

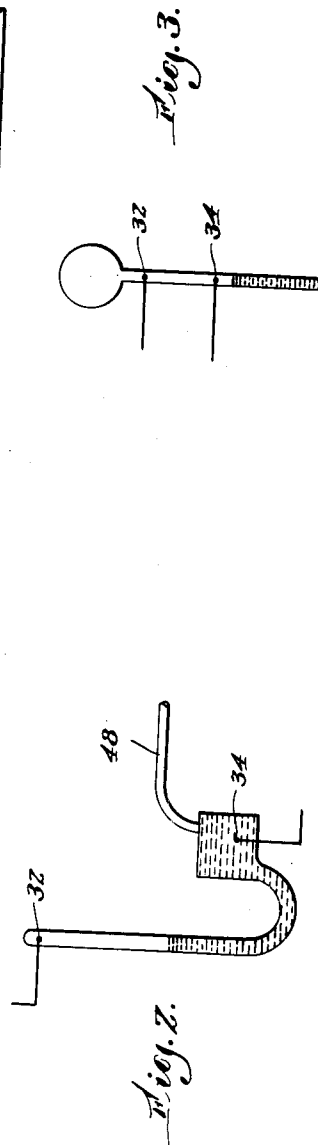
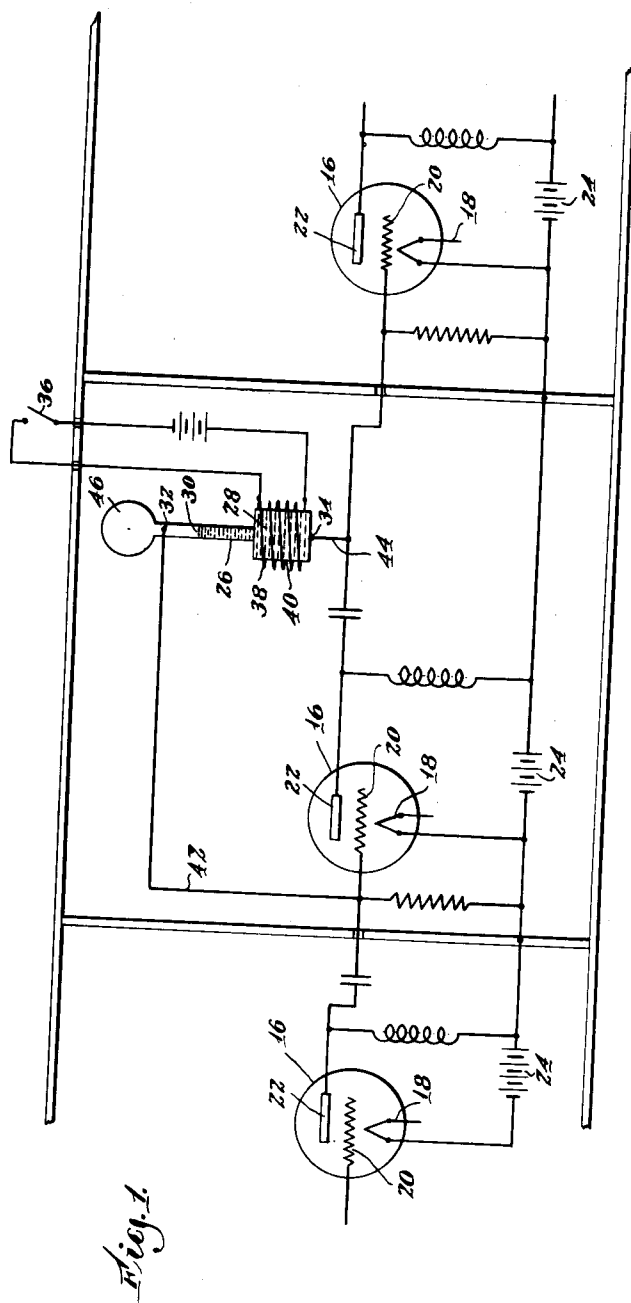
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ELECTRIC SYSTEM

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ELECTRIC SYSTEM

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5 Claims. (Cl. 179—171)

The present invention relates to electric systems, and more particularly to multi-stage shielded amplifiers, such as are used in acoustic-electric systems.

