United States Patent

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[33] **Germany**
[31] **No. S 106,796**

[54] **MICROPHONE WITH A PLURALITY OF HAND CONNECTABLE CONTROL ELECTRODES**
20 Claims, 4 Drawing Figs.

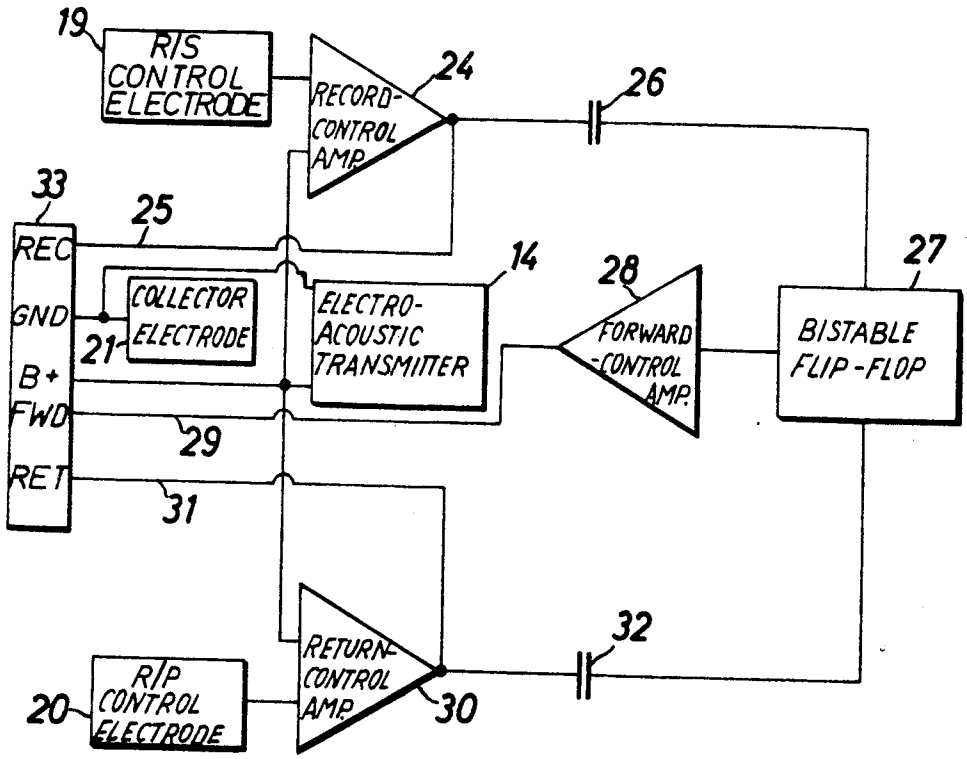
[52] **U.S. Cl.** **179/100.1**
[51] **Int. Cl.** **G11b 19/16**
[50] **Field of Search** ..... 179/100.1 DR, 6R, 1SW, 2R; 274/1, 17; 200/157(Inquired)

[56] **References Cited**
UNITED STATES PATENTS

2,576,929	12/1951	Evcolino	200/159X
3,418,432	12/1968	Boggs	179/100.1

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Assistant Examiner—Raymond F. Cardillo, Jr.
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ABSTRACT: A hand-held microphone electrically connected with a sound-recording and reproducing apparatus and including a housing containing an electroacoustic transmitter and a plurality of electrodes mounted on the outside of the housing, at least one electrode being a counter electrode and other electrodes constituting control electrodes. The electrodes are selectively interconnected, through the operator's hand, to actuate the recording and reproducing functions of the apparatus.



