April 22, 1958 L. E. HAYSLETT 2,831,649

PALLET VALVES

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Fig. 1.

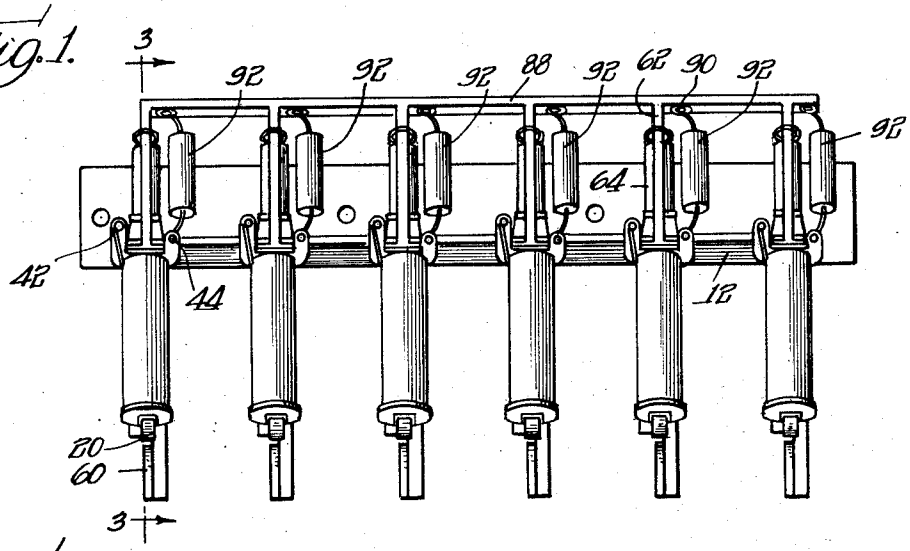


Fig. 2.

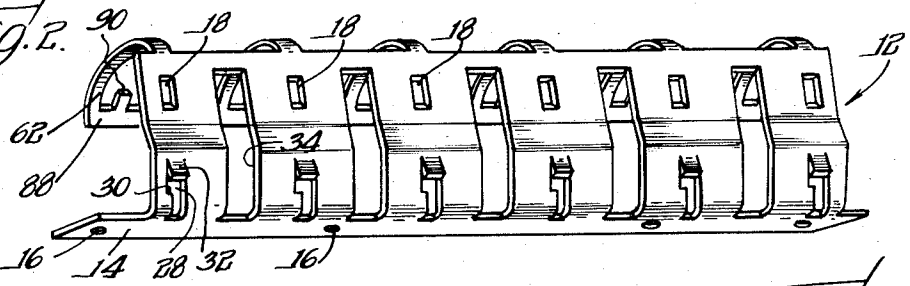


Fig. 3.

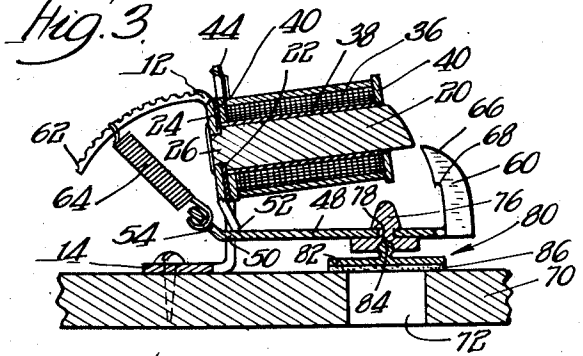


Fig. 4.

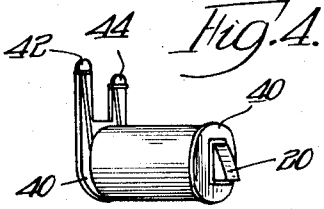


Fig. 6.

