

[54] **HAND MICROPHONE FOR SOUND RECORDING AND REPRODUCING INSTRUMENTS WITH AC SWITCHING**

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[51] Int. Cl.....**G11b 19/16**
[58] Field of Search.....179/100.1 DR, 1 SW, 6 E; 307/253

[56] **References Cited**

UNITED STATES PATENTS

3,555,202 1/1971 Warnke.....179/100.1 DR

FOREIGN PATENTS OR APPLICATIONS

1,282,089 11/1968 Germany.....179/100.1 DR

OTHER PUBLICATIONS

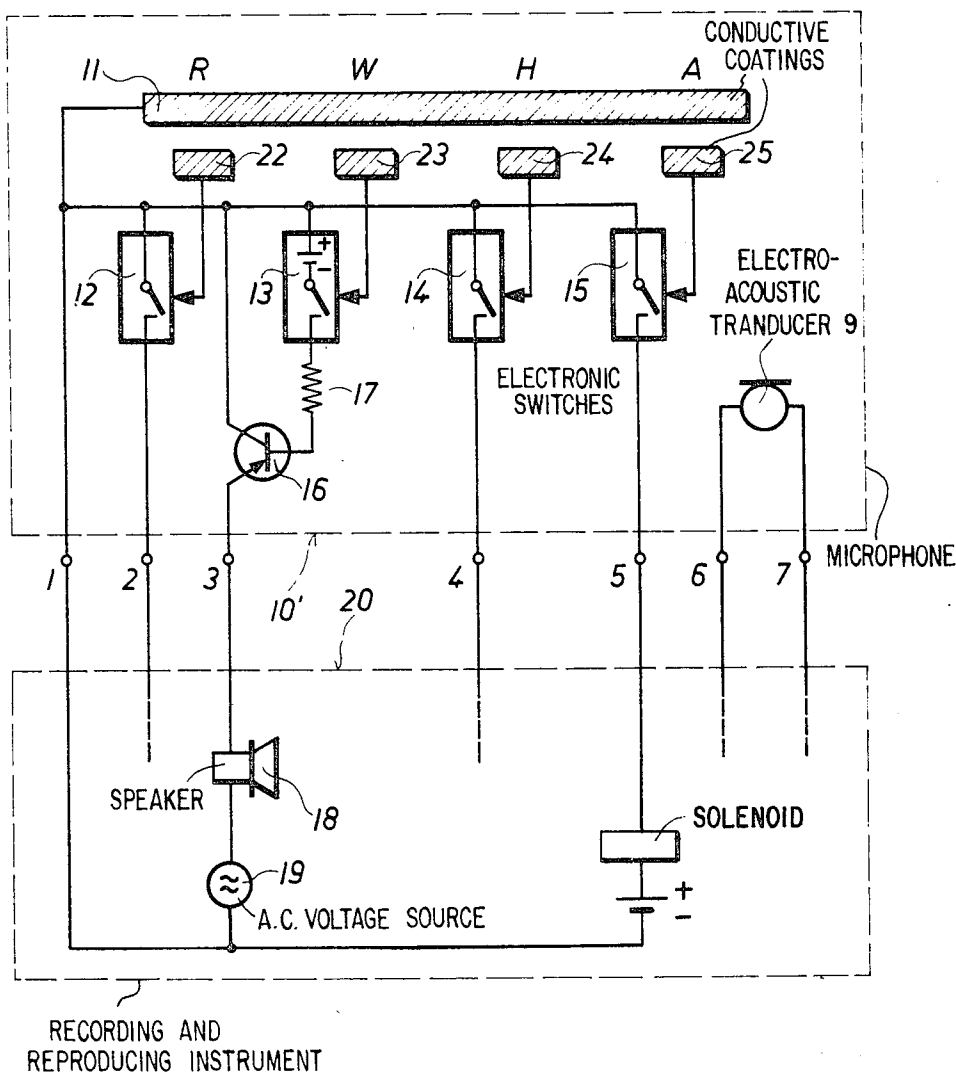
Hurley, Junction Transistor Electronics, 1958, 339- 342, 346- 347.

