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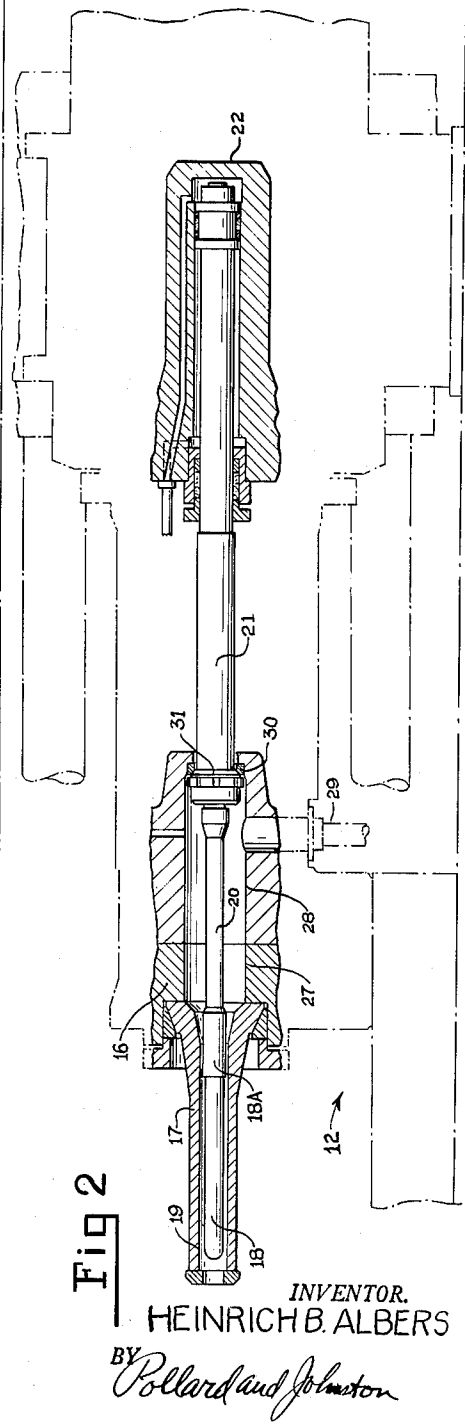
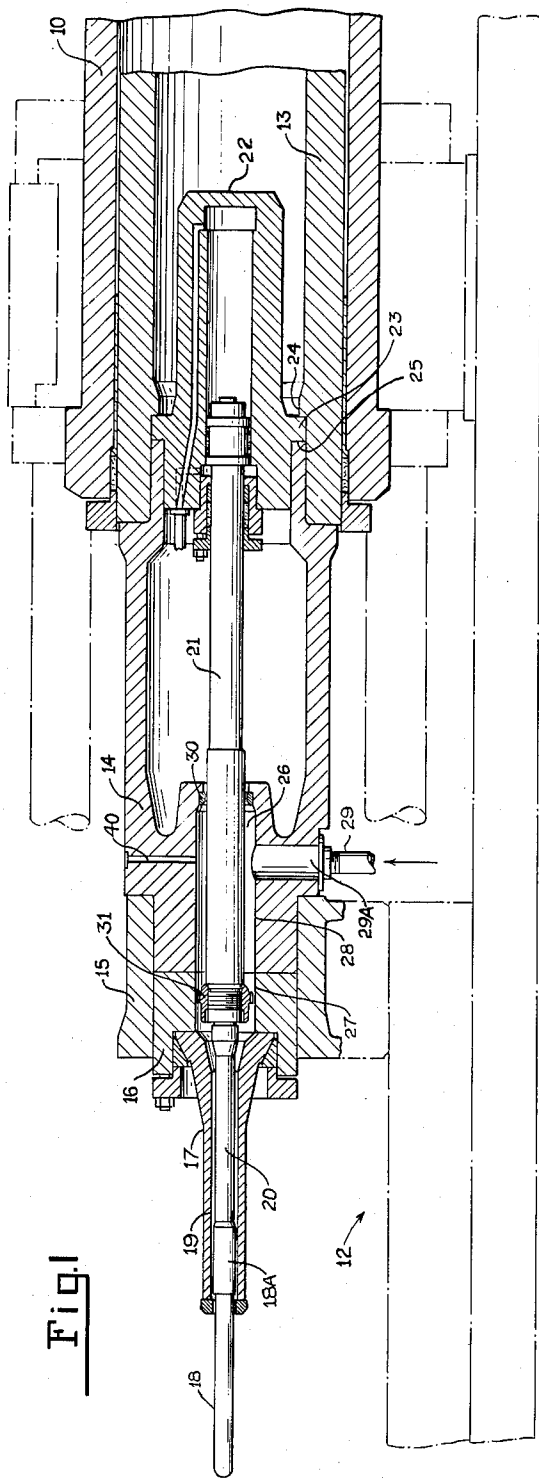
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2,732,066

