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EXTRUSION CONTAINER CLEANING APPARATUS

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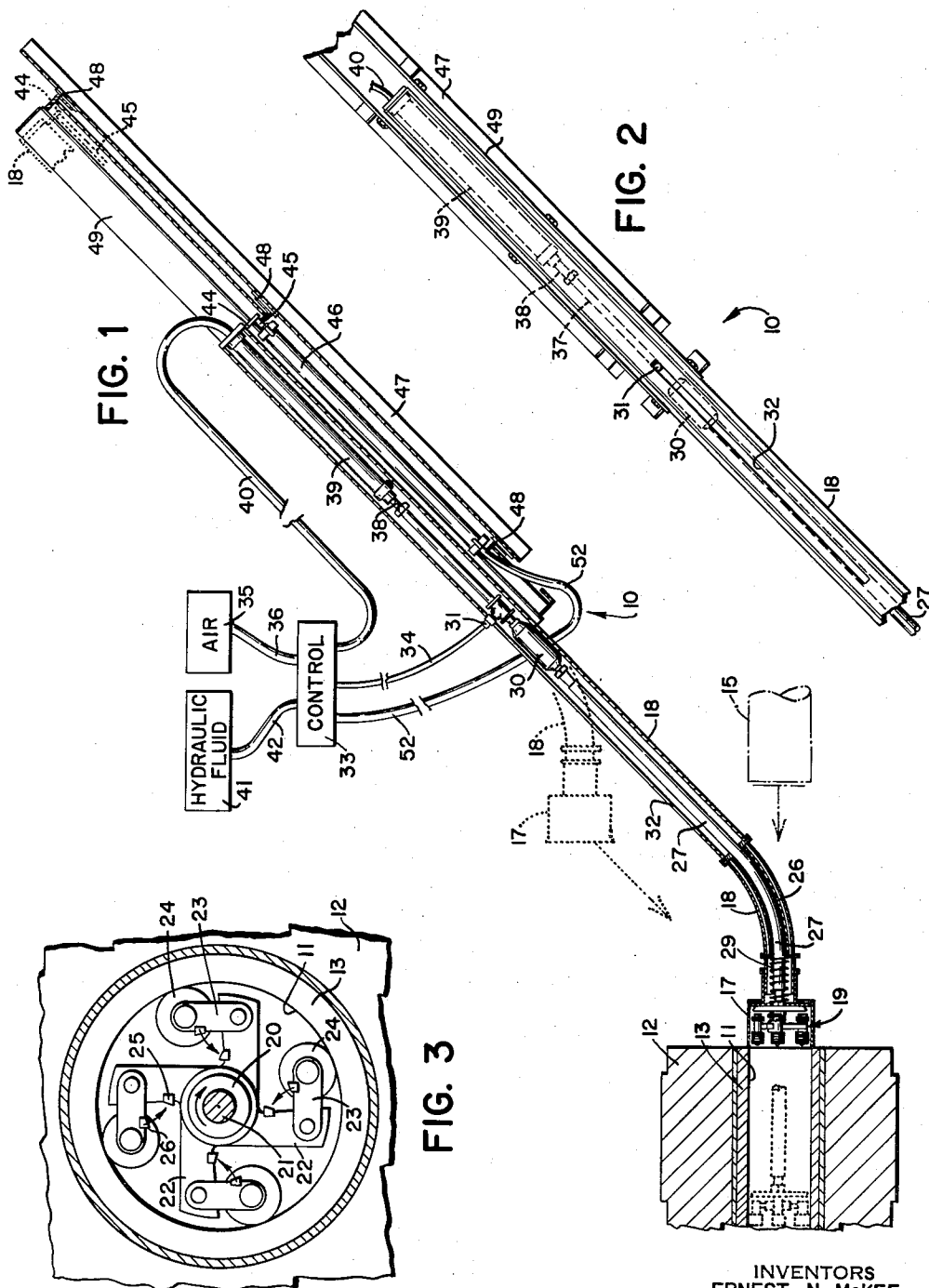


FIG. 3

FIG. 2

FIG. 1

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EXTRUSION CONTAINER CLEANING APPARATUS

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This invention relates to cleaning devices for billet chambers in extrusion presses. More particularly, it relates to a semi-automatic device for cleaning billet chambers which is selectively operable from a central control and includes a rotary cutter head and drive means therefor which are movable toward the chamber such that the cutter head moves through the chamber.

