Oct. 23, 1956 M. S. REED 2,767,601

COUNTERBALANCE CYLINDER FOR FORGING PRESSES AND THE LIKE

Filed June 15, 1953

2 Sheets-Sheet 1

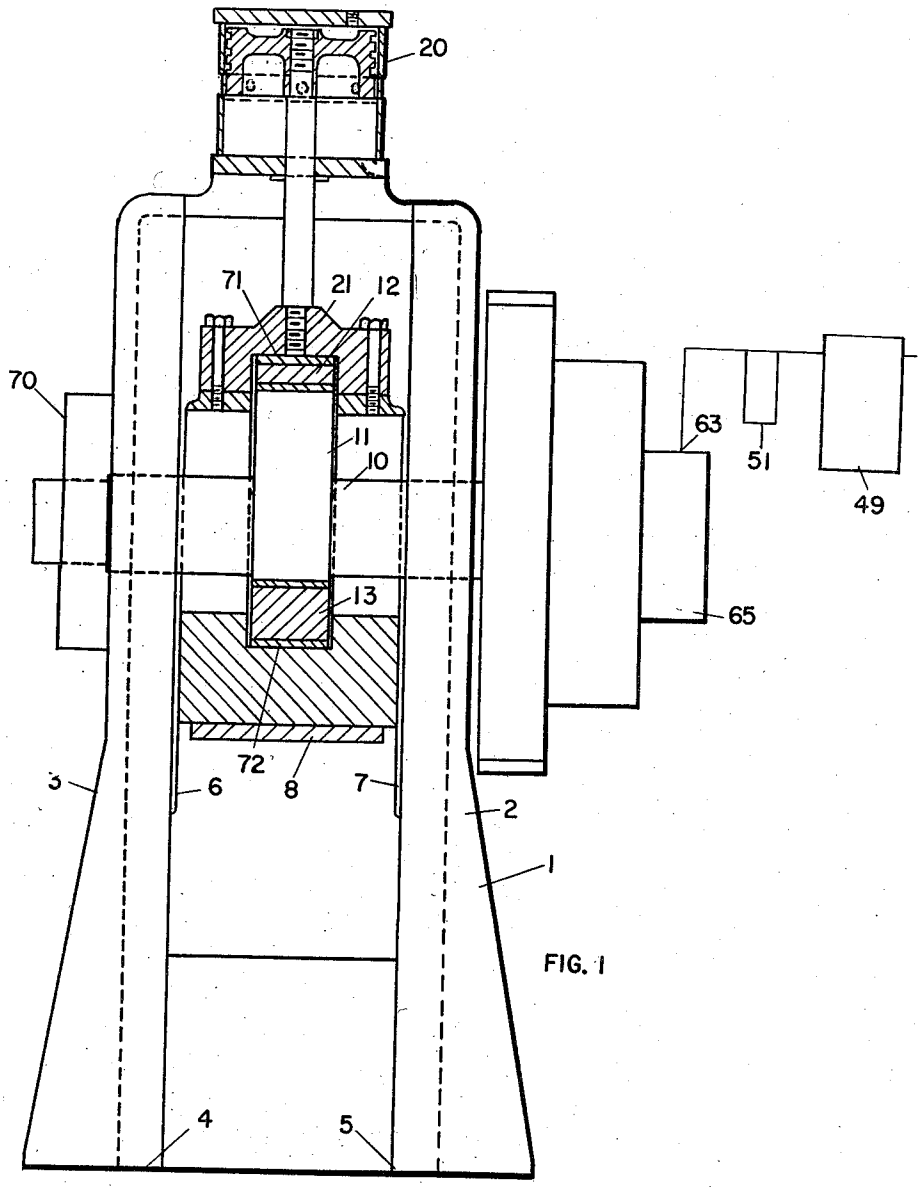


FIG. 1

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2 Sheets-Sheet 2

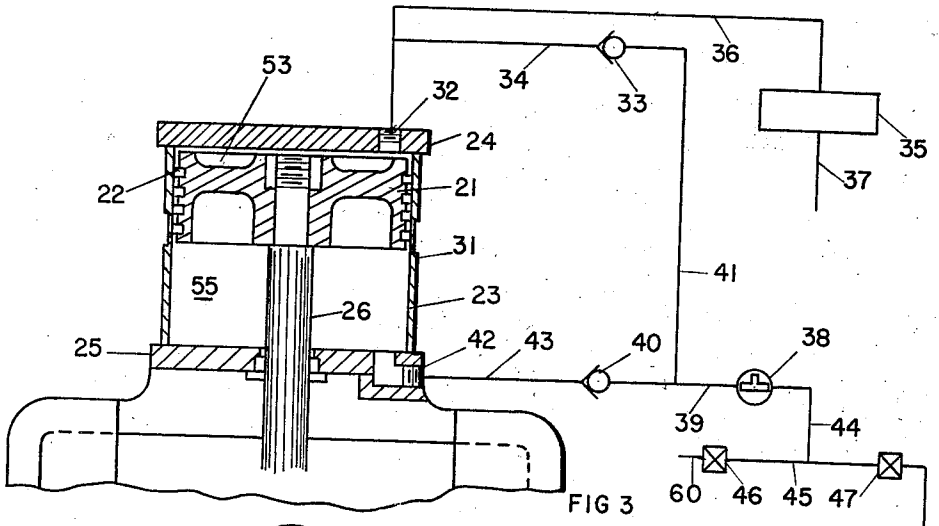


FIG 3

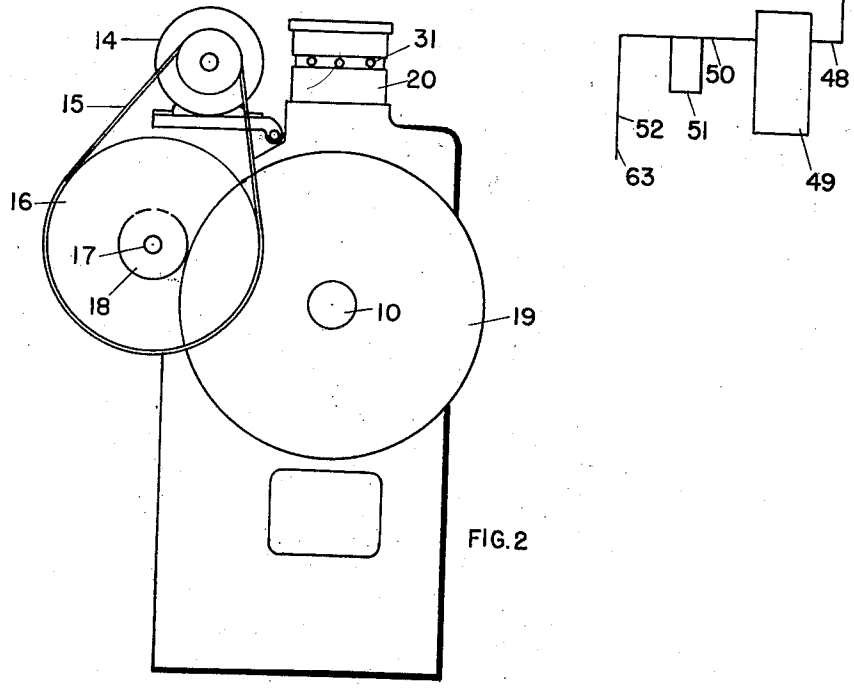


FIG. 2

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COUNTERBALANCE CYLINDER FOR FORGING PRESSES AND THE LIKE

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3 Claims. (Cl. 78—42)

This invention relates to presses and more particularly to the type of presses having a ram driven by power means which may be stopped at various times during the stroke of the ram by means of a clutch and braking arrangement.