MANDREL COOLING FOR EXTRUSION PRESSES

Filed June 21, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

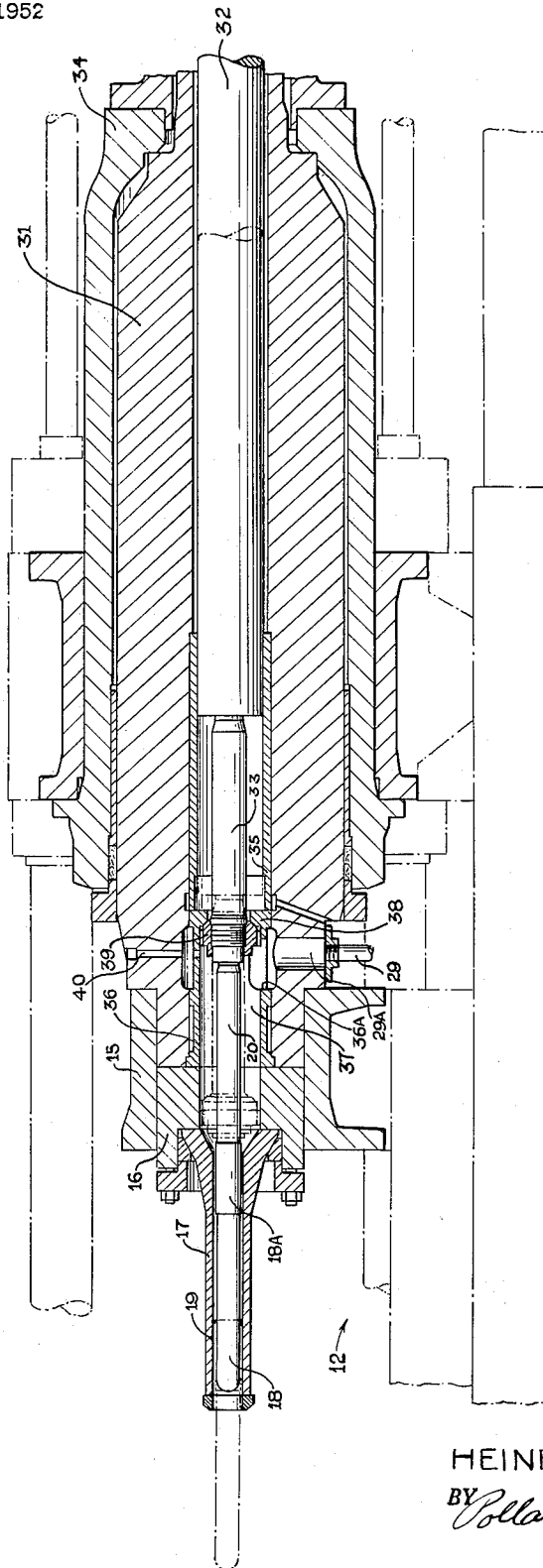


Fig. 3

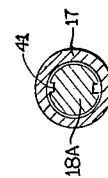


Fig. 4

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MANDREL COOLING FOR EXTRUSION PRESSES

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6 Claims. (Cl. 207—16)

This invention relates to an extrusion press or the like which has a mandrel and is used in the extrusion of tubes and the forming of hollow shapes, and more particularly to an arrangement for cooling the mandrel so that the press can achieve increased production when extruding metals at relatively high temperatures.

