

[54] **GATE OPERATING SYSTEM FOR CONCRETE BUCKETS**

[76] Inventor: **Leslie H. Garlinghouse**, 1585 Sierra Madre Villa, Pasadena, Calif. 91107

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[51] Int. Cl. **E21b 33/132**

[58] Field of Search.. 294/68, 69, 70, 71, 88; 60/62; 91/44; 222/503

[56] **References Cited**

UNITED STATES PATENTS

2,342,812	2/1944	Martinson.....	294/71 X
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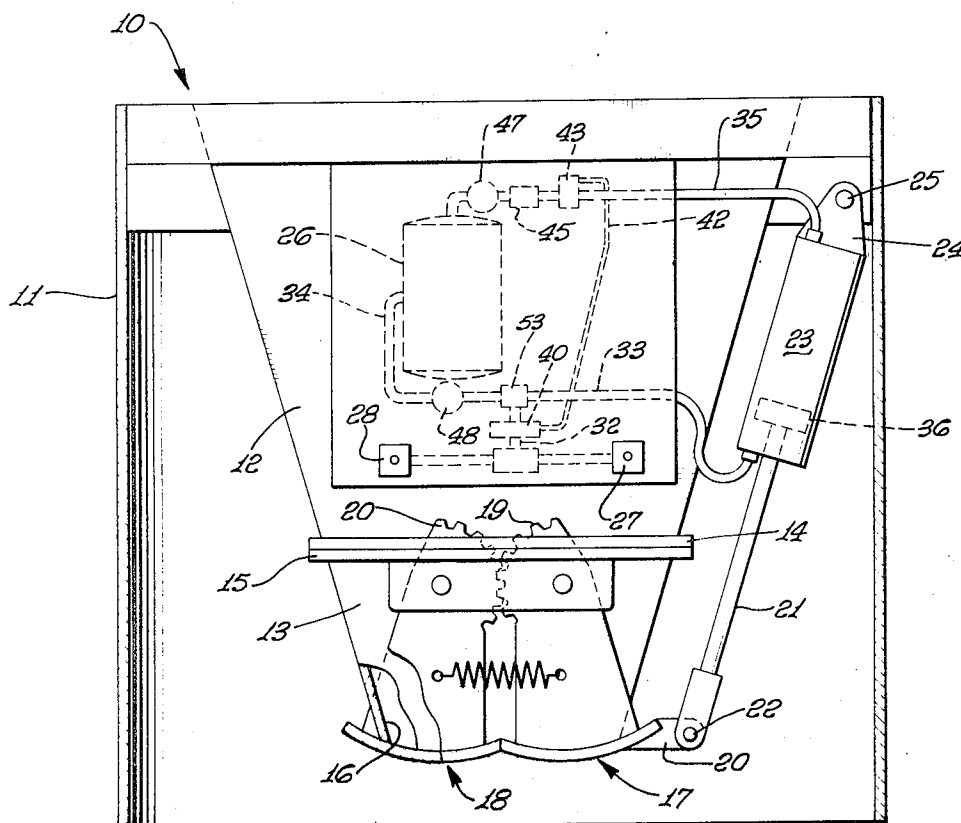
Primary Examiner—Evon C. Blunk

Assistant Examiner—Johnny D. Cherry

[57] **ABSTRACT**

A system for opening and closing the clamshell gates at the bottom of the hopper of a bucket for placing concrete makes use of a receiver tank for storing air under pressure and a pneumatic actuating cylinder. A main pressure line for air under pressure has one branch connected to the opening end of a pneumatic cylinder and another branch connected to the receiving tank. A pneumatic line from the tank is connected to the pneumatic cylinder at the closing end and a pilot valve in the last mentioned line is subject to control by a pilot pneumatic line fed from the main pressure line whereby to vent the closing end of the cylinder when the opening end is in operation.

4 Claims, 4 Drawing Figures



SHEET 1 OF 2

FIG. 1.