In presses made according to previous designs, the ram is driven at a rather high speed and when it is necessary to stop the ram, considerable energy is absorbed by the brake. In operations where it is necessary to start and stop the ram frequently, the brake has to absorb energy at a rapid rate in bringing the ram to a stop and the brake has a tendency to overheat and to wear out rapidly. Counterbalance cylinders have been tried which were connected to the ram and the shop compressed air supply exerted a continuous upward force on the counterbalance cylinder and ram. This exerted a continuous force on the bottom of the cylinder regardless of whether it was traveling upward or downward.

It is, accordingly, an object of my invention to overcome the above and other defects in previous counterbalance cylinders in forging presses by providing an attachment for a forging press which will assist in bringing all the energy for stopping the ram.

Another object of my invention is to provide an attachment for a forging press which will absorb energy from the operation of stopping the ram and which will not interfere with the operation of the ram when it is required to operate the ram continuously.

Another object of my invention is to provide an attachment for a forging press which will be simple and economical in operation, simple in construction, and which is adapted for use on the present type press equipment.

Another object of the invention is to provide a forging press equipped with a double acting counterbalance cylinder connected to the ram wherein the cylinder will assist in stopping the ram.

Another object of the invention is to provide a counterbalance cylinder for a forging press which will provide a large upward force on the bottom of the cylinder at the bottom of the stroke but will offer very little resistance to downward movement at the top of the stroke.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Fig. 1 is a view of a forging press partly in section;

Fig. 2 is another view of the forging press shown in Fig. 1; and

Fig. 3 is an enlarged view of the counterbalance cylinder according to my invention shown connected in a pneumatic circuit.

Now with more specific reference to the drawings, Fig. 1 shows a forging press having a frame 1 showing side members 2 and 3 which terminate in floor engagement at points 4 and 5. Guides 6 and 7 are attached to the sides 2 and 3 for guiding the ram 8 in its downward and upward oscillatory movement.

The ram is driven downward and upward through shaft 10 to which eccentric 11 is fixedly attached and eccentric 11 cooperates with sliding blocks 12 and 13 to move the ram downward and upward. Sliding blocks 12 and 13 oscillate laterally in ways 71 and 72 as the ram oscillates down and up. Shaft 10 is driven by motor 14 through belt 15 and pulley 16 which is fixed to the back shaft 17 and clutch member 18 is operatively associated with the opposite end of back shaft 17. Clutch member 18 cooperates with clutch member 19 and clutch member 19 is fixed to shaft 10. Clutch members 18 and 19 are provided to disconnect the motor and drive assembly from the ram when it is desired to stop the ram and a brake 70 is provided to bring the ram to a stop.

The counterbalance cylinder 20 in some respects has the function of a dash pot. Counterbalance cylinder 20 is provided with counterbalance piston 21 fitted with piston rings 22 which engage cylinder wall 23. Cylinder 20 has top cylinder head 24 fixed to the upper side thereof and bottom cylinder head 25 fixed to the bottom end thereof. The upper end of piston rod 26 is fixed to counterbalance piston 21 and the bottom end of piston rod 26 is fixed to the yoke 27 which, in turn, contains the sliding blocks 12 and 13.

Counterbalance cylinder 20 has ports 31 disposed in a circumferential belt around its outer surface and port 32 connects with check valve 33 through line 34 and with solenoid valve 35 through line 36. Solenoid valve 35 communicates through pipe line 37 to the ambient atmosphere. Three-way cock 38 is connected by pipe 39 to check valve 40 and pipe 39 is connected to check valve 33 through pipe 41. Port 42 is connected to check valve 40 through pipe 43. Three-way cock 38 connects through pipe 44 to pipe 45 which is in turn connected to globe valve 46 and to air supply at 60 and pressure regulator 47. Pressure regulator 47 is connected through pipe 48 to surge tank 49 and surge tank 49 is connected through pipe 50 to lubricator 51 and pipe 52 which is connected to an air operated clutch at 63.

