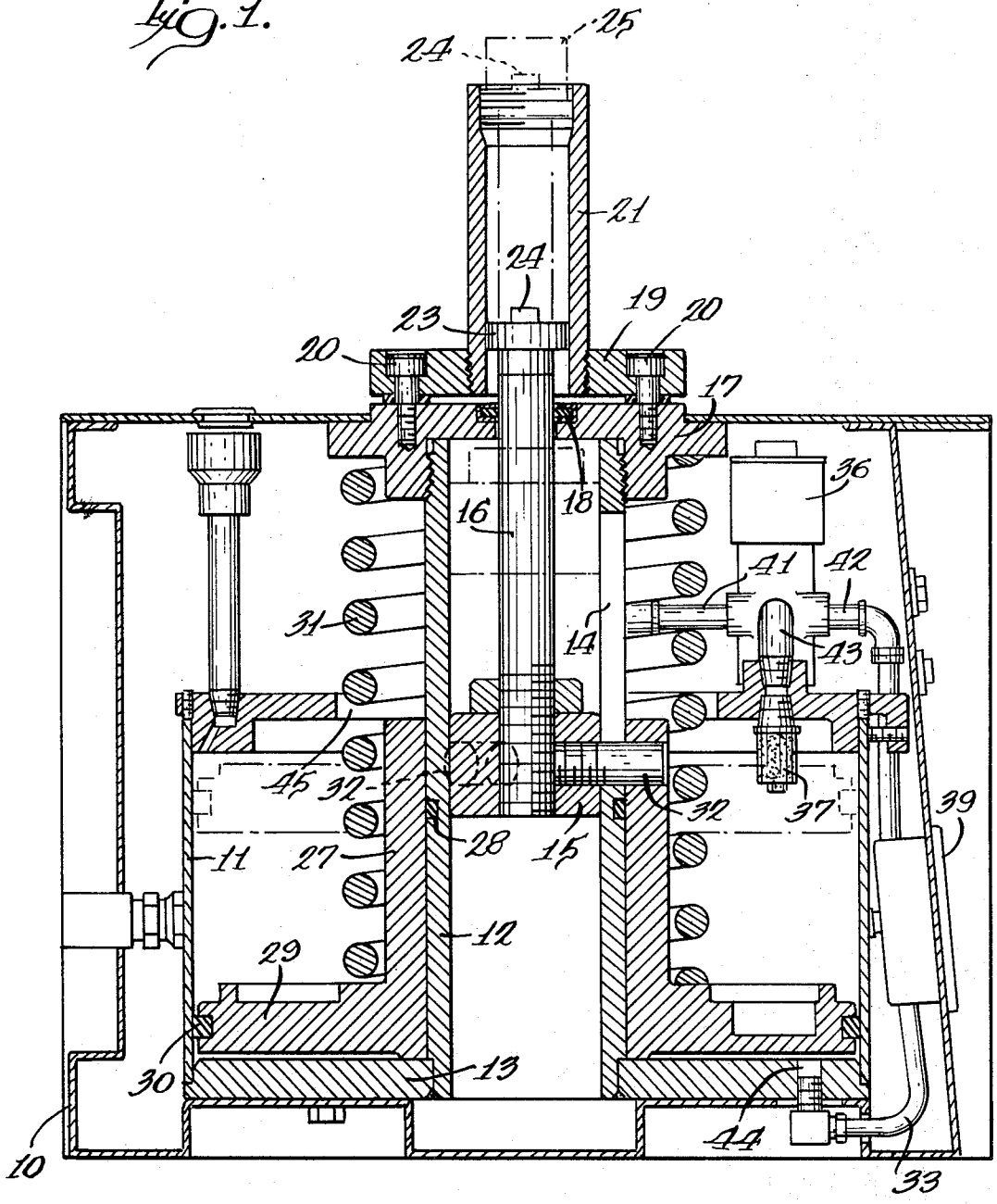
Oct. 20, 1970 R. W. JOHANSON 3,534,441

OPEN ENDED AIR CYLINDER PRESS

Filed Dec. 4, 1968 2 Sheets-Sheet 1

Fig. 1.



Inventor:
Roy Walter Johanson
By Gary, Parker,
Juettner, Pigott & Cullinan
Atty's

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Fig. 2.

