ram 34 has an axially extending bore 37 and also has a tubular projection 38 extending inwardly from the inner end of the ram. The projection 38 extends through an opening 39 in the inner end wall of the cylinder 35, and has a bore 40 axially aligned with the bore 37.

It will further be noted from Figure 1 of the drawings that the bores 37 and 40 slidably receive an operating part 41. The inner end of the operating part 41 is supported on a cross head 42, and is also coupled as at 43 to the outer end of a ram 44. The ram 44 is slidably mounted in a cylinder 45 carried by the frame structure 20 of the press in axial alignment with operating part 41. The inner end of the cylinder has a port (not shown) adapted to be selectively connected to a source of fluid under pressure and to a reservoir in a manner not shown herein.

The outer end of the operating part 41 projects into the bore 37 of the ram 34 and is axially recessed to receive a nut or holding sleeve 47. The outer end of the holding sleeve 47 is externally threaded for threadably engaging the adjacent wall of the recess in the operating part 41, and is internally threaded for threadably engaging the inner end of a mandrel holder 48. As shown in Figure 3 of the drawings, the mandrel holder 48 projects into the recess 31 in the block 29 through an axially extending opening 49 in the block, and has an enlargement 50 at the outer end which slidably engages the inner wall of the tubular stem 27.

A piercing pin or mandrel 51 extends axially within the tubular stem 27 and is secured at its inner end to the enlargement 50 on the mandrel holder 48. The outer end of the piercing pin or mandrel 51 is shaped to pierce a heated billet 52 in the container liner 22, and is of a size to coact with the die opening 25 to provide an annular space corresponding in size to the tube to be extruded.

Assuming that the several parts of the press are in the relative positions thereof shown in Figures 1 and 3 of the drawings, and that a billet 52 preheated to the proper temperature has been conveyed to the position shown in Figure 1 of the drawings by mechanism not illustrated herein, it will be noted that outward movement of the ram 34 engages the outer end of the stem 27 with the inner end of the billet 52. Continued outward movement of the ram 34 causes the stem 27 to push the billet 52 into the container 22 against the inner side of the die 24. After the preheated billet is properly positioned in the container 22, the stem 27 is retracted by movement of the ram 34 in an outward direction. This is accomplished by connecting the port 36 to the reservoir and by introducing fluid under pressure into suitable return cylinders (not shown) having pistons connected to the ram 34. The return cylinders and pistons for the ram 34 may be similar to the ones shown in the Otto R.

Schuler application Serial No. 204,919, filed January 8, 1951, now abandoned.

After the stem 27 is retracted from the container 22, a pressure head 53 is positioned in alignment with the inner end of the container 22 and the ram 34 is again moved outwardly to cause the stem 27 to move the pressure head into the container 22. The billet 52 is compressed by the head 53 against the inner surface of the die, and into engagement with the inner walls of the container liner 22.

Upon completion of the above operation, the ram 34 is retracted slightly to release the pressure applied by the head 53 against the billet 52, and the billet is pierced by the mandrel or pin 51. The piercing operation is effected by moving the ram 44 together with the operating part 41 and associated elements outwardly a sufficient distance to project the piercing mandrel 51 through the billet and into the die opening 25. The ram 34 is then again moved in an outward direction to cause the pressure head 53 to extrude the piercing billet 52 through the die opening 25 over the outer end portion of the piercing mandrel 51.

Upon completion of the extrusion operation the several parts of the press are returned to the relative positions thereof shown in Figure 1 of the drawings, and any shim or excess material remaining on the inner end of the extruded tube is removed. The removal of this excess material may be accomplished in the manner described in some detail in the Otto R. Schuler application Serial No. 204,919, filed January 8, 1951.

It will be understood from the foregoing operation that the piercing mandrel is subjected to considerable heat during the piercing and extruding operations. It practice it is necessary to allow the piercing mandrel to cool after each extruding operation, and this requirement reduces the rate of production of a given extrusion press.