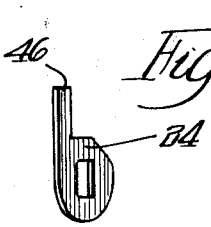
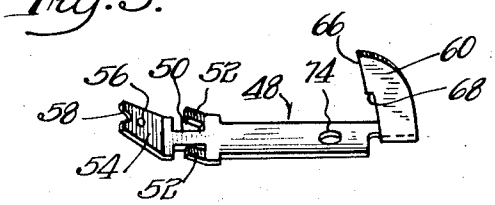


Fig. 5.



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Fig. 7.

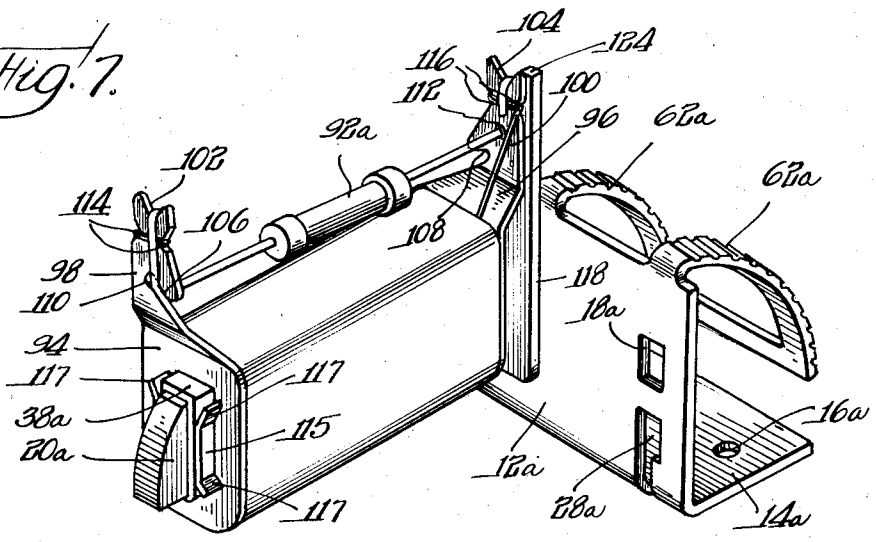


Fig. 11.

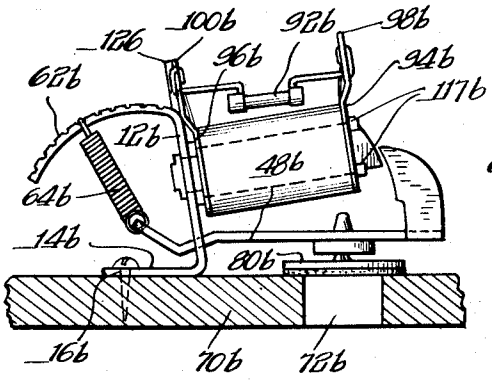


Fig. 8.

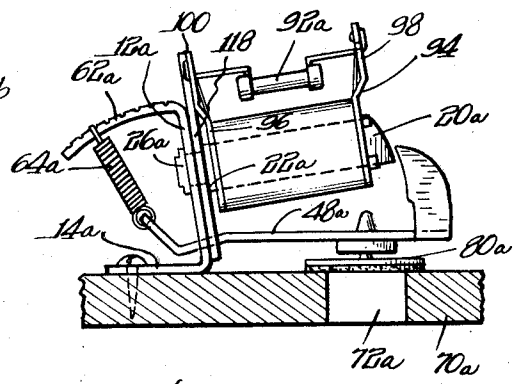


Fig. 9.

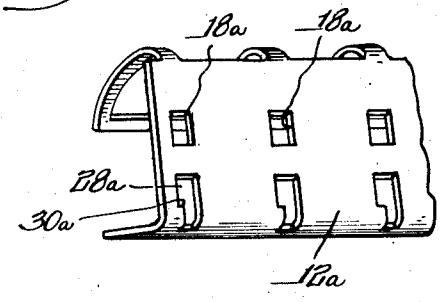
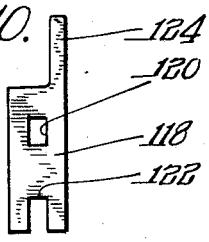


Fig. 10.



