VALVE FOR FLUID-PRESSURE SYSTEMS

Filed Feb. 23, 1949

2 Sheets-Sheet 1

Frederick Gash

Inventor

By

Attorney
F. GASH

VALVE FOR FLUID-PRESSURE SYSTEMS

Filed Feb. 23, 1949

2 Sheets-Sheet 2

Inventor,

Frederick Gash;

By

Attorney
UNITED STATES PATENT OFFICE

2,570,937

VALVE FOR FLUID-PRESSURE SYSTEMS

Frederick Gash, Carlisle, England, assignor to
Carlthard & Company Limited, Carl-
isle, England, a British company

Application February 23, 1949, Serial No. 77,851
In Great Britain February 11, 1948

1 Claim. (Cl. 277—61)

This invention is for improvements in or re-
lating to valve means. The invention is more
particularly concerned with valve means for con-
trolling pressure fluid operated devices of the
kind in which a member, e.g. a piston or plun-
ger, is moved in at least one direction by fluid
pressure and then makes a return stroke, during
which return stroke the pressure fluid is ex-
austed. A particular application of the invention
is to die-casting or moulding machines of the
kind in which fluid pressure, generally
through a plunger or ram, forces the molten
metal into the dies. In such machines a device
is required which can be adjusted and set so
as automatically to control the supply and exhaus-
tion of the pressure fluid to the plunger or ram
and thereby the speed of the forward or “shooting”
and return movement of the ram or plunger.

One object of the present invention is to meet
this requirement.

According to the present invention there is
provided a valve means comprising two valve de-
vice proper arranged so that pressure fluid
passing through either acts to close the other
and an independent adjustable setting device for
each of said valve devices proper adapted to
govern the amount of opening thereof.

According to a further feature of the present
invention there is provided a valve means com-
prising a valve block or casting having two cavi-
ties each adapted for connection to a pressure
fluid system, two-way valve devices between
said cavities, one valve device opening in one di-
rection and the other in the opposite direction,
fluid flowing through either of said valve de-
vice acting to keep the other valve device closed,
and an independent adjustable setting device
for each of said valve devices proper adapted to
govern the amount of opening thereof. Con-
veniently the valve devices proper are ball valves
and each adjustable setting device is a screw,
screw-threaded into the valve block and adapted
to form a stop to limit opening movement of the
ball valve.

In applying the valve means just described to
a die-casting machine, one cavity in the valve
block is connected to the main pressure-fluid
control valve of the machine and the other cavity
is connected to the cylinder of the ram or plun-
erg for shooting the molten metal into the dies.

Thus, when the main pressure-fluid control valve
is opened pressure fluid will be supplied to the
cylinder but the speed of movement of the ram
or plunger will depend on the maximum per-
mitted opening of the ball or other valve through
which the pressure fluid flows to the cylinder.

Similarly when the main control valve is subse-
quently operated to exhaust the cylinder, the
speed of return movement of the ram or plunger
(which may be effected by pressure-fluid in a
double-acting or single cylinder and plunger de-
vice or by spring means or the like) depends on
the maximum permitted opening of the other ball
valve. The maximum permitted opening can
readily be set to give the best operating condi-
tions and this setting may be varied from job
to job. One embodiment of the invention as applied
to a valve means particularly suitable for appli-
cation to a pressure-fluid operated die-casting
machine will now be described by way of example
with reference to the accompanying semi-di-
agrammatic drawings. On the drawings:

Figure 1 is a side elevation of the complete
machine,

Figure 2 is a sectional elevation of the com-
bined shooting cylinder and metal magazine, the
section being through the vertical axis of the
cylinder.

Figure 3 is a detail sectional view of the valve,
and

Figure 4 is an end elevation of the valve.

The general construction of the machine
shown in Figure 1 follows existing practice and
comprises a frame 10 supporting a fixed die-car-
ier 11 and guides 12 for a movable die-carrier
13. Movement of the movable die-carrier is
affected by compressed air through a piston and
cylinder device 14 under the control of a hand-
operable valve 15.

