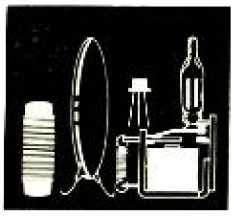

PARTS PROFILES

By DON LANCASTER

COMPONENTS OF THE MONTH

This is the second installment of our new "Parts Profiles" column which is intended to provide you with exciting information about unusual or little known electronic components and devices that are inexpensive, interesting, and useful. These products will usually enable you to build more interesting projects at less cost, in less time, and with improved performance. All items covered are available nationally or from at least one reliable source of supply.

THE EDITORS

PORTABLE 12-VOLT LEAD ACID BATTERY

A sealed, lightweight, completely rechargeable lead acid battery that never requires refilling with either water or electrolyte is now available. You can turn the Exide MF2 upside down and shake it—it won't leak. Weighing eight pounds, this 4″ x 5″ x 6″ six-ampere-hour, 12-volt battery is ideal for camp lights, mine lanterns, portable power tools, and television sets. Combining the light weight and high power normally found only in nickel cadmium cells costing twice as much, the MF2 features an entirely new design that overcomes the problem of *hydrogen formation* inherent in lead acid cells.

Of special significance is a new controlled charging concept. Since most of the hydrogen formed in the ordinary lead acid cell is due to the rapid charging, and consequent heating, of the battery, a special charger designed for the MF2 has overcome this problem by using a power transistor regulator to limit the maximum charging current to less than 0.5 ampere. The regulator automatically adjusts the energy applied to the battery to just the right amount required for the proper charge. To avoid violent destruction, both the charge and discharge rate should not exceed the manufacturer's specifications. For those *aficionados* who would rather build than buy the charger, free data sheets are available from the manufacturer. The cost of the charger is about the same, whether you build or buy—$8.80.

Also available is a smaller battery, the MF1. It is rated at 6 volts and sells for about $5 less than the MF2. However, if you are designing anything that requires more power than dry cells can provide, you will probably be better off with a 12-volt system which is generally preferable because of its compatibility with most automobile batteries and trickle chargers.

The MF2 battery is available from Exide Industrial Marketing Division, The Electric Storage Battery Co., Philadelphia 20, Pa., for $22.30. The companion charger, Model MFC2, Catalog No. 95327, is available from the same source for $8.80.

200-WATT SCR RUNS WITHOUT HEAT SINK

Here's a new low-cost SCR that looks like an oversized TO-5 transistor, mounts either on a printed board or on a special socket, and needs no heat sink. True, SCR's have been around for quite some time, but the new low price and unusually small size of this 1.3-ampere, 200-volt 2N3528 RCA unit

"on" and light the indicator lamp if the SCR being tested is good. The SCR is reset by depressing switch *S2*. If, during a test, the indicator lamp goes on immediately, before *S1* is pressed, the SCR is shorted or is rated at well below 200 PIV. If the indicator fails to go on, the SCR is open. *A word of caution:* Observe proper connections and polarity when connecting the SCR. The SCR case is usually the anode—just the opposite of zeners and power diodes. If an "R" appears at the end of the part number, the case is the cathode.

If you've used SCR's before, you may want to try your hand with the dimmer circuit of Fig. 2. This is a full-range symmetrical dimmer with which you can operate a number of a.c.-d.c. loads not requiring more than 200 watts continuous or 250 watts intermittent operation. The dimmer handles regular incandescent bulbs as well as fluorescent lamps—provided that the fluorescent lamp is always started in the maxi-

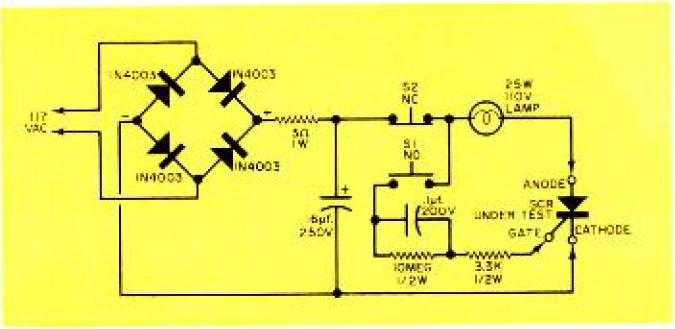

Fig. 1. Circuit of SCR demonstrator/tester suitable for observing operation of SCR's, and for SCR testing. The 117-volt, 25-watt lamp indicates the conduction of SCR under test when S1 is depressed. Switch S2 resets SCR.

makes it ideally suited for the experimenter. If you've never "played" around with SCR's before, start with the simple demonstrator/tester with which you can learn some basic principles of SCR operation, and which can double as an SCR tester. The schematic of this unit is shown in Fig. 1.

When the circuit is used as an SCR tester, depressing *S1* produces a momentary gate pulse that causes the SCR to latch

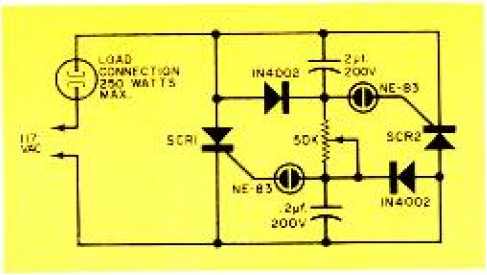

Fig. 2. Full-wave control can vary the speed of most small brush-equipped motors, and dim incandescent and fluorescent lamps not exceeding 200 watts.

mum position of the control, and the control is never varied to its lowest point. You can also use the dimmer to provide precise temperature control of a soldering gun or iron, so long as the maximum power rating of the SCR is not exceeded. The speed of small brush-equipped motors can be controlled with the dimmer, but it cannot be used with induction motors or loads specifically requiring a.c. only.