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PALLET VALVES

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Application April 17, 1950, Serial No. 156,407

7 Claims. (Cl. 251—86)

This invention relates generally to the operation of air actuated electric organs and more particularly to the operation and mounting of valves in such an organ.

In a preferred type of electric organ a metal reed spaced from a pickup element is used as a tone generator as described by Hoschke in his Patent No. 2,015,014. A potential is applied across each reed and its associated pickup element or elements, so that the reed and its pickup act as the plates of a capacitor. The capacitance of each of said capacitors is varied by vibrating the reed by an air blast and the electrical oscillation set up is amplified and applied to some transducing means such as a loud speaker. An electric organ utilizing such tone generators is provided with either a pressure or a vacuum air chest and a pallet valve is provided for each reed or for a group of reeds. This invention is primarily concerned with electromagnetic means for controlling pallet valves in electric organs.

Electromagnets for controlling pallet valves could be mounted individually, but this would be cumbersome and expensive and wiring would be difficult.

An object of this invention is a provision of structure for mounting a plurality of pallet valve actuating electromagnets.

A further object of this invention is the provision of structure as set forth in the foregoing object, said structure being of electrically conductive material to provide a common connection to a plurality of electromagnets.

A magnetic field is the strongest when it is provided with a complete path of low reluctance. Specifically, in an electromagnet having an armature, the armature is actuated most efficiently when the total air gap between one end of the magnet core, the armature, and the other end of the magnet core is very small. To preclude interaction and improper operation of adjacent electromagnets, it is imperative that stray flux from each magnet should be precluded in so far as possible.

An important object of this invention is the provision of a pallet valve actuating electromagnet having a magnetic path of extremely low reluctance.

A specific object of this invention is the provision of a mounting structure for a plurality of pallet valve actuating electromagnets which provides areas of high reluctance between adjacent magnets to afford a distinctive magnetic path for each electromagnet to preclude interaction among electromagnets.

Energization of pallet valve actuating magnets causes transient disturbances which may be picked up inadvertently and magnified to cause clicks or other annoying noises to appear in the output of an electric organ.

Another object of this invention is the provision of electromagnetic valve actuating means and mounting structure for eliminating transient disturbances.

Other and further objects and advantages of the present invention will appear from the following description when taken in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of a magnet group assembly;

Fig. 2 is a perspective view of the magnet group frame;

Fig. 3 is a section of one of the magnets as taken along the line 3—3 of Fig. 1;

Fig. 4 is a perspective view of one of the magnets;

Fig. 5 is a perspective view of a magnet armature;

Fig. 6 is a perspective view of a grounding tab;

Fig. 7 is a perspective view of an improved form of magnet group frame showing a magnet in place thereon;

Fig. 8 is a side view showing the modification of Fig. 7;

Fig. 9 is a perspective view showing a portion of the frame of Fig. 7;

Fig. 10 is a plan view of a magnetic tab; and

Fig. 11 is a side view similar to the sectional view of Fig. 3 showing a modified structure.

Reference should first be had to Fig. 2 wherein a magnet mounting frame 12 made of iron, steel, or other material of high magnetic permeability is illustrated. The frame 12 is provided with a rearwardly directed flange 14 at its lower edge having a plurality of apertures 16 through which screws or other fastening elements may be placed to secure the frame at a convenient point on an electric organ. The frame is provided with rectangular spaced slots or apertures 18 for receiving magnet cores 20 (Fig. 3). The magnet cores are constructed with rectangular cross sections so that the magnets may be spaced closer than they could be with the usual round cores and so that the cores can be fabricated from flat stock without the necessity of grinding the forward extremity or armature attracting surface of the core to the shape shown. The core is reduced in cross sectional dimension to form a shoulder 22 which abuts against a spring contact 24 as will be explained later and has a neck 26 extending through the aperture 18. The core may be secured to the frame by welding or by peening over the end of the neck 26 or by any other desirable means. Directly below each slot or aperture 18 in the frame 12 is a slot 28, each of which has a shoulder 30 and a forwardly projecting tongue 32. A large transverse slot 34 is placed substantially midway between each pair of slots 18 and extends transversely of the frame a distance at least as great as the extreme transverse limits of the slots 18, 28 as will be apparent hereinafter.