Scale from billets often becomes deposited on the inside liner of billet chambers of extrusion presses. Formerly when the need arose, a man working immediately next to the billet chamber would insert cleaning apparatus into the billet chamber and manually operate the same until he had satisfactorily removed the scale from the billet chamber liner. Due to the high temperature of the atmosphere within and immediately surrounding the billet chamber and because of the limited space usually available at the billet chamber opening, a manual cleaning operation performed as noted above is both difficult and time consuming and therefore reduces the output capacity of the extrusion press.

The primary purpose of the present invention is to provide a cleaning device which eliminates this unpleasant and prolonged manual work. Hence, the new device is one which can be permanently mounted in close proximity to the billet chamber opening such that it is adapted to be selectively operated from a central control situated remote from the immediate area of the extrusion press.

The present invention provides a device having a cutter head assembly operatively connected to a flexible shaft, and a curved rigid guide tube which supports the cutter head assembly and in which a flexible shaft is slidable. Also included are positioning means for moving the guide tube to and from its operating position adjacent the billet chamber, translating means for linearly inserting and removing the cutter head assembly from the billet chamber, and driving means on said slide means for rotating the cutter head assembly. Control means are also provided for selectively operating said positioning, translating and driving means.

Since the device is to be mounted for frequent re-cleaning of a single billet chamber, the control system allows one operator to selectively operate the device and to move it from its retracted position into its initial operating position adjacent the billet chamber by actuating the positioning means. The cutter head assembly can then be selectively rotated by the driving means while the cutter head assembly is linearly inserted into the billet chamber. After the cutter head assembly has been fully extended into the billet chamber, the operator reverses the translating means and idles the cutter head assembly while removing the same from the billet chamber. Once removed, the device is brought back to its mounted position, away from the billet chamber to permit the extrusion operations to be continued.

Due to the fact that the cleaning device may be permanently located in proximal relationship with the billet chamber such that it can be quickly moved to its operating position when the need arises, efficiency and output of the extrusion press is increased and, more importantly, the entire operation may be performed without requiring personnel to work under the hazardous and unpleasant conditions immediately adjacent the hot chamber.

A preferred embodiment of the present invention is de-

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scribed hereinbelow with reference to the accompanying drawing, wherein—

FIG. 1 is an elevation partly in section of the cleaning device in its initial operating position;

FIG. 2 is a fragmentary plan view of a portion of the cleaning device; and

FIG. 3 is a fragmentary elevation of the cutter head assembly of the cleaning device operating in the billet chamber of an extrusion press.

Referring first to FIG. 1, a cleaning device 10 is shown in its initial operating position relative to a billet chamber 11 of an extrusion press. The cylindrical billet chamber 11 is defined by a frame 12 in which is positioned a cylindrical extrusion liner 13. Indicated in dotted lines in FIG. 1 is an aligned extrusion ram 15 in retracted position.

The cleaning device 10 includes a guide hood 17 which is substantially cylindrical in shape and has a diameter substantially equal to the diameter of the billet chamber 11. One end of the hood is open while the other end is resiliently mounted on a guide tube 18 and is substantially closed. The hood 17 is adapted to encompass a multi-cutter head assembly 19 which includes (FIG. 3) a cutter head body 20 circumferentially mounted about a shaft 21 and a plurality of arms 22 extending tangentially from and integrally connected to the cutter head body 20. Pivotaly connected at substantially the end of the respective arms 22 are brackets 23 which support cutters 24. Included on the arms 22 and brackets 23 are permalloy-type magnets 25 and 26 respectively. The magnets 25 and 26 have sufficient magnetic attraction to retract and hold the brackets 23 in against the arms 22 but are not of such strength that they cannot be overcome by centrifugal force when the cutter head assembly is being re-rotated in a clockwise direction as shown in FIG. 3. Hence, when the cutter head assembly 19 is within the hood 17, the magnets hold the cutters 24 away from the hood.