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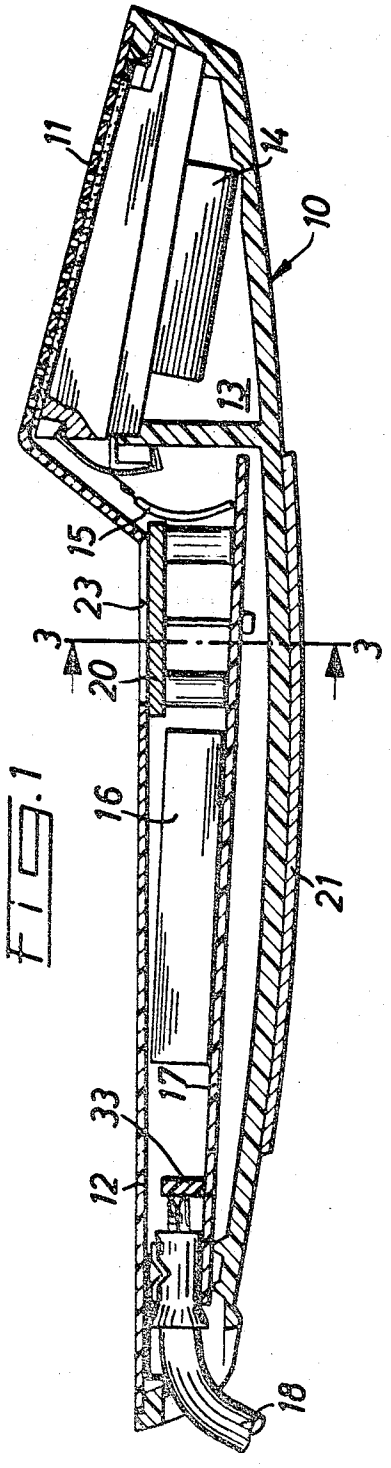