Extrusion presses of this type usually include a billet container into which a billet is placed, a reciprocable extrusion stem, and a reciprocable mandrel within the stem, the extrusion stem and mandrel being hydraulically operated. The mandrel is moved relative to the stem and can be projected therefrom to be inserted in a hollow billet and form a tube during extrusion, or to pierce a solid billet and then form a tube during extrusion. When billets comprising materials, such as steel, are processed, the mandrel becomes exceedingly hot and must be cooled between each extrusion; otherwise, the useful life of the mandrel will be of short duration and the operation of the extrusion press will be most uneconomical since the materials used in making mandrels of this nature are expensive and must be of high quality metal.

Heretofore, the cooling of such mandrels has involved a considerable expenditure of time, and the more time that is expended in cooling, the less time there is available for productive extrusion, so that the output of each press is limited by the time required to cool the mandrel used in the press. Moreover, between each extrusion a billet must be placed into the billet container in preparation for the next extrusion. In the interest of conserving time, it is desirable to charge the billet container during the time the mandrel is being cooled, and this can be accomplished while the mandrel is retracted from its projected position during the cooling operation.

The primary object of this invention is to provide a cooling arrangement for mandrels of extrusion presses by which the mandrel is cooled quickly and efficiently without undue loss of operating time of the press.

Another one of the objects of this invention is to provide improved means for cooling the mandrel of an extrusion press without removing the mandrel from the press.

According to this invention, a cooling arrangement is provided for cooling a mandrel means in a position in which the mandrel has been withdrawn into the extrusion stem so that it does not interfere with placing a billet into the billet container and without removing the mandrel from the press. The extrusion stem is constructed with a passage through which the mandrel is movable and with which the mandrel forms fluid channel means, preferably completely around the mandrel, so that cooling fluid may be introduced to the fluid channel means to cool the mandrel within the stem; thus, cooling of the mandrel may be accomplished quickly and efficiently without removing the mandrel from the press, thereby preparing the mandrel for the next extruding operation in a very short time.

Other objects, features and advantages of the invention will become apparent from the following detailed

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description and the accompanying drawings showing illustrative embodiments of the invention.

In the drawings:

Figure 1 is a fragmentary sectional elevation with the mandrel projected from the extrusion stem before the stem has been advanced toward the billet container;

Figure 2 is a fragmentary sectional elevation generally similar to Figure 1 but with the mandrel located in the extrusion stem in position for cooling;

Figure 3 is a fragmentary sectional elevation of another embodiment of the invention, showing by full and by broken lines different positions of the mandrel relative to the stem;

Figure 4 is a sectional view showing an alternative form of fluid channel means.

Figures 1 and 2 show a cooling arrangement according to the invention applied to one type of extrusion press in which the mandrel within an extrusion stem moves whenever the main ram of the extrusion stem is moved but which may be moved relative to the extrusion stem.

The main cylinder 10 is supported on a main bed generally indicated at 12 and has a main ram 13 connected by a distance piece 14 to a main crosshead 15 which is slidably mounted by means (not shown) on the main bed 12 and carries a pressure block 16 and extrusion stem 17. The extrusion stem cooperates with a billet container bore (not shown) in the conventional manner.

The mandrel assembly includes a mandrel 18 reciprocable in a bore or passage 19 in the extrusion stem 17 and fixed to a mandrel holder 20, as by screw threads, said holder being attached to a mandrel moving ram 21 which is adapted to be moved in a mandrel moving cylinder 22 secured to and carried by the main ram 13 as by flange 23 of the mandrel moving cylinder being locked between a flange 24 of the main ram and an end face 25 of the distance piece 14.