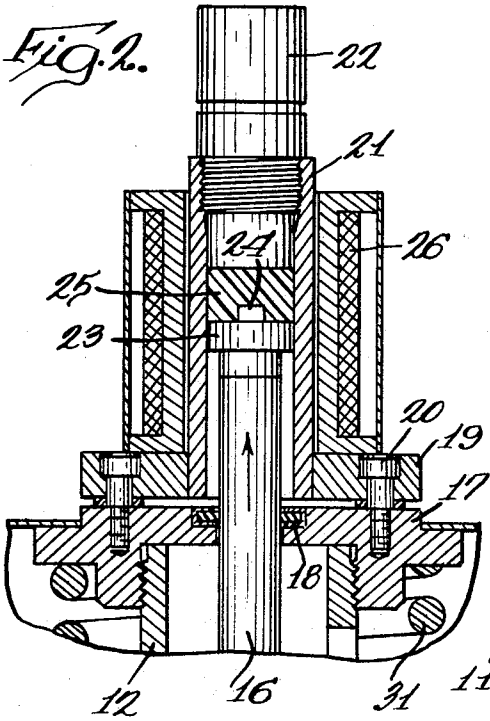
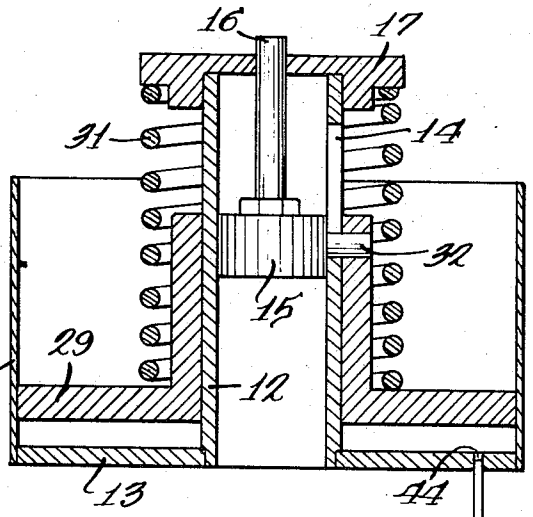
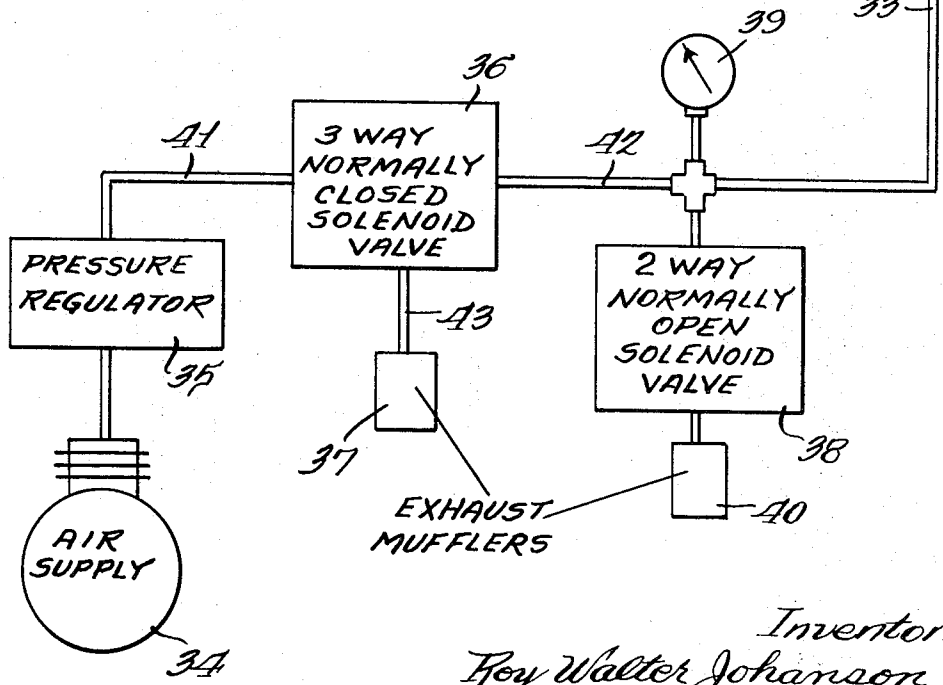


Fig. 3.





