

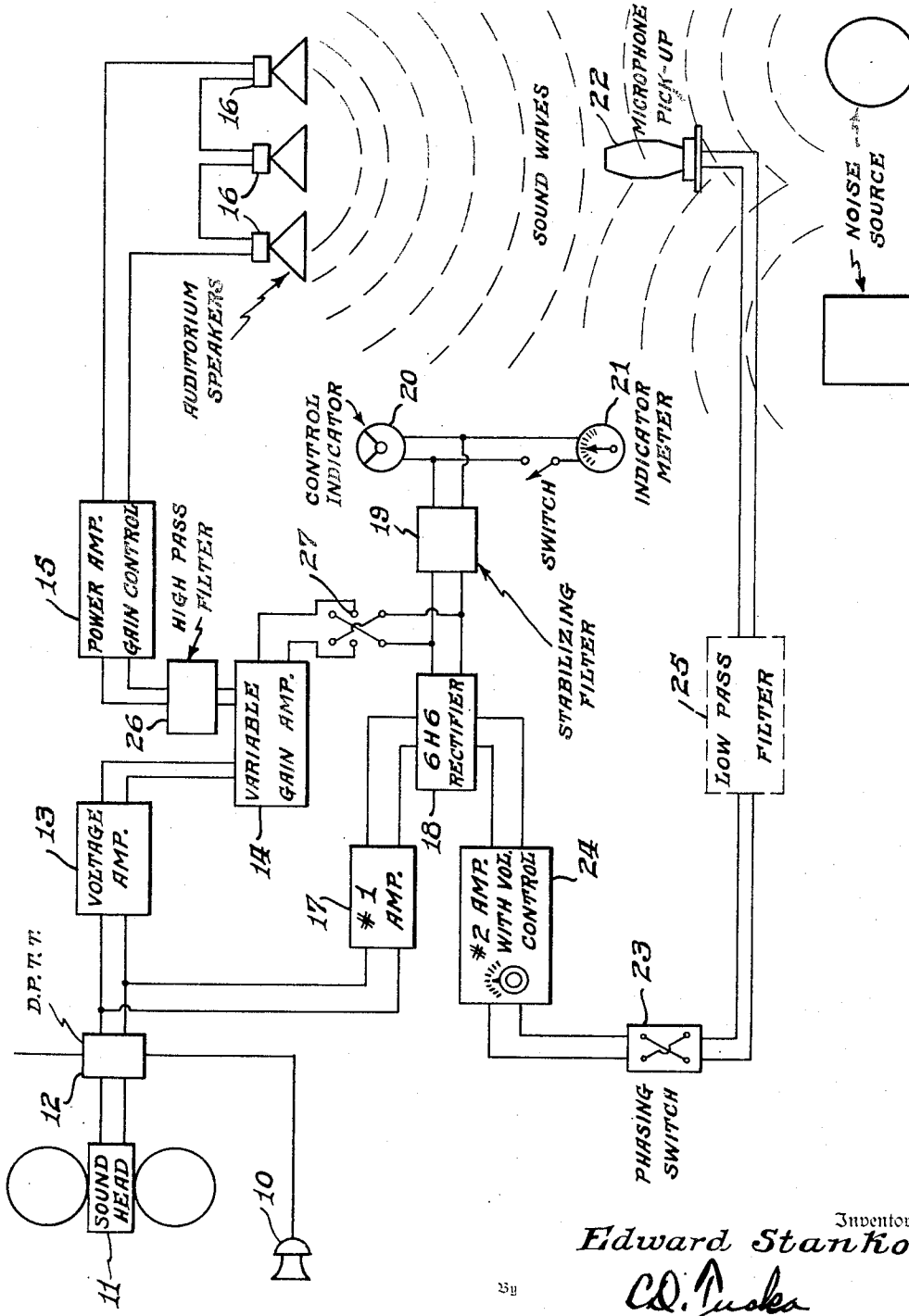
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AUTOMATIC VOLUME CONTROL

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AUTOMATIC VOLUME CONTROL

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4 Claims. (Cl. 179—1)

This invention relates to an automatic volume control for controlling the output volume from a set of loudspeakers in accordance with the noise level in the vicinity of the speakers. The output level of the apparatus is set to operate a certain degree above the surrounding noise level and as the noise level varies, the output volume varies similarly so that the output of the speakers is maintained sufficiently audible above the other noises while if the noise level decreases, the output level of the speakers decreases so that the output will not be annoying and loud.

The invention is of use in theatres where the noise level changes in accordance with the size of the audience and in connection with announcement systems in manufacturing plants where the noise level varies from time to time depending on the number and variety of the machines in operation.

One object of the invention is to provide an improved volume control.

Another object is to provide an automatic volume control for maintaining the sound output of a group of loudspeakers above the ambient noise level.

Another object of the invention is to provide a thermionic amplifier with automatic volume level controls.

Another object of the invention is to provide a thermionic amplifier in which the output level will be controlled in accordance with an extraneous sound source.

Other and incidental objects of the invention will be apparent to those skilled in the art from a reading of the following specification and an inspection of the accompanying drawing in which the single figure of drawing is a schematic block diagram of an amplifier, loudspeaker and volume control arrangement in accordance with my invention.