FIG. 1

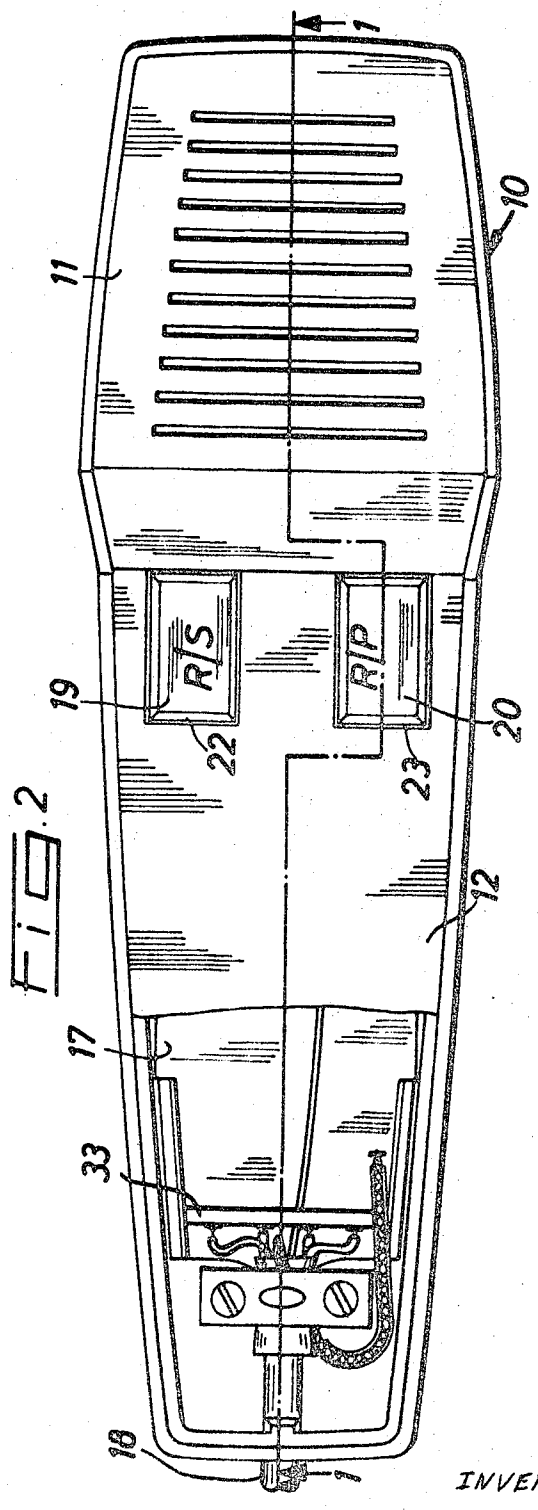


FIG. 2

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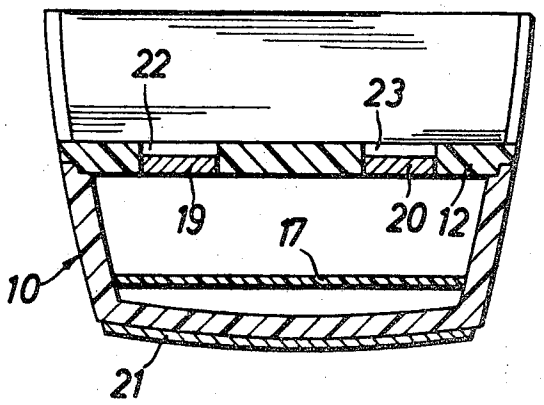
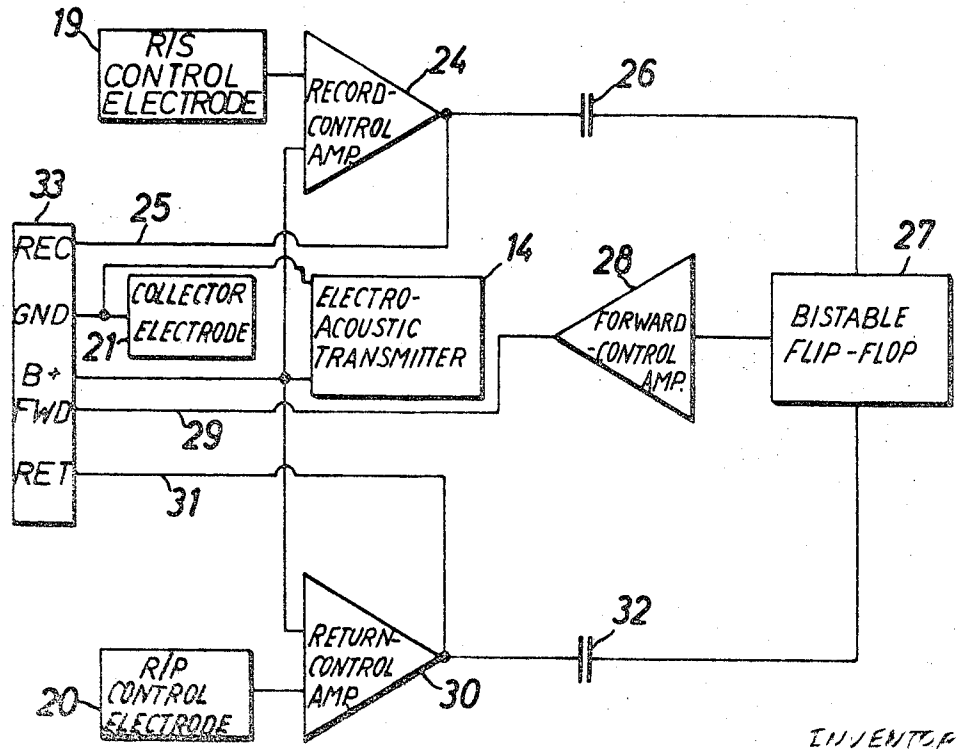


FIG. 3

FIG. 4



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MICROPHONE WITH A PLURALITY OF HAND CONNECTABLE CONTROL ELECTRODES

The present invention relates to hand-held microphones, for example, those incorporated in handles used in combination with sound-recording and reproducing equipment, especially dictating machines. The known microphones generally consist of an electroacoustic transmitter built into a housing and means to selectively energize the transmitter for use in sound-recording and reproduction modes. The microphone is connected to a recording and reproducing apparatus by means of a cable, and control of the apparatus is accomplished through selective interconnection of electrodes mounted on the outside of the housing. The electrodes, when selectively connected, complete electronic circuits, preferably semiconductor or other solid-state circuits, in the microphone housing itself and/or in the sound-recording and reproducing apparatus electrically connected thereto. The circuits in turn cause the actuation of the selected recording and reproduction mode.