The mandrel 18 has a slightly smaller diameter than the diameter of bore 19 so that when the mandrel is in the bore 19, an annular channel is formed around the mandrel by the clearance space between the mandrel and the bore. Cooling fluid is introduced under pressure into this annular channel from a cavity 26 which is adjacent bore 19 and may be formed in the press by juxtaposed bores 27 and 28 in the pressure block 16 and the distance piece 14, respectively, the bores 27 and 28 having a larger diameter than the bore 19 in the extrusion stem. The cavity 26 is connected to a suitable source of cooling fluid by means such as a flexible conduit 29 and a passage 29A in distance piece 14. A valve (not shown) is connected to conduit 29 for admitting fluid during cooling and for shutting off the fluid thereafter. Air vent 40 may be provided if desired. The means reciprocating the mandrel extends through openings at each end of the cavity. In order to direct all the cooling fluid entering the cavity toward that end of the cavity opening into the bore 19, and in order to prevent the passage of cooling fluid through the other end of the cavity opening into other parts of the press to keep such parts free of foreign matter to preserve clearances and high hydraulic pressures, a valve is provided at that other end which is operative to close this opening during the cooling operation. The valve may comprise a valve seat 30 which is fitted around the opening to be closed and which cooperates with a valve ring 31 on the mandrel moving ram 21 to close the opening when the mandrel is retracted into the extrusion stem 17 and the ring 31 is brought into contact with the seat 30. Thus, whenever the mandrel is in position for the cooling operation, this opening will be closed and all the cooling fluid will be directed toward the annular channel formed around the mandrel. Merely by way of example, the clearance

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between enlarged portion 18A and the interior bore 19 may be in the range of $\frac{1}{16}$ inch.

Figure 3 shows an application of the cooling arrangement of Figures 1 and 2 to an extrusion press in which the mandrel can be moved independently of the main ram. The same reference characters are used to represent the same parts when appropriate. The mandrel 18 is moved relative to the main ram 31 by a moving assembly including a mandrel holder 20, and a mandrel moving stem 32 connected to the mandrel holder 20 by an adapter or connecting piece 33. The mandrel moving stem 32 differs from that shown previously in that it extends to the rear entirely through the main ram 31 and main cylinder 34 and is actuated by a hydraulic cylinder (not shown) removed from the main ram assembly. The mandrel moving stem 32 is slidable in a bushing 35 supported in ram 31 while the mandrel holder 20 extends through a tubular member 36 also mounted in ram 31 so that the main ram may be moved without moving the mandrel moving assembly.

A cavity 37 has cooling fluid selectively fed thereto through a flexible pipe 29, a passage 29A in the main ram 31, and an opening 36A in tubular member 36 for cooling the mandrel when the mandrel is in the retracted position as illustrated in full lines in Figure 3. A valve seat 38 cooperates with valve member 39 carried by connecting piece 33 to close off the passage on the right from cavity 37 during cooling. The flow of cooling fluid is controlled by means of a shut-off valve (not shown) connected to pipe 29.

If desired, grooves or channels 41 (Fig. 4) can be cut longitudinally in enlarged portion 18A so as to provide a passage past the portion 18A. Alternatively, channels or recesses could be cut in the guide portion of the bore through the extrusion stem so as to provide a passage for cooling fluid past the enlarged portion 18A.

It is to be understood that various details of construction can be varied without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

1. In an extrusion press or the like having a die arrangement wherein metal at a high temperature is to be shaped, an extrusion stem reciprocable toward and away from the die arrangement for forcing metal through a die, said stem having a passage therethrough, reciprocable means connected to said stem and operable to move the stem relative to the die arrangement, a mandrel movable through said stem in said passage and forming with said passage fluid channel means, mandrel actuating means connected to said mandrel and operable to project the operating part of said mandrel through said passage beyond said stem toward the die arrangement and to withdraw said operating part away from the die arrangement into said passage between operations, fluid introducing means for introducing cooling fluid into said channel means, and means connected to a source of cooling fluid for feeding cooling fluid to the fluid introducing means and through said fluid channel means around said mandrel between operations so as to cool the mandrel.

2. In an extrusion press or the like having a die arrangement wherein metal at a high temperature is to be shaped, an extrusion stem reciprocable toward and away from the die arrangement for forcing metal through a die, said stem having a passage therethrough, reciprocable means connected to said stem and operable to move the stem relative to the die arrangement, a mandrel movable through said stem in said passage and spaced from the walls of said passage to form fluid channel means, mandrel actuating means connected to said mandrel and operable to project the operating part of said mandrel through said passage beyond said stem toward the die arrangement and to withdraw said operating part away from the die arrangement into said passage between operations, fluid introducing means for introducing cooling fluid into said channel means, and

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means connected to a source of cooling fluid for feeding cooling fluid to the fluid introducing means and through said fluid channel means around said mandrel between operations so as to cool the mandrel.

