

Apparatus for bisensory presentation of coded signals*

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Apparatus capable of transmitting signals to either a vibrator or to a light, or to both vibrator and light simultaneously, is described. The basis for encoding vibrotactile and visual stimuli is varying intensities and durations of signal.

Although the field of bisensory presentation of data has been studied for some years, it is only comparatively recently that a large number of researchers have begun to concentrate on laboratory experimentation. Generally, bisensory experiments appear to have concerned the visual and auditory senses and the skin senses have been somewhat neglected in these studies (Loveless et al, 1970).

The apparatus here described was designed to transmit signals (a) either to a single vibrator or (b) to an array of three P lamps, or (c) simultaneously to both vibrator and lights. The unit's advantages are that it is compact (10 x 5 x 4 in.) and that it may be used in vibrotactile learning experiments or in bisensory experimentation when the stimuli are, e.g., visual and vibrotactile, visual and auditory, or vibrotactile and auditory. Power is supplied from a domestic mains outlet (in Australia: 240 V ac, 50 Hz).

The cylindrical vibrator is a modification of the electromechanical transducer described by Sherrick (1965), and its components are shown in Fig. 1. This unit has been used successfully in a number of experiments over the last 6 years and has proved to be robust and reliable (Diespecker, 1968; Diespecker & Davidson, 1971).

Low voltages (e.g., 10, 15, or 20 V) are transmitted to the vibrator, which operates at 50 Hz. The vibrator is normally taped firmly to the skin at a convenient locus, usually the volar surface of the wrist. Although vibratory stimuli can be neither seen nor heard, information may be coded by varying the available intensities and durations and transmitting these signals to the vibrator so that S feels and discriminates between the differing combinations of signals. Thus, it is possible, with four intensities and four durations, to encode 16 items of information, i.e., the basis of coding is x intensities and y durations, giving xy combinations (although one of the durations in this apparatus is continuous) of signal. For example, the shortest and weakest signal may be coded as "A" or as "1." In experiments reported elsewhere, up

to nine stimulus elements per vibrator have been used, and it has been possible for Ss to learn the vibrotactile equivalents of the letters of the alphabet via three, four, five, or six vibrators (Diespecker, 1970).

The light source, also operated by the control unit, consists of three P lamps assembled in line immediately adjacent to one another. The light stimulus receives the same variable intensity-duration signals that activate the vibrator. Since most Ss in this type of experiment are unable to discriminate reliably small differences in light intensity, it is desirable to parallel a display of several lamps in line. The lamps may also be hooded or placed in a tube to heighten the visual effect.

The signaling unit diagrammed in Fig. 2 provides a variable intensity and duration signal to a visual output, L_1 , and to a vibrotactile output, V_1 . There are four degrees of intensity (S_1) and four durations (S_2) with provision for continuous operation. It is possible to apply any intensity-duration combination to either L_1 or V_1 , or to both of these together via S_3 .

TR_1 provides trigger impulses which cause SCR_1 and SCR_2 to conduct. TR_1 operates according to the time constants provided by C_1 through C_4 , which are discharged by the back contacts of the operator's switch, S_4 . Therefore, S_4 serves only to activate the signal to L_1 and V_1 , while the duration is automatically determined. The intensity of the applied signal is obtained from a voltage divider network, R_1 , R_2 , and R_3 , with provision for baseline adjustment for each intensity.

The parts are listed in Table 1.

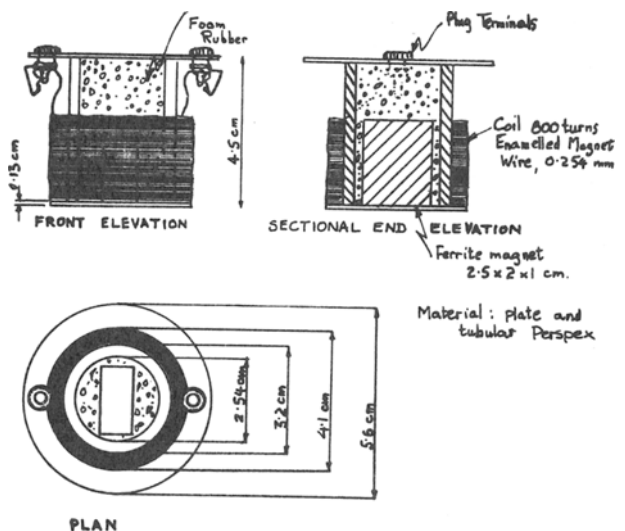


Fig. 1.

