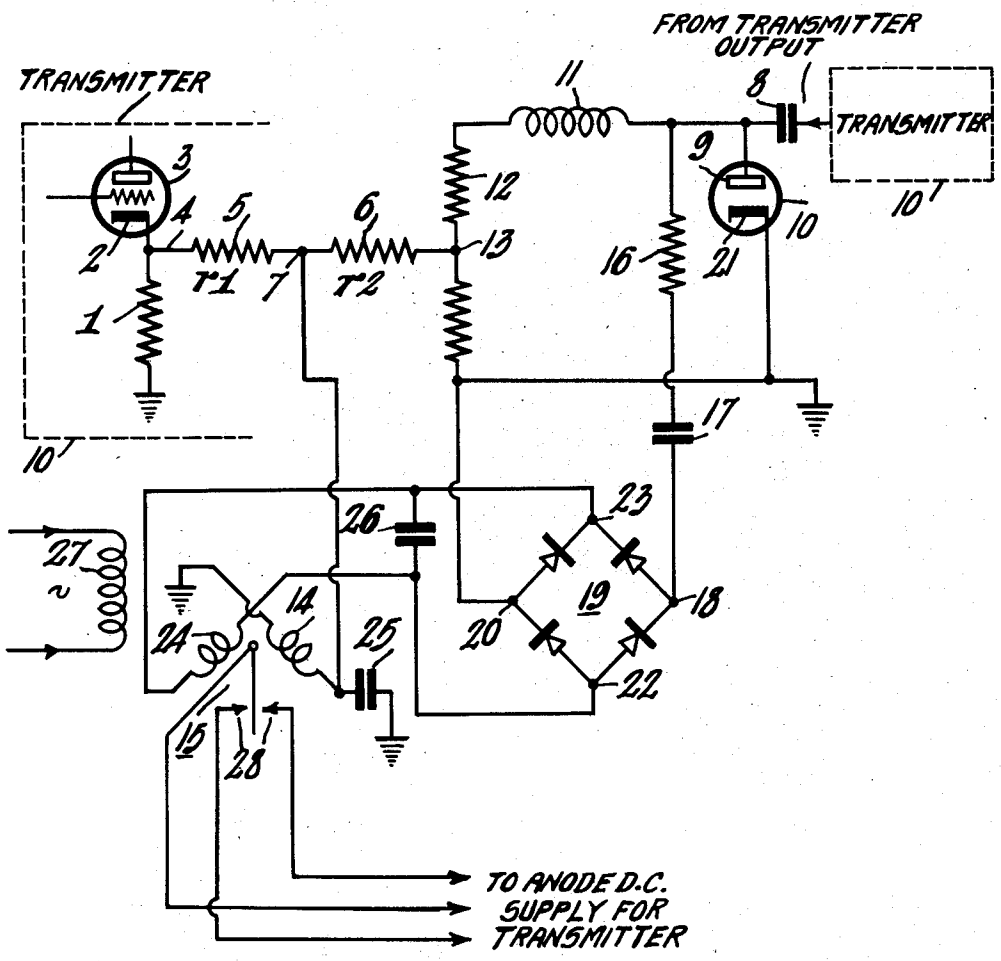
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OVERLOAD PROTECTION ARRANGEMENT

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OVERLOAD PROTECTION ARRANGEMENT

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This invention relates to radio and other modulated carrier transmitters, and more particularly to such transmitters of the kind in which automatic overload protection of the tubes in the output stages is provided.

In transmitters in which the input power to the output stages varies with the applied modulation or with the degree of loading of the output stages, the problem of obtaining protection of the tubes against momentary or sustained overloading is very difficult to solve and known automatic overload protection circuits fall considerably short of what is required. If by design the transmitter output stages have a varying effective value of anode load whilst the efficiency of conversion of tube input power to tube output power and the applied anode direct current voltage remain substantially constant, the input current to the tubes will vary. Moreover, in a transmitter whose output stages are supplied with a constant anode D.C. voltage and which is required to give a variable level of output power, there is not normally a linear relationship between the current input and output radio frequency current, and, therefore, those known arrangements in which automatic protection is obtained by simply balancing a proportion of the output current against a proportion of the input current to produce protective switching when lack of balance occurs are insufficient to give adequate protection in such cases.

The present invention seeks to provide an automatic protecting arrangement in which a high degree of protection is obtained and which shall nevertheless be simple both as to the circuits and apparatus required.

According to this invention an overload protection arrangement for a radio transmitter or the like comprises means for rectifying a proportion of the output current from an output stage of said radio transmitter or the like; means for balancing the rectified resultant against input to said stage to provide one control voltage or current; a bridge rectifier; means for feeding a proportion of said rectified resultant to said bridge rectifier to provide a second control voltage or current; a differential relay or equivalent differential circuit arrangement; means for feeding the two said control voltages or currents to the opposed coils of the relay or to the opposed inputs of the differential circuit arrangement, as the case may be; and means for utilising said relay or differential arrangement to produce protective switching when a predetermined degree of unbalance is set up therein.

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Preferably the differential relay or equivalent arrangement is provided with a third coil or input fed from an adjustable independent source, whereby it may be given a predetermined adjustable amount of bias.

The invention is illustrated in the accompanying drawing which shows in simplified diagrammatic form one embodiment thereof.