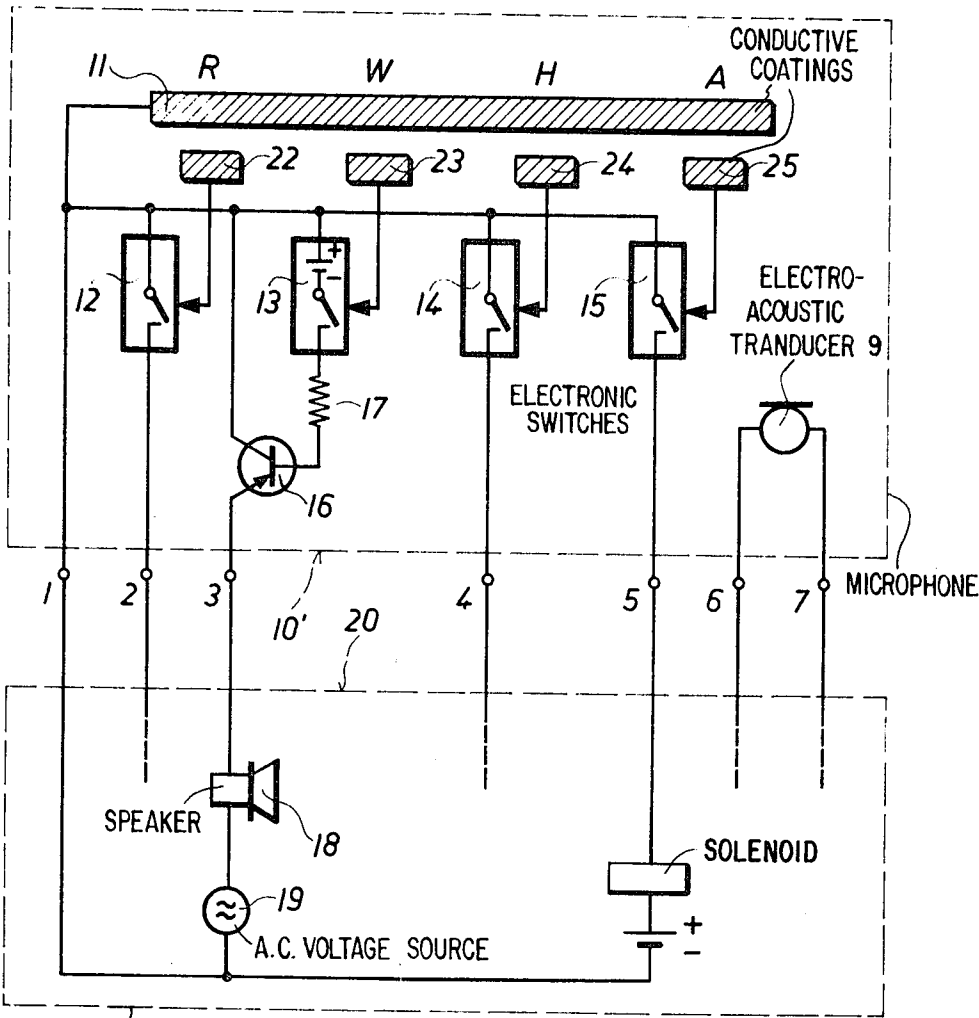
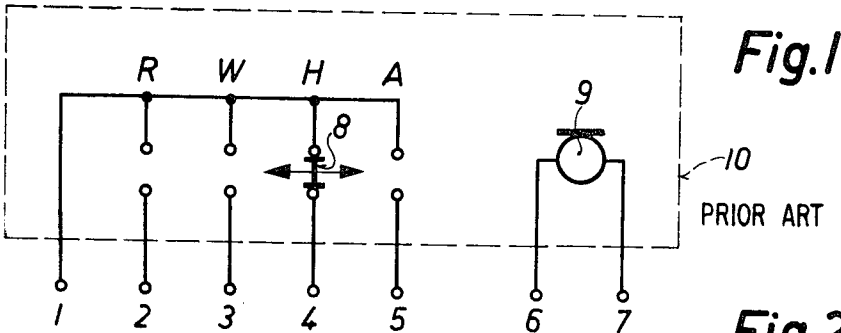
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[57] **ABSTRACT**

A hand microphone for use with sound recording and reproducing instruments and including a control portion from which various control functions can be initiated in the instrument, one of which control functions involves switching an alternating voltage circuit, the unit for switching such circuit including a transistor having its collector-emitter path connected in series in such alternating voltage circuit and a mechanically stationary electronic switch connected to the base of the transistor for applying thereto, when the electronic switch is closed, a bias voltage which causes the transistor collector-emitter path to conduct current in both directions.