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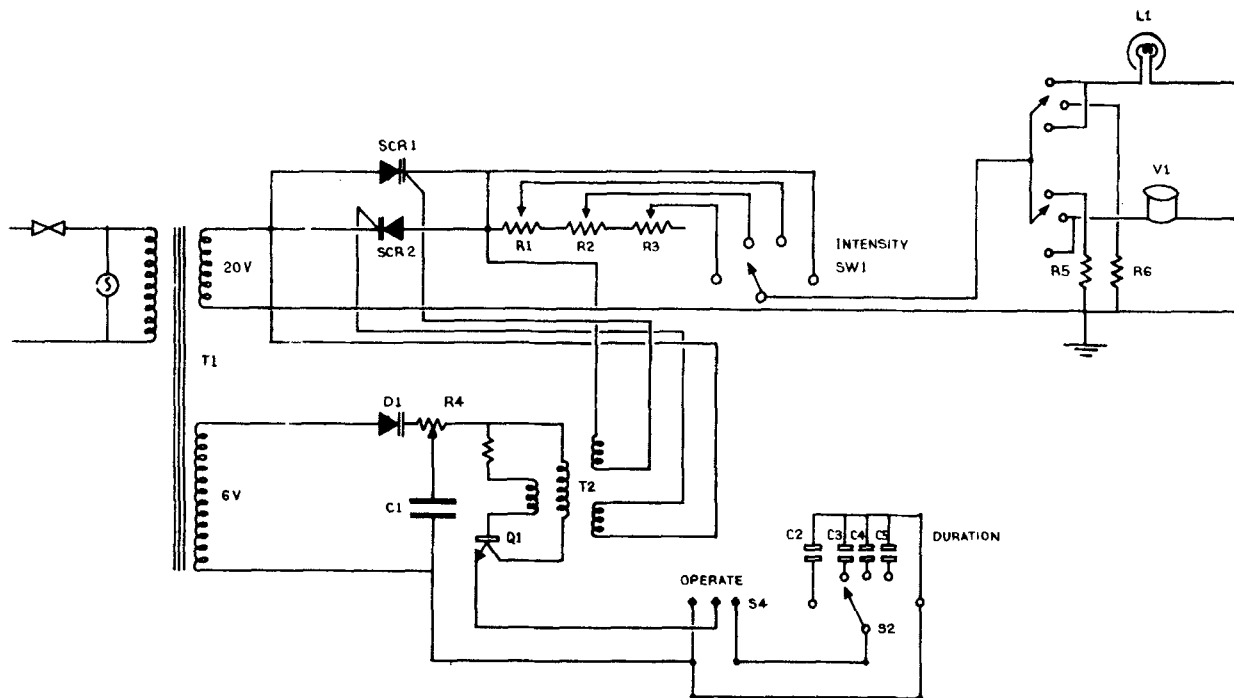


Fig. 2.

Table 1
Parts List

T1	Transformer	240 V Pri., 20 V at 1a and 6 V at 1a	
T2	Transformer	LA 200 Pot Core, Pri. 800t, Feedback 300t, 2 x sec 40t	
SCR1, 2	GEC 6A		
D1	EM 401		
Q1	BC 107		
C1	100 μ f	25 V ω	
C2	47 μ f	25 V ω	
C3	1 μ f	25 V ω	
C4	5 μ f	25 V ω	
C5	10 μ f	25 V ω	
R1, 2, 3	100 Ω	2 ω	Potentiometer
R4	50 Ω	$\frac{1}{2}\omega$	
R5, 6	5 Ω	5 ω	
V1	Vibrator Unit (See Text)		
L1	P Lamp 6 V .04 amp		

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