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2,577,580

ORGAN VALVE

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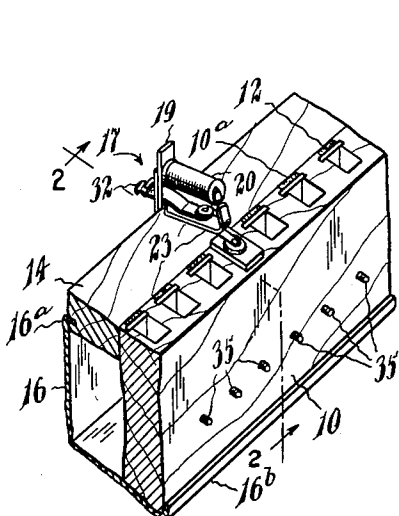


FIG. 1.

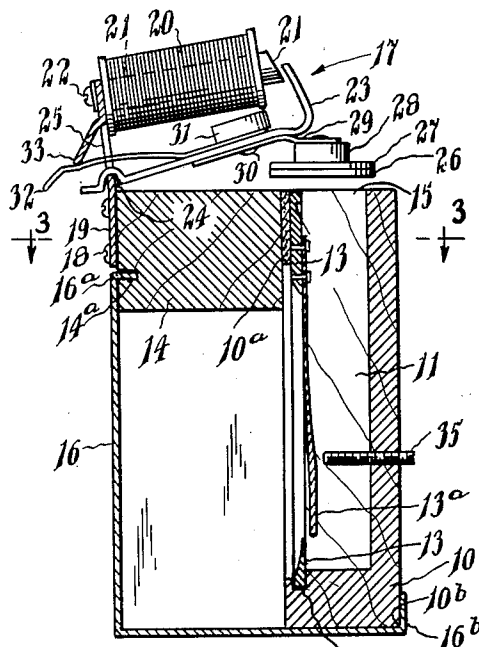


FIG. 2.

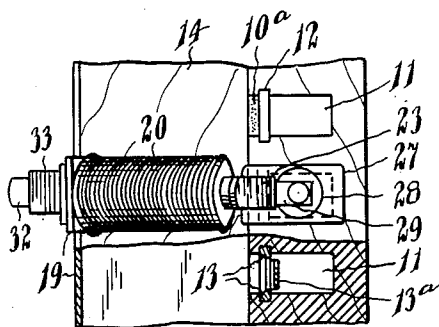


FIG. 4.

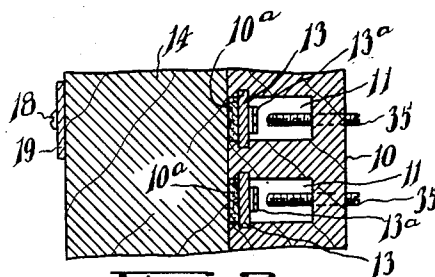


FIG. 3.

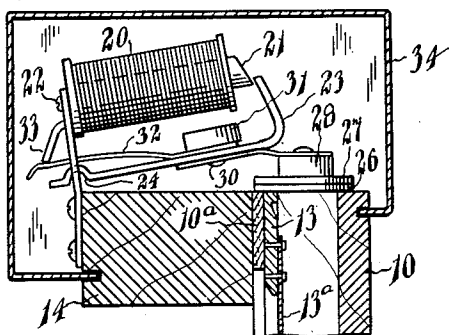


FIG. 5.

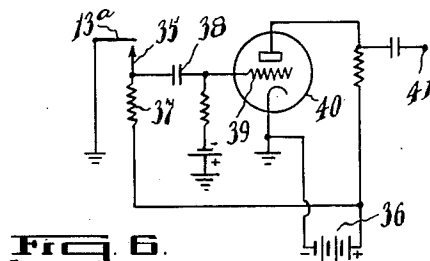


FIG. 6.

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ORGAN VALVE

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6 Claims. (Cl. 84—337)

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This invention relates to electric organs, and more particularly to electrically operated reed organs wherein an improved valve mechanism is incorporated.

An object of this invention is to provide an electrically operated valve that will permit ready access to the reed for inspection, repair or renewal.

A further object of this invention is to provide a device for smoothly controlling the flow of air through organ reeds both at the initiation and cessation of said flow. It is necessary to provide rapid closing of organ valves for rapid keying. This frequently results in an undesirable acoustical effect commonly known as a "thud." In the present invention this effect is reduced to insignificance by the provision of spring means which normally tends to urge the valve into an open position so that as the valve closes the spring tension increases to thereby cushion the closing of the valve.

The foregoing and other objects and advantages of the invention will become apparent from a study of the following specification, taken in conjunction with the accompanying drawings, wherein like characters of reference indicate corresponding parts throughout the several views and wherein:

Fig. 1 is a perspective view of a portion of a rank constructed in accordance with this invention;

Fig. 2 is a section of a valve on the line 2—2 in Fig. 1;

Fig. 3 is a section on the line 3—3 in Fig. 2;

Fig. 4 is a plan view of the valve actuating mechanism shown in Figs. 1 and 2;

Fig. 5 is a section as in Fig. 2, illustrating an alternative mode of construction; and

Fig. 6 is a schematic diagram illustrating a mode of converting reed vibration into corresponding electrical impulses.