It is well known to provide electrodes in the housing of a microphone for galvanically and/or capacitively controlling electronic switches. Such switches are used to control the operational modes of the sound-recording and reproducing apparatus connected to the microphone. This may be accomplished either directly or through interposed mechanical switches, for example, relays, mechanical clutches and the like. With these constructions, the circuit associated with the electrodes are accommodated either in the microphone housing itself and/or in the sound-recording and reproducing apparatus connected thereto.

The hitherto known microphones carry generally four electrodes. One of these electrodes usually serves to supply the control voltage or current for controlling the switching circuits. The other electrodes are individually connected galvanically or capacitively to the voltage or current electrode by means of the operator's finger or hand and finger. These other electrodes supply the control voltage or current to the individual switching circuits.

The disadvantage of these known constructions is that the three control electrodes for the switching circuits take up a relatively large space on the housing. There is also the danger that the close juxtaposition of the electrodes and of the electrode for supplying the control voltage or current may give rise to wrong circuit connections via leakage paths in the housing.

The present invention has as an object to avoid the above disadvantages. In addition, the invention has for an object to provide considerable simplification and greater comfort of operation of the microphone by the operator.

The foregoing objects are achieved in that the outside of the housing carries only three electrodes, one of which serves as a counterelectrode and the remaining two as control electrodes for controlling the operations of the sound-recording and reproducing apparatus connected thereto. This also permits the construction of a small and conveniently usable microphone.

The counterelectrode is preferably mounted on the housing in such a way that it is associated with the palm of the operator's hand in normal use.

The counterelectrode further can comprise two or more portions which are mechanically separated on the surface of the housing but are electrically interconnected.

The control electrodes, for actuating the control operations, are associated with that portion of the microphone housing readily accessible to fingers or thumb and fingers of the operator's hand. However, in view of the position of the electrodes on the outside of the housing, the control electrodes should also be readily accessible to two fingers, for example, the index finger and the middle finger of the hand holding the microphone.

The control electrodes are preferably located on the side of the microphone housing which is to face the sound source. The connection between the control electrodes and the counterelectrode is brought about by the hand holding the microphone. By making a manual connection between one

control electrode and the counterelectrode, one particular operation of sound recording and reproducing is actuated and a sequential operation is actuated when this connection is broken. It is preferable if one of the control electrodes is associated with the operation "play and record" and the sequential operation "stop and no recording" while the other control electrode is associated with the operation "return and no recording or reproduction" with the sequential operation "play and electroacoustic reproduction."

In the event of a common connection of both control electrodes to the counterelectrode a predominating operation is brought about which may correspond to the operation of one of the control electrodes. Accordingly, the opening of this common connection actuates the sequential operation associated with the predominating operation. For example, with a common connection of both control electrodes to the counterelectrode, it is possible to bring about the operation "return and no recording or reproduction" as the predominating operation. After breaking this common connection with the counterelectrode, the sequential operation "play and electroacoustic reproduction" becomes effective.

Of course, it is possible that, with a common connection of both control electrodes to the counterelectrode, a further operation will be brought about while a sequential operation will take place upon breaking the common connection with the connector electrode. This sequential operation can also be a further sequential operation or one of the sequential operations associated with either of the control electrodes.

Upon opening the common connection of both control electrodes with the counterelectrode and a simultaneous connection of one of the control electrodes to the counterelectrode, the operation of this control electrode becomes effective.

While it should be observed that the hand of the operator is serving as an electrically conductive connection between the electrodes, it is to be noted that such contact would not prove to be uncomfortable. If the resistance of the operator's hand is taken as the normal approximate 1 megohm, then with a maximum permissible voltage of 30 volts, a current on the order of a magnitude of 3×10^{-5} amperes will flow through the hand. This current is so low that it is not only completely free of danger but cannot normally be noted by the operator.