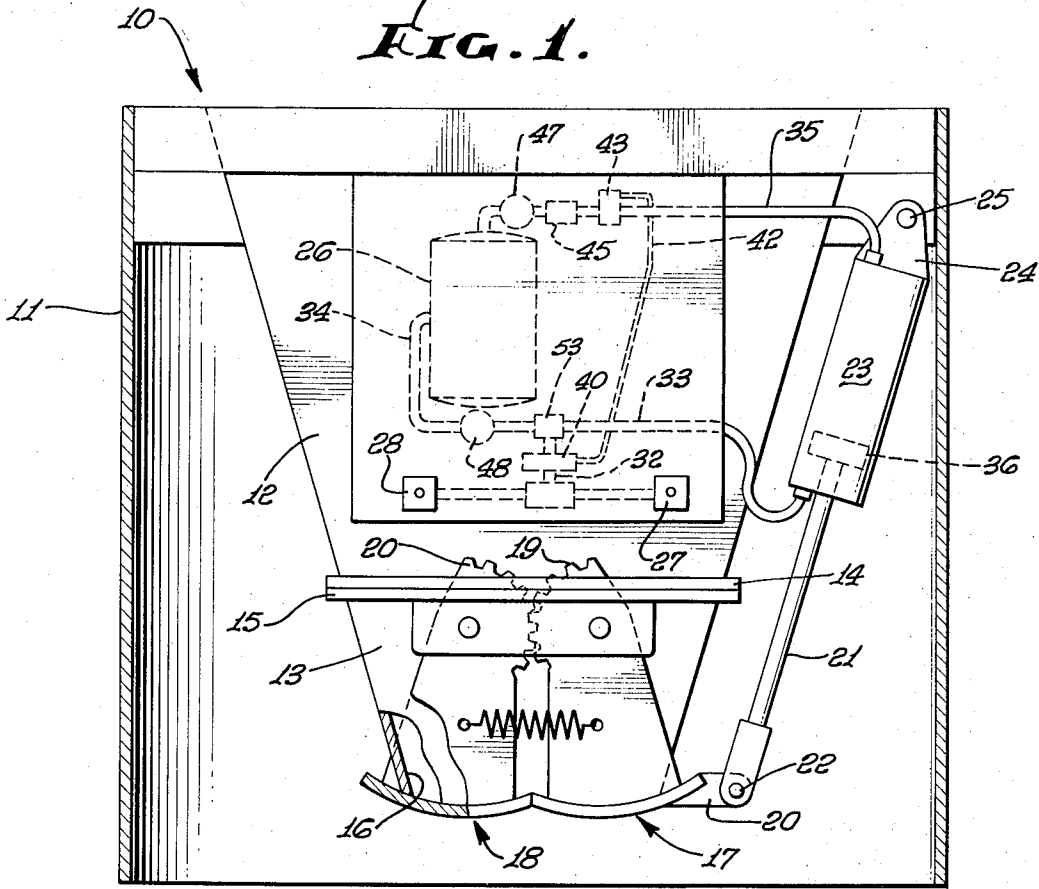


FIG. 4.

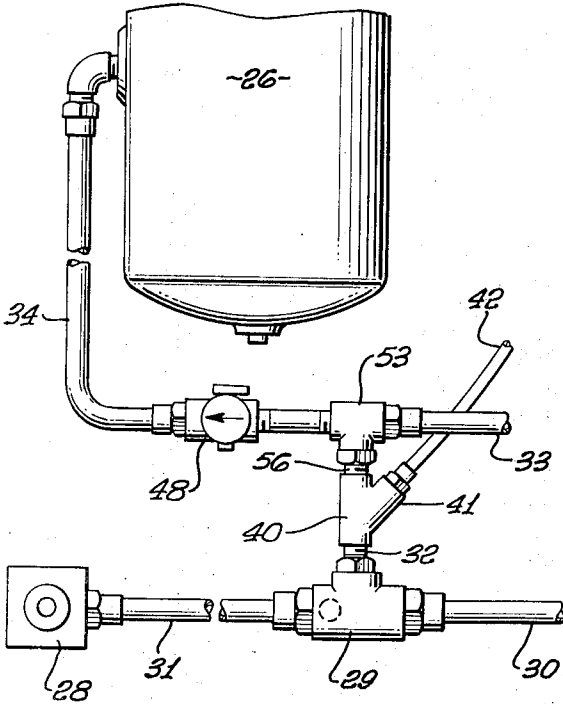


FIG. 3.

