May 8, 1934. W. B. GRATIAN 1,957,585

ORGAN VALVE

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Fig. 1.

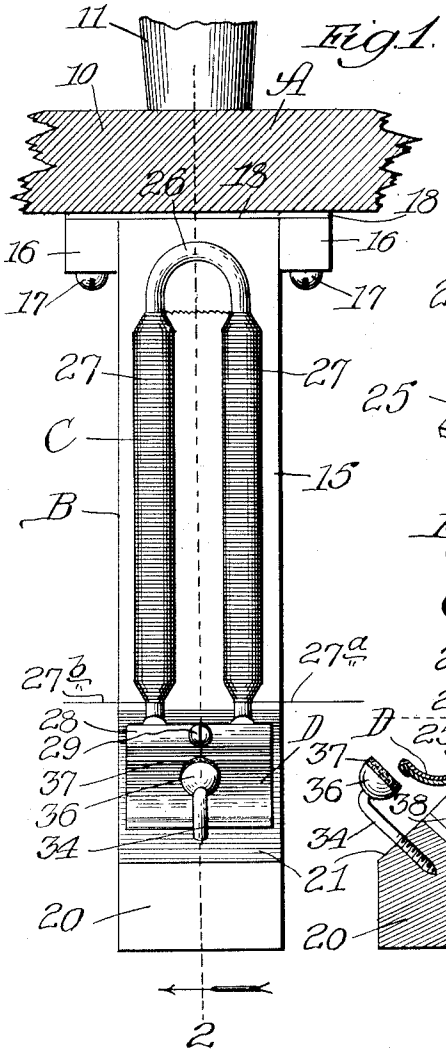


Fig. 7.

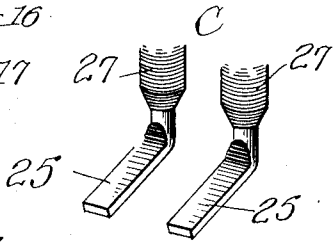


Fig. 2.

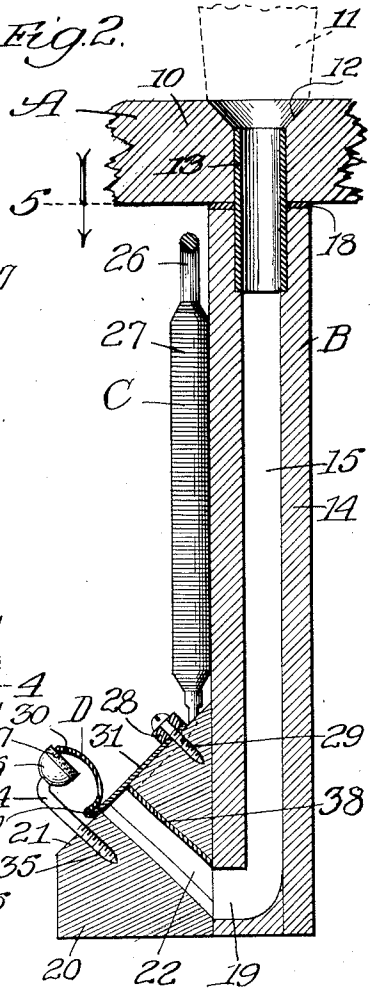


Fig. 3.

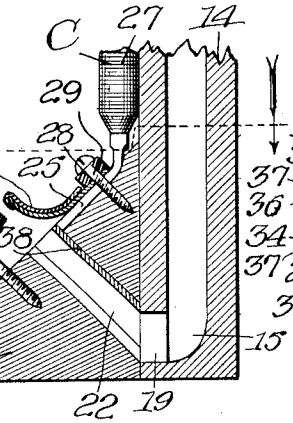


Fig. 4.

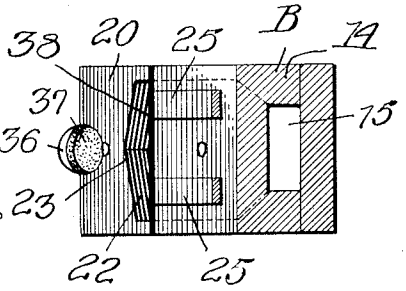


Fig. 5.

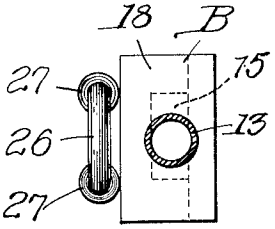
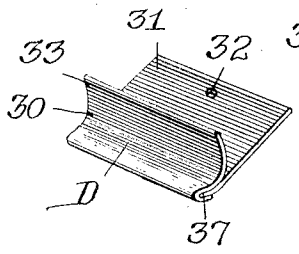


Fig. 6.



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Fig. 9.