The combined metal magazine and shooting
cylinder is indicated generally at 16, see Figure
1, and comprises (see Figure 2) a cylinder proper
17 in which works a piston 18 connected to and
operating the shooting ram 19, the latter shoot-
ing the molten metal from the metal magazine
20 into the cavities of the mated dies 21 and 22
in the usual way. Movement of the piston 18
and ram 19 in the “shooting” direction is ef-
fected by compressed air supplied by a part-
flexible pipe 24a, 24a, and acting on the underside
23 of the piston 18. Return movement of the
piston and ram is effected by compressed air at
constant pressure supplied by a part-flexible pipe
28 and acting on the annulus 27 of the piston.
The compressed air acting on this annulus is only
capable of effecting return movement of the pis-
ton and ram when the pipe 24a is open to atmos-
phere. Control of the connection of pipe 24a
to the source of compressed air, to effect a “shot”
and to atmosphere for return movement of the shooting ram is provided by a hand-operable valve 28. The valve means provided for the purpose of the present invention is connected between the pipes 24 and 24a as indicated at 39 in Figure 1. The valve means comprises a rectangular valve block having opposite faces of which are bored or drilled to provide two cylindrical cavities 41 and 42 one towards one side of the block and one towards the other side. The open and screw-threaded end 43 of one cavity is adapted for connection by the pipe line 24 to the shooting cylinder 17. The open and screw-threaded end 44 of the other cavity is adapted for connection by the pipe 24a to the manual control valve 28. The cavities 41 and 42 are connected together by two holes 45 and 46 which taper in opposite directions and each of which houses a ball valve 47 and 48 respectively seated in the taper of the hole. Thus each hole and ball constitutes a one-way valve and one ball valve opens in one direction and the other opens in the opposite direction. Each ball valve is provided with an independent adjusting and setting device by which the amount of opening of the valve can be pre-selected. Each adjusting device comprises a gland 49 screw-threaded into a wall of the valve block 40 in axial alignment with the ball and its conical seats and an adjusting screw 50 screw-threaded into the inner end of said gland so that its forward end is adjacent to and forms a stop for the ball valve. Thus, by screwing the adjusting screw into or out of the gland the maximum permitted opening of the ball valve can be selected and set to give the required shooting speed and return speed of the ram 19. It will be appreciated that the separate adjusting devices provide for differential settings as between the one valve device 47 and the other 48. Preferably the balls are urged in the closing direction by springs 52.

During the making of a "shot" the compressed air flows to the shooting cylinder 17 from a supply pipe 24b (see Figure 1) via valve 28 (which is positioned so as to connect pipe 24b to pipe 24c, pipe 44a, valve 47 and pipe 24). The speed of the "shot" will, as stated, depend on the setting of the adjusting device 50 for the valve 47. On completion of a "shot" the valve 28 is operated to connect pipe 24c to atmosphere and close pipe 24b. The piston 18 then returns under the action of the compressed air supplied by pipe 26 and by exhausting the air below piston 18 via pipe 24, valve 46, 48, pipe 24a and valve 28. The speed of the return movement of piston 18 and ram 19 depends, of course, on the speed with which the air can be exhausted from the lower part of the cylinder 17 and, as stated, this can be selected to give the return speed required, by an appropriate setting of the adjusting device 50 for the valve 48.

It will be noted that when the air is flowing from opening 44 to opening 43, during the making of a "shot" it acts to close the valve 48 whereas when the air is flowing in the reverse direction it acts to close the valve 47.

Whilst the invention has been described more particularly as applied to die-casting machines it is of general application to pressure-fluid systems and apparatus. Furthermore, whilst the valve device, according to the invention, is particularly suitable for controlling the operation of the metal shooting plunger or ram of a die-casting or like machine it can also be used with advantage in some cases for controlling the opening and closing speed of the dies being connected, for example in a pipe extending between the cylinder 14 and valve 15 so as to constitute or form part of an anti-slam device for the dies.

I claim:

A two-way pressure fluid system comprising two conduits through which pressure fluid flows alternately from one to the other and valve means connecting said conduits together, said valve means including a rectangular shaped valve box having two short sides and two long sides, two relatively spaced cavities in said valve box parallel to each other and parallel with the short sides of said valve box, one of said cavities extending toward one long side of said valve box and the other of said cavities extending toward the other long side of said valve box and the outer end of each cavity having means for connecting it to one of said conduits, two oppositely tapered relatively spaced bores in said valve box between said cavities and communicating therewith, said bores being parallel to each other and parallel with the long sides of said valve box, a ball valve in each of said bores, said ball valves opening in opposite directions, a gland screw-threaded into each short wall of the valve box in axial alignment with a respective bore and the ball valve therein, an adjusting screw screw-threaded into the inner end of each of said bores so that its forward end is adjacent to and forms an adjustable stop for the ball valve to limit opening movement of the ball valve in the tapered bore, a reduced portion on the inner end of each gland, and a coil spring about each reduced portion and each adjusting screw and engaging each of said ball valves to urge each of said ball valves into closing position within its respective bore.

FREDERICK GASH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>479,309</td>
<td>Sewall</td>
<td>July 19, 1892</td>
</tr>
<tr>
<td>720,341</td>
<td>Ball</td>
<td>May 5, 1903</td>
</tr>
<tr>
<td>1,563,834</td>
<td>Humphrey</td>
<td>May 11, 1926</td>
</tr>
<tr>
<td>1,925,127</td>
<td>Veenscheuten</td>
<td>Aug. 23, 1933</td>
</tr>
<tr>
<td>2,171,626</td>
<td>Lannett</td>
<td>Sept. 5, 1939</td>
</tr>
<tr>
<td>2,207,681</td>
<td>Hibner</td>
<td>July 9, 1940</td>
</tr>
<tr>
<td>2,210,555</td>
<td>Podolsky</td>
<td>Aug. 6, 1940</td>
</tr>
<tr>
<td>2,271,031</td>
<td>Parker</td>
<td>Jan. 27, 1942</td>
</tr>
</tbody>
</table>