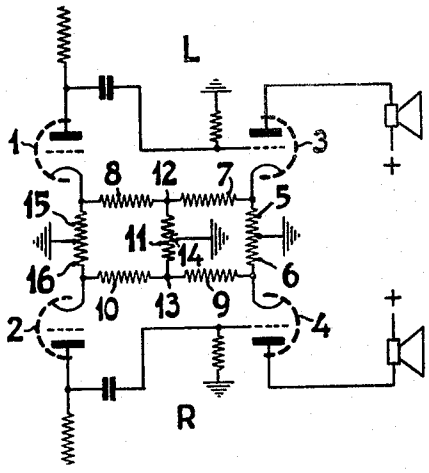
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ADJUSTMENT OF ACOUSTIC BALANCE IN STEREOPHONIC REPRODUCING DEVICES

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ADJUSTMENT OF ACOUSTIC BALANCE IN STEREOPHONIC REPRODUCING DEVICES

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This invention relates to circuits for adjusting the acoustic balance in a stereophonic reproducing device. For this purpose, it is common practice to use a control device for reducing the amplification of one channel and increasing that of the other channel. Consequently, the sound volume of the loudspeaker connected to one channel becomes less than that of the loudspeaker connected to the other channel, so that the sound image is apparently displaced from one loudspeaker to the other. However, since the two channels usually require approximately the same amplification (central adjustment of the control), a loss of amplification results, because the two channels are adjusted to reduced amplification for the central adjustment.

For this reason it has lately become common practice to use a control by means of which either one channel or the other is controlled so that maximum amplification occurs for the central position of the control means and any adjustment results in a lower amplification. This required hitherto the use of a double potentiometer arranged so that the two channels have maximum amplification for the central adjustment of the control means, so that the amplification of one channel is reduced whereas that of the other channel remains constant upon adjusting of the adjustable tapping in one direction, and that the amplification of the other channel is reduced, but that of the first-mentioned channel remains constant upon adjusting of the tapping in the other direction. However, such a double potentiometer is expensive and also involves further difficulties, since it is arranged in a high-ohmic circuit and thus brings about an amplification loss of the treble due to the internal capacitances of the leads connecting the potentiometer to this circuit.

The invention is characterized in that the resistance body of the adjusting potentiometer is connected between a point in the positive feedback circuit of one channel and a point in the positive feedback circuit of the other channel, whilst the adjustable tapping of the potentiometer is connected to a point of constant potential. Owing to the step according to the invention, a much cheaper circuit is obtained in which the above-mentioned disadvantage may also be avoided.

Circuits are known per se in which the value of the negative feedback voltage applied to one channel or the other may be controlled by means of a single adjusting potentiometer. However, in this circuit also allowance must be made for a considerable loss of amplification, since a material negative feedback is active in each channel for the central adjustment of the potentiometer.

In order that the invention may be readily carried into effect, it will now be described in detail, by way of example, with reference to the accompanying drawing.

The figure shows a first channel L and a second channel R, provided with pre-amplifying stages **1** and **2** respectively and output amplifying stages **3** and **4** respectively. The stages **1**, **3** and **2**, **4** may be designed as amplifiers immediately following one another. However, it is also possible to interpose several further amplifiers. The cathode circuits of the output stages **3** and **4** include resistors **5** and **6** respectively, across which signal

voltages are set up which are supplied back as positive feedback voltages to the pre-amplifying stages **1** and **2** respectively. These positive feedback circuits include resistors **7**, **8** and **9**, **10** respectively.

According to the invention, a resistance body **11** of an adjusting potentiometer connects the common point **12** of the resistors **7** and **8** of the positive feedback circuit in the channel L to the common point **13** of the resistors **9** and **10** of the positive feedback circuit in the channel R, an adjustable tapping **14** of the control potentiometer being connected to a point of constant potential (earth). The positive feedback circuits **7**, **8** and **9**, **10** respectively may be proportioned so as to eliminate wholly or in part the negative feedbacks brought about by the cathode resistors **5**, **6** and **15**, **16** respectively. The two channels thus have the same amplification at the central position of the adjustable tapping **14** on the potentiometer. This amplification may be adjusted to the maximum value permissible for the stages **3** and **4** respectively.

Assuming that the body **11** of the adjusting potentiometer has a high resistance relative to the resistors **7**, **8** and **9**, **10** respectively, then the positive feedback in the channel R is not substantially varied by the upward displacement of the tapping **14**, whereas the positive feedback in the channel L is gradually reduced to zero. Only the negative feedback by means of the resistors **5** and **15** then still remains effective in the channel L so that the amplification in this channel is considerably reduced. However, when the tapping **14** is displaced downwards, the positive feedback in the channel L does not substantially vary, but that in the channel R is considerably reduced. Since the resistors **5**, **6** and **15**, **16** respectively may be comparatively low-ohmic, the whole of the device may be designed with comparatively low resistances so that the treble reproduction is not detrimentally effected. If the resistance of the body **11** is chosen of the same order of magnitude as the resistors **7** to **10**, the increase in positive feedback is usually still permissible.

In one practical embodiment the circuit elements were proportioned as follows:

	Ohms
Resistors **5**, **6**, **15** and **16**	2.2
Resistors **7**, **8**, **9** and **10**	22K
Resistance body **11**	50K

As a matter of fact, the circuit may also be equipped with transistors. As an alternative, use may be made of positive and negative feedback circuits of different designs. The negative feedback for obtaining the effect according to the invention may even be fully dispensed with, but in practice some negative feedback or other will in most cases be used for avoiding undesirable distortion. If necessary, blocking capacitors may be provided for avoiding undesirable variations in the direct-current adjustments of the amplifiers. However, such variations may also be used for increasing the control effect.

What is claimed is:

1. A stereophonic signal reproducing system comprising first and second amplifier channels, each of said channels comprising input and output amplifier stages, an amplifying device in each of said stages having at least an input electrode, an output electrode, and a common electrode, means applying separate signals to the input electrodes of the amplifying devices of said input stages, a point of reference potential, separate unbypassed resistors connected between the common electrode of each amplifier device and said point of reference potential for providing negative feedback in each of said stages, positive feedback means comprising separate tapped impedances connected between the common electrodes of the amplifier devices of the output and input stages of each

channel, potentiometer means connected between the taps of said impedances, and means connecting the movable tap of said potentiometer means to said point.

2. A stereophonic signal reproducing system comprising first and second amplifier channels, each of said channels comprising input and output amplifier stages, an amplifying device in each of said stages having at least an input electrode, an output electrode, and a common electrode, means applying separate signals to the input electrodes of the amplifying devices of said input stages, a point of reference potential, separate impedance means connected between the common electrode of each amplifier device and said point of reference potential, positive feedback means comprising separate tapped impedances connected between the common electrodes of the amplifier devices of the output and input stages of each channel, potentiometer means connected between the taps of said impedances, and means connecting the movable tap of said potentiometer means to said point, said amplifier devices comprising electron discharge devices having at least cathode, control grid, and anode electrodes, said impedance means comprising unbypassed resistors connected between said cathode electrodes and said point of reference potential for providing negative feedback in each of said stages.

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