4 Claims, 5 Drawing Figures





RECORDING AND
REPRODUCING INSTRUMENT

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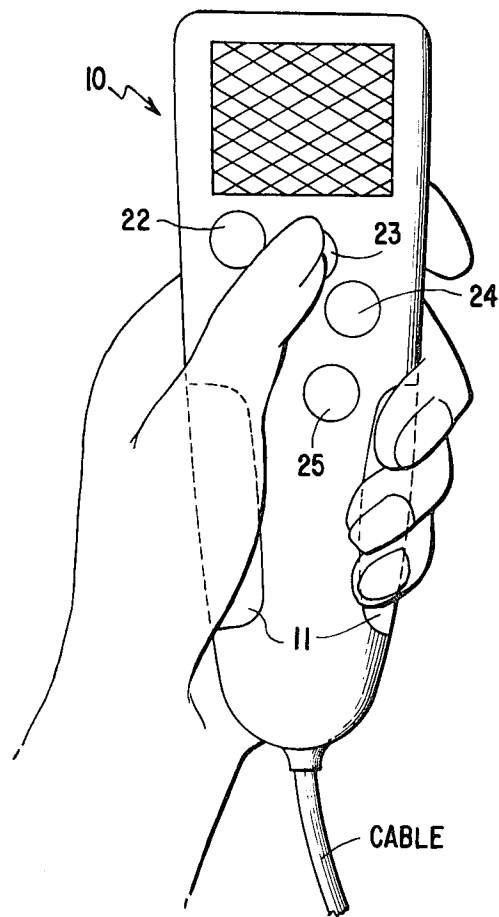


Fig. 3

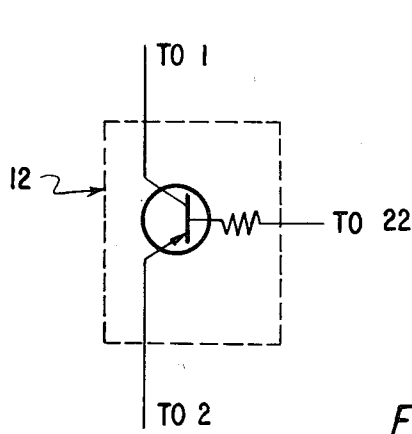


Fig. 4

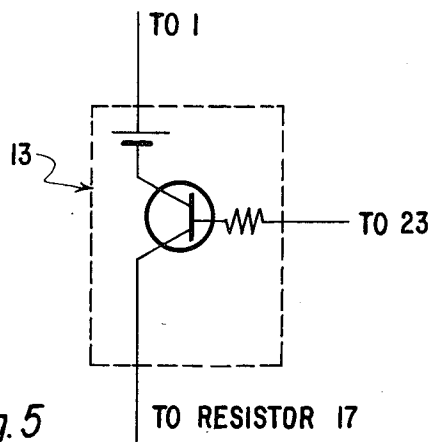


Fig. 5

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HAND MICROPHONE FOR SOUND RECORDING AND REPRODUCING INSTRUMENTS WITH AC SWITCHING

BACKGROUND OF THE INVENTION

The present invention relates to a hand microphone for sound recording and reproducing instruments, particularly for dictating equipment, which microphone is of a type containing a control portion from which various control functions can be initiated in the main instrument, e.g., the functions of recording, playback, rewind and stop.

It is already known in the art to produce these control functions by one or a plurality of control buttons which act on mechanical, metallic contacts to initiate switching signals. These metallic control contacts, however, have only a limited service life and, what is perhaps their greatest drawback, the actuation of these metallic control contacts through the mechanical buttons causes strong, interfering noises, during recording due to the fact that these control means are disposed, together with a microphone capsule, in a common hand microphone housing.

In order to eliminate these drawbacks of the mechanical control contacts and control buttons, it has already been proposed for example in German Pat. No. DAS 1,282,089, to provide electronic switching means without movable contacts, i.e., mechanically stationary electronic switching means, to perform the control functions in place of the mechanical control buttons. Such movable contact-free electronic switching means may include, for example, capacitor plates disposed in the microphone housing so as to be externally influenced by the capacitance of the operator's hand in order to perform the same switching function through an electronic switch as was previously performed by a metallic contact.

