

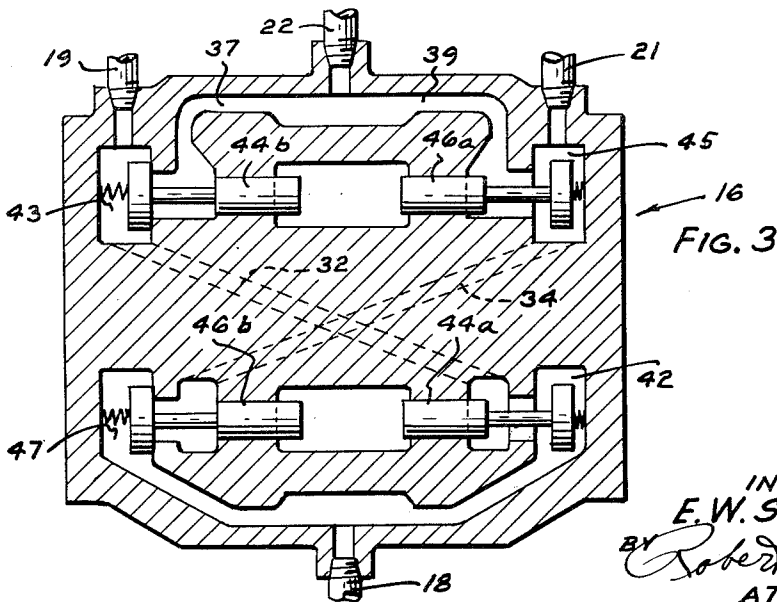
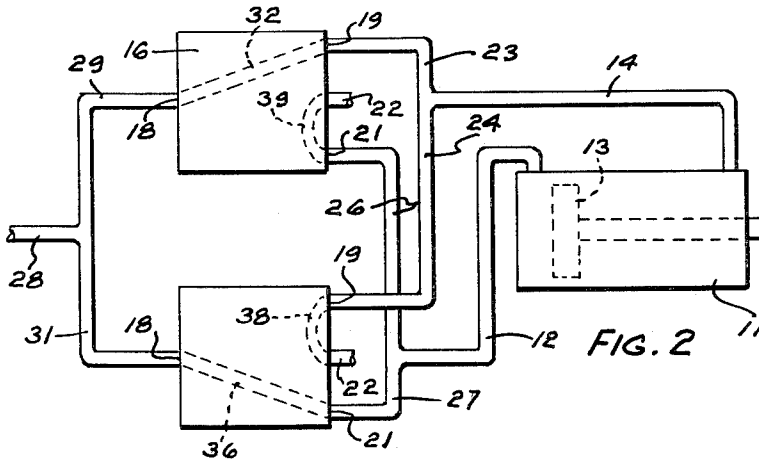
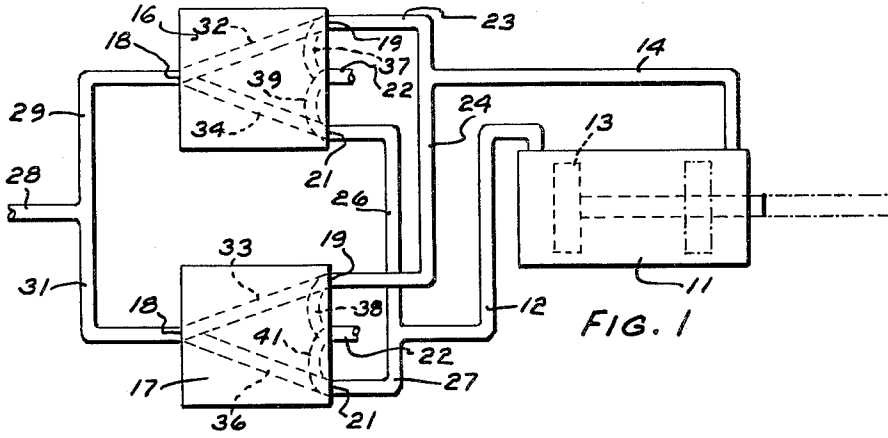
March 13, 1962

