

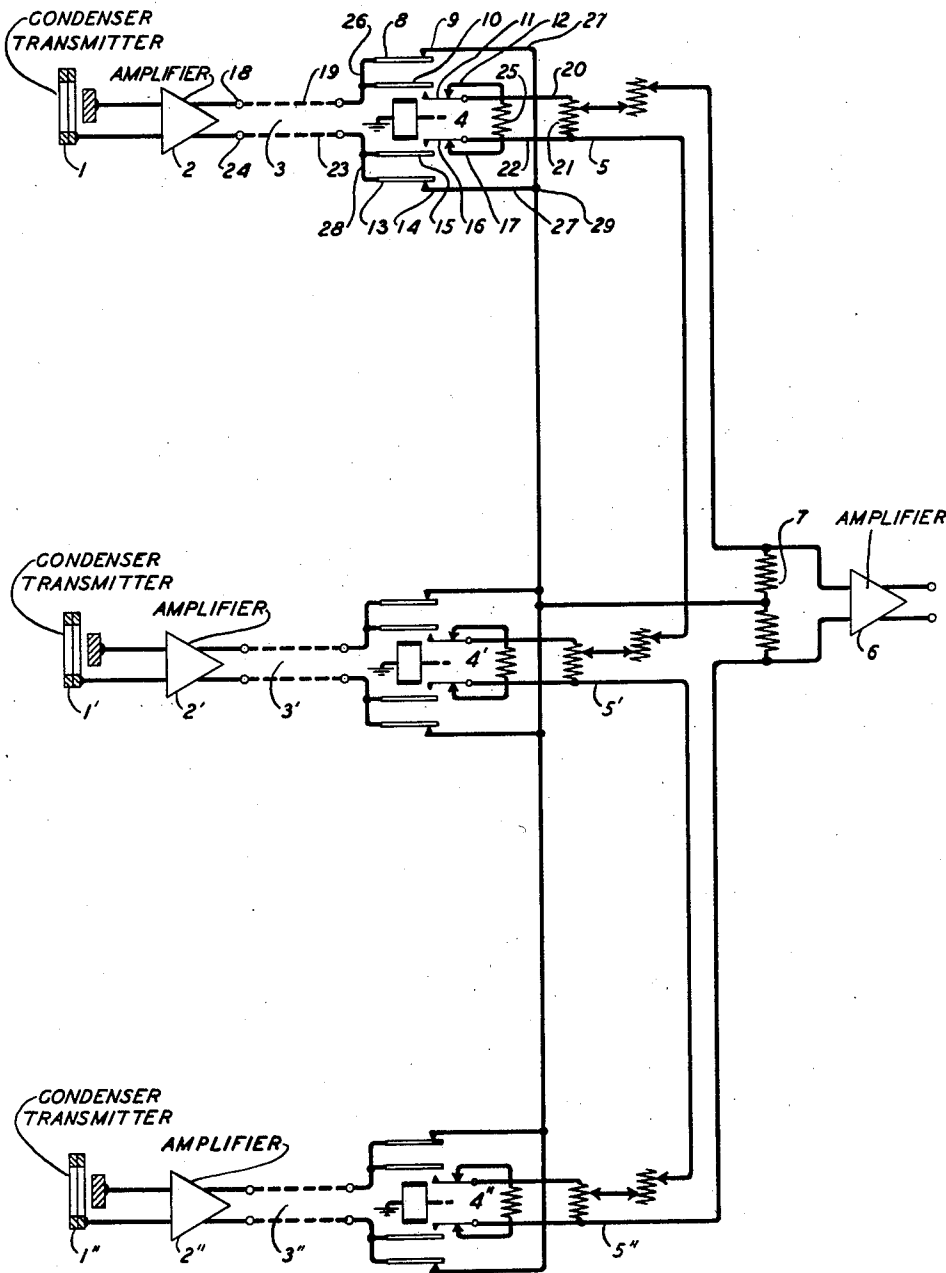
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AMPLIFIER SYSTEM

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AMPLIFIER SYSTEM

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This invention relates to amplifiers and more especially to amplifying arrangements in which an associated transmitter or microphone or a plurality of them may be switched on and off as desired.