Referring to the drawing, input derived from a suitable impedance inserted in a convenient part of the anode current circuit of the transmitter 10 power stage tubes, e. g. as shown input derived from a resistance 1 in the lead between the cathode 2 of a transmitter valve 3 and ground, is fed to one outer end 4 of a resistance bridge consisting of two resistances 5, 6 with a balance point 7 between them. A portion of the transmitter output current is fed, for example, through a coupling condenser 8, to the anode 9 of a diode 10 or other rectifier across which is a circuit consisting of a low frequency (audio frequency) choke 11 in series with a resistance potentiometer 12. A point 13 on this potentiometer is connected to the second outer end of the resistance bridge 5, 6. The balance point 7 is connected through one operating coil 14 of a differential relay, generally designated 15, to earth. The diode anode 9 is also connected through a resistance 16 in series with a condenser 17 to one end 18 of one diagonal of a bridge rectifier generally designated 19, the other end 20 of this diagonal being connected to the cathode 21 of the diode. The two ends 22, 23, of the remaining diagonal of the bridge rectifier are connected to the ends of a second coil 24 of the relay 15, this relay coil 24, of course, opposing the first coil 14. The two coils 14, 24 are separately shunted by suitable condensers 25, 26 so as to provide smoothing. The relay is preferably provided as shown with a third coil 27 fed from an independent source, not shown (e. g., the filament supply of the transmitter), through a suitable resistance, not shown, whereby desired adjustable bias may be given to the relay. The contacts 28 of the relay are employed to provide protective switching, e. g. to complete or open circuits associated with the anode power supply to the transmitter output stages. The circuits of these contacts 28 may take any suitable form and are accordingly not shown.

With this arrangement, by suitably adjusting the various components, the result may be achieved that the relay does not operate so long as the operating conditions do not produce any dangerous overloading, for within range of

permissible working the differentially acting opposing coils 14, 24 mutually cancel out their effects, at least to such an extent that the relay bias (if any) applied by the coil 27 is not overcome. The contributory action of the relay fed from the bridge rectifier 19 can thus be chosen to give the necessary opposition effect at the maximum permissible current into the output stage tubes and the current in the two opposed coils 14, 24 will substantially cancel out for all levels of transmitter output power, from carrier level up to the permitted or anticipated maximum. If, however, for any reason, working conditions impose what is regarded as an unsafe momentary or continuous load on the output stage tubes, the balance in the relay is upset, the bias (if any) is overcome and the relay operates to protect the transmitter, restoring normal working conditions when the overload conditions cease.

It will be apparent to those skilled in the art that it is not necessary to employ a differential relay in the manner described, for equivalent control circuits with a differential action and, if desired, a superimposed controllable bias may be utilised, the protective switching being accomplished, for example, by a simple relay actuated by out-of-balance as between the component circuits in the differential circuit arrangements.

What is claimed is:

1. An overload protection arrangement for a radio transmitter or the like, comprising means for rectifying a portion of the output current from an output stage of said radio transmitter or the like, means for balancing the rectified current against input to said stage to provide a first control voltage, a bridge rectifier, means for feeding a portion of said rectified current to said bridge rectifier to provide a second control voltage, a differential relay having two opposed coils, means for feeding the two said control voltages to the opposed coils of the relay and means for utilising said relay to effect protective switching when a predetermined degree of unbalance is set up between said two control voltages.

2. An arrangement as claimed in claim 1 wherein the differential relay is provided with a third coil fed from an adjustable independent source, whereby it may be given a predetermined adjustable amount of bias.

3. An overload protection arrangement for a radio transmitter or the like, comprising means for rectifying a portion of the output current from an output stage of said radio transmitter or the like, means for balancing the rectified current against input to said stage to provide one control voltage, a bridge rectifier, means for feeding a portion of said rectified current to said bridge rectifier to provide another control voltage, a differential circuit arrangement having two opposed inputs, means for feeding the two said control voltages to the opposed inputs of said differential circuit arrangement, and means for utilising said differential circuit arrangement to effect protective switching when a predetermined degree of unbalance is set up between said two control voltages.

4. An arrangement as claimed in claim 3 wherein the differential circuit arrangement is provided with a third input fed from an adjustable independent source, whereby it may be given a predetermined adjustable amount of bias.

5. An overload protection arrangement for a radio transmitter or the like, comprising means for rectifying a portion of the output current from an output stage of said radio transmitter or the like, an impedance bridge, means for feeding to one end of said bridge a voltage proportional to input to said stage, means for feeding to the other end of said bridge a portion of said rectified transmitter output, a rectifier bridge, means for feeding to one diagonal of said rectifier bridge a portion of said rectified transmitter output, a differential relay having two opposed coils, means for feeding one of said coils from the balance point of the impedance bridge, and means for feeding the other of said coils from the remaining diagonal of the rectifier bridge.

6. An overload protection arrangement, comprising apparatus to be protected, said apparatus having input and output signal circuits in which input and output signal potentials appear, a bridge supplied by said potentials and balanced at critical values thereof, a differential relay having two opposed windings, means connecting one of said windings across said bridge, a bridge rectifier having a diagonal across which said signal output potential is impressed, and means connecting the other of said windings across the other diagonal of said bridge rectifier.

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