5 The invention will be explained in connection with the accompanying drawing, in which Fig. 1 is a diagrammatic view of apparatus and circuits constructed and arranged according to a preferred embodiment of the present invention; and Figs. 2 and 3 are similar views of modifica-

10 tions. Three stages of amplification of a multi-stage, electrically and acoustically shielded amplifier are illustrated in Fig. 1, it being understood that 15 more or less than this number will be employed, in practice, as desired. Each stage comprises an amplifier 16, shown as a vacuum tube or audion, having a filament 18, a grid 20 and a plate 22. The plate batteries are shown at 24, the filament- 20 heating batteries being omitted, for clearness. One or more stages of amplification may be cut into or out of circuit, at will, by means of a switch. A mechanical switch, or a switch having me- 25 chanically moving parts, such as a coil relay, would have a tendency to introduce shock or vibration, with the attendant microphonic disturbances. Such disturbances render it inconvenient and even impracticable, in many cases, to use mechanical relays in acoustically and 30 electrically shielded amplifiers.

According to the present invention, however, the switch comprises a capillary tube 26 of glass, quartz or other insulating material, and containing mercury 28, the top of which is shown at 30. The switch comprises two upper and lower 35 sealed-in contact members 32 and 34. The contact member 34 is always immersed in the mercury. The contact member 32 is normally raised above the mercury, but may become electrically 40 connected with the other contact member 34, through the mercury, upon heating the latter. This may be effected by means of a switch 36 that closes the circuit of an electric-heating coil 38 that surrounds an enlarged bulb 40 at the bot- 45 tom of the tube 26. To disconnect the contact members, all that is necessary is to open the circuit of the coil 38.

The contact member 32 is connected with the grid 20 of one tube 16 by a conductor 42, and the 50 contact member 34 with the grid of another tube 16 by a conductor 44. When the mercury bridges the contact members 32 and 34, therefore, one or more tubes 16 will become short-circuited.

Means is thus provided for acoustically insu- 55 lating the stages of amplification, since the only

control necessary is a pair of control wires for heating the mercury. The contact members 32 and 34 become bridged together without any jar or shock. There is but a small capacity between the contact members 32 and 34, and this is con- 5 trollable by spacing between the top 30 of the mercury column and the contact member 32. As the mercury may rise above the upper contact member 32, an expansion chamber 46 is provid- 10 ed in the tube 26. The switch has but very slight capacity and will not affect the electrical operation of the amplifier, particularly the inter-electrode capacities of the tube.

Of course, the mercury could be heated in other 15 ways than by means of the coil 38; by induction, for example. The contact members could, furthermore, be bridged in other ways than by heat, as illustrated in Fig. 2, where the lower part 40 of the tube 26 is shown connected by a small rubber or metal air hose 48, through which compressed 20 air may be driven, at will. The arrangement of the contact members 32 and 34 may be changed also, as illustrated in Fig. 3. Other modifications, too, could be employed, such as the use of a mul- 25 tiplicity of contact members that could be closed, either simultaneously or consecutively, by the same mercury column, to control one or more stages of amplification simultaneously or in suc- 30 cession. Other uses, too, of the invention will readily suggest themselves to persons skilled in the art. It is therefore desired that the ap- 35 pended claims be broadly construed, except insofar as limitations may be necessary to be imposed in view of the prior art.

What is claimed is:

1. An electric system comprising a plurality of 35 amplifiers connected together, and a switch for short-circuiting one of the amplifiers comprising two insulated contact members, a conducting fluid, and means for moving the fluid to cause the fluid 40 to connect the contact members.

2. An electric system comprising a plurality of amplifiers connected together, and a switch for short-circuiting one of the amplifiers comprising 45 a bulb constituted of insulating material and containing mercury, two contact members carried by the bulb, and manual means for heating the mercury to cause the mercury to connect the contact 50 members.

3. An electric system comprising a shield, a plu- 50 rality of amplifiers in the shield, and a switch for connecting one of the amplifiers into or out of circuit, comprising two insulated contact mem- 55 bers, a conducting fluid, and means for moving the fluid.

4. An electric system comprising a shield, a plurality of amplifiers in the shield and adapted to be connected together into a multi-stage, electrically and acoustically shielded system, and a non-mechanical switch in the shield for connecting one of the amplifiers into or out of circuit, the switch comprising a bulb constituted of insulating material and containing mercury, two contact members carried by the bulb, and manual means disposed outside the shield for changing the temperature of the mercury, whereby the switch is actuated without introducing shock or vibration.
5. An electric system comprising a shield, a plurality of amplifiers in the shield and adapted to be connected into a multi-stage, electrically and acoustically shielded system, and a non-mechanical switch in the shield for connecting one of the amplifiers into and out of circuit, the switch comprising a bulb constituted of insulating material and having an enlarged lower portion containing mercury and its upper portion being provided with an expansion chamber, an electric-heating coil surrounding the enlarged lower portion, two contact members carried by the bulb, there being small capacity between the contact members so as not to affect the electrical operation of the system, and a switch disposed outside of the shield in circuit with the coil for closing the circuit of the winding and thereby heating the mercury to cause the mercury to connect the contact members without introducing shock or vibration.

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