In the drawing, the sound to be reproduced is fed into the double pole, triple throw switch 12 either from the microphone 10, a photoelectric or electromechanical sound reproducer 11 or from an appropriate transmission line indicated above the switch 12. Any one of these sources may be selected by the switch, as desired. The output from the switch 12 is fed in the usual voltage amplifier 13 through the variable gain amplifier 14 to the usual power amplifier 15, which is provided with a gain control, and thence to the speakers 16. It will be understood that a larger or smaller number of speakers may be used and that a plurality of power amplifiers may be used depending on the power require-

ments of the speaker arrangement used. The variable gain amplifier 14 is preferably of the type in which the gain may be either increased or decreased on increase in applied voltage depending upon the polarity of the applied voltage which is determined by the reversing switch 27. A portion of the input to the voltage amplifier 13 is fed to an amplifier 17 and thence to a rectifier 18. The output from the rectifier 18 is fed through the switch 27 to the variable gain amplifier 14, referred to above. A portion of the output from the rectifier 18 is fed through a stabilizing filter 19 to an appropriate voltage control indicator tube 20 and another portion of the output is fed through an appropriate switch to a volume indication meter 21.

Within the field of sound output of the speakers 16 and also within the field of disturbance caused by noise sources which interfere with the sound reproduction from the speakers 16, there is located a microphone pickup 22. The output of the microphone 22 is passed through an appropriate phasing switch 23 to an amplifier 24 which is provided with an appropriate volume control. The output from the amplifier 24 is fed to the rectifier 18 in such polarity relation that it opposes the output from the amplifier 17 and it is the difference of these two outputs which is applied to the variable gain amplifier 14 and to the volume indicators 20 and 21.

The two inputs to the rectifier 18 are put in proper phase relation by the phasing switch 23 or its equivalent. Since most noises, both auditorium noises and factory machine noises are usually of low frequencies, a low pass filter 25 which may, for example, pass substantially all frequencies below 200 cycles, while greatly attenuating frequencies above that value, may be provided.

In order to insure that the microphone 22 and amplifier 24 will be predominantly controlled from the noise sources rather than from the auditorium speakers, a high pass filter 26 greatly attenuating the frequencies passed by the filter 25 may be inserted at an appropriate point in the audio frequency channel.

It will be apparent from the foregoing that in the normal use of this apparatus the noise level around the microphone 22 will determine the gain of the amplifier 14 and thereby determine the output of the speakers 16. The apparatus may, however, be used for other purposes. For example, if the amplifier 24 is turned off or the phasing switch 23 is left open, then the only input to the rectifier 18 will be from the amplifier 17.

If the switch 27 is then turned to the opposite polarity of input to the amplifier 14 from that used for controlling the speakers in accordance with the noise level, the circuit will act as a compressor and the output from the speakers 16 will be rendered at a more uniform level than the input through the switch 12, the high amplitudes being lowered and the low amplitudes being raised.

The apparatus may also be used to measure the frequency characteristics of an auditorium. If the switch 27 is left open so that the output of the rectifier does not affect the output of the speakers and if a variable frequency constant output record is reproduced by the apparatus 11, then the microphone 22 will pick up the effective sound level in the auditorium and the indicator 21 will then indicate the difference between the input to the speakers 16 and the auditorium sound level produced thereby. If the characteristics of the various amplifiers, speakers and the microphone are known, then the readings of the meter 21 may be used directly to determine the auditorium frequency response.

In the first applications of this apparatus, the amount by which the sound level produced by the speakers 16 exceeds the noise level is determined by the gain control on the amplifier 15 and with the setting of this gain control, the variation in the output is determined by the variable gain amplifier 14.

I claim as my invention:

1. In combination a variable gain amplifier, loudspeakers operated by the output from said amplifier, noise pick-up means, and means operated by said noise pick-up means and varying the gain of said amplifier in accordance with the noise level.

2. In combination a loudspeaker, an amplifier supplying audio frequency current to said loudspeaker, sound pick-up means in the acoustic field of said speaker for picking up noise, and means controlled by the output of said sound pick-up means and controlling the output of said amplifier.

3. In combination a source of audio frequency impulses, a variable gain amplifier fed from said source, a power amplifier actuated by the output from the variable gain amplifier and loudspeakers operated by the output from the power amplifier, a second amplifier operated by the audio frequency impulses and feeding a rectifier connected to the variable gain amplifier, and a microphone within the acoustic field of the loudspeakers and feeding the rectifier through an amplifier connected in opposition to the second amplifier whereby the gain of the variable gain amplifier is determined by the difference in the input to said rectifier.

4. In combination a source of audio frequency impulses, a variable gain amplifier fed from said source, a power amplifier actuated by the output from the variable gain amplifier and loudspeakers operated by the output from the power amplifier, a second amplifier operated by the audio frequency impulses and feeding a rectifier connected to the variable gain amplifier, a microphone within the acoustic field of the loudspeakers and feeding the rectifier through an amplifier connected in opposition to the second amplifier whereby the gain of the variable gain amplifier is determined by the difference in the input to said rectifier, and a reversing switch between the rectifier and the variable gain amplifier.

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