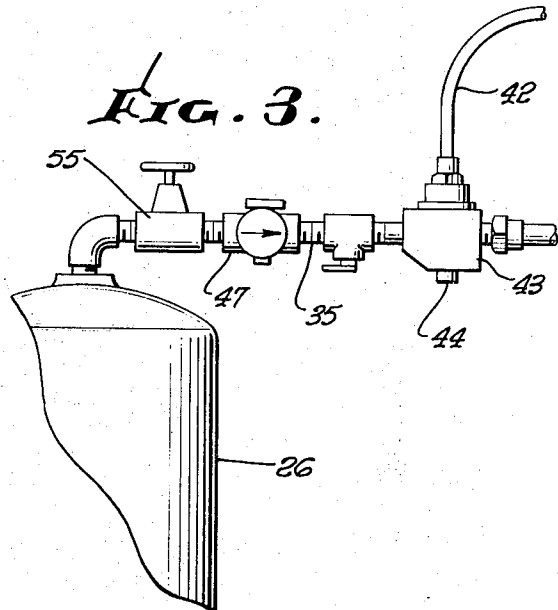
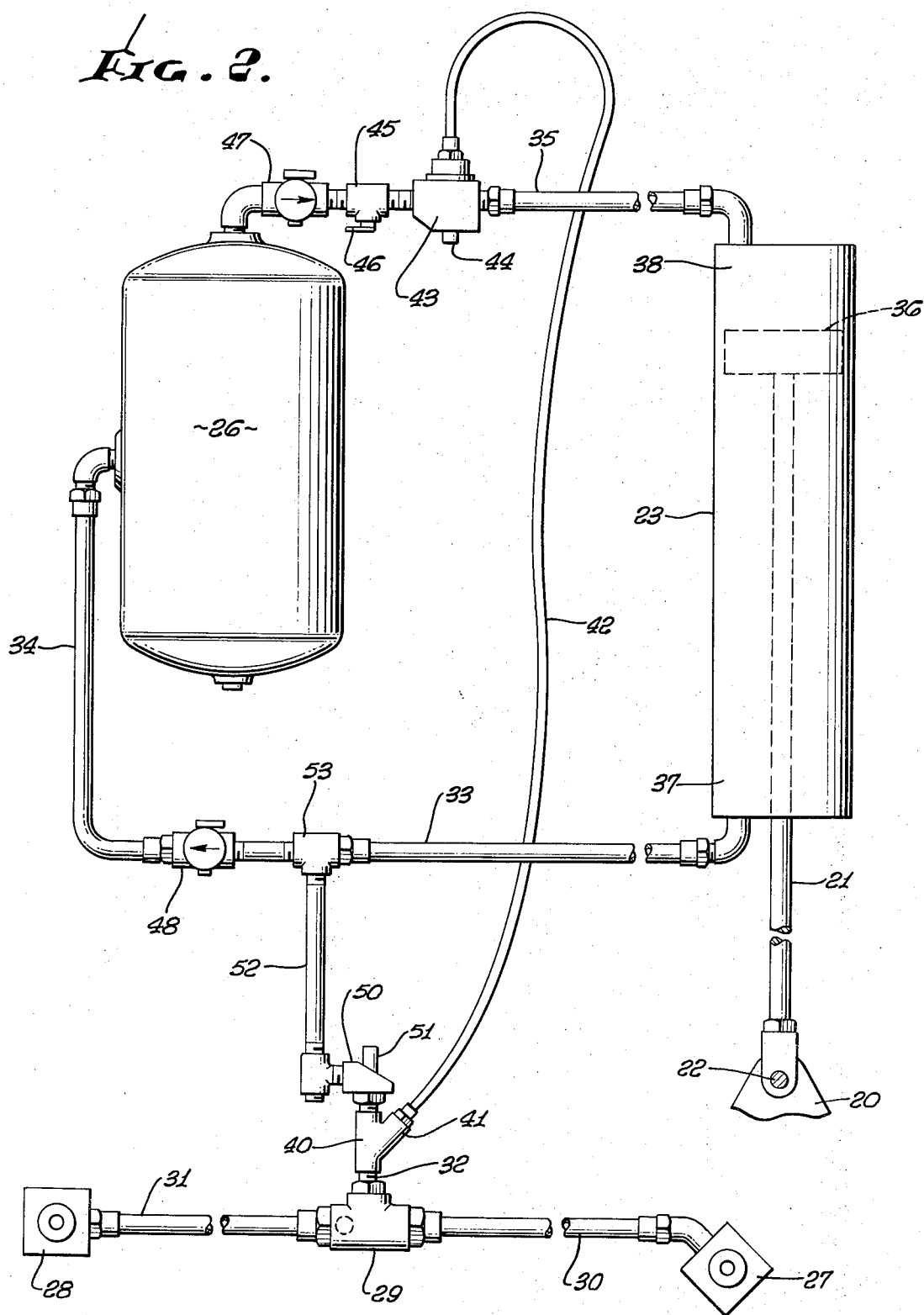


FIG. 2.