The means for accomplishing the foregoing objects and other advantages, which will be apparent to those skilled in the art, are set forth in the following specification and claims and are illustrated in the accompanying drawings dealing in a basic embodiment of the present invention. Reference is made now to the drawings in which:

FIG. 1 is a longitudinal section through the inventive microphone taken along line 1–1 of FIG. 2;

FIG. 2 is a plan view of the microphone showing the side normally facing the sound source and with a portion of the cover plate removed;

FIG. 3 is a transverse section through the microphone taken along line 3–3 of FIG. 1; and

FIG. 4 is a block level schematic of the electrical circuitry contained within the microphone handle.

Referring now to FIG. 1 showing the inventive microphone in longitudinal section, the microphone comprises a housing 10 having a sound-permeable cap 11, for example, a grid or perforated plate, and cover plate 12. Both the sound-permeable cap and the cover plate may be on the same side of the microphone as shown in FIG. 1; however, this is not necessarily so.

Beneath the sound-permeable cap, there is a compartment 13 which contains a suitable electroacoustic transmitter 14, here shown merely as a block. Lead wires 15 connect the electroacoustical transmitter to the electronic amplifying components which will be discussed later. These components have been schematically represented by the block 16 mounted on the printed circuit board 17. The printed circuit board is likewise connected through terminal strip 33 to an electrical cord 18 which passes out of the microphone housing and is connected to a suitable recording and reproducing apparatus, not shown.

Mounted on one side of the housing **10** are a pair of control electrodes **19** and **20**. On the opposite side of the housing, a counterelectrode **21** is mounted. The electrodes are suitably connected to the electronic components mounted within the housing.

The electrodes may consist of a film such as a thin film of chrome plating on the surface of the plastic housing. The control electrodes have been shown positioned below access openings **22** and **23**. The control electrodes are so located that they are readily accessible to the operator's fingers. If desired, the control electrodes may be marked or engraved with an appropriate inscription, such as a R/S or a R/P standing for record/stop and return/playback, respectively. These letters designate the operation and sequential operation associated with the respective control electrode. If we assume the illustration above, the electrode **19** will, upon being connected to the counterelectrode, control the operation "play and record" and, upon breaking connection with the counterelectrode, energize the sequential operation "stop and no recording." Upon connecting of the counterelectrode **21** to the control electrode **20**, the operation "return and no recording or reproduction" will take place, and upon breaking this connection, the sequential function "play and electroacoustic reproduction" will take place.

If sound recording is to be continued after playing back a portion of the recording, then, as described above, the connection between the control electrode **19** and the counterelectrode **21** is remade and dictation may be continued. If the machine is to be stopped during or after listening to the playback, the electrode **19** is momentarily touched and then immediately released again so that the sequential operation "-stop and no recording" becomes effective.

The arrangement of the electrodes as shown in FIGS. **1** and **2** is particularly advantageous since both control electrodes may be actuated by the thumb and the microphone held in either the right or left hand with the fingers grasping the counterelectrode. Other suitable positioning of the control electrodes, such as longitudinal spacing, will be apparent to the skilled artisan, the invention not being limited to the specific location of the electrodes as illustrated.

FIG. **2** shows a plan view of the microphone as it would be viewed from the sound source, normally the operator himself. Only the two control electrodes are visible, the counterelectrode being on the reverse side of the microphone housing. It may be clearly seen that this design of the housing is particularly advantageous since the cover plate **12** may be readily removed to provide access to either of the control electrodes **19** or **20** as well as to the electronic components in the block **16**, the lead wires **15**, terminal strip **33**, and cord **18**.

The back of the microphone housing shown will normally be associated with a portion of the operator's hand. If it was desired to have complete thumb operation, the operator would grasp the microphone housing with his hand positioned so that his fingers wrap around the counterelectrode placing the thumb in a position where the control electrodes would be readily in reach. The housing could also be grasped so that the counterelectrode rested upon the palm of the operator's hand with one control electrode being operated by the forefinger and the other being operated by the thumb. The housing could be further rotated in the operator's hand so that both control electrodes would be accessible to either the forefinger alone or the forefinger and the index finger.