The present invention finds application in public address systems, radio broadcasting systems, etc. where the program source changes as, for instance, from one studio to another or from one city to another, etc. Such switching is often accompanied by clicks which after amplification are extremely annoying as reproduced in loud speaking arrangements.

It is an object of this invention to improve the operation of public address systems, radio broadcast studio systems, and similar systems, as regards the facilitating of circuit changes.

It is a further object of the invention to permit switching from one transmitter or microphone to another in such systems without clicks or other undesirable noises.

The above objects are accomplished in one embodiment of the invention by short-circuiting the output of the microphone which is to be discontinued and connecting the output to some suitable point in the load circuit so that no potential difference exists between these points and hence no current will flow when the microphone is cut in, which current flow has been found to be the cause of the annoying clicks.

The invention will be better understood from the following description together with the attached drawing which shows the invention as applied to a system involving condenser microphones and a common amplifier.

In the drawing three condenser microphones 1, 1' and 1'' with their associated amplifiers 2, 2' and 2'' are shown. These amplifiers may be located in different studios of a broadcasting station, at different points at a speaker's table etc.

Connecting circuits 3, 3' and 3'' serve to

transmit current from the individual microphones and amplifiers to the control center at which are located relays 4, 4' and 4''. The control circuits for these relays have not been shown as they are well understood in the art and form no part of the present invention.

When the relays 4 etc. are operated the connections from the transmitters to amplifier 6 are made and the output current from the microphone amplifiers may be adjusted by means of mixing potentiometers 5, 5' and 5''. These potentiometers are described and claimed and their purpose as to impedance matching is explained in the Patent No. 1,778,779, to D. F. Whiting, Oct. 21, 1930. As an understanding of the function of these potentiometers is not necessary to an understanding of the present invention no further description of them will be given here, except to state that they permit the input to amplifier 6 from the microphones to be separately adjusted while keeping the impedance out of which amplifier 6 works substantially constant.

The output of these mixing potentiometers is impressed upon a common amplifier 6 across the input of which is shunted a high resistance 7. Resistance 7 is made of two parts of equal value and is tapped at the midpoint. This resistance may also be considered as being shunted across the output of potentiometers 5 etc.

Amplifier 6 is preferably a vacuum tube amplifier of one or more stages as desired. The power of this amplifier and the manner in which its output is utilized will depend upon the kind of system in which it is used, that is, whether it is a radio broadcasting system, public address system etc.

Relays 4, 4' and 4'' are duplicates and the connections of only one will be described. The armatures are shown with the relays unoperated or deenergized in which position the corresponding microphone is cut out of service. The two sets of armatures and con-

tacts of each relay perform similar functions for each of the line wires leading from amplifier 2 to the mixing potentiometer 5.

When microphone 1 is to be cut into use relay 4 is energized whereupon it attracts both sets of armatures. Armature 8 breaks contact with arm 9, armature 10 makes contact with arm 11 and then arm 11 breaks contact with arm 12. Similar operations occur at armature 13, arm 14 etc. The output circuit of amplifier 2 may then be traced from terminal 18 of the amplifier through line wire 19 of connecting circuit 3, armature 10, arm 11 of relay 4, line wire 20, resistance 21 of potentiometer 5, line wire 22, arm 16, and armature 15 of relay 4, line wire 23 to amplifier 2. From resistance 21 the output circuit continues through amplifier 6 across the input of which is bridged resistance 7.

