

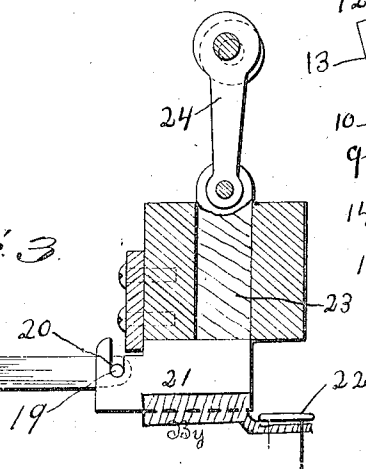
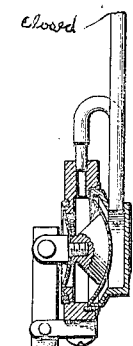
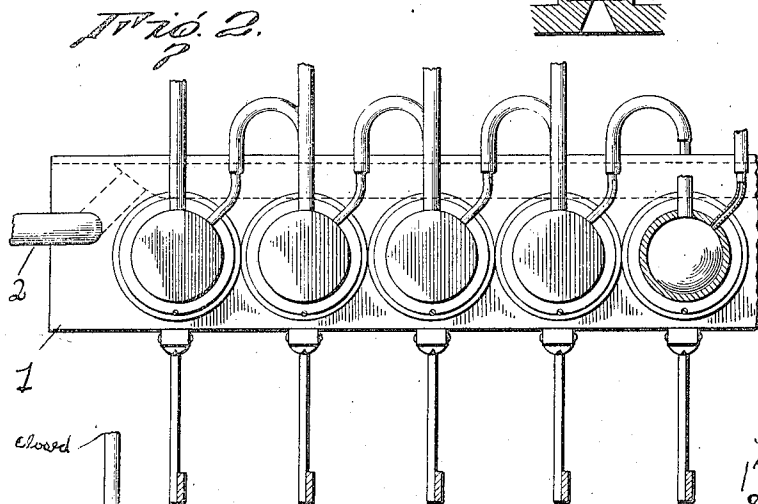
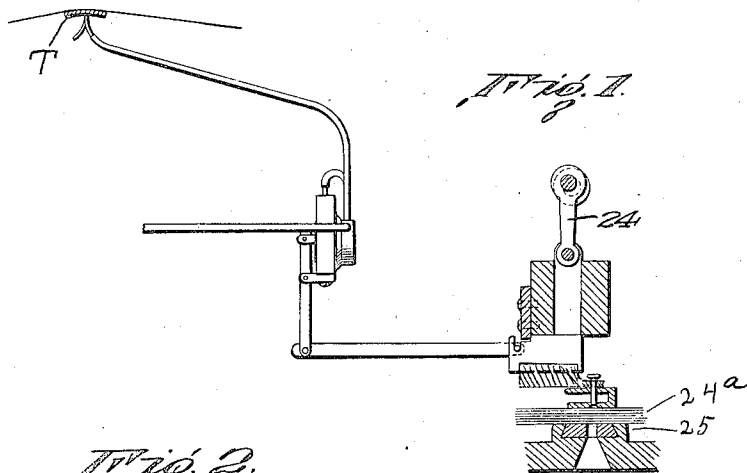
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PNEUMATIC CONTROL

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PNEUMATIC CONTROL.

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To all whom it may concern:

Be it known that I, HARRY M. SALYER, a citizen of the United States, and a resident of Bloomfield, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Pneumatic Controls, of which the following is a full, clear, and exact description, whereby any one skilled in the art may make and use the same.

The invention relates to an apparatus which will become active under varying fluid pressures for the purpose of translating energy thus developed thru suitable mechanical connections for operating any desired mechanism.

The object of the invention is to provide an apparatus which will be capable of automatic control and thereby translate movements induced by varying fluid pressures to any given apparatus.

More particularly, the object is to provide an extremely responsive, positive and quick acting pneumatic device, the control of which depends upon the rapid unbalancing of the pressures in opposite sides of the diaphragm.

The apparatus is illustrated herein, in conjunction with a music sheet perforating machine wherein its application is well illustrated. In such machines it is necessary to have an extremely rapid and responsive co-ordination between the tracker board of the master roll and the punching mechanism for perforating the music sheets.

By illustrating the mechanism in conjunction with such an apparatus its extreme simplicity, certainty, and rapidity of action would be obvious. It is to be understood, however, that the apparatus and the invention is not limited in its field of application to music perforating machines.