Referring in detail to Figs. 1 to 4 inclusive, a rank which may include as many as 73 or more reeds, is founded upon a base 10 which preferably is of well seasoned hardwood. For each reed which is to be utilized, a channel is cut in one side of the base and opening through the upper end of the base. Each channel provides a reed cell 11. In the opposite side walls of each cell is provided a slot 12 extending substantially from the open upper end of the cell to the lower end of said cell, said slots forming guideways to receive the edges of a reed 13 as shown in Fig. 3.

Metal reeds, of the class used in this invention, are commonly known in the art and need

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not be described in detail. With the arrangement shown, the reed is inserted in the slot so that the tongue 13^a is within the cell. As shown in Figs. 1, 3 and 4, a plurality of these cells are arranged parallel with one another, all having their ends opening into a common ambient at the upper end of base 10. Following the cutting of the cells and slots, a wooden riser strip 14 is glued or otherwise firmly secured to the inner side of base 10, the upper surface of the riser being flush with the upper end of base 10. The space between the outer side of the riser strip 14 and each reed 13 is closed by a strip of felt 16^a. It will therefore be clear from Fig. 2 that a continuous plane surface 15 is produced by the upper end of base 10 and the upper surface strip 14. By this arrangement the openings along the end of base 10 in conjunction with suitable closing means constitute valves for the cells. For this reason surface 15 which is formed by strip 14 and the edge of base 10 is called a valve seat.

It will be observed that the riser strip closes the open side of each cell at its upper end only, opposite the fixed end of tongue 13^a.

In the preferred construction shown in Figs. 1 and 2 a hood 16 of medium gauge steel and having flanges 16^a and 16^b along its two longitudinal sides, engages slot 14^a in riser strip 14 and the remote corner 10^b of member 10 to form an enclosure or suction box for the cells and reeds in the entire rank.

Mounted on riser strip 14 is the valve actuating mechanism designated generally as 17. Screws 18, 18 extend through bracket 19 into riser 14 securing the bracket to the riser. Magnet coil 20 is secured by means of a core 21 to bracket 19 through the medium of screw 22 threaded into core 21. Soft iron armature 23, having a transverse recess 24 on its underside at one end, is pivoted by means of this recess on the lower edge of slot 25 in bracket 19. Felt valve head 26 mounted on backing board 27 is secured through felt shock cushion 28 to a short strip of leaf spring 29 which in turn is secured by rivet 30 to armature 23 at a point remote of the pivot point 24. It will be seen therefore that, when the electro-magnet is energized, armature 23 raises valve head 26 from the valve seat 15 to thereby open the opening to the cell 11. Since the opening action is very rapid, a cushioning shock absorber 31 is provided on armature 23 which coacts with the edge of the coil to prevent overtravel of the armature when the coil is energized.

A second leaf spring 32 is secured intermediately of rivet 30 and recess 24, and is adapted to co-

act with and press against knock-out projection 33 which extends outwardly from bracket 19. It will be seen that pressure by spring 32 against projection 33 is such as to tend to urge the valve into an open position. This spring pressure is very gentle when the valve is in a partially opened position, but increases markedly as the valve approaches a closed position, with the result that valve closure is cushioned so that the common "thud" arising in other organs of this nature is reduced.

It will be seen from Figs. 1, 2 and 4 that the armature may be removed from the entire magnet assembly by raising the transverse recess 24 from the lower edge of slot 25 and then withdrawing the armature from the slot. In this manner the valve head 26 may be removed from over the opening to the cell. Then, if it is desired to inspect, clean, adjust or replace the reed therein, it is merely necessary to withdraw the reed from the cell through the opening which had previously been covered by the valve head.

It should be noted that a complete magnet and valve head assembly such as that described above is used for every reed and cell, and that in Fig. 1 only one such assembly is shown in order to simplify the drawing.

In the preferred construction, shown in Figs. 1 and 2, hood 16 forms an enclosure or suction box within which a partial vacuum is created by means of a suitably arranged air pump. That is to say the atmospheric pressure within hood 16 is reduced to a value considerably below that in the surrounding atmosphere.

When the blower system is not operating, the valve will be partially open due to spring pressure by leaf spring 32, even when magnet coil 20 is unenergized. However, when an inrush of air into the cell takes place due to the creation of a partial vacuum within the hood by the blower system, valve head 26 is drawn down upon seat 15 and thereafter no more air will enter the cell unless and until the magnet coil 20 is energized by the organist. (Fig. 5 illustrates the position of the valve head when the valve is closed.) Spring pressure by leaf spring 32 is itself insufficient to open the valve against the pressure of the surrounding air, although it is sufficient to cushion the valve closing.

In organs in which the valve is arranged at the fluid exit from the cell, the valve closes against the flow of air and "thudding" occurs on valve closing due to the production of a condensation of air. The air condensation strikes the reed tongue and imparts thereto the undesirable transient displacement referred to above as a "thud." In this invention the cushioned closing of the valve takes place in the air inlet to produce a rarefaction which causes negligible transient displacement of the reed tongue and "thudding" is reduced to insignificance.