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Attys

United States Patent Office 3,534,441
Patented Oct. 20, 1970

3,534,441

OPEN ENDED AIR CYLINDER PRESS

Roy Walter Johanson, Arlington Heights, Ill., assignor to Buehler Ltd., Evanston, Ill., a corporation of Illinois

Filed Dec. 4, 1968, Ser. No. 781,125
Int. Cl. B29h 5/01
U.S. Cl. 18—17 3 Claims

ABSTRACT OF THE DISCLOSURE

A pneumatic press comprising a cylinder having an upwardly open outer wall, an inner guide tube, and a connecting base plate, said inner tube being formed with a plurality of longitudinal slots. A yoke is disposed in said inner tube. A ram is carried by said yoke and there is a top closure for said inner tube formed with an aperture embracing said ram. A pneumatic piston is disposed about said inner tube and a return spring is disposed between the piston and top closure. The top closure provides an abutment to limit piston travel. A plurality of studs extend from said yoke through said slots and into said piston and retain the yoke in reciprocable relationship in said inner tube to the length of said slots. The piston is of relatively smaller diameter than said outer cylinder wall and includes a base flange extending to said outer wall. Means are provided for controllably introducing compressed air to and between said flange and said cylinder base plate, and for exhausting said air therefrom. The press further includes a mold cylinder and cap for the cylinder carried by said top closure and receives a head secured to said ram. Heater means is disposable about said cylinder for curing thermosetting resin or thermoplastic materials disposed within said mold cylinder.

This invention relates to a novel pneumatic press comprising a cylinder and piston ending in a ram going to a mold and is characterized by an open-ended air cylinder as distinguished from prior constructions wherein the piston moved in a completely closed cylinder and the stem was guided through the top of the piston. In the present invention, the top, and one-half of the piston of the former construction is now eliminated to present as a whole a novel and economical construction.

In general, the present invention comprises a cylinder having an upwardly open outer wall and an inner guide tube, the tube being connected by means of a base. The inner tube is formed with a plurality of longitudinal slots and a vertically reciprocable yoke is disposed in said inner tube. A ram is carried by said yoke and there is a top closure for said inner tube formed with an aperture embracing said ram. A pneumatic piston of relatively smaller diameter than said outer cylinder wall is disposed about said inner guide tube, and a return spring is disposed between the piston and the top closure. Means are provided for controllably introducing compressed air to and between said flange and said cylinder base plate and for exhausting the air therefrom. The top closure provides an abutment to limit piston travel. A plurality of studs extend from the yoke through the slots in the inner guide tube and into the piston thereby retaining the yoke in reciprocable relationship in said inner guide tube to the length of the slots.

The press further comprises a mold cylinder and closure cap therefor carried by the top closure and receives a head secured to the ram whereon there can be deposited a charge of thermosetting or thermoplastic materials and an item to be embedded therein. There is further provided a heater means disposed about said mold cylinder for curing the thermosetting resin or heating thermoplastic materials disposed within the mold cylinder and for permanently embedding the article in the thermosetting resin or thermoplastic materials which may then be used for such purposes as metallurgical polishing.

The objects and advantages of the present invention, its details of construction, arrangement of parts and economies thereof will be further apparent from a consideration of the following specification and accompanying drawings, wherein:

FIG. 1 is a vertical sectional view of the press of the present invention.

FIG. 2 is a fragmentary vertical section of the press of the present invention with the mold cylinder and cap secured thereto, and with the ram and its head in raised molding position and showing disposed therein a charge of thermosetting resin or thermoplastic materials and an article to be embedded therein.

FIG. 3 is a schematic drawing of air control means together with a vertical sectional view of the press of the present invention.

Referring to the drawings, the reference numeral **10** illustrates a housing within which there is contained the press of the present invention comprising an upwardly open outer cylinder wall **11** and an inner guide tube **12** and a connecting base plate **13**. The inner guide tube **12** is formed with a plurality of longitudinal slots **14**, which are desirably three in number and disposed 120° apart. A yoke **15** is disposed in the tube **12** and a ram **16** is carried on the yoke. A top closure for the inner guide tube **12** in the form of an annular nut **17** is provided in threaded engagement with the tube **12** so as to receive therethrough the ram **16** through a suitable seal or dirt shield **18**.

Secured over the nut **17** is the annular internally threaded mounting plate **19** secured thereto as by means of the bolts **20**. This mounting plate **19** receives the mold cylinder **21**, the latter being threaded at its upper end to receive the closure cap **22** as shown in FIG. 2. The upper end of the ram **16** is provided with a head **23** on which, when the cap **22** is separated, there can be deposited a metallic sample **24** which it is desired to metallurgically polish, and for this purpose there is disposed thereover a charge of the thermosetting resin or thermoplastic material **25** which is cured about the specimen **24** when the ram **16** is elevated and disposed in pressure engagement with the cap **22** and heat cured by means of the annular heating element **26** which is disposed about the mold cylinder **21**.

Disposed about the inner guide tube **12** is the piston **27** which is of relatively smaller diameter than the outer cylinder wall **11** and relatively shorter than the length of inner cylinder **12**. Disposed in the outer wall of inner guide tube **12** and between it and the piston **27** is the O-ring **28**. The piston **27** is provided with an annular base portion **29** which extends to the wall **11** and is provided thereat with O-ring **30**.