Referring next to Figs. 3 and 4, each magnet coil 36 is wound on an insulated form 38, the inside dimensions of which fit snugly over the armature core 20. Each form 38 has end sections 40 of insulating material for retaining the coil windings thereon. The end section at the rear of each coil form has two upwardly projecting lugs 42 and 44 thereon, the former extending upwardly a greater distance than the latter. The leads of the coil winding are wrapped around small necks adjacent the upper extremity of each of these lugs. The grounding tab 24 previously referred to is shown in perspective in Fig. 6 and conforms in shape generally to the rear end piece 40 having an upstanding finger 46 similar to the lug 42, but having no structure comparable to the lug 44. The tab is formed from a thin sheet of phosphor bronze or other switch material and as previously noted with respect to Fig. 3 is held against the frame 12 by the shoulder 22 of the magnet core. The finger 46 bears against the lead wire wrapped around the lug 42 and the wire is electrically connected to the finger 46 by a band of solder to ground one side of the coil to the magnet frame.

The magnet armature 48 (Fig. 5) is formed from a strip of sheet metal and has a narrow neck 50 from each side of which is spaced an upwardly directed ear 52. The rear section 54 of the armature is provided with an aperture 56 and a slot 58, the purpose of which will be disclosed later. The forward end 60 of the armature is displaced upwardly so that it may cooperate with the

magnet core **20** as seen in Fig. 3. The armature is mounted in the slot **28** in a vertical plane and is then twisted into a horizontal plane with the neck **50** of the armature resting on the shoulder **30**. The lower edge of the angularly disposed tongue **32** provides a knife-edged bearing for the upper surface of the neck **50**.

A curved frame section **62** extends rearwardly from directly above each slot or aperture **18** and has a corrugated upper surface. A tension spring **64** fits over the section **62** and is connected to the end section **54** of the armature **48**. Spring tension is adjusted by moving the spring from one to another of the corrugations on the upper surface of the section **62**. The aperture **56** and slot **58** prevent rotation of the spring and consequent change in spring tension. The forward end of the core **20** is substantially arcuate in shape as is the cooperating portion at the tip **66** of the forward end **60** of the armature. The tip **66** is provided with a shoulder **68** in order that the tip **66** will align itself directly with the core **20** when the magnet is energized.

In Fig. 3 the frame **12** is shown secured to a mounting surface **70** of an electric organ with an aperture **72** in this surface which is to be understood as being an air passage to or from a vibratile reed. The armature **48** is provided near its forward end with an aperture **74** within which is removably secured a rubber grommet **76** having at its lower extremity a socket **78** provided for retaining the pallet member **80** of the valve. The pallet includes a thin section **82** of rigid plastic having a ball **84** fitting within the socket **78**. A surface layer **86** of felt or leather is secured to the lower surface of the plastic section **82** as by an adhesive to seal the aperture or port **72** and to eliminate mechanical noise. In the position shown in Fig. 3 wherein the magnet is deenergized, the resiliency of the rubber grommet **76** and the ball and socket action insures that the pallet **86** will be flat against the surface **70** to seal the port **72** under the action of spring **64**. When the magnet is energized, the section **66** quickly aligns with the armature **20** and tends to stop without overshooting due to the shoulder **68** restricting the magnetic path and also due to the top of the grommet **76** abutting against the magnet. It may be seen that the magnetic path through the core **20**, armature **48** and frame **12** is of very low reluctance as each of these is of magnetic material and the air gap between the core **20** and section **66** is short. The slots **34** in the frame provide areas of high reluctance between adjacent magnets and prevent undesirable interaction. An integral strip **88** joins the extremities of the curved sections **62** of the frame **12** and a projection **90** is provided on the strip **88** adjacent each section **62** to provide a mounting lug for a resistor **92** which is also connected to the lead wire of the magnet coil which is wrapped around the lug **44**. These resistors are provided to reduce transient voltages developed upon energization and deenergization of the magnets.