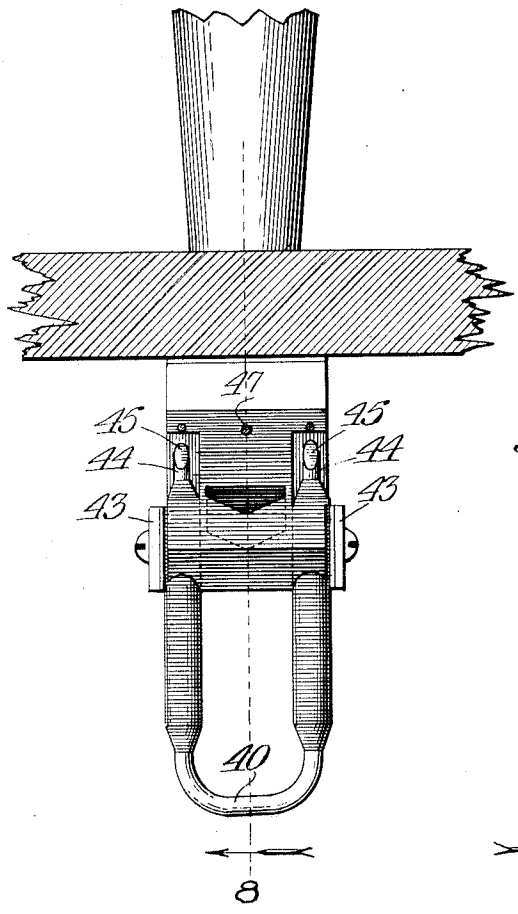
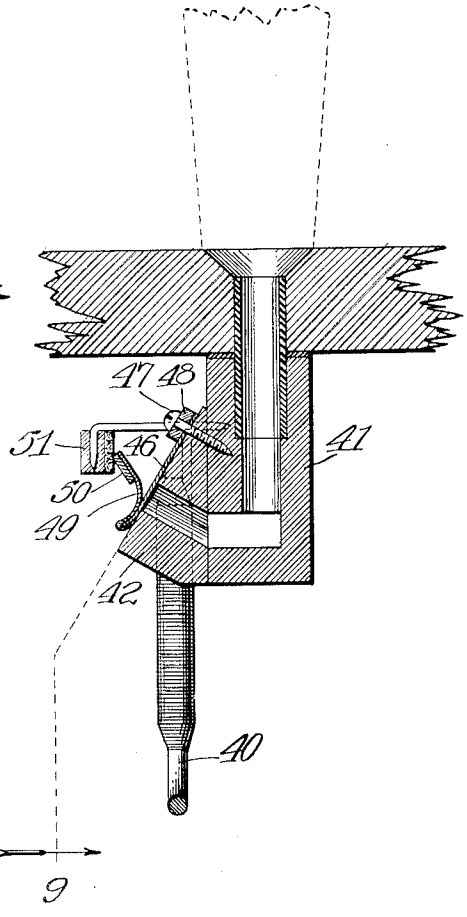


Fig. 8.



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UNITED STATES PATENT OFFICE

1,957,585

ORGAN VALVE

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Application January 30, 1933, Serial No. 654,353

9 Claims. (Cl. 84—342)

This invention relates to a valve mechanism for an organ or the like, and more particularly to an electrically-operated valve-action.

An object of the invention is to provide improved valve mechanism by which a port can be opened and closed effectively, quietly, and with the expenditure of less electrical energy than heretofore required.

Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in a preferred embodiment, by the accompanying drawings, in which—

Fig. 1 is a broken front view in elevation of valve-action mechanism applied to a wind-chest and embodying my invention; Fig. 2, a side view in elevation, and showing the armature-valve in closed position; Fig. 3, a view similar to Fig. 2, but showing the valve in open position; Fig. 4, a plan sectional view, the section being taken as indicated at line 4 of Fig. 3, and the valve-armature being removed; Fig. 5, a transverse sectional view, the section being taken as indicated at line 5 of Fig. 2; Fig. 6, a perspective view of the armature-valve; Fig. 7, a perspective view of the flattened ends of the magnet core; Fig. 8, a transverse sectional view of a modified form of the invention, the section being taken as indicated at line 8 of Fig. 9; and Fig. 9, a front view in elevation, the valve and stop being removed, and the view being taken as indicated at line 9 of Fig. 8.

In the illustration given, A designates a portion of the wind-chest or chamber; B, a valve-action member suspended from the top wall of chest A; C, an electro-magnet; and D, an armature-valve.

The chest A is of well known construction and need not be described in detail. It is an ordinary air-tight chamber in which air is maintained under a slight pressure. The top wall 10 of chest A is adapted to support a number of pipes, but for the purpose of illustration, only one pipe 11 will be shown. As shown more clearly in Fig. 2, the upper surface of wall 10 is provided with a conical recess 12 adapted to receive the lower end of pipe 11. A tube 13 extends through the wall 10 and communicates with the bottom of pipe 11.