If the reed 13 were turned over so that tongue 13^a projected upwardly within hood 16 rather than downwardly within cell 11, the reed would operate only if a pressure within hood 16 were maintained greater than atmospheric, but under these circumstances the valve mechanism utilized herein could not be applied since direction of airflow would therefore be the reverse. However, an alternative construction which can be utilized with this invention while still remaining within the scope thereof is illustrated in Fig. 5. Herein, a hood 34, which replaces hood 16 in the preferred construction, is arranged to encompass the valve actuating mechanism, the exit from reeds

13 being left open to atmospheric pressure. With this arrangement, it is therefore possible to use a blower system which creates a pressure within the hood that is higher than atmospheric, rather than, as in the preferred construction, utilizing a fluid flow pumping means which creates a partial vacuum within said hood. The preferred construction disclosed in Figs. 1 and 2 has the constructional advantage that it is possible to service both the reeds and the valve actuating mechanism individually without having to disrupt the operation of the instrument; whereas in the device illustrated in Fig. 5 it would be possible to clean the reeds, but if replacements thereof were desired or if it were necessary to adjust the valve actuating mechanism, the hood 34 would have to be removed, thereby preventing operation of the entire rank.

The actual acoustical sound of the vibrating reeds is not utilized in this invention. Referring to Figs. 1, 2 and 3, a screw 35 preferably of such electrically conductive material as brass, is threaded through the base of each reed cell so as to form a stylus projecting near, but nevertheless spaced from, the free end of reed tongue 13^a. Since stylus and reed tongue are metallic and insulated from each other, they form an electrical capacitor the value of which varies inversely as the separation of the stylus and tongue. Hence vibration of the tongue due to air flow over it causes the electrical capacitance to vary. If a direct current potential is applied between tongue and stylus an alternating current will flow in the circuit since the electrical charge on a capacitor is a function of its capacitance.

In Fig. 6 a typical elementary schematic diagram is shown, by means of which the above-mentioned alternating current flow caused by reed tongue vibration may be utilized. Battery 36 applies a direct current potential through resistor 37 between the stylus 35 and the tongue 13^a. Alternating current variations due to changing capacitance therefore cause an alternating voltage to appear across resistor 37. This voltage is coupled by capacitor 38 to control grid 39 of vacuum amplifier tube 40. (Terminal 41 is the audio output terminal, a voltage appearing between that terminal and ground which voltage has a frequency equal to that of the reed tongue 13^a.) The remainder of the amplifier circuit is of customary design and familiar to anyone skilled in the art and therefore will not be described.

For simplicity only one tongue and stylus is shown, but it will be understood that in practice all styli are connected in parallel, as are the reed tongues.

It is thought that the construction and use of the invention will be apparent from the above description of the various parts and their purpose. It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim as my invention is:

1. The combination of a reed cell through which air is adapted to flow, having an air inlet port and an air outlet opening, a reed mounted in the reed cell for vibration by the air flow, a valve having a head movable to open and close said inlet port, the air flow normally retaining the head in port closing position, spring means tending to urge the valve into an open position against

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the air flow, the pressure of said spring means being insufficient to open the valve against the air flow but sufficient to cushion the valve closing movement, and means for lifting the head from the port to permit air flow through the cell.

2. The combination of a reed cell through which air is adapted to flow, said reed cell having an air inlet port, and an air outlet opening, a reed mounted in the reed cell for vibration by the air flow, a valve head movable to open and close said inlet port, the air flow normally retaining the head in port closing position, an electro-magnet having an armature on which the head is mounted, a spring engaging the armature and tending to urge armature to open the valve against the air flow, the pressure of said spring being insufficient to open the valve against the air flow but sufficient to cushion the valve closing movement, and means to energize the electro-magnet to raise the armature and lift the valve head from the port to permit air flow through the cell.

3. The combination as claimed in claim 2, wherein the magnet is mounted on a frame and the spring comprises a leaf spring having one end secured to the armature and the other being adapted to press against the frame to thereby tend to urge the valve into an open position.

4. The combination as claimed in claim 2, wherein the magnet includes a frame on which the armature is pivoted, and wherein the spring comprises a leaf spring having one end secured to the armature intermediately of the point of pivot and the point of connection of the valve head, a projection on the frame on the opposite side of

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the fulcrum from said point of connection, the spring being adapted to press against the projection to thereby tend to urge the valve into an open position.

5. Means for actuating an organ valve having a seat and a head adapted to rest on the seat, comprising an electro-magnet having an armature on which the valve head is mounted, a frame for supporting the electro-magnet, straight edge on which the armature is pivoted, and a spring removably retaining the armature in pivotal engagement with the straight edge.

6. Means for actuating an organ valve having a seat and a head adapted to rest on the seat, comprising an electro-magnet having an armature on which the valve head is mounted, a frame for supporting the electro-magnet, a straight edge on which the armature is pivoted, and a leaf spring secured at one end to the armature and having its other end in engagement under compression with the frame to apply downward spring pressure to removably retain the armature in pivotal engagement with the straight edge.

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