Disposed about piston **27** and between its annular base flange **29** and nut **17** is the return spring **31**.

The yoke **15** which reciprocates within the inner tube **12** is provided with a plurality of mold studs **32**, one extending into each of the slots **14**.

FIG. 1 shows the ram and piston at their lowest positions and in which position the piston is adapted to be elevated and carry the ram by means of the load studs engaged to the yoke **15** by introducing compressed air through the conduit **33** and orifice **44** which then enters between the base **13** and the annular flange **29** of the piston **27** to raise the piston against the pressure of spring **31** thereby elevating ram **16** and its head **23** so that it can mold the thermosetting or thermoplastic materials **25** about the sample **24** after the cap **22** is in place as shown in FIG. 2 wherein the ram is in partly raised position.

The diagrammatic arrangement of FIG. 3 shows control means for admission and exhaust of air comprising a compressed air supply **34**, pressure regulator **35**, the three-way normally closed solenoid valve **36**, and the exhaust muffler **37**, and a two-way normally open solenoid valve **38** provided with an exhaust muffler **40**, and gauge **39** in the line **33** between the three-way normally closed solenoid valve and the inlet and outlet to the piston **27**.

FIG. 1 shows the three-way solenoid valve **36** but does not show the normally open two-way solenoid valve, the only purpose of this valve being to cut the length of time required to return the ram to its lowest position.

Thus, in operation the three-way normally closed solenoid valve **36** is energized and its ports **41** and **42** are opened with exhaust port **43** closed. Simultaneously, the two-way normally open solenoid valve **38** is energized and closed. Air commences flowing from compressor **34** through regulator **35** and through ports **41** and **42** of solenoid valve **36** and enters the expansion chamber disposed between plate **13** and annular flange **29**. As air pressure in this area increases, the piston **27** guided by inner tube **12** moves upward and compresses return spring **31**. The upward force and motion of piston **27** is transferred to load studs **32** which pass through slots **14** in the inner tube **12**, these load studs being free to move longitudinally the length of the slots **14**.

The yoke **15** carries the ram extension **16** and head **23** which delivers force to the contents of the mold cylinder **21**. The top nut **17** limits travel of the piston **27** and acts as an upper stop, this top nut **17** also acting as a fixed retainer for the spring **31**, the top nut **17** also acting as a platform for mounting the mold cylinder adapter **19**.

When electric current is shut off or broken, the three-way valve **36** is deenergized and port **41** closes off the air supply and ports **42** and **43** open. The air under compression in the expansion chamber formed between the flange **29** and plate **13** exits through orifice **44** in base plate **13** from whence it entered. The air passes back through port **42** of solenoid valve **36** and leaves the solenoid **36** at port **43**. The air exhausts to the atmosphere through muffler **37** and through the annular opening **45**.

Simultaneously, when deenergized the two-way solenoid valve **38** returns to its normally open position thus helping solenoid **36** exhaust a portion of the air in the expansion chamber beneath the piston flange **29**. When the air pressure in this expansion area below piston flange plate **29** drops from approximately 80 pounds per square inch to approximately 8 pounds per square inch, return spring **31** commences moving piston **27** to its lowest position, the piston pulling with it through slots **14** the load studs **32**, yoke **15** and the ram extension **16**, the piston **27** stopping against the base plate.

I claim:

1. In a pneumatic press, a cylinder comprising an upwardly open outer wall, an inner guide tube, and a connecting base plate, said inner tube being formed with a plurality of longitudinal slots, a yoke disposed in said inner tube, a ram carried by said yoke, a top closure for said inner tube formed with an aperture embracing said ram, a pneumatic piston disposed about said inner tube, and return spring means disposed between said piston and said top closure, said top closure providing an abutment to limit piston travel, and a plurality of studs extending from said yoke through said slots and into said piston and retaining said yoke in reciprocable relationship in said inner tube to the length of said slots.

2. The pneumatic press of claim **1** wherein said piston is of relatively smaller diameter than said outer cylinder wall and includes a base flange extending to said outer wall, and means for controllably introducing compressed air to and between said flange and said cylinder base plate, and for exhausting said air therefrom.

3. The pneumatic press of claim **1**, further including a mold cylinder and cap therefor carried by said top closure and receiving a head secured to said ram, and heater means disposable about said cylinder for curing thermosetting resin or heating theermoplastic material disposed within said mold cylinder.

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WILLIAM S. LAWSON, Primary Examiner

U.S. Cl. X.R.

92—113; 100—266