An isotonic transducer for general use

The increasing use of electronic recording techniques in pharmacology has meant also an increase in the cost of equipping large numbers of students with modern apparatus. In Fig. 1 the circuit details of an inexpensive, stable and reliable isotonic transducer are shown.

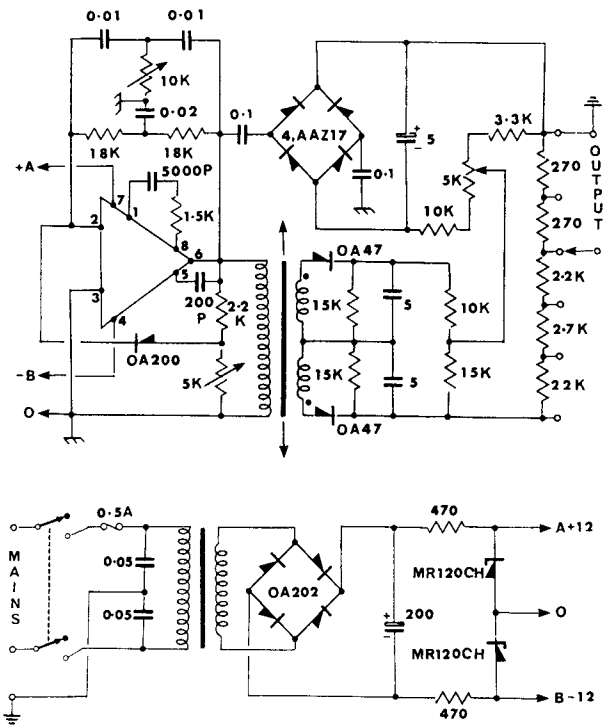

FIG. 1. Circuit diagrams for the isotonic transducer (upper) and power supply (lower) interconnected as indicated by the arrows. The operational amplifier is type μA7709C (SGS Fairchild Ltd.) and all potentiometers are 16 turn Painton mini-flatpots. Values of resistors and capacitors (tolerance ±5%) are in ohms and microfarads respectively unless otherwise stated.

An oscillator (900 Hz), driven by a mains operated semi-stabilized power supply, energizes the primary windings of a linear voltage differential transformer (LVDT) the moving core of which is connected to the tissue. Movement of the core of the LVDT (produced by contraction or relaxation of the tissue) gives rise to a change in the output from the secondary windings of the transformer which is fed to a phase discriminator, filters and attenuator and provides the output of the transducer. The unattenuated d.c. output (500 mV: 9 KΩ source resistance) is sufficient to drive most pen recorders but an attenuator is provided which will reduce the output in 5 steps to a minimum of 5 mV (270 Ω source resistance) which may be more suitable for high gain recorders with a low input resistance.

The core of the LVDT has a moving range of 1·5 cm; the output linearity of the transducer is better than 1% of full scale over the entire range. The zero stability and gain stability are better than 0·05% and 0·1% of full scale respectively, both of these measurements being made over a period of 2 h. Incorporation of the semi-stabilized power supply and constant amplitude integrated-circuit oscillator ensures that the transducer is insensitive to fluctuations in mains voltage, changes of 15%

producing a change in the output of the transducer which was indistinguishable from variations due to gain stability and zero stability.

Eight of these isotonic transducers have been used for teaching and research in this department for 3 months and no breakdowns have yet occurred. The tissue can be connected directly to the moving core of the LVDT (weight 5 g), counterbalance being provided by a weighted pulley system above the core, or more usually through a conventional isotonic lever system which can provide the necessary demagnification of the response from the tissue where this is greater than 1·5 cm This system has been used successfully on a variety of tissues including rabbit, rat and guinea-pig intestine (for conventional and also cumulative dose-response curves), transmurally stimulated guinea-pig vas deferens, rabbit and rat uteri, phrenic nerve-diaphragm and guinea-pig atria. With the latter two preparations "bounce" and the harmonics of the recording system can cause problems as they do with any isotonic recording from these tissues.

The total cost of the components and case for the complete transducer and power supply is £19 15s 0d, the most expensive item being the LVDT (type E300D; cost £13) which was obtained from Electromechanisms Ltd., of Slough.

This isotonic transducer will drive satisfactorily most pen recorders and provides an effective and inexpensive way of replacing the smoked drum.

Department of Pharmacology,
The Medical School,
Thoresby Place,
Leeds LS 2 9NL,
Yorkshire.

D. M. HANNON
I. E. HUGHES
E. LETLEY

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Effects of a marihuana homologue (Pyrahexyl) on avoidance learning in the gerbil

Pyrahexyl (synhexyl, 3-hexyl-7,8,9,10-tetrahydro-6,6,9-trimethyl-6*H*-dibenzo[*b*,*d*] pyran-1-ol) is a synthetic cannabis compound having behavioural effects similar to tetrahydrocannabinol (THC) one of the active principles of *Cannabis sativa* L (Hollister, Richards & Gillespie, 1968). Although pyrahexyl has been studied in man (Stockings, 1947; Parker & Wrigley, 1950; Thompson & Procter, 1953; Hollister & others, 1968), little is known of its specific behavioural effects except that it seems to have euphoriant properties. Recently, Abel (1969) found in rats that pyrahexyl markedly reduced the amount of time required to resume lever pressing for water after this activity had been suppressed by a fear-producing stimulus and Abel & Schiff (1969) reported that pyrahexyl increased "curiosity" in rats as measured by the time they spent observing other animals. We now report its effect in an avoidance learning situation. The particular testing procedure chosen assessed the effect of pyrahexyl on the acquisition of new behaviour rather than its effect upon a previously learned response as examined by Abel (1969).

Six adult male Mongolian gerbils (*Meriones Unguiculatus*), 80–90 g, were injected intraperitoneally with 0·2 ml of a solution of pyrahexyl (2·3 mg/kg) in olive oil; six control animals received only oil injections. After 2 h animals were placed individually into a standard two-compartment automated shuttle box (Lehigh Valley Electronics, Model 146–04) in which they could avoid being shocked through the grid floor by jumping over a barrier dividing the apparatus. An auditory signal was the conditioned stimulus and a 0·8 mA constant current electric shock the unconditioned stimulus. The conditioned stimulus preceded the onset of shock by