

S. G. BOWMAN

PIPE ORGAN VALVE

FIG. 1.

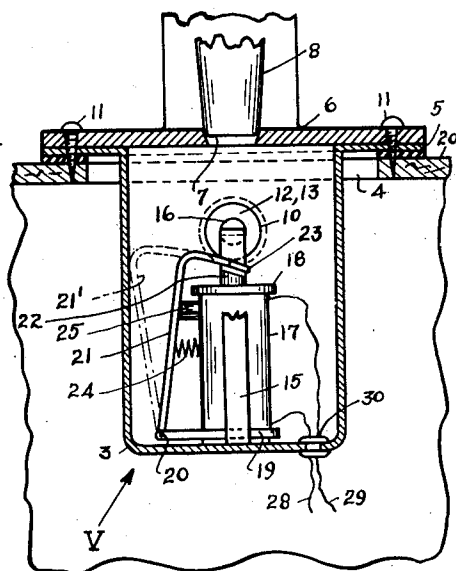


FIG. 2.

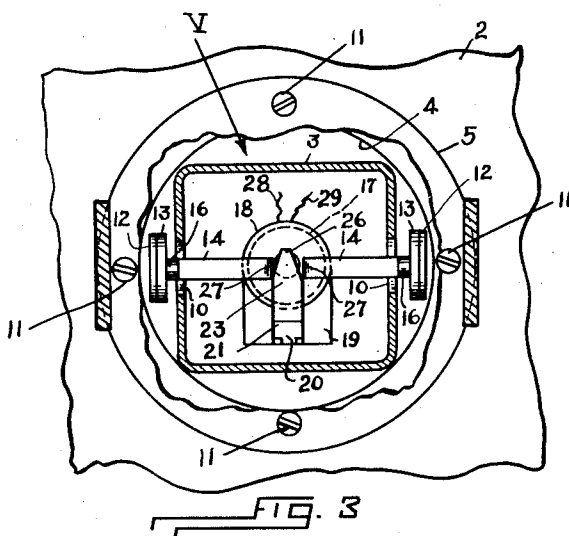
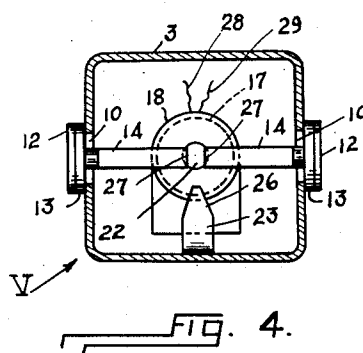


FIG. 4.

INVENTOR.

Samuel G. Bowman

BY

BY
Christy, Parmelee and Strickland
his attorneys

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PIPE ORGAN VALVE

Samuel G. Bowman, Mount Lebanon Township, Allegheny County, Pa., assignor of one-half each to Anna H. Bowman, Mount Lebanon Township, Allegheny County, and James M. Guthrie, Crafton, Pa.

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5 Claims. (Cl. 84—337)

My invention relates to pipe organs, and consists in certain new and useful improvements in the valves and actuating devices that control the flow of air to the organ pipes.

It will be understood that the usual pneumatic pipe organ has an air chest, in which a supply of air is maintained under superatmospheric pressure. Air flow from the chest to the several pipes of the organ is controlled by valves. In accordance with age-old practice a single valve is usually employed to control the pneumatic flow from the air chest to each pipe of the organ, and, in the case of the organs built in more recent years, the valves are severally actuated by means of the movable armatures of electro-magnetic actuators. The energizing electrical circuits of such actuators are severally controlled by the keys and stops of the organ manual, whereby the pressing of a key of the manual effects the closing of an electrical circuit to the actuator of the pipe corresponding to the particular key, with the effect that the air valve of such pipe opens, and air flows from the chest to the pipe.

The common practice in the past has been to mount the air valves on the inside of the wall of the air chest and through holes formed in such wall of the chest to establish communication severally with the air-receiving ends of the organ pipes mounted externally of the chest. The air valves mounted on the inside of the wall control the flow of air from within the chest to the pipes. It is a difficult and laborious task properly to mount and secure the air valves on the inside of the wall of an air chest, and an object of my invention is to provide an air valve structure that may be simply inserted through a hole in the wall of an air chest, and secured in mounted position within the chest by means that are readily accessible externally of the chest.

A further object of my present invention is to provide a valve and electrical actuator unit that is more quickly and sensitively responsive to a key-controlled electric circuit, a unit that affords a more instantaneously complete air flow, a unit that is more powerfully responsive to an energizing current of given magnitude.

As distinguished from prior practice, my invention consists in the provision of a plurality of valves—in this case two valves—for controlling air flow to each organ pipe, and in a particularly effective organization of a single electro-magnetic device for simultaneously actuating the two valves with greater mechanical advantage than has hitherto been realized.