Referring once again to FIG. 1, the guide hood 17 is slidably fitted about the end portion of the substantially rigid guide tube 18 which is substantially parallel to the axis of the billet chamber 11. The remainder of the guide tube 18 curves upwardly and outwardly with a substantial length thereof being inclined at substantially a 45° angle to the billet chamber axis. Fixed concentrically within the guide tube 18 is a secondary tube 26 and within it extends a flexible shaft 27 which is operatively connected to the cutter head shaft 21 such that rotation of the shaft rotates the cutter head assembly 19. Surrounding a short length of the flexible shaft 27 and inserted between the cutter head assembly and the secondary guide tube 26 is a spring 29. By means of the spring 29, the guide hood 17 is made resiliently movable longitudinally on the end of the guide tube 18 thereby insuring that the guide hood can be tightly pressed around the outside diameter of the opening of the billet chamber 11 when in the position shown in FIG. 1.

An air motor 30 disposed within the guide tube 18 is operatively connected to the opposite end of the flexible shaft 27 and is adapted to rotate the shaft. As shown in FIG. 2, an inlet valve 31 extends out of an elongated slot 32 formed in the wall of the guide tube 18 and is connected to control means 33 by a flexible hose 34. The control means 33 in turn is connected to a source of compressed air 35 by means of conduit 36.

Coaxially mounted within the guide tube 18 and connected to the inlet valve 31 is a connector pipe 37 which is threaded to a piston rod 38 of a hydraulic cylinder 39. The hydraulic cylinder 39 is also coaxially mounted within the guide tube 18 and is rigidly connected to and forms the end of the guide tube 18. Extending from the end of the hydraulic cylinder 39 is a flexible tube 40 which serves as a conduit for delivering hydraulic fluid

thereto. The flexible tube 40 is connected to the control means 33 which regulates the flow of hydraulic fluid to the cylinder from a source 41 through a conduit 42. Actuation of the cylinder 39 causes the cutter assembly and flexible shaft to be translated axially between extended and retracted positions. The air motor 30 is carried along with them while the valve 31 rides in the elongated slot 32.

Referring now to FIG. 2 as well as FIG. 1, a bracket 44 depends from the end portion of the guide tube 18 and is attached to a piston rod 45 of an air cylinder 46. The air cylinder 46 is secured to a fixed frame 47 by means of a plurality of structural supports 48 which also support a channel 49 upon which the guide tube 18 is slidable. Extending from the air cylinder 46 is a flexible tube 52 which serves as a conduit for compressed air and leads to the control means 33. By this construction, the guide tube 18 and the cutter head assembly may be moved between the positions shown in solid and dotted lines in FIG. 1 when the cylinder 46 is actuated.

In operation, the cleaning device 10 is normally withdrawn upwardly substantially out of the horizontal plane traversed by the ram 15. When a sufficient amount of scale is deposited on the liner 13 in the billet chamber 11 to warrant removal thereof, the cleaning device 10 of the present invention may be put into operation by means of controls located remote from the area immediately surrounding the billet chamber 11. The need for a cleaning device which can be operated from a remote position is readily apparent due to the high temperature around the billet chamber 11 and the limited amount of space that normally exists between the extrusion ram 15 and the billet chamber 11.

According to the present invention, the operator actuates the air cylinder 46 by the control means 33 to cause the piston rod 45 to move into the cylinder 46. Hence, the guide tube 18 slides downward a length equal to the stroke of the plunger 45. The cutter head assembly is thereby moved from its normal position shown in the upper dotted line position in FIG. 1 to its initial operating position shown in solid lines. In the initial operating position, the guide hood 17, which is resiliently mounted and slidable on the guide tube 18, circumscribes the billet chamber opening and is maintained flush against the billet chamber frame 12. Preferably, the guide hood is forced against the frame 12, such that the spring 29 is put in tension thereby causing the device to be tightly held in contact therewith.

With the device 10 in this initial position, the control means 33 is operated to actuate the hydraulic cylinder 39. This causes the piston rod 38 to be extended from the cylinder 39 and in turn moves the pipe 37, the air motor 30, and the flexible shaft 27 relative to the guide tube 18, and ultimately moves the cutter head assembly 19 linearly into the billet chamber 11. As soon as the cutters 24 are inserted into the billet chamber 11 the operator activates the air motor 30 which drives the flexible shaft 27 and thereby causes the cutter head assembly 19 to rotate. This rotation is of a sufficient speed to produce a centrifugal force sufficient to overcome the attracting forces of the magnets 25 and 26 and to permit the cutters 24 to ride flush against the liner 13. As indicated by the dotted line position of the cutter head assembly to the left in FIG. 1, it is moved linearly into the billet chamber 11 while the cutters continuously rotate against the billet chamber liner 13 to remove the scale therefrom.