It should be noted that the counterelectrodes are mechanically isolated but electrically connected to the electronic amplifying components in block **16**. The relatively large distance between the control electrodes and the counterelectrode, with the electrodes being oppositely directed on the casing, will practically eliminate any error in making connection due to faulty insulation, dirt on the surface, or humidity of the air. The very large areas of contact between the palm of the hand and the counterelectrode will give an extremely low contact resistance. The control electrodes are readily available to the tips of the operator's fingers so that a large surface area with low contact resistance is available.

The control electrodes may be placed on the surface of the housing, be recessed beneath the surface as shown, or be substantially flush with the surface. It has been found preferable to either countersink the control electrodes or to provide them with a flanged rim so that the operator will be able to more positively feel and correctly position his finger and thus be able to ascertain whether the machine has been actuated or not without looking at it.

FIG. **3** is a transverse sectional view taken along line **3–3** of FIG. **1** showing the countersunk position of the control electrodes **19** and **20** and the thin film forming the counterelectrode **21** on the reverse side of the housing. It should be noted that, for the sake of clarity, the electrodes have been shown on a disproportionately enlarged scale in order to obtain the necessary hatching. It will be readily appreciated that the electrode may be formed from an electroplated material and be just a thin film.

Turning now to FIG. **4**, this FIG. illustrates a schematic block diagram of the control block **16** of FIG. **1**. This circuit is merely exemplary, and it should be noted that the switching functions could be carried out by a large number of other suitable circuits. Further, the circuitry may be located in the microphone housing as shown in FIGS. **1** to **3** or in the recording and reproducing apparatus itself. In the diagram there is shown a terminal strip **33** for connecting the microphone to the amplifier of the recorder apparatus, to the relays for controlling recording and playback of the recorder apparatus, to the electrical and mechanical devices for forward and return control of the recording medium, as well as for the voltage supply. The circuit consists essentially of three semiconductor amplifiers which are connected between the control electrodes and the terminal strip. The three amplifiers are the recording control amplifier, the return control amplifier, and the forward control amplifier. The circuit further includes a bistable semiconductor switching circuit.

The recording voltage amplifier **24** is controlled by making contact between the record/stop control electrode **19** and counterelectrode **21**. The recorder apparatus is energized for recording with this contact made. Upon breaking this contact, the sequential function stop is actuated. The return/playback amplifier **30** is controlled by making contact between the return/playback electrode **20** and counterelectrode **21**. The function return is energized by making this contact, and upon the breaking thereof, playback is energized as the sequential function.

Upon closing contact between counterelectrode **21** and the record/stop electrode **19**, an output signal from the recording amplifier is passed via the recording line **25** to the recorder apparatus which is thereby energized for recording. A control pulse is taken from the output of the recording control amplifier **24** through capacitor **26** and fed to the bistable flip-flop **27**. The flip-flop is triggered by the control pulse and sends a signal through the forward control amplifier **28** and along line **29** to shift the driving portion of the recorder apparatus to a forward mode.

Upon actuation of the sequential function, by breaking connection between the record/stop and counterelectrodes, the bistable flip-flop is triggered from the forward condition to the stop condition sending an appropriate signal to stop the drive mechanism of the recorder apparatus.

If the return/control amplifier **30** is energized by closing contact between the return/reproduction contact **20** and counterelectrode **21**, a control signal is passed from the output of amplifier **30** via the return line **31** to the recorder apparatus and to energize the drive thereof for return operation. When this contact is broken, a forward signal is passed over the same line to effect a playback function. A control pulse is taken from the output of return amplifier **30** via the capacitor **32** to trigger the bistable flip-flop **27**. The flip-flop will send a further signal through the forward control amplifier **28** and the forward line **29** to obtain forward drive for reproduction of the recorded signals.

The present invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore to be embraced therein.