The valve-action member B may also be of any suitable construction. In the illustration given, it comprises a vertical block 14 provided with a rectangular longitudinal opening 15. The block is equipped at its upper end with lateral projections 16 which are attached by screws 17 to the top wall 10. A sealing gasket or strip 18 of felt, leather, or other suitable material is preferably secured between the member B and the wall A. The sealing strip is apertured, as shown more clearly in Fig. 5, to allow the tube 13 to extend therethrough. At its lower end, the passage 15 merges into a horizontal passage 19.

Secured to the front face of block 14 and near its bottom is a block 20 of the shape illustrated more clearly in Figs. 2, 3 and 4. The block 20 is provided with a downwardly inclined top wall 21. Communicating with the horizontal passage 19 of block 14 and extending diagonally through the block 20, is a relatively wide passage 22 affording a port of the shape shown more clearly in Fig. 4. It will be observed that the forward or lower end of the opening 22 is drawn to a V-point 23. The block 20 is provided with two spaced recesses 24 adapted to receive the flattened ends 25 of the magnet-core 26.

The electro-magnet C may be of any suitable construction. In the illustration given, a magnet of the horseshoe type is shown, the core 26 having a large portion of its legs covered with fine copper magnet wire 27. The Roman numerals 27^a and 27^b indicate the wires leaving the magnet. In order to increase the effectiveness of the lower terminals 25 of the core 26, I prefer to flatten them by cutting away portions thereof or by swaging them to the form illustrated more clearly in Fig. 7. Core terminals of this shape have been found to increase the magnetic pull with respect to the preferred form of armature-valve which I employ.

The flattened ends 25 are received within the recesses 24 of block 20 and serve as a support for the electro-magnet C. The ends are preferably held in position by means of a cross-strip 28 which extends over the ends 25 and which is secured to block 20 by screw 29.

The armature-valve D is preferably so constructed as to roll over the port or passage 22 as it opens and closes the opening. Secured to one end of the metal piece 30 is a flexible strip 31 of leather or other suitable material. The strip 31 is apertured at 32 to receive the screw 29, and the strip is clamped by means of the cross bar 28 firmly against the inclined wall 21 of block 20.

The metal valve piece 30 is preferably formed in the shape illustrated in the drawing, one end of the piece being bent about and clamped against an end of the strip 31. Near this lower end, as shown more clearly in Fig. 6, the piece 30 is curved with a substantially short radius. However, to-

ward its outer or free end 33, the degree of curvature diminishes so as to give the entire piece substantially an elliptical curve. The advantage of this form of construction will be pointed out hereinafter.

In order to stop the outer free end 33 of the member 30, when the valve is in closed position, I provide a stop 34 which is equipped with a screw 35 extending into the block, and a leather head 36 having a felt face 37. If desired, the stop may be formed of other suitable materials. Between the free ends of the flattened core terminals 25, I prefer to secure a fiber sheet 38 or other suitable material to space the magnet a proper distance from the hole 22.

Operation

In the operation of the device, the armature-valve or piece 30 is normally in the closed position shown in Fig. 2, with the flexible member 31 serving as a closure for the port 22. As already stated, the wind-chest or chamber is maintained under slight pressure. When the magnet C is energized, the armature-valve 30 rolls rearwardly to the position shown in Fig. 3, and draws the flexible strip 31 away from the opening 22. It will be noted that in the opening operation, the V-point 23 of the opening is first uncovered and permits a certain amount of air to rush into the passage. The equalization of pressure caused thereby on both sides of the flexible member 31 enables the flexible closure member to be withdrawn from the remainder of the opening with very slight energy. The elliptical shape of the member 30 also aids in the opening operation. It will be noted that the lower part of the member is fairly close to the magnet terminals, and this reduces the power required to draw the flexible member away from the V-point 23. The attractive force of the magnet upon the armature increases very rapidly as the armature moves toward the magnet. By increasing the radius of the armature toward its free end, advantage is taken of the increased attractive force, so that with the same amount of power, a larger opening of the port is effected; in other words, the increased force is utilized for effecting a more rapid and extensive opening of the port as the free end of the armature approaches the core terminals 25. When the magnet is de-energized, the armature falls of its own weight to the position shown in Fig. 2, the pressure within the chest serving to accelerate the closing movement. The stop 34 prevents further swinging of the armature 30.

The roller motion of the armature produces a valve-action that is absolutely quiet. The curvature of the armature utilizes the increasing attractive force of the magnet. These factors, in combination with the shape of the port or opening, combine to effect the opening of a relatively large port with a minimum current consumption.

