

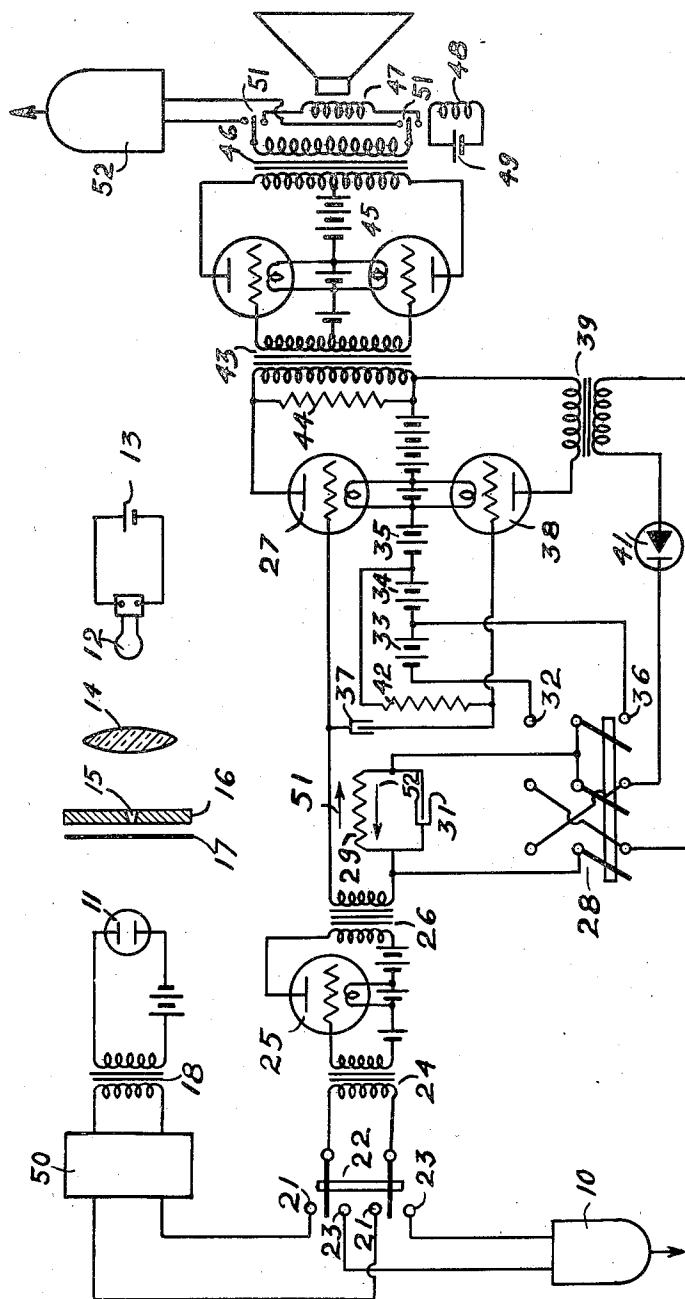
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CONTROL OF DYNAMICS OF SOUND

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## CONTROL OF DYNAMICS OF SOUND

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3 Claims. (Cl. 179—100.4)

This invention relates to amplifying systems, and more particularly to an improved system for controlling the amount of amplification in accordance with the strength of the applied energy.

5 The invention relates particularly to a system of amplification in which the ratio of amplification or gain may be controlled so that it may increase with increase in sound volume or may decrease with increase in sound volume. In the first case the volume ratio of loud to soft sound may be said to be "expanded", while in the second case it may be said to be "compressed".

10 The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

15 Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawing forming a part thereof, in which

20 The single figure of the drawing illustrates diagrammatically the system as applied to the reproduction of the sound record of a talking moving picture projector or phonograph.

25 In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

30 Referring more particularly to the drawing, the figure shows an amplifying system which receives its energy from a phonograph pick-up 10, or a photoelectric cell 11. This cell receives light from a lamp 12, which is energized from a source of power 13. The light from this lamp is focused by a lens 14, through an aperture 15, in an aperture plate 16, upon the sound record of a moving film 17. The light which passes through this film then impinges upon the photoelectric cell 11. This cell is connected through a transformer 18 to two contacts 21, of a double pole, double throw switch 22, the other contacts 23 of which are connected to the phonograph pick up 10. If found desirable, one or more stages of amplification 50 may be inserted between the transformer 18 and the switch 22 for amplifying the energy from the photoelectric cell 11.