A modification of my invention is shown in Figs. 7–10 wherein parts similar to those heretofore described are identified by like numerals with the addition of the subscript *a*. The frame member **12***a* is made in this embodiment of non-magnetic material which, for example, may be aluminum, brass or plastic. The frame member **12***a* is provided with a rearwardly directed mounting flange **14***a* having apertures **16***a* therein for receiving screws or other fasteners. Apertures **18***a* are provided for receiving the armature cores **20***a*, and apertures **28***a* having shoulders **30***a* are spaced therebelow for receiving the armatures. In this modification the upper bearing surface for the armature is not struck forward to form a tongue as disclosed in the earlier form. Sections **62***a* extend to the rear of the frame for receiving armature biasing springs **64***a* which are connected to armatures **48***a* which may be identical with the armatures **48**. In this modification the spool end pieces **94** and **96** are made of metal or other conductive material and have upstanding offset arms **98** and **100** respectively. Each of the arms is notched at the top as at **102** and **104** and is provided with a lower notch **106** and **108** respectively. Additionally, each arm is provided with an aperture **110** and **112**, respectively, and with lateral notches **114** and **116** between the upper and lower notches. The insulating coil form **38***a* is provided with tabs **115** at the forward end which have ears **117** which may be bent outwardly to secure the spool end **94** in place. The ends of the coil winding are brought out at opposite ends of the magnet and wound about the notches **114** and **116** of the metallic spool ends, and soldered to provide a good electrical connection. A resistor **92***a* is provided to suppress clicks as explained with regard to the earlier form of the invention and is connected directly between the spool ends. The end of the resistor connected to the rear spool end **96** preferably has its lead placed through the aperture **112** and bent over the top notch **104** to form a good mechanical connection prior to soldering. The lead from the other end of the resistor could be placed through the hole **110**, but for simplicity of mounting it is preferable to wrap it around the top of the arm through the notches **106** and **102**, and soldered.

A tab **118** of magnetic material (Fig. 10) is provided with an aperture **120** similar in size and shape to the aperture **18***a* and has a notch **122** extending upwardly from its bottom and with the top of the notch spaced from the aperture **120** the same distance as the distance between the bottom of the aperture **18***a* and the top of the slot **28***a*. An ear **124** extends upwardly from the top of the body of the tab **118** and is integral therewith. As may be seen in Figs. 7 and 8, the tab **118** is inserted against the front of the frame **12***a* with the aperture **120** and notch **122** aligned with the aperture **18***a* and the slot **28***a* respectively and is held in place by a shoulder **22***a* of the core **20***a* impinging against it, the extending neck **26***a* of the core being peened over, welded, or otherwise suitably secured to the frame **12***a* to clamp the tab **118** to the frame. The magnetic path in this embodiment is completed through the core **20***a*, the short air gap between the core and the armature **48***a*, the armature **48***a*, and through the magnetic tab **118** back to the core **20***a*. The non-magnetic character of the frame **12***a* precludes undesired interaction between the magnets. The ear **124** of the magnetic tab **118** engages with the arm **100** and associated wire connections to form a good electrical connection therewith so that both the resistor and the magnet coil may be grounded through the frame **12***a*. In the event the frame **12***a* is made of plastic, additional grounding connections may be required as will be understood. As seen in Fig. 8 the frame and magnet are mounted similarly to the construction previously described on a mounting board **70***a* with the pallet **80***a* covering a port **72***a*.

Another form of my invention which is substantially a combination of the two forms previously described is shown in Fig. 11, the frame being of magnetic material and the individual tabs, such as tabs **118** of Fig. 10 being eliminated. More particularly, frame **12***b* is made of magnetic material such as iron or steel and is provided with a mounting flange **14***b* having mounting apertures **16***b*. Rearwardly curved sections **62***b* having scalloped upper edges are provided for adjustably securing armature biasing springs **64***b* which are attached to armatures **48***b* which may be identical with the armature **48***a* previously described. The spool end pieces **94***b* and **96***b* are made of sheet metal and may be identical with the end pieces **94** and **96**. The end piece **94***b* may be secured by ears **117***b* and a resistor **92***b* may be secured between the upstanding arms **98***b* and **100***b* of the end pieces.

