A HIGH-POWER NOISE AMPLIFIER WITH AN ELECTRONIC KEYING SYSTEM

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In studying the effects of intense noise on escape responding in the cat, we have modified an amplifier in which keying artifact is minimized.

Specifications: Frequency response = 3000 to 18,000 cps
Distortion = less than 5%
Power output = 80 watts at 16 ohms impedance

The keying system of many amplifiers often involved the opening or shorting of the output. In the former, a brief instant occurred when the output was not terminated; this gave rise to excessively high and damaging voltages across the primary circuit of the output transformer. In the latter, it was necessary to switch or break the flow of several amperes. The amplifier illustrated here provides a possible solution to these difficulties by functioning in the following manner.

Figure 1. Circuit diagram of the amplifier.

The signal is applied to a phase inverter V₁, then in push-pull to gating tubes V₂ and V₃. The gain from the gating tubes is balanced by means of a 100-ohm potentiometer applied to the cathode. This insures that the gate voltage, applied in phase to the suppressors, will be effectively equal and will cancel in the output.

The negative voltage applied to the suppressors of V_2 and V_3 turns off the noise output. It is developed across the load resistor in the second plate of the bi-stable multivibrator V_4 (Degelman, 1957). It is applied to V_2 and V_3 when the OFF terminal of V_4 is grounded. This condition persists until the ON terminal is also grounded.

This negative keying voltage from V_4 is obtained by grounding the B plus, and supplying -150 volts to its cathode. This negative voltage source is also used to supply a fixed bias to the two pairs of power output tubes V_6 and V_7 , and V_8 and V_9 .

In our laboratory, the power of the output stage must be delivered approximately 50 feet to a soundproof chamber. It is very difficult to deliver the power over this distance to the voice coils of the speakers. The currents involved were of the order of several amperes, and both attenuation and feedback were severe. To remedy this situation, the power was transmitted at the plate impedance of the output stage to the output transformer at the site of the speakers.

The bi-stable multivibrator (Chance, 1949; Puckle, 1951) offers a variety of keying modes, e.g.:

- (a) Grounding the ON contact for a few milliseconds will activate the amplifier. This condition will persist until a similar grounding is applied to the OFF terminal.
- (b) The ON and OFF terminals may be alternately grounded with a single-pole, double-throw relay or switch.
- (c) When a 47,000-ohm resistor is connected between the OFF terminal and ground, the noise stimulus can be keyed by closing the ON contact to ground.
- (d) When connections as above (c) are made, the system can be keyed with a voltage applied to the ON terminal. A resistance of 1 megohm (more or less) in series may be required, depending upon the resistance of the generator.

REFERENCES

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