E. W. SHALGREN

3,024,768

TWO-HAND PNEUMATIC CONTROL AND SIGNALLING SYSTEM

Filed May 9, 1960



INVENTOR  
E. W. SHALGREN  
BY *Robert C. Camp*  
ATTORNEY

1

3,024,768

TWO-HAND PNEUMATIC CONTROL AND  
SIGNALLING SYSTEMErnest W. Shalgren, Lawrence, Ind., assignor to Western  
Electric Company, Incorporated, New York, N.Y., a  
corporation of New York

Filed May 9, 1960, Ser. No. 27,555

1 Claim. (Cl. 121-38)

This invention relates to a two-hand pneumatic control and signalling system and more particularly to an all-pneumatic control system which produces an audible indication of the improper operation thereof.

Operators of pneumatically controlled punch presses, cutters and other fabricating machines utilize numerous two-hand control devices having various safety features which are designed to minimize the occurrence of injuries. In general, these control devices, when improperly operated, function to preclude the operation of the machinery controlled thereby but fail to provide instrumentalities which yield an indication that such improper operation has occurred.

Accordingly, it is a prime object of this invention to provide a new and improved two-hand pneumatic control and signalling system.

More particularly, it is an object of this invention to provide a two-hand pneumatic control and signalling system which produces an audible warning signal and does not effect the actuation of an external device controlled thereby when improperly operated.

With these and other objects in view, the present invention contemplates a pneumatic control and signalling system, a preferred embodiment of which includes a pair of manually operable valve units that is cooperatively connected by an arrangement of conduit members. Corresponding portions of each of the valve units are connected by the conduit members to an external apparatus which is rendered effective each time the valve units are jointly actuated. If only one of the valves is actuated, the external apparatus will not be rendered operable and an audible warning signal will be produced by the passage of air through the valves as an indication of improper operation.

Other objects and advantages of the present invention will become apparent from the following detailed description of a specific embodiment thereof when considered in conjunction with the accompanying drawing wherein:

FIG. 1 is a diagrammatic representation of a preferred embodiment of a two-hand pneumatic control and signalling system;

FIG. 2 is a diagrammatic representation of the pneumatic control and signalling system illustrated in FIG. 1; and

FIG. 3 is a view illustrating the internal structure of a commercially available control valve unit of the type utilized in the system illustrated in FIGS. 1 and 2.

The two-hand pneumatic control and signalling system shown in FIGS. 1 and 2 is designed to control any external apparatus which is responsive to the application of air or other gaseous substance through a pair of supply lines associated therewith. A piston-cylinder arrangement of the type generally illustrated in FIGS. 1 and 2 is a typical example of such apparatus.

Pneumatic pressure resulting from the application of air to a cylinder 11 through a supply line 12 effects the advance of a piston 13 to the right as viewed in FIG. 1; and during this advance, a supply line 14 acts as an exhaust passageway. In a similar manner, the flow of air to the cylinder 11 through the supply line 14 effects the retraction of the piston 13 with the cylinder while the supply 12 functions as an exhaust passageway. For purposes of illustration, the following description of a preferred em-

2

bodiment of the two-hand pneumatic control and signalling system will be premised on the assumption that the piston 13 is normally positioned to the left in a retracted position; accordingly, the normal or unactuated state of the pneumatic system will be such that air is maintained in the supply line 14.

The pneumatic system includes a pair of manually operable, spring biased four-way valve units 16 and 17. The valve units 16 and 17 (FIG. 3) utilized in the illustrated embodiment are of a commercially available type produced by the Ross Operating Valve Company and each is provided with an inlet port 18, a pair of cylinder ports 19 and 21, and an exhaust port 22. Corresponding cylinder ports 19-19 of each of the valve units 16 and 17 are connected by conduit members 23 and 24 to the supply line 14. Similarly, corresponding cylinder ports 21-21 are connected by conduit members 26 and 27 to the supply line 12. Air or similar gaseous substance is supplied from a source thereof to the inlet ports 18-18 of the valve units 16 and 17 through a supply conduit 28 and conduit members 29 and 31, respectively.