I claim:

1. A hand microphone for use with a recording and playback machine, comprising a housing, an electroacoustic transducer mounted in the housing and connected with the recording and playback machine, at least three electrodes mounted on the housing, one of which is a counterelectrode and the other electrodes are control electrodes, amplifying and control means in the said housing and connected on the one hand with the electroacoustic transducer and the three electrodes in such a manner that a controlling and amplifying of control signals produced by the connecting of the electrodes through the hand of the operator is effected, and which means on the other hand are connected with elements which initiate and control the functions of the recording and playback machine.

2. A hand microphone according to claim 1 in which said amplifying and control means comprises control amplifiers and at least one bistable flip-flop circuit.

3. A hand microphone for use with a recording and playback machine, comprising a housing, an electroacoustic transducer mounted in said housing and connected with the recording and playback machine, at least three electrodes mounted on the housing, one of which is a counterelectrode and the other electrodes are control electrodes, amplifying and control means in the recording and playback machine selectively connected on the one had with the electroacoustic transducer and the three electrodes in such a manner that a controlling and amplifying of control signals produced by the connecting of the electrodes through the hand of the operator is effected, and which means on the other hand are connected with elements which initiate and control, the functions of the recording and playback apparatus.

4. A hand microphone according to claim 3 in which said amplifying and control means comprises control amplifiers and at least one bistable semiconductor-switching circuit.

5. A hand microphone according to claim 3 in which said amplifying and control means comprises control amplifiers and at least one bistable flip-flop circuit.

6. A hand microphone for use with a recording and playback machine, comprising a housing, an electroacoustic transducer mounted in said housing and connected with the recording and playback machine, at least three electrodes arranged on the housing, one of which is a counterelectrode, while the other electrodes are control electrodes, amplifying and control means mounted in the housing and comprising control amplifiers, as well as at least one bistable semiconductor switching circuit cooperating with same, said amplifying and control means being selectively connected with the electroacoustic transducer and the three electrodes in such a manner that a controlling and amplifying of control signals produced by the connecting of the electrodes by the hand of the operator is effected by them, and which on the other hand are connected with the elements initiating the functions of the recording and playback machine and which control them.

7. A hand microphone according to claim 6 in which said counterelectrode is mounted on the housing on the side opposite the direction of the sound source whereby it will be readily contacted by the palm of the operator's hand.

8. A hand microphone according to claim 6 in which said counterelectrode comprises at least two portions mounted on the surface of said housing, said portions being mechanically separated but electrically interconnected.

9. A hand microphone according to claim 6 in which said control electrodes are positioned on said housing so as to be readily accessible to the fingers of the operator's hand when holding the microphone.

10. A hand microphone according to claim 6 in which said control electrodes are positioned with respect to the fingers of the operator's hand holding the microphone.

11. A hand microphone according to claim 6 wherein said control electrodes are positioned so as to be readily accessible to the thumb of the operator's hand holding the microphone.

12. A hand microphone according to claim 6 in which said control electrodes are mounted on the side of the housing facing the source of sound.

13. A hand microphone according to claim 6 in which the connection of one control electrode with the counterelectrode actuates one function of said apparatus and opening of said connection actuates a sequential function of said recording and reproducing apparatus.

14. A hand microphone according to claim 6 wherein one of the control electrodes is operatively connected to actuate the function "play and record" and the sequential function "stop and no recording" and the other said control electrode is operatively connected to actuate the function "return and no recording or reproduction" and the sequential function "play and electroacoustic reproduction."

15. A hand microphone according to claim 6 in which said control electrodes are countersunk in said housing.

16. A hand microphone according to claim 6 in which a raised flange projects from said housing and encloses the periphery of said control electrodes.

17. A hand microphone according to claim 6 in which said amplifying control means contained in said housing are solid-state semiconductor circuits.

18. A hand microphone according to claim 6 in which said counterelectrode is a thin film formed on said housing.

19. A hand microphone according to claim 6 in which a common connection of both said control electrodes to said counterelectrode causes a predominating function of said machine corresponding to the function controlled by one of said control electrodes and the breaking of said common connection actuates the sequential operation.

20. A hand microphone according to claim 19 in which said predominating operation is "return and no recording or reproduction" and the sequential operation is "play and electroacoustic reproduction."