It is also possible to connect the external leads of electrically conductive plates with another conductive coating on the outside of the microphone via the ohmic resistance of the operator's hand to control an electronic switch. At the output of these contact-free electronic control means there is thus present, in almost all cases, an electronic switch which replaces the original movable metallic control contact. The electrical properties of such control components in hand microphones are preferably so designed that this microphone can easily be exchanged for another microphone having movable metallic control contacts.

The necessity often arises, however, of using the movable mechanical control contacts in the hand microphone to directly switch alternating voltages, e.g., low-frequency voltages. The previously known contact-free electronic control means in hand microphones, however, were designed only for switching direct voltages and were not suited for alternating voltages. For this reason it was necessary to further connect an electromagnetic relay or the like which was able to switch the alternating voltage by means of its movable metallic contacts.

SUMMARY OF THE INVENTION

It is an object of the invention to eliminate the wear experienced by the control contacts in a hand-held microphone.

A further object of the invention is to reduce the cost of the control unit provided in such a microphone.

It is a more specific object of the present invention to employ the principle of the fully electronic movable contact-free control of the functions in sound recording and reproducing instruments, particularly in dictating equipment, for switching alternating voltages.

The present invention thus involves a hand microphone whose control portion has movable contact-free electronic control means as a substitute for the metallic control contacts and can directly switch, in at least one of its control positions, alternating voltages, e.g., the low-frequency signals to be delivered to an electroacoustical transducer when the machine is in the playback condition. According to a basic feature of the present invention, the collector-emitter path of a transistor is provided for selectively conducting the alternating voltages and the switching state of the transistor is control-

lable by the associated movable contact-free electronic means to such an extent that it is able to switch through the highest occurring alternating voltage peaks in the forward as well as in the reverse direction without being blocked.

The present invention thus makes it possible to connect the collector-emitter path of a transistor to any desired movable contact-free electronic control means in the hand microphone in order to switch through alternating voltage signals in any desired operating position of the control portion. It is of course also possible to equip all the movable contact-free electronic control units of the control portion in this manner in order to be able to switch alternating voltages as well as direct voltages.

The control of the transistor for switching through alternating voltage signals is accomplished preferably in the manner that a switch-through control voltage can be applied to the base of the transistor by the electronic means which is so high that sufficient base current flows in the forward direction during normal operation as well as during reverse operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is the circuit diagram of a known microphone with movable metallic control contacts.

FIG. 2 is the circuit diagram of a microphone according to the present invention connected to a main instrument for recording and reproducing sound.

FIG. 3 is the diagram of the microphone of the present invention.

FIGS. 4 and 5 shows the electronic switches 12 and 13.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows the most important electrical components of a conventional hand microphone 10 for dictating equipment. Terminals 1 through 7 are the connections through which the hand microphone is connected with the actual dictating equipment 20 (FIG. 2). An operating voltage is applied through terminal 1 which is switched, depending on the switching position of the slide switch, or button 8 to one of the four terminals 2 through 5. The switch 8 connects the operating voltage from terminal 1 with terminal 2 in position R (rewind), with terminal 3 in position W (playback), with terminal 4 in position H (stop) and with terminal 5 in position A (recording). Terminals 6 and 7 are connected with the electroacoustical transducer 9 of the microphone.

FIG. 2 shows the hand microphone 10' according to the invention with an electronic control portion which has no movable contacts and which is to perform the same functions as the control portion of the microphone of FIG. 1. The switch 8 of FIG. 1 is here replaced by electronic means 12, 13, 14 and 15 which may be of any desired construction and which each contain an electronic switch which is here shown with the symbol of a switch contact. As is well known, electronic switches do not rely for their operation on the physical movement between contact members and hence do not produce any contact noise, which would be picked up by the microphone transducer. Terminal 1 is connected to a metallic coating 11 near which there are disposed the metallic coatings 22, 23, 24 and 25 which are associated with the four different switching positions R, W, H and A. The finger of the operator can connect any coating 22, 23, 24 or 25 with the main coating 11 so that an appropriate control signal reaches the associated contact-free control means 12, 13, 14 or 15. While the resistance provided by the operator's finger is relatively high, it is as is well known, sufficiently low to provide the current necessary to actuate many types of electronic switches, particularly those of the semiconductor.