In the modification shown in Figs. 8 and 9, a more compact construction is shown. The magnet 40 is inverted and this permits the valve-action member 41 to be reduced in length. An angular member 42 is secured to the front face of the member 41 and is provided with a longitudinal passage which communicates with the passage in member 41. The magnet 40 is extended through lateral openings in the block 41 and held in position by metal side clamps 43. The terminals 44 of the magnet are cut away as shown more clearly in Fig. 9, so as to provide elongated faces 45. The flexible closure member 46 is secured to the block 42 and action member 41 by means of a screw 47 which passes through block 48.

Secured to the end of the flexible member 46 is a metal piece 49 preferably formed of aluminum or a metal which is not readily attracted by the magnet. A cross bar 50 of iron or other magnet-attracted metal is secured to the free end of the member 49. A stop 51 is constructed and supported, as shown in Fig. 8, so as to engage the tip portion of the bar 50. With this construction, the flexible member 46 and member 49 are maintained constantly in their desired position.

The operation of the modified form of the invention will be readily understood from the description heretofore given. The metal bar 50 will be attracted by the magnet terminals 45 and drawn to open position. When the magnet is de-energized, the weighted end will fall to the closed position shown in Fig. 8. In this improved construction, it will be noted that the lines of force are concentrated upon the top edge of the roller and the power is thus increased considerably.

While I have described the opening as V-shaped, it will be obvious that other irregular shapes may be employed by which a small fraction of the port is opened initially when the attractive force on the magnet is weakest. Also, while I have described, for purposes of illustration, the mechanism in great detail, it will be obvious that the details may be changed and modified greatly without departing from the spirit of my invention.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

I claim:

1. In valve mechanism for a pipe organ or the like, a chamber, a port leading therefrom, an electromagnet adjacent said port, a curved armature-valve, a flexible member secured to said valve and normally closing said port, said armature being adapted to be drawn back against said magnet and to raise said flexible member from said port when the magnet is energized, and a stop disposed below said port to limit the swing of said valve.

2. In combination with a chamber and a port therein, an electro-magnet adjacent said port, a flexible member fixed at one end and adapted to cover said port, and an armature-valve secured to the free end of said flexible member and adapted to be drawn toward said magnet when the same is energized, said valve having a substantially elliptical curvature.

3. In combination with a valve-action member having an opening therethrough, a flexible member fixed at one end and adapted to extend over said opening, a roller armature secured at one end to the free end of said flexible member, and an electro-magnet supported adjacent the port of said passage and adapted to draw said armature theretoward when energized, said armature having a curvature of short radius near the point where it is connected to said flexible member and having the curvature of its free end portion of relatively greater radius.

4. In a pipe organ or the like, the combination with a valve-action member having a passage extending therethrough, of an electro-magnet ad-

jacent the port of said opening, a flexible member fixed at one end and adapted to close said opening, a roller armature fixed at one end of said flexible member, and a stop positioned below said armature and adapted to limit the downward swing thereof.

5. In combination with a valve-action member of a pipe organ or the like, said valve-action having a passage therethrough terminating in a port having a V-shaped point, a flexible member adapted to cover said opening, a roller valve-armature secured to one end of said flexible member and adapted to be rolled back to uncover first the V-point of the port and then the remainder of the port, and electro-magnetic means for actuating said valve-armature.

6. In a pipe organ or the like, a chamber, a port therein, an armature-valve adapted to close said port, and an electro-magnet supported adjacent said port and having flat core terminals adapted to actuate said valve-armature when the magnet is energized.

7. In combination, a chamber, a port leading therefrom, an electro-magnet supported below said port but having terminals extending thereabove, a flexible member fixed at one end above said port and extending over a portion of said terminals and over said port, a roller-valve-armature of relatively non-magnetic metal secured to the free end of said flexible member, and a magnet-attracted bar secured to the free end of said valve-armature and adapted to be drawn toward said terminals and to lift said flexible member from said port when the magnet is energized.

8. In combination, a chamber, a port leading therefrom, an electro-magnet having its terminals extending above said port, a flexible member fixed at one end and extending over a portion of said terminals and over said opening, a roller-valve-armature secured to the free end of said flexible member, a magnet-attracted bar secured to the free end of said valve-armature, and a stop member adapted to engage the magnet-attracted bar.

9. In combination, a wind-chest, a valve-action member secured to the top wall thereof, said member having a passage extending therethrough and terminating in a port within said chest, a horseshoe magnet secured to said valve-action member and having core terminals extending above and adjacent to said port, a flexible closure member secured over said core terminals and to said valve-action member above the port and adapted to extend over the port, a curved valve-armature secured to the lower free end of said flexible member and adapted to be drawn toward said magnet to uncover said opening, and a stop member supported below said port and adapted to limit the swing of the free end of said armature-valve.

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