An exemplary embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a view partly in side elevation and partly in vertical section, showing an air chest and an organ pipe fragmentarily, and illustrating a structural organization of my invention in operative assembly therewith;

Fig. 2 is a sectional view of the assembly, as seen on the plane II—II of Fig. 1, with certain parts shown fragmentarily and in side elevation;

Fig. 3 is a view of the assembly, as seen generally on

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the plane III—III of Fig. 1, but with a portion of the structure medially broken away to show the valve structure per se in cross section on the plane IV—IV of Fig. 1, the two air-valves of the structure appearing in open position; and

Fig. 4 is a sectional view of the valve structure alone, as seen on the plane IV—IV of Fig. 1, and showing the air-valves in closed position.

Referring to the drawings, the reference numeral 2 is applied to the fragmentarily indicated air chest of a pipe organ with which chest each pipe of a bank of pipes of the organ derives its pipe-vibrating stream of air. While all or some of the pipes of the organ may be located remotely from the air chest and connected thereto by valve-controlled air passages, in the present case I illustrate a preferred construction, in which the organ pipes or most of them, are mounted in intimate association with the chest.

More particularly, for each of the pipes referred to, a valve unit V is provided, comprising a hollow or tubular valve housing or well 3, formed of molded plastic or of metal, and fashioned either in circular or in rectangular cross section. The valve unit is mounted to project into the air chest 2. An orifice 4 is provided in the wall 2a of the chest, and the wall of the well 3 is provided with a peripheral flange 5 that is hermetically gasketed and secured to the chest wall. The otherwise open end of the well 3 is hermetically closed by a disk or cover plate 6, having an orifice 7 in which the air-receiving end of an organ pipe 8 is seated and secured, as by means of a pipe support, such a support, for example, as is shown in my copending United States patent application, Serial No. 428,451, filed May 10, 1954. Screws 11 may be employed to hold the cover plate 6 and well 3 in assembly with the wall of the air chest 2.

A feature of my improved valve unit V is found in the simplicity of the operations required to install it. The hole 4 is readily drilled or cut in the top wall 2a of the air chest, and the valve is dropped through the hole and quickly secured in service position by the screws 11.

Communication between the interior of the air chest 2 and the pipe 8 is afforded by means of two axially aligned orifices or passages 10, located in opposite wall portions of the well, as shown, and such communication through each orifice is controlled by means of a valve 12, faced with a sealing disk 13 of kid or leather, or other suitable material. Each valve carries a boss 16, by means of which the valve is soldered, or brazed, or otherwise secured to the end of an arm 14. The arms 14 that carry the valves 12 comprise the outspread terminals of the two legs of an U-shaped leaf spring 15. The U-shaped spring is so formed and stressed that the valves 12 are by spring tension normally held in closed positions upon the orifices 10, blanking air flow between the air chest 2 and the pipe 8. As shown, the valves 12 are arranged on the outside of the tubular body or well 3, whereby the said superatmospheric pressure of the air in the chest 2 also acts normally to hold the valves in closed or sealed positions upon their orifices 10.

An electro-magnet 17 is mounted between the legs of the U-shaped leaf spring, and the assembled electro-magnet and spring are secured to the bottom of the well 3. Through a head plate 18 of the electro-magnet an iron core 22 projects upwardly for the attraction of a movable armature 21, which is pivoted at its lower end, as at 20, to the base plate 19 of the said electro-magnet. The armature 21 includes a head 23 that extends angularly from the lever-like body of the armature 21, where it is accessible to the attraction of the core 22, when the magnet is energized. Under the urging of a helical spring 24, biased between the side of the body of electro-magnet 17 and the armature 21, the armature normally occupies

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the position shown in dotted lines 21' in Fig. 2, bearing against the side wall of the well 3. The electrical terminals of the magnet coil are connected to conductor wires 28 and 29, which extend through a seal 30 in the wall of the well 3, and thence to the electric contacts of an associate organ key or stop and a source of electric power, whereby, when the key or stop is manipulated, an electric circuit is closed and the electro-magnet 17 is energized.

Such energizing of the electro-magnet 17 attracts the head 23 of the armature and moves the armature against the restraint of spring 24 in a direction that extends between the two legs of the spring 15. The head 23 of the armature includes a cam portion 26, wedge shaped in this case, which enters spreading engagement with inturned portions 27 of the legs (Fig. 3) and effects the powerful separating movement of the upper or distal ends of the legs, with the result that the arms 14 move apart and unseat the valves 12 from the orifices 10. Air in complete volume instantaneously flows from the chest 2 into the well 3, and thence in a pipe-sounding stream through the orifice 7 into the pipe 8.

When the key or stop is released or restored to normal position, the electro-magnet is instantaneously de-energized, and the spring 24 "snaps" the armature 21 back into its normal position, allowing the valves 12, under the inherent resilience of the spring legs 15, quickly to reseat themselves on the orifices 10 (Fig. 4), and blank air flow to the pipe 8.

In order that the rapid movement of the armature 21 under the attraction of the energized magnet will not be too violent and will not drive the cam portion too far between the leg portions 27, a cushion stop 25 is provided on the side of the magnet coil, as appears in Figs. 1 and 2.

An effective and improved structure of the nature indicated in the introduction to this specification is obtained, and it will be understood that various modifications and variations may be made without departing from the spirit of the invention defined in the appended claims.