3. In an extrusion press or the like having a die arrangement wherein metal at a high temperature is to be shaped, an extrusion stem reciprocable toward and away from the die arrangement for forcing metal through a die, said stem having passage means therethrough, reciprocable mechanism connected to said stem and operable to move the stem relative to the die arrangement, a mandrel means movable through said stem in said passage, at least one of said means having grooves forming fluid channel means, mandrel actuating means connected to said mandrel and operable to project the operating part of said mandrel through said passage beyond said stem toward the die arrangement and to withdraw said operating part away from the die arrangement into said passage between operations, fluid introducing means for introducing cooling fluid into said channel means, and means connected to a source of cooling fluid for feeding cooling fluid to the fluid introducing means and through said fluid channel means and around said mandrel between operations so as to cool the mandrel.

4. In an extrusion press or the like having a die arrangement wherein metal at a high temperature is to be shaped, an extrusion stem reciprocable toward and away from the die arrangement for forcing metal through a die, said stem having a passage therethrough, reciprocable means connected to said stem and operable to move the stem relative to the die arrangement, a mandrel movable through said stem in said passage and forming with said passage fluid channel means, said reciprocable means having a cavity formed therein in open communication with said passage and fluid channel means, mandrel actuating means extending through an opening in the wall of said cavity opposite to said passage in the stem and connected to said mandrel and operable to project the operating part of said mandrel through said passage beyond said stem toward the die arrangement and to withdraw said operating part away from the die arrangement into said passage between operations, fluid introducing means for introducing cooling fluid to said channel means through said cavity, means connected to a source of cooling fluid for feeding cooling fluid to the fluid introducing means through said cavity and said fluid channel means around said mandrel between operations so as to cool the mandrel, and valve means operable to close said opening and prevent the leakage of cooling fluid to other parts of the machine when the operating part of said mandrel is withdrawn into said passage and cooling fluid is being fed to said cavity and passage.

5. In an extrusion press or the like having a die arrangement wherein metal at a high temperature is to be shaped, an extrusion stem reciprocable toward and away from the die arrangement for forcing metal through a die, said stem having a passage therethrough, reciprocable means connected to said stem and operable to move the stem relative to the die arrangement, a mandrel movable through said stem in said passage and forming with said passage fluid channel means, mandrel actuating means connected to said mandrel and operable to project the operating part of said mandrel through said passage beyond said stem toward the die arrangement and to withdraw said operating part away from the die arrangement into said passage between operations, said mandrel actuating means extending through said reciprocable means and movable independently thereof, fluid introducing means for introducing cooling fluid into said fluid channel means, and means connected to a source of cooling fluid for feeding cooling fluid to the fluid introducing means and through said fluid channel means around said mandrel between operations so as to cool the mandrel.

6. In an extrusion press or the like having a die arrangement wherein metal at a high temperature is to

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be shaped, an extrusion stem reciprocable toward and away from the die arrangement for forcing metal through a die, said stem having a passage therethrough, reciprocable means connected to said stem and operable to move the stem relative to the die arrangement, a mandrel movable through said stem in said passage and forming with said passage fluid channel means, mandrel actuating means connected to said mandrel and operable to project the operating part of said mandrel through said passage beyond said stem toward the die arrangement and to withdraw said operating part away from the die arrangement into said passage between operations, and means selectively delivering cooling fluid to said fluid channel means.

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References Cited in the file of this patent

UNITED STATES PATENTS

1,989,948	Singer	Feb. 5, 1935
2,139,551	Klopsch et al.	Dec. 6, 1938
2,231,761	Hill	Feb. 11, 1941
2,337,804	Dempsey	Dec. 28, 1943
2,276,234	Lorant	Mar. 16, 1954

FOREIGN PATENTS

301,381	Germany	July 5, 1919
629,311	Germany	Apr. 30, 1936