In order to overcome the above objection, provision is made herein for circulating a cooling medium throughout substantially the full length of the piercing mandrel during operation of the press. In this connection it will be noted from Figures 4 and 5 of the drawings that the mandrel 51 has a bore 54 which extends axially outwardly from the inner end of the mandrel and is closed at the outer end by the tip portion of the mandrel. It will further be noted that a tube 55 extends into the bore 54 and is seated within a counterbored recess 56 in the tip of the piercing mandrel 51. The tube 55 is of less diameter than the bore 54, and cooperates with the walls of the bore 54 to provide a passage 57. Suitable openings 58 are formed in the tube 55 to establish communication between the tube 55 and passage 57. As will be presently set forth cooling medium flows outwardly through the tube 55 and is discharged through the openings 58 into the return passage 57. The openings 58 are spaced from each other along the length of the tube 55 and progressively decrease in size from the outer end of the tube 55 so that an ample supply of cooling medium reaches the outer end of the tube.

The cooling medium in the return passage 57 is discharged into a second tube 59 surrounding the tube 55 and having the outer end supported within an enlargement 60 at the inner end of the bore 54 in the mandrel 51. The inside diameter of the tube 59 is greater than the external diameter of the tube 58 in order to provide a space therebetween which forms a continuation of the return passage 57. The tubes 55 and 59 extend inwardly through a bore 60' in the mandrel holder 48 and also through an aligned bore 61 formed in the operating member 41. It will also be noted that the nut 47 connecting the operating member 41 to the mandrel holder 48 is also bored to enable passage of the tubes therethrough.

The inner end of the adjacent tube 55 terminates at the cross head 42 and is connected to a flexible conduit 61' by a fitting 62. The flexible conduit 61' is in turn

connected to a source of cooling medium supply not shown herein, and is of sufficient length to permit the required travel of the operating member 41 and associated parts during operation of the press. The inner end of the outer tube 59 is connected to a suitable drain (not shown) by a flexible conduit 64, which is also of sufficient length to permit unrestricted travel of the member 41 and associated parts during operation of the press.

It follows from the above that cooling medium is continuously circulated through the piercing mandrel 51 during operation of the press. Thus the piercing mandrel is maintained at a relatively low temperature, and it is not necessary to cool the piercing mandrel between successive extruding operations.

What we claim as our invention is:

1. In an extrusion press, a frame, a cross head supported on the frame for movement in opposite directions, a tubular part having the inner end secured to the cross head for movement as a unit therewith and having an axially extending passage, an elongated holder removably secured at its inner end to the outer end of the tubular part and having an axially extending passage therethrough communicating with the passage in said tubular part, a piercing pin removably secured at its inner end to the outer end of the holder and having an axially extending passage communicating with the passage in said holder, the passage in said piercing pin extending outwardly to a point adjacent the outer end of said pin and being closed at its outer end, a tube extending within said passages from a point adjacent said cross head to the outer end of the passage in said piercing pin, said tube coacting with said passages to provide a return for cooling medium circulated through the piercing pin, the portion of said tube within the passage in said pin having openings spaced lengthwise thereof providing communication between the return and the interior of the tube, said openings being of progressively decreasing size from the outer end to the tube, and a supply conduit for cooling medium movable as a unit with said cross head and connected to said tube at the inner end of the latter.

2. In an extrusion press, a frame, a cross head supported on the frame for movement in opposite directions, a tubular part having the inner end secured to the cross head for movement as a unit therewith and having an axially extending passage, an elongated holder removably secured at its inner end to the outer end of the tubular part and having an axially extending passage therethrough communicating with the passage in said tubular part, a piercing pin removably secured at its inner end to the outer end of the holder and having an axially extending passage communicating with the passage in said holder, the passage in said piercing pin extending outwardly to a point adjacent the outer end of said pin and being closed at its outer end, a tube extending within said passages from a point adjacent said cross head to the outer end of the passage in said piercing pin, said tube coacting with said passages to provide a return for cooling medium circulated through the piercing pin, the portion of said tube within the passage in said pin having openings spaced lengthwise thereof providing communication between the return and the interior of the tube, and a supply conduit for cooling medium connected to said tube at the inner end of the latter.

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