One of the special features of the apparatus, as will be hereinafter explained, is the individual unit construction of pneumatics all actuated from a main suction chest and controlled by "venting" without necessitating a closure of the connections from the diaphragm chamber to the main suction chest. This is all accomplished by differential sizes in two diaphragms both forming walls of the suction chest and with constant suction imposed upon both diaphragms from the suction chest side.

The main or actuating diaphragm is always in equilibrium with a constant suction

on opposite sides thereof, except when one side is open to atmospheric pressure. It will then be displaced through connections intermediate it and the opposed diaphragm by atmospheric pressure, it being larger in area than the opposing diaphragm which is always under atmospheric pressure on one side and normally under the same suction pressure.

Referring to the drawings:—

Fig. 1, is a diagrammatic view illustrating the elemental connections between the tracker board and punchers of a sheet perforating machine.

Fig. 2, is a fragmentary detail showing in elevation a series of pneumatic controllers looking from the right of Fig. 1.

Fig. 3, is a sectional view through one of the controllers of Fig. 2 illustrating the connections therefrom to the punch slides, and the provision of the controller parts with a tracker connection closed.

Fig. 4, is an enlarged sectional view of the pneumatic controller showing the parts in position with the tracker connection open.

I am aware that it is known in the art to provide two diaphragms of different areas, each having one side open to atmospheric pressure and with the opposite sides connected with a closed suction chest with provision for "venting" one of the diaphragms to cause an overbalancing of the system.

The invention herein defined involves the use of two diaphragms in parallel planes, both diaphragms freely connected with the main suction on the adjacent faces and one of said diaphragms normally connected at its opposite side with the main suction chest and periodically connected with the atmosphere. To effect the proper results there is a comparatively small connection or bleed from the main suction chest to the outside of the larger diaphragm and a comparatively large atmospheric vent for said chamber controlled from a tracker board or the like.

In the accompanying drawings a form of the invention is illustrated in conjunction with perforating punchers the numeral 1, denotes a suction chest suitably connected through a conduit 2, with a suction apparatus not specifically illustrated in the drawings. This suction chest has a series of openings 3, preferably of circular form into which fit cylindrical covers 4, forming diaphragm chambers 5.

These covers are held in place by any suitable means as for instance, by screws 6, and the joint is sealed by diaphragm 7, which extends about an annular shoulder 8^A, against which the cap or casing 4, is pressed.

Opposed to the opening 3, of the suction chamber 1^A there is a smaller diaphragm member 8, suitably held in place as by a ring 9, forcing the diaphragm into an annular groove 10. The center of the diaphragm has a contact piece 11, clamped to it by a bifurcated stud 12, to which is pivoted as at 13, a lever 14. The lever in turn is pivoted as at 15, to a bracket 16.

The outer end of the lever 14, is pivoted as at 17, to a punch slide rod 18, which through a pivot and socket 19, 20, is connected with the punch slide 21. These punch slides (there being one for each pneumatic actuator) are suitably supported and guided to be moved longitudinally into an outer contacting position over the punchers 22, so that a punch head 23, reciprocated by an eccentric connecting rod 24, will drive the punchers 22, through the sheets 24^A, overlying the guide 25.

The contact piece 11, bears upon the diaphragm 7, and the diaphragm chamber 5, is connected through a comparatively large duct 5^A, with a tracker board T. The diaphragm chamber, 5, is also connected through a comparatively small duct 5^B, with the main suction chamber 1^A.

This connection 5^B, provides for a constant suction on both sides of the diaphragm 7, so that the diaphragm is normally in equilibrium and although of a larger area than the opposing diaphragm 8, will be displaced by the atmospheric pressure upon the diaphragm 8, as illustrated in Fig. 3. This is due to the bleed connection 5^B which equalizes the pressure on opposite sides of the diaphragm 7, so that both sides of the diaphragm are subject to the same pressure as that represented by the suction in the main suction chest 1^A.

As soon as the comparatively large duct 5^A, is opened to atmosphere the diaphragm 7, of comparatively larger area than the diaphragm 8, it instantly moves inward under the suction of the chest 1^A, moving the contact piece 11, and forces the lever together with the diaphragm 8, into the position illustrated in Fig. 4.

It will be obvious that there be an instantaneous reaction of the diaphragm 7, whenever the duct 5^A, is open to atmosphere and will likewise be substantially an instantaneous reaction of the diaphragm 7, the instant the duct 5^A, is closed.

I have found in practice that this pneumatic system is much more reliable and quicker in its reactions than an electromagnet which I have employed hereinbefore

in music perforating apparatus. It is far less liable to derangement than an electrical apparatus and will give comparatively longer movements with greater certainty of action and increased power for any given leverage.