My application for these Letters Patent comprised a continuation-in-part of my application Serial No. 428,452, filed May 10, 1954, now abandoned.

I claim:

1. For use with a pipe organ having an air chest provided with a wall that includes an orifice and an organ pipe having an inlet end mounted to receive air under superatmospheric pressure from said chest by way of said orifice; a valve unit for assembly with said orifice for controlling the flow of air from said chest to the inlet of the organ pipe, said valve unit having a tubular body including a passage for the flow of air from the interior of the body to the inlet of said organ pipe and including two valve-orifices for the flow of air from said chest into the said interior of the body, a valve for each valve-orifice arranged to move inwardly of the tubular body into normally seated position upon its associate orifice, said tubular body including means for opening the valves of said two valve-orifices comprising two arms outwardly directed from the ends of two movable legs which are stressed to hold said valves seated upon their orifices, an electro-magnet mounted on the body of said valve unit, an armature mounted on the latter body for movement relatively to said electro-magnet, and a cam portion carried by said armature and movable therewith, when said electro-magnet is energized, into engagement with said legs for spreading the legs and shifting said arms to move said valves outwardly from seated positions upon said orifices.

2. For use with a pipe organ having an air chest provided with a wall that includes an orifice and an organ pipe having an inlet end mounted to receive air under superatmospheric pressure from said chest by way of said orifice; a valve unit for assembly with said orifice for controlling the flow of air from said chest to the inlet of the organ pipe, said valve unit having a tubular body including a passage for the flow of air from the interior of the body to the inlet of said organ pipe and including

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two valve-orifices for the flow of air from said chest into the said interior of the body, a valve for each valve-orifice arranged to move inwardly of the tubular body into normally seated position upon its associate orifice, said tubular body including means for opening the valves of said two valve-orifices comprising two arms outwardly directed from the ends of two movable legs which are stressed to hold said valves seated upon their orifices, an electro-magnet mounted on the body of said valve unit, an armature mounted on the latter body for movement relatively to said electro-magnet, a spring mounted to urge said armature into a retracted position, and a cam portion carried by said armature and movable therewith, when said electro-magnet is energized, into engagement with said legs for spreading the legs and shifting said arms to move said valves outwardly from seated positions upon said orifices.

3. For use with a pipe organ having an air chest provided with a wall that includes an orifice and an organ pipe having an inlet end mounted to receive air under superatmospheric pressure from said chest by way of said orifice; a valve unit for assembly with said orifice for controlling the flow of air from said chest to the inlet of the organ pipe, said valve unit having a tubular body including a passage for the flow of air from the interior of the body to the inlet of said organ pipe and including two valve-orifices for the flow of air from said chest into the said interior of the body, a valve for each valve-orifice arranged to move inwardly of the tubular body into normally seated position upon its associated orifice, said tubular body including means for opening the valves of said two valve-orifices comprising two arms outwardly directed from the ends of two movable legs which are stressed to hold said valves seated upon their orifices, an electro-magnet mounted between said legs in the body of the valve unit, an armature mounted on the body for movement laterally of the plane of said legs, and a cam portion carried by said armature and movable therewith, when said electro-magnet is energized, into engagement with said legs for spreading the legs and shifting said arms to move said valves outwardly from seated positions upon said orifices.

4. In combination with a chest containing air under super-atmospheric pressure for the operation of a pipe organ, said air chest having a wall including an orifice, a valve unit having a tubular body extended inwardly through said orifice, means accessible externally of the chest for securing the tubular body in such assembly, a perforate disk seated externally upon said tubular body, an organ pipe mounted to receive air flowing from the interior of said tubular body of the valve unit, the tubular body of said valve unit having a wall portion in said air chest that includes two valve-orifices for the flow of air from the chest into the interior of said tubular body, a valve for each valve-orifice arranged to move inwardly of the tubular body into normally seated position upon its associate orifice, said tubular body including means for opening the valves of said two valve-orifices comprising two arms outwardly directed from the ends of two movable legs which are stressed to hold said valves seated upon their orifices, an electro-magnet mounted on the body of said valve unit, an armature mounted on the latter body for movement relatively to said electro-magnet, and a cam portion carried by said armature and movable therewith, when said electro-magnet is energized, into engagement with said legs for spreading the legs and shifting said arms to move said valves outwardly from seated positions upon said orifices.

5. For use with a pipe organ that comprises an air chest having a wall that includes an orifice and an organ pipe having an inlet end mounted to receive air under superatmospheric pressure from said chest by way of said orifice; a valve unit for assembly with said orifice for controlling the flow of air from said chest to the inlet of the organ pipe, said valve unit having a tubular

body which, when the unit is assembled in said orifice, forms a well in said chest, the wall of said well including two oppositely located orifices for the flow of air from the chest into the well, two valves normally seated externally of the well in closed position upon said valve orifices severally, a resilient leg for each valve mounted within the well and having leg portions extending outwardly through said orifices severally for supporting said valves, and magnetic means having a device mounted within the well for engaging and effecting the outward movement of said leg portions simultaneously through the orifices to shift said valves from seated positions.

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