When microphone 1 is to be cut out of use relay 4 is deenergized whereupon both sets of armatures resume the positions shown in the drawing. Armature 10 and arm 11 no longer contact and neither do armature 15 and arm 16. Amplifier 2 is therefore disconnected from potentiometer 5. Arms 11 and 12 are in contact as are also arms 16 and 17 thereby connecting a resistance 25 across the leads to potentiometer 5. (Resistance 25 is inserted between leads 20 and 22 to afford the proper impedance in the line looking from amplifier 6).

Armature 8 contacts with arm 9 and armature 13 contacts with arm 14 to short circuit the output of amplifier 2 over a circuit including strap 26, armature 8, arm 9, strap 27, arm 14, armature 13 and strap 28.

The contacts of the relays are so adjusted that when the relays are energized the transmitter amplifier leads are disconnected from each other and from the mid-point on resistance 7 before they are connected to potentiometer 5. Although the transmitter amplifier circuit is free for a fraction of a second, the charge which accumulates during this short period is not sufficient to produce a noticeable "click" in the output of the system.

From some point 29 in the short circuit a connection is made to the midpoint of the resistance 7. Resistance 7 is of such high value that practically none of the energy impressed upon amplifier 6 is shunted through it. The function of resistance 7 is to act as a leak between amplifier 2 and the input of amplifier 6 whereby no potential difference can build up between these points to cause a surge of current when microphone 1 is again cut into use. The potential which might otherwise exist between the two amplifiers is apparently due to the electrostatic field which exists between the high voltage lead of amplifier 2 and the shield of connecting cord 3. If nothing were done to prevent it there would be a surge of current due to this charge from the amplifier leads to potentiometer 5 when

the microphone is cut into use. By short circuiting the amplifier and providing leak path 7 no charge accumulates and hence no surge occurs, with the accompanying noise, when the microphone is again cut-in.

What is claimed is:

1. In combination, a source of input electrical waves, an amplifier therefor, switching means for connecting and disconnecting said source from said amplifier and means for short circuiting the output of said source and maintaining it at the same potential as a point in the circuit into which it works.

2. In combination, a plurality of microphones, individual amplifiers for each microphone, a second amplifier common to all said individual amplifiers and means for short circuiting the output of each of said individual amplifiers, when its associated microphone is idle, and maintaining the output of said individual amplifier at the same potential as the input circuit of said common amplifier.

3. In combination, a plurality of microphones, an individual amplifier for each microphone, a second amplifier common to all said individual amplifiers, switching means to connect and disconnect said individual amplifiers from said common amplifier and means actuated by said switching means to short circuit the output of each of said individual amplifiers and connect the short circuit to the input of said amplifier.

4. In an amplifier system, a plurality of microphones, an individual amplifier associated with each microphone and an amplifier common to all said amplifiers, a resistance element bridged across the input of said second amplifier, means to disconnect each individual amplifier from said second amplifier, and means to short circuit each individual amplifier output when disconnected from said second amplifier and to connect such short circuited amplifier to the resistance across the input of said second amplifier.

5. In an amplifier system, a plurality of microphones, an individual amplifier associated with each microphone, a second amplifier common to all said amplifiers, a resistance element bridged across the input of said second amplifier, unitary means for simultaneously disconnecting said second amplifier from said individual amplifier, for short circuiting the output of said individual amplifier and for connecting said short circuited amplifier to the mid-point of said resistance.

6. An amplifier system comprising a plurality of microphones, individual amplifiers therefor, a second amplifier common to all said individual amplifiers, a resistance element bridged across the input of said second amplifier, a relay, contacts associated therewith so arranged that in one position of said contacts the individual amplifiers are disconnected from said common amplifier, the

individual amplifier outputs are short circuited and the short circuited outputs are connected to the mid-point of said resistance and in the other position of said contacts, 5 said short circuit is removed, the connection to said resistance is broken and the output of said individual amplifier is connected to the input of said second amplifier.

In witness whereof, I hereunto subscribe
10 my name this 6th day of June, 1930.

JAMES E. TARR.

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