During operation, the ram 8 is driven down and up by eccentric 11 which is in turn driven by motor 14. During continuous operation, the solenoid valve 35 will be open and space 53 above piston 21 will be connected through pipe 36 and solenoid valve 35 to the atmosphere so that the only resistance offered to the top of counterbalance piston 21 will be the pumping of air through the pipes described into the atmosphere with the downward and upward motion of the ram.

When the work of the press is such that it is necessary to stop the ram and start it frequently by engaging and disengaging clutch 65 and brake 70, the solenoil valve 35 is closed. When the ram 8 is in the downwardmost portion of its stroke, the counterbalance piston 21 will be at the bottom of cylinder 20 and air will be admitted through ports 31 to the enclosure 53 above the piston. On the upward stroke of the ram 8, the piston 21 will move upwardly in cylinder 20 and compress the air in chamber 53 above the piston. When the air in the chamber 53 has reached and exceeded a pressure equal to the pressure in the supply 60, some air from the chamber will be forced through pipe 34, check valve 33, pipe 41, three-way cock 38, pipe 44, pipe 45, globe valve 46, and into the shop supply at 60, thus taking energy from the moving parts and assisting the brake 70 in stopping the ram. The work of compressing the air in the chamber

53 above the piston 21, as explained above, will assist brake 70 in bringing the ram 8 to a stop on its upward stroke, thereby relieving the brake of doing all the work of stopping the ram. During the downward portion of the stroke, the flow of air into the space 53 above the piston will be intercepted by the check valve 33.

When the ram 8 is in the top position, piston 21 will be at the top of the cylinder 20 and air will be admitted through ports 31 into the space 55 below piston 21. On the downward stroke of the ram, piston rod 26 will draw piston 21 downward to compress air in space 55. When the air in space 55 reaches and exceeds the pressure of the shop supply 60, air will be forced through pipe 43, check valve 40, pipe 39, three-way cock 38, pipe 44, pipe 45, globe valve 46 into supply 60. The flow of air into space 53 will be intercepted by check valve 33. When the ram starts upward, the air compressed in the space 55 under the cylinder helps move the ram.

It will be apparent that the pressure in the space 55 below the piston is equal to atmosphere when the piston is at the upwardmost part of its stroke and the air is compressed to a value equal to the shop supply when the piston is at the bottom of its stroke. Therefore, very little resistance is offered to the downward movement of the piston at the beginning of its downward stroke and a considerable force is exerted against the bottom of the piston to start it on its upward stroke from its extreme downward position.

In the foregoing specification, I have set forth the invention in its preferred practical form but I am aware that the structure shown is capable of modification within the range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

What I claim is:

1. A forging press comprising a frame, a ram operably mounted on said frame, driving means for driving said ram up and down, a counterbalance cylinder and brake for stopping said ram substantially beyond the central portion of the up and down movement, said brake operation being initiated by air pressure, said counterbalance cylinder comprising a cylinder attached to said frame, a piston connected to said ram for compressing air in said counterbalance cylinder whereby energy is absorbed from said ram during the termination of the up and down stroke of the ram to aid said brake in stopping said ram at predetermined times, said cylinder having a port through the walls thereof and disposed intermediate the top and bottom of the cylinder communicating with the inside thereof whereby the inside of said cylinder above said piston is connected to the ambient atmosphere when the piston is in the lower portion of its stroke and the portion thereof below said piston is connected to the ambient atmosphere when said piston is in the upper portion of its stroke, a pipe connected to the top of said counterbalance cylinder and communicating with the inside thereof and to a supply of compressed air, said supply of compressed air connected to the operating means of said brake, a second pipe connected to the bottom of said counterbalance cylinder and communicating with the inside thereof and to a supply of compressed air, and check valves in said pipes to allow air to be pumped from said counterbalance cylinder into said supply but preventing the flow of air from said supply to said cylinder, said counterbalance cylinder assisting said brake in bringing said ram to a stopped position.

2. The forging press recited in claim 1 wherein a means is provided to selectively connect the space above said piston to the ambient atmosphere.

3. The forging press recited in claim 1 wherein a plurality of said ports is disposed in spaced relation on the periphery of said cylinder.

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