A plurality of upstanding lugs **126** are formed integral with the frame **12***b*, and each of the arms **100***b* impinges against one of these lugs to form an electrical connection for the associated coil and resistor. The frame is mounted on a mounting board **70***b* with the pallet **80***b* closing a

port 72*b*. As the frame 12*b* is made of magnetic material, slots similar to the slots 34 (Fig. 2) are provided to magnetically isolate each magnet.

It is apparent that I have herein presented an improved pallet valve actuating electromagnet and structure for mounting a plurality of such electromagnets in which a path of high magnetic permeability is provided through the magnet core, armature, and mounting structure with a very small air gap between the core and armature to insure rapid and certain operation with a minimum number of ampere turns of energization. Paths of high reluctance are interspersed between adjacent magnets to prevent interaction therebetween.

Although certain preferred embodiments of my invention have been shown and described for illustrative purposes, it is to be understood that my invention is not to be limited thereby, but is to include all that which falls within the spirit and scope of the following claims.

I claim:

1. An electromagnetic valve actuating mechanism comprising a plurality of magnet cores, a magnet armature associated with each of said cores, and an elongated plate-like member for mounting a plurality of said magnets and their associated armatures, said plate-like member having substantially continuous free longitudinal edges demarcating and terminating the main portion of said elongated plate-like member and including transverse portions of magnetic material between each magnet core and associated armature, and longitudinally spaced non-magnetic portions extending transversely substantially the entire distance between said longitudinal edges, the non-magnetic portions being positioned between adjacent magnet cores to prevent interaction therebetween.

2. An electromagnetic valve actuating mechanism comprising a plurality of units, each including a magnet core and an armature including magnetic material actuatable towards said core, and means for mounting a plurality of said units, said means comprising an elongated section having substantially continuous free longitudinal edges demarcating and terminating the main portion of said elongated section and including transverse portions of magnetic material between the core and armature of each of said units and longitudinally spaced non-magnetic portions extending transversely substantially the entire distance between said longitudinal edges, the non-magnetic portions being positioned between adjacent units to prevent interaction therebetween.

3. An electromagnetic valve actuating mechanism comprising a mounting bracket, electromagnetic means carried by said mounting bracket, an armature carried by said bracket and actuatable towards said electromagnetic means, said armature having an aperture near its free end, and a valve closure member carried by said armature, said valve closure member including a resilient support member detachably snapable into the aperture in said armature, a pallet, and a universal connection between said pallet and said resilient mounting member.

4. In electromagnetic valve actuating mechanism, an elongated mounting bracket comprising a plate-like mounting surface, rearwardly directed means providing attaching structure adapted to be mounted on a supporting surface, said rearwardly directed means being integral with and extending substantially the entire length of said bracket, and a plurality of arms integral with and rearwardly bent from adjacent the top of said plate-like mounting surface and curving downwardly therefrom in a substantially continuous curve and having a plurality of means therein to provide spring anchors, the extremities of the arms being joined by a continuous longitudinal edge integral with the arms.

5. In electromagnetic valve actuating mechanism as set forth in claim 4, and further including a plurality of units mounted on said plate-like mounting surface and each including a magnet core and an armature including magnetic material associated with said core, said plate-like mounting surface including transverse portions of magnetic material between each magnet core and associated armature, and longitudinally spaced non-magnetic portions between adjacent magnet cores to prevent magnetic interaction therebetween.

6. An electromagnetic valve actuating mechanism as set forth in claim 1, wherein the plate-like member is made of magnetic material and has slots forming the non-magnetic portions.

7. An electromagnetic valve actuating mechanism as set forth in claim 1 wherein the plate-like member is made of non-magnetic material, and the magnetic portions comprise inserts of magnetic material.

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