As illustrated in FIG. 1, when the valves 16 and 17 are in a normal or unactuated position, air from the supply conduit 28 flows through a pair of parallel paths to the supply line 14 of the piston-cylinder arrangement 10. The first of these paths includes the conduit member 29; the inlet port 18, a passageway 32 and the cylinder port 19 of the valve unit 16; and the conduit member 23. The second path for the flow of air to the supply line 14 includes the conduit member 31; the inlet port 18, a passageway 33 and the cylinder port 19 of the valve unit 17; and a conduit member 24.

If it is desired to advance the piston 13 within the cylinder 11 to perform an external function, an operator jointly actuates the valve units 16 and 17. When the valve units 16 and 17 are actuated, the passageways 32 and 33 through the valve units 16 and 17 are blocked; and a pair of passageways 34 and 36 are provided to direct the flow of air to the supply line 12 through the conduit members 26 and 27.

When the air flow is directed to the supply line 12, the advance of the piston 13 with the cylinder 11 is initiated. Air to the right of the cylinder is exhausted through the supply line 14, the conduit members 23 and 24, and a pair of exhaust passageways 37 and 38 provided by the valve units 16 and 17. The exhaust passageways 37 and 38 lead directly from the cylinder ports 19-19 to the exhaust ports 22-22 when the valve units 16 and 17 are in an actuated position.

As will be hereinafter described, the flow of air through the exhaust ports 22-22 will, under certain circumstances, result in the production of an audible warning signal. Inasmuch as the joint actuation of the valve units 16 and 17 merely results in the cylinder 11 being exhausted of the air previously maintained therein, and since no direct path for the flow of air from an inlet port to the exhaust port is provided, substantially no audible signal is produced when the cylinder is exhausted by movement of the piston therein.

When the function performed by the advance of the piston 13 within the cylinder 11 has been completed, the valve units 16 and 17 may be released by an operator to return by spring action to normal or unactuated positions. In a manner analogous to that previously described, air to the left of the piston 13 is exhausted through the supply line 12, the conduits 26 and 27 and a pair of exhaust passageways 39 and 41 that lead directly to the exhaust ports 22-22 when the valve units resume a normal position.

FIG. 3 illustrates the internal structural features of a four-way valve unit of the type utilized in a preferred embodiment of the invention. Although a pair of four-way

valve units is nominally utilized in the illustrated embodiment, the system need not be limited to include four-way valve units. A plurality of simple and/or three-way valve units could readily be combined to perform substantially the same functions. The four-way valve unit shown in FIG. 3 is essentially a compact combination of what may be regarded as two three-way valve units or four simple valve units.

The valve unit illustrated in FIG. 3 will be assumed to represent the control valve unit 16 which is identical to the valve unit 17. As shown in FIG. 3, the valve unit includes a plurality of normally closed, spring biased valves which are positioned by a valve handle (not shown). The valves function to establish passageways through the valve units for air supplied to the inlet port 18.

The valve unit 16 is provided with a pair of chambers 42 and 43, each of which has positioned therein one of the aforementioned valves. The chamber 42 is located at the inlet to the passageway 32 while the chamber 43 is located at the opposite extremity of the passageway adjacent the inlet to the exhaust passageway 37. A valve 44a, which is positioned within the chamber 42 and which is opened when the valve unit 16 is in a normal position, allows air to pass from the inlet port 18 through the passageway 32 and to the cylinder port 19 through the chamber 43. A valve 44b, which is positioned within the chamber 43 and which is closed when the valve unit is in a normal position, blocks the exhaust passageway 37 so that air flowing from the inlet port does not pass to the exhaust port 22. However, an exhaust passageway is provided when the valve unit 16 is in a normal position. The exhaust passageway 39 links the exhaust port 22 to the cylinder port 21 through a chamber 45 which has positioned therein an open valve 46a.