If for example, coating 22 is connected with coating 11, the contact resistance conducts a control signal to the control means 12 (FIG. 4) to close its electronic switch and thus apply the voltage at terminal 1 to terminal 2 and from there to the dictating equipment. This applied voltage actuates the appropriate function in the dictating equipment 20 for rewind-

ing. This applies similarly for the electronic control means 14 and 15.

It can be seen that the circuits of conductors 1, 2, 3, 4 and 5 of FIG. 2 can serve the same switching purposes as conductors 1, 2, 3, 4 and 5 of FIG. 1. If, for instance, electromagnetic solenoids are to be controlled, these have to be connected in series with a DC voltage, between conductor 1 and any of the conductors 2, 4 or 5.

If now the voltage at terminal 1 is connected through the metallic coating 23 to the input of the electronic control means 13 (FIG. 5), the associated electronic switch is closed and a bias is applied, via the series resistance 17 to the base of a transistor 16. This bias is, as shown, negative in the case of a PNP-transistor 16; for a NPN-transistor it would be positive. The collector-emitter path of the transistor 16 thus becomes conductive and closes the loop containing an alternating voltage source 19 and an electroacoustical transducer 18, e.g., a speaker, in the machine 20 through terminals 1 and 3.

During the positive half cycles of the alternating voltage from source 19 (e.g., audiofrequency output), the terminal 3 which is connected to the emitter of transistor 16 is positive with respect to line 1 so that the transistor operates normally in its conductive state. During the negative half cycles of the alternating voltage from source 19, however, terminal 3 is negative and transistor 16 can only be kept in its conductive stage if its base remains more negative than terminal 3. For this reason the negative bias voltage for the base must have a certain minimum value which is higher than the maximum occurring negative voltage peaks of the alternating voltage from source 19. During the negative half cycles of the alternating voltage from source 19 the transistor 16 thus operates in the reverse direction. Account must therefore be taken of the fact that an asymmetric transistor has a lower current amplification in reverse conduction operation than in normal forward operation. One skilled in the art would be readily able to select the appropriate transistor for a given circuit and to determine the necessary bias voltage level which could be provided, for example, by a small battery in the microphone case.

In this way it is possible to switch through alternating voltage signals of relatively high power to an electroacoustical transducer 18 without the need for movable metallic contacts. If control signals of sufficient amplitude are applied to the base of transistor 16 distortions and losses can be kept to a negligible maximum.

It is of course also possible to equip a plurality of these contact-free means 12 to 15 with an additional transistor for switching through alternating voltages. Under certain circumstances it might be advisable to provide appropriate additional transistors 16 for all channels. It is of course also possible to switch direct voltages by means of the control structure connected to line 3.

FIG. 3 shows the hand microphone 10 with the metallic coating 11 at the back of the microphone housing and the associated coatings 22, 23, 25 and 25, which represent the four different switching positions. The finger of the operator may connect the main coating 11 with any of the coatings 22 to 25.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. In a hand microphone for use with, and electrically connectable to, a sound recording and reproducing instrument containing at least one alternating voltage circuit to be controlled from the microphone, the improvement wherein said microphone contains circuit control means comprising: a transistor; connection means connected to the collector and emitter of said transistor and connectable to the machine for connecting the collector-emitter path of said transistor in series with said at least one alternating voltage circuit for permitting the conduction state of said transistor to control the operation of such circuit; mechanically stationary electronic switch means connected to said transistor, said switch means defining a conductive path which is selectively closeable for placing said transistor in a conductive state with respect to all amplitude levels of the alternating voltage in such circuit; and operating means connected to said switch means for controlling the switching state thereof.

2. An arrangement as defined in claim 1 wherein said switch means comprises a bias voltage source and is connected to the base of said transistor for applying a base bias voltage which maintains a forward base current for either direction of current flow through the collector-emitter path of said transistor.

3. An arrangement as defined in claim 2 further comprising additional electronic switch means connectable to control other circuits in the instrument and each defining a conductive path which is selectively closeable, and additional operating means connected to said additional switch means for individually controlling the switching states thereof.

4. An arrangement as defined in claim 3 wherein said operating means and said additional operating means together comprise a common conductive strip connectable to a voltage source and a plurality of individual conductive coatings spaced from said strip and each forming part of a respective operating means, and wherein said electronic switch means and additional electronic switch means are of a type whose conductive path is closed by the voltage applied thereto when said strip is connected to such voltage source and the gap between said strip and a respective coating is bridged by the finger of an individual using the instrument.

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