GATE OPERATING SYSTEM FOR CONCRETE BUCKETS

This is an improvement on Gossett et al. U.S. Pat. No. 2,856,222 for a pneumatic gate actuating device for concrete buckets.

The pneumatic system herein disclosed is directed primarily to the opening and closing of clamshell gates of the type used at the bottom of a hopper which carries a concrete mix so that selected quantities of the concrete mix can be deposited in an appropriate form. For such a system to be effective, there must be control of the pneumatic system and the gate operating effect sufficient to selectively deposit either small quantities of the concrete mix or large quantities of the concrete mix and also to cut off the supply at any time. Obviously the deposit of large quantities is needed when the form is to be filled up rapidly. The deposit of small quantities is necessary when the form filling is to be topped off at just the correct level. For the latter operation to be dependably effective, the system must be capable of closing the gates at any time.

It is, moreover, quite commonly known that one of the problems in the deposit of a concrete mix is the fact that the mix will bridge over an opening at times when the hopper is to be discharged. To break up such a bridging effect, there needs to be a dependable control over the oppositely acting clamshell gates. Although pneumatic systems have been known heretofore and used for manipulating such clamshell gates, one handicap has been the need for what may be termed a super abundance of pressure because of the fact that the opening pressure has had to be great enough to not only overcome the necessary friction needed for opening the gates but also to counter-balance and overcome a back pressure maintained on the opposite side of the pneumatic cylinder for closing the gates. While, concededly, the presence of a back pressure has some beneficial effect in cushioning the forward acting high-powered gate opening cycle, air pressure has to be sufficiently high to provide adequate power for swinging the gates on buckets of relatively large size. It follows therefore that where such an abundance of pressure is necessary, the engine and pump providing the power source must be extra heavy, the pneumatic lines must be heavy enough to handle the relatively larger pressure, leaks in the line are more troublesome, equipment on the bucket itself must be extra heavy, and more fuel obviously becomes necessary to maintain the pressure at such a higher level.

It is therefore among the objects of the invention to provide a new and improved gate operating system for concrete buckets which is capable of operating effectively at relatively lower pressure than those heretofore employed.

Another object of the invention is to provide a new and improved gate operating system for the opening and closing of clamshell gates on a concrete placing bucket wherein rapid and adequate control can be exercised over the gate operating characteristics at any instant.

Still another object of the invention is to provide a new and improved gate operating system for the opening and closing of clamshell gates on concrete placing buckets which is simple in its design, relatively inexpensive in installation and maintenance cost and which has a high degree dependability at all times for exercising effective control over both gate opening and gate closing

cycles irrespective of how remote the bucket may need to be from the source of pneumatic power.

With these and other objects in view, the invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a side elevational view of a typical clamshell gate mechanism on a concrete placing bucket illustrating the location of the pneumatic system.

FIG. 2 is a schematic diagram of the operating parts of the pneumatic system.

FIG. 3 is a side elevational view of a portion of the pneumatic system in slightly modified form.

FIG. 4 is a partial view of another portion of the pneumatic system in still another modified form.

In an embodiment of the invention chosen for the purpose of illustration, there is shown a concrete placement bucket indicated generally by the reference character 10 which includes a frame 11 which contains a hopper 12. A chute 13 is attached by flanges 14 and 15 to the lower end of the hopper 12. An opening 16 is located at the bottom of the chute, the opening being closed by clamshell gates indicated generally by the reference characters 17 and 18. Gearing, 19 and 20, respectively, on the clamshell gates is in meshing relationship so that the clamshell gates move in directions opposite with respect to each other, either away from each other, when opening, or toward each other, when closing, the degree of opening and closing of the respective clamshell gates being substantially equal. In an arrangement of the type described, only one of the clamshell gates as, for example, gate 17, needs to be provided with a bracket 20 to which a piston rod 21 is pivotally attached by means of a pin 22 in order that a pneumatic cylinder 23 may be manipulated, serving as a motor, to open and close the gates 17 and 18. As noted, a bracket 24 at the top of the pneumatic cylinder 23 is pivotally secured to the frame 11 by means of a pin 25.