When an operator actuates the valve control handle (not shown), the spring biased valves 44a, 44b, 46a and a fourth valve 46b, which was previously closed, are repositioned within the chambers so that the flow of air from the inlet port 18 is thereafter directed to the cylinder port 21. The passageway 34 provided by the actuated valve unit 16 is linked to the inlet port by a chamber 47 wherein the now opened valve 46b is positioned. The chamber 45 which is arranged at the opposite extremity of the passageway 34, links the passageway to the cylinder port 21. The valve 46a, which has been closed by the actuation of the valve control handle, precludes air from flowing through the exhaust passageway 39 to the exhaust port 22. The simultaneous opening of the valve 44b allows exhaust air to flow from the cylinder port 19 through the chamber 43 and the exhaust port 37 to the exhaust port 22.

As previously set forth, it is desired that the system produce an audible warning signal if only one of the valve units is actuated. The manner in which the illustrated embodiment accomplishes this result will best be understood by reference to FIG. 2. If an operator should, for example, tie the operating handle (not shown) of the valve unit 17 in an actuated position, the passageway 36 is provided through the valve unit 17 while the passageway 32 through the valve unit 16 is maintained. Accordingly, air supplied by the conduit members 29 and 31 to the inlet ports 18—18 of the valve units 16 and 17, respectively, will flow to the cylinder port 19 of the valve unit 16 and the cylinder port 21 of the valve unit 17.

Air flowing through the cylinder port 19 is directed to the conduit member 23, the supply line 14 and the conduit member 24. Similarly, air flowing to the conduit member 27 through the cylinder port 21 will be directed to the supply line 12 and the conduit member 26. Due to the application of substantially equal force to opposite sides of the piston 13 resulting from the supply lines 12

and 14, no movement of the piston within the cylinder 11 occurs. Moreover, air directed to the conduit members 24 and 26 simultaneously flows directly to the exhaust ports 22—22 of the valve units 16 and 17 through the exhaust passageways 41 and 33, respectively. Since the air flow exhausted at the ports 22—22 is, in effect, supplied directly from the supply line 23, the magnitude thereof is sufficient to produce the desired audible warning signal whereby an inspector is immediately apprised of the improper operation of the valves. If desired a whistle, siren or other air-operated noise maker may be applied to the exhaust ports 22—22. However, such a device should be of such character as to require a large flow of air for operation, since it may otherwise produce a signal each time the system is operated. It has been found that a suitable audible signal is obtained simply by the flow of high pressure air through the exhaust ports of the valves, whereas the normal ejection of air resulting from proper operation of the system produces no significant sound.

It is apparent that the four-way valve units, when connected by the conduit members as previously described, produce an audible signal if only one valve unit is actuated. Moreover, it is desirable that the valves be actuated substantially simultaneously; accordingly, if an operator actuates the valve units in succession or ties one valve unit in an actuated position, an audible warning signal will be produced by the direct passage of air from a cylinder port in each of the valve units to the exhaust port in the other.

The foregoing description is illustrative of but one sequence of operation of the two-hand pneumatic control and signalling system. Inasmuch as the control valve units are of the commercially available type, it is conceivable that other valve units or combinations thereof could be substituted therefor without departing from the spirit of the invention.

Accordingly, it is to be understood that the above-described arrangements are simply illustrative of the application of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

A two-hand pneumatic control and signalling system for controlling the flow of air to and from a piston and cylinder mechanism which has ports leading to opposite faces of the piston, said system including two sets of valve means each arranged to connect an air inlet port alternately to either of two cylinder ports and to connect an exhaust port to the other of said cylinder ports, first conduit means connected to one port of said mechanism and to one cylinder port of each of said valve means, and second conduit means connected to the other port of said mechanism and to the other cylinder port of each of said valve means, whereby said valve means may be arranged in first positions to connect said air inlet port to one of said conduit means and said exhaust port to the other of said conduit means and may be arranged in second positions to connect said exhaust port to said one conduit means and said air inlet to said other conduit means, and whereby arrangement of either of said valve means in said first position and the other of said valve means in said second position connects said air inlet through both of said valve means directly to said exhaust port.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

1,912,861	Sauerbrey	June 6, 1933
2,028,379	Davis	Jan. 21, 1936
2,906,246	DiTirro et al.	Sept. 29, 1959