55 The blades of the switch 22 are connected to the primary of a transformer 24, the secondary of which is connected in the input circuit of a space discharge device 25. The output circuit

of this device is connected to the primary of a transformer 26. One side of the secondary of this transformer is connected to the grid of a space discharge tube 27, the other side being connected to one blade of a triple-pole, double-throw switch 28 and also through a resistance 29 to the other two blades of this switch. The resistance 29 is shunted by a condenser 31. One contact 32 of the switch 28 is connected through three batteries 33, 34, and 35 to the filament of the space discharge means 27. Another contact 36 of the switch 28 is connected to a point between the batteries 33 and 34.

15 The grid circuit of the space discharge tube 27 is connected through a blocking condenser 37 to the grid of a space discharge tube 38, the output circuit of which is connected to the primary of a transformer 39. The secondary of this transformer is connected through a rectifier 41 to the remaining contacts of the switch 28 so that, when this switch is thrown from one position to the other, the connections to this circuit will be reversed. A high resistance 42 is connected from the grid circuit of the space discharge means 38 to a point between the batteries 34 and 35.

25 The output circuit of the space discharge tube 27 is connected to the primary of a transformer 43. This primary is shunted by a resistance 44. The secondary of the transformer 43 is connected in the input circuit of a push-pull amplifier 45, the output circuit of which is connected through a transformer 46 to a double pole, double throw switch 51. One pair of poles of switch 51 is connected to the moving coil of a loud speaker 47. The field winding 48 of this loud speaker is energized from a battery 49. The other pair of poles of switch 51 is connected to an engraving tool 52 for engraving a selection on a blank record.

40 In the operation of the form of the invention shown in the accompanying figure, when it is desired to have the amplification factor increased with increase of signal strength, the switch 28 is thrown in the up position. Energy which is then received from either the phonograph pick up 10 or the photoelectric cell 11 is amplified by the space discharge amplifier 25. Switch 51 will be thrown either to connect the engraving tool 52 or the loud speaker 47.

50 The amplified output from amplifier 25 passes through the transformer 26 to the input circuit of the space discharge tube 27. Some of the energy passes through the condenser 37 to the input circuit of the space discharge tube 38. The amplified current from this device passes 55

through the transformer 39 and is rectified by the rectifier 41, thus causing a direct current to flow in the resistance 29 in the direction of the arrow 51. This causes a potential difference to be built up across this resistance which is proportional to the current flowing through it and, therefore, substantially proportional to the input signal strength. This current flows in such a direction as to decrease the bias of the space discharge device 27, thereby decreasing its impedance and, therefore, increasing the amplification factor of the stage.

It is thus seen that with the switch 28 in the up position the amplification factor or gain ratio of the amplifier is increased with an increase of signal strength.

If it is desired to have the amplification factor of the system decreased with increase of signal strength, the switch 28 is thrown in the down position. With the switch in this position, the current flowing through the resistance 29 is in the opposite direction as shown by the arrow 52. The potential difference built up across this resistance is, therefore, in the opposite sense to that built up when the switch is in the up position. The current flowing through this resistance tends, therefore, to increase the bias on the device 27, thereby increasing its impedance and, reducing the amplification factor of the stage.

It is thus seen that, when the switch is in the down position, the gain ratio of the system is decreased with increase of input signal, thus limiting the output voltage so as to prevent blasting of the loud speaker, or compressing the volume of the selection for re-editing purposes.

The resistance 44 across the primary 43 is used to maintain the frequency characteristics independent of the amplitude characteristics.

The output from the space discharge tube 27 in either case passes through the transformer 43 and is amplified by the push-pull amplifier 45, the output from this amplifier then passes through the transformer 46 to either the engraving tool 52 or to the loud speaker 47 where it is reproduced as speech or music.

Although only a few of the various forms in which this invention may be embodied have been

shown herein, it is to be understood that the invention is not limited to any specific construction, but might be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In an amplifying system for use with a sound record, an electron discharge device having a control element, means for controlling the potential of said control element comprising a resistance connected in series therewith, means for varying the current flow through said resistance in accordance with the average value of the strength of signal impressed upon said element, means for reversing the current flow in said resistance and means for varying the initial bias on said electron discharge device when said current is reversed.

2. In an amplifying system for use with a sound record, an electron discharge device having a control element, means for controlling the potential of said control element comprising a resistance connected in series therewith, means for varying the current flow through said resistance in accordance with the average value of the strength of signal impressed upon said element, means for reversing the current flow in said resistance, and means for preventing excessive changes in fidelity of amplification comprising an output transformer having a resistance across the primary thereof.

3. In an amplifying system for use with a sound record, an electron discharge device having a control element, means for controlling the potential of said control element comprising a resistance connected in series therewith, means for varying the current flow through said resistance in accordance with the average value of the strength of signal impressed upon said element, comprising an electron discharge device operated in accordance with the impressed signal and having said resistance in its output circuit, means for reversing the current flow in said resistance and means for varying the initial bias on said electron discharge device when said current is reversed.

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