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STIMULATOR-OPERATED GRID SCRAMBLER FOR RELIABLE DELIVERY OF SHOCK TO ANIMALS[1]

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The scrambler described is unlike most in that: (a) it changes the grid-bar polarity pattern only when the animal is not receiving a shock; and, (b) it provides a continuous (or continuously pulsing) shock to an animal that remains standing in one position.

A schematic diagram of the stimulator-operated grid scrambler unit is presented in Fig. 1. As long as the amplifier relay is open, the stepping-switch continuously cycles, presenting new patterns of grid polarities in rapid succession. As soon as a grid polarity pattern is reached which passes current through the animal, however, the stimulation current is amplified and used to close the amplifier relay, which in turn breaks the current to the stepping switch.

The net effect is that the scrambler operates until it "finds" the subject, then holds stimulation until the subject moves. Then the "seeking" process is initiated again and continues until the subject is found again, *etc.* Since the

[1]The amplifier component was designed by Mr. John E. Lauer, Boulder, Colorado, for a different purpose. G. M. Sterritt designed a first version of the stimulator-operated grid scrambler unit, for use in a project supported by a research grant (M-2776) from the National Institute of Mental Health, U.S. Public Health Service.

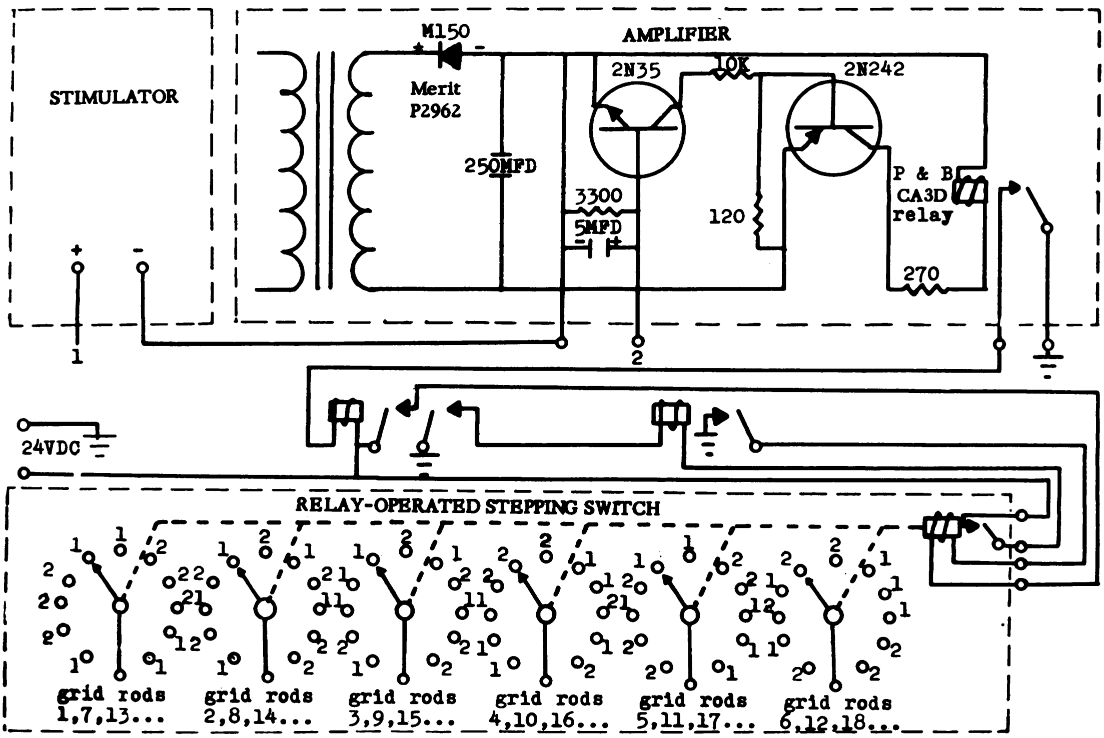

Fig. 1. A schematic diagram of the amplifier, relay-operated stepping switch, and associated relays for the stimulator-operated scrambler unit. All resistors are ½ w. All relays and the six-level, 11-point relay-operated stepping switch operate from 24v dc. The Merit P2962 is a filament transformer for 117v ac input and 25.2v ac, 1 amp. output.

stepping-switch moves very quickly through alternative grid-polarity patterns, the process of finding the subject is correspondingly rapid, with the result that the shock stimulation is ordinarily never escaped for longer than a fraction of a second.

The stimulator-operated grid scrambler unit was used daily for nearly five months with good results in an experiment (Parks, 1963) which called for the use of a shuttle-box in a rat avoidance learning situation. The grid floor of the shuttle-box was made of 25⅛ in. brass rods placed at ⅝ in. intervals. An electric shock of 0.8 ma intensity from an Applegate model 228 constant current stimulator was applied to the rats after the sounding of a buzzer. The rats were to learn to avoid the shock by "shuttling" from one side of the box to the other during the interval between the tone sounding and the shock presentation.

Before the stimulator-operated scrambler unit was introduced it was found that with grid rods placed close enough together to exclude the possibility of the rats straddling rods, all animals would frequently avoid the shock by defecating, which shorted the grid rods.

When the rods were placed far enough apart to allow for the passage of feces all animals would occasionally avoid the shock by straddling grid rods. Many subjects (between 15 and 20 out of 30 animals) quickly learned to straddle bars, thus permanently avoiding shock.

In the five months after the stimulator-operated grid scrambler unit was introduced there were only two occasions when any animals avoided shock other than by jumping the barrier. Both of these occurrences were due to the accumulation of wet feces along the wall from which the grid rods protruded—a problem which in the future could be remedied by changing the method of attaching the grid floor.

REFERENCES

Parks, E. R. The orientation reaction as a mediator in sensory preconditioning. Unpublished doctoral dissertation, University of Nebraska, 1963.