The pneumatic system for manipulating the clamshell gates 17 and 18, shown schematically in FIG. 2 includes, in addition to the pneumatic cylinder 23, a receiving tank 26 for air under pressure.

An external source of air under pressure (not shown) may be of a conventional kind, with means, also not shown, for interconnecting such air under pressure to either the right-hand air lance socket 27 or the left-hand air lance socket 28. A shuttle valve selector 29 lies intermediate the air supply connections 27, 28 to which it is connected by respective air pressure lines 30 and 31. The air lance sockets are preferably located on opposite sides of the bucket 10 as a matter of convenience so that irrespective of the position of the bucket and the stance of an operator, connection can be readily made to the external source of air pressure. The shuttle valve selector 29 of substantially conventional construction is one capable of shutting off the air pressure line opposite from that which is employed to pass air under pressure into the system.

From the shuttle valve selector 29 a gate opening air pressure line 32 is connected to and communicates with a first air pressure branch line 33 which connects to the pneumatic cylinder 23 and a second air pressure

branch line 34 which communicates with the receiving tank 26.

As indicated on FIG. 2, there is a piston 36 in the pneumatic cylinder 23 to which the piston rod 21 is connected which is reciprocatably mounted in the pneumatic cylinder thereby separating the cylindrical chamber into two parts, namely, an opening end 37 and a closing end 38 following substantially conventional practice. The first branch line 33 is accordingly connected to the opening end of the cylinder and the closing air pressure line 35 is connected to the closing end 38.

Located in the opening pressure line 32 at a location adjacent the shuttle valve selector 29 is a strainer 40 and a side outlet 41 on the strainer has connected to it a pilot line 42 which interconnects with a pilot control valve 43 which is located in the closing air pressure line 35.

The pilot valve 43 of substantially conventional construction, is one of such character that when there is air under pressure in the pilot line 42, where the pressure is derived from air pressure from an external source passing into the opening pressure line 32, the pilot valve will be in a position exhausting air from the closing end 38 of the pneumatic cylinder 23 through the closing air pressure line 35 and exhaust fitting indicated by the reference character 44. Also located in the closing air pressure line 35 is a drain T 45 at the bottom of which is a drain cock 46, and a one-way check valve 47 which is open to fluid flowing in a direction from the receiving tank 26 to the closing end 38 of the pneumatic cylinder 23, and closing against flow in the opposite direction. Another one-way check valve 48 is located in the second branch line 34 which opens to flow in the direction toward the receiving tank 26 and closes to flow in an opposite direction.

In the opening pressure line 32, and immediately above the strainer 40, is a selective exhaust valve 50 at the top of which is an exhaust fitting 51, there being connected to the exhaust valve 50 a section 52 of the opening pressure line 32, this being the section that interconnects through a T 53 to the branch lines 33 and 34.

In operation of the system illustrated in FIG. 2, when it is desired to open the clamshell gates 17 and 18, air is admitted into the right air supply connection 27. This air then passes into the opening pressure line 32 where a portion of it is directed through the section 52 and branch lines 33 to the opening end 37 of the pneumatic cylinder 23 and a portion of it simultaneously passes through the pilot line 42 to the pilot control valve 43. The effect of air under pressure from an external source through the pilot line 42 to the pilot control valve 43 produces an adjustment in the pilot control valve such that air under pressure is exhausted out the exhaust fitting 44 from the closing end 38 of the pneumatic cylinder 23, passing from that end through the closing air pressure line 35 to the pilot valve 43.

At the same time air under pressure from an external source passes through the selective exhaust valve 50 and section 52 into the branch line 33 and opening end 37 of the pneumatic cylinder 23 thereby to push against the piston 36 in an upward direction as viewed in FIG. 2. This in turn moves the piston rod 21 in a corresponding direction and pulling on the bracket 20 moves the clamshell gates in an opening direction. At the same time that air under pressure from an external source is

performing the gate opening action, some of that air is also being passed through the second branch line 34 into the receiving tank 26 wherein pressure builds up. Since the closing end 38 of the pneumatic cylinder 23 is exhausted freely to the atmosphere, all of the air pressure applied to the opening end 37 and a corresponding side of the piston 36 is made use of in overcoming the friction needed to swing the gates to open position.