It will be apparent that there is no valve connection necessary for controlling the pneumatic other than the opening and closing of the atmospheric ducts 5^A, and therefore no loss of air such as occurs in the ordinary pneumatic devices due to changing from suction to atmosphere.

The valve chest and the pneumatic chambers are in closed circuit always under constant sub-atmospheric pressure except as the diaphragm chambers 5, are vented through the ducts 5^A. Obviously the volume of exhaust and intensity of the suction of the single suction chest may be such that the slight induction of atmospheric air through the comparatively small bleed ducts 5^B, will have no appreciable effect upon the operation of the diaphragms where one or many of them are in operation at the same time.

Attention is particularly called to the novel condition under which the suction bleed connection and atmospheric connection 5^B, 5^A, affect only the diaphragm 7, and in no way interferes with the full value of atmospheric pressure upon the diaphragm 8. The said diaphragm being always under atmospheric pressure at one side and always under full suction at the opposite side.

This system, as above defined, must not be confused with those systems using differential sized diaphragms both of which are constantly open to atmospheric pressure at one side and rely upon an overbalancing through the difference in degree of suction upon the diaphragms from the opposite sides. It will be at once apparent that the pneumatic controls, hereinbefore described, are applicable to many types of apparatus such, for instance, as weaving and embroidering machines and in fact, any machines wherein a selective operation of various units is desired and may be controlled from a comparatively remote "manual" tracker board or smaller controlling apparatus.

For instance, I have employed this same type of pneumatic control in conjunction with a manual for automatically changing master sheets to be used as masters in the production of perforated music roll sheets.

What I claim as my invention and desire to secure by Letters Patent is:

1. A pneumatic control comprising a suction chest, two oppositely disposed diaphragms, one of said diaphragms of greater area than the other, a casing forming a diaphragm chamber enclosing the larger dia-

phragm, a duct communicating with the diaphragm chamber and the suction chamber and an atmospheric duct for modifying the action of the suction duct.

5 2. A pneumatic control comprising a suction chest, axially aligned perforations extending to opposite walls of the suction chest and of different areas, a diaphragm closing each of said perforations, a diaphragm chamber exterior to the suction chest and closing the larger of said diaphragms, a comparatively small bleed connection from the diaphragm chest to the suction chest and a comparatively large atmospheric duct connected with the diaphragm chamber, means for controlling the atmospheric duct and a lever for translating the movements of the diaphragm.

3. A pneumatic control for music punching machines comprising a suction chamber, oppositely disposed diaphragms of different areas, the larger of said diaphragms being enclosed by a diaphragm chamber, a comparatively small bleed connection from the diaphragm chamber to the suction chamber, an atmospheric connection for the diaphragm chamber, a tracker controlling said connection, a lever reciprocated by the movements of the two diaphragms, a punch slide connected with said lever, a reciprocating punch head and punchers moved by the punch slide and reciprocating head.

4. A pneumatic control for music punching machines comprising a suction chest, a plurality of diaphragm chambers, diaphragms in each of said chambers, a diaphragm oppositely disposed to the diaphragm chamber and subject to the suction of the suction chest of one side and open to atmospheric pressure of the opposite side, a lever connection at the outer side of said

diaphragm and contact piece extending from the inner side of the diaphragm to the opposed diaphragm which is of larger area, comparatively small bleed ducts communicating between each of the diaphragm chambers and suction chamber and comparatively large atmospheric ducts communicating between each of the diaphragm chambers and a tracker board.

5. A pneumatic control comprising a suction chest, two oppositely disposed diaphragms, one of said diaphragms having a greater area than the other, the larger of said diaphragms arranged in a chamber, a duct communicating with said chamber and the suction chamber and an atmospheric duct for modifying the action of the suction duct.

6. A pneumatic control comprising a suction chest, two oppositely disposed diaphragms, one having a greater area than the other, a suction duct for causing movement of both diaphragms in one direction and an atmospheric duct for breaking the suction at one side of the larger diaphragm, whereby both diaphragms are moved in the opposite direction.

7. A pneumatic control comprising a suction chest, two oppositely disposed diaphragms, one having a greater area than the other, the smaller diaphragm being constantly subject to atmospheric pressure and the larger diaphragm being normally subject on both sides, to sub-atmospheric pressure and an atmospheric duct for breaking the sub-atmospheric pressure on one side of the diaphragm.

HARRY M. SALYER.

Witnesses:

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M. JOSEPHINE CROWELL.