After the cutter head assembly 19 has traversed the entire length of the billet chamber 11, the operator stops the air motor 30, thereby causing the arms 22 to be retracted against the brackets 23 by means of the magnets 25 and 26 respectively. The operator then withdraws the cutter head assembly 19 from the billet chamber 11 by means of the cylinder 39 and returns the cleaning

device 10 to its normal position by actuating the cylinder 46.

We claim:

1. A semi-automatic cleaning device for use in removing scale from a billet chamber in an extrusion press comprising a cutter head assembly, a curved rigid guide tube supporting said cutter head assembly, a flexible shaft operatively connected to said cutter head assembly and slidably disposed within said guide tube, positioning means for moving said guide tube to and from its operating position adjacent said billet chamber, translating means for linearly inserting and removing said cutter head assembly from said billet chamber, driving means on said translating means for rotating said flexible shaft and thereby driving said cutter head assembly, and control means for selectively operating said positioning, translating and driving means.

2. A semi-automatic cleaning device for use in removing scale from a billet chamber in an extrusion press comprising a rotatable cutter head assembly, a curved rigid guide tube supporting said cutter head assembly, a substantially cylindrical guide hood adapted to surround said cutter head assembly, said guide hood connected to said guide tube at one end and open at the other end, a flexible shaft operatively connected to said cutter head assembly and slidably disposed within said guide tube, positioning means for moving said guide tube operatively adjacent said billet chamber, translating means disposed within said guide tube and operatively connected to said flexible shaft for linearly inserting said cutter head assembly into said billet chamber and removing it therefrom, an air motor on said translating means for rotating said flexible shaft and thereby rotating said cutter head assembly, and central control means for selectively operating said positioning and translating means and said air motor.

3. A semi-automatic cleaning device for use in removing scale from a billet chamber in an extrusion press comprising a rotatable multi-cutter head assembly, a curved rigid guide tube supporting said cutter head assembly, a substantially cylindrical guide hood adapted to surround said cutter head assembly, said guide hood being resiliently connected to said guide tube at one end and open at the other end, said open end having a diameter substantially equal to the diameter of said billet chamber, a flexible shaft operatively connected to said cutter head assembly and slidably disposed within said guide tube, first cylinder means for moving said guide tube operatively adjacent to and away from said billet chamber, second cylinder means disposed within said guide tube and movable therewith, said second cylinder means being operatively connected to said flexible cable for linearly inserting said cutter head assembly into said billet chamber and removing it therefrom, an air motor adjacent said second cylinder means and connected for movement therewith, said air motor operatively connected to rotate said flexible shaft and thereby rotate said cutter head assembly, and central control means for selectively operating said first and second cylinder means and said air motor.

4. A semi-automatic cleaning device for use in removing scale from a billet chamber in an extrusion press comprising a cutter head assembly which includes a plurality of cutters movable between retracted and operating positions, a curved rigid guide tube supporting said cutter head assembly, a substantially cylindrical guide hood adapted to surround said cutter head assembly, said guide hood being resiliently connected to said guide tube at one end and open at the other end, said open end having a diameter substantially equal to the diameter of said billet chamber, a plurality of magnets in said cutter head assembly for normally holding the cutters in said retracted position when the cutter head assembly is within said hood, a flexible shaft operatively connected to said cutter head assembly and slidably disposed within said

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guide tube, air cylinder means for moving said guide tube operatively adjacent to and away from said billet chamber, hydraulic cylinder means disposed within said guide tube and movable therewith, said hydraulic cylinder means being operatively connected to said flexible cable for linearly inserting said cutter head assembly into said billet chamber and removing it therefrom, an air motor adjacent said second cylinder means and connected for movement therewith, said air motor operatively con-

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nected to revolve said flexible shaft and thereby rotate said cutter head assembly, and central control means for selectively operating said air and hydraulic cylinder means and said air motor.

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