When the gates are to be closed, all that is necessary by way of manipulation of air under pressure is to release air pressure from the right air supply connection 27. Under this condition the pilot control valve 43 will automatically shift to a position cutting off exhaust through the exhaust fitting 44 and permitting air under pressure to pass from the receiving tank 26 through the one-way check valve 47, the pilot valve 43, and thence into the closing end 38 of the pneumatic cylinder 23. This means that there will be air under pressure on the top side of the piston 36 as viewed in FIG. 2 coming to it at a pressure the equivalent of air pressure in the receiving tank 26.

At the same time the opening end 37 of the pneumatic cylinder 23 will be open to exhaust, with exhaust air passing in a reverse direction through the first branch line 33, and section 52 of the opening pressure line. Exhausting air after reaching the selective exhaust valve 50 is vented at two locations to the atmosphere, part leaving through the exhaust fitting 51 and the remainder leaving from the now open lance socket 27.

As a consequence, all of the air under pressure in the opening end 37 of the pneumatic cylinder 23 is used to move the piston rod 21 in a direction causing opening of the gate, without need for operating against any back pressure in the closing end 38. The valve 50, of substantially conventional construction, is such that when there is reduced pressure in the section 52, the valve mechanism will permit such pressure to be exhausted through the exhaust fitting 51. Upon completion of discharge, the exhaust valve 50 will then readjust itself closing the exhaust fitting 51 so that when air under pressure is applied to the exhaust valve on the opposite side, as when the gates are to be opened, there will be no exhaust through the exhaust fitting 51 and the air under pressure will be directed through the section 52 and the first branch line 33 to the opening end 37 of the pneumatic cylinder 23 causing the piston 36 to raise and the gates to be opened.

It will be clear further that air pressure used for the closing of the gates is initially supplied by the external source of air pressure which finds its way into the receiving tank 26 and from there is used by passing it through the closing air pressure line 35 to the closing end 38 of the pneumatic cylinder 23.

On those occasions where it may be found desirable to carefully control the pressure of air in the closing air pressure line 35, a pressure regulator 55 may be installed in the closing air pressure line 35 at a location between the receiving tank 26 and the pilot control valve 43, preferably on the upstream side of the one-way check valve 47. By reason of presence of the pressure regulator 55, the entire closing pressure may be set at a desired amount.

In another form of the device as illustrated in FIG. 4, the selective exhaust valve 50 has been eliminated and a direct connection made from the strainer 40 through a nipple 56 to the T 53 which supplies the branch lines

33 and 34. During the closing cycle all air from the opening end 37 will this time be exhausted through the air lance socket 27 when the lance is removed. The closing operation under these circumstances is effective, but not as rapid as is the situation when the selective exhaust valve 50 is present.

While the invention has herein been shown and described in what is conceived to be a practical and effective embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described the invention, what is claimed as new in support of letters patent is:

1. A pneumatic system for opening and closing clamshell gates of a concrete placing bucket comprising a receiving tank, a pneumatic cylinder having a chamber, a piston reciprocatably mounted in the chamber separating the chamber into an opening end and a closing end, and a piston rod on said piston adapted to be connected to the clamshell gates, an opening pressure line for air under pressure from an external source, said opening pressure line having a branch connected to the opening end of the cylinder and a second branch connected to the tank, a closing pressure line connected between the tank and the closing end of the cylinder, a pilot valve in the closing pressure line and a pilot line

connected between the opening pressure line and the pilot valve, said pilot valve having a first position exhausting air from the closing end of the cylinder when there is air pressure from an external source in the opening pressure line and a position passing air from the tank to the closing end of the cylinder when there is no air under pressure in the pilot line.

2. A pneumatic system as in claim 1 wherein said opening pressure line has a quick exhaust valve therein at a location between the connection of the pilot line to the opening pressure line and the connection to the cylinder, said quick release valve having a closed position when there is air under pressure from an external source in the opening pressure line and a release position when there is no air under pressure from an external source in the opening pressure line.

3. A system for opening and closing clamshell gates as in claim 1 wherein there is a check valve in the branch connected to the tank opening in a direction toward the tank and a check valve in the closing pressure line between the tank and the pilot valve opening in a direction toward the pilot valve.

4. A system for opening and closing clamshell gates as in claim 1 wherein there is a pressure regulator in the closing pressure line between the tank and the pilot valve.

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