If you need more power, the RCA 2N3228 is the same SCR but in a bigger package. With a heat sink, you can run up to 5 amperes or 600 watts at 120 volts. The 2N3228 costs a penny less than the 2N3528. (See article entitled "Low-Cost SCR Motor Speed Control," in the December, 1964, issue of POPULAR ELECTRONICS.)

The 2N3528 SCR's are available at RCA semiconductor distributors for $1.63. Also available, free, is RCA Data Sheet 2N3528 8-64 from an RCA distributor or from Radio Corporation of America, Electronic Components and Devices, Harrison, N.J.

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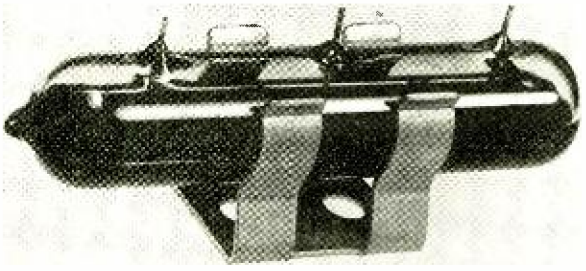
ELECTRONIC LEVEL INDICATOR

Here's an electronic component that's always on the level. If it isn't, it promptly "tells" you so. This new and unusual device, measuring a little over two inches, is the Hamlin EP-10 gravity sensing electronic potentiometer that can be used in electronic levels, percent-of-grade meters, inclinometers, accelerometers, and other balancing devices.

A typical circuit application is shown in Fig. 3. The EP-10 consists of a glass tube half-filled with a conducting liquid. In the tube are three electrodes as shown. When the tube is level, the resistance between either end electrode and the middle electrode is the same. If the tube tilts, more liquid makes contact with one of the end electrodes, and less contact with the other. This results in an electrical imbalance in the circuit. Unlike a mercury switch, the EP-10 is not an *on-off* device but rather a *linear* resistor whose ratio changes over a range of 10 degrees inclination.

For a.c. operation, a *stable* 10-12 volt input is required. For d.c. operation, a transistor audio frequency oscillator output of



approximately 150 milliwatts is required. In either case, the source voltage *must* be stable. The circuit unbalance is detected by the germanium diodes in the bridge, and the d.c. error output is then monitored by one of the metering configurations shown. A 0-1 d.c. milliammeter can be used for most experimental applications although a significant circuit loading will be evidenced.

Before calibrating the circuit, add a mechanical zero-set to adjust the electrical

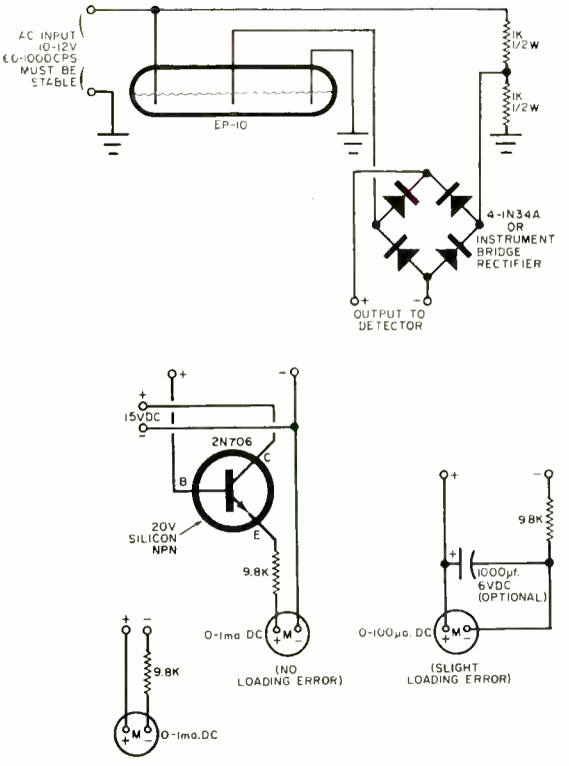


Fig. 3. Schematic of level indicator circuit using Hamlin EP-10 gravity sensing tube. When tube is level, resistance between either end electrode and middle electrode is the same. Any of the three meter circuits shown, or another similar configuration, can serve as level readout. Meter accuracy and circuit loading determine overall instrument efficiency.

output to precisely zero when the EP-10 is level. Then place the circuit on a 10″-long board and zero mechanically with an accurate level.

From a trig table, the *sine* of one degree is 0.0175. Multiplying this by 10, we get 0.175, the amount in inches by which the board is raised at one end. Meter output corresponds to one degree of tilt in either direction. You can mark the meter face directly. Continue in this manner to determine the meter output for 2, 3, 4, 5 . . . etc. degrees, always finding the *sine*, multiplying it by 10, and then jacking up the end of the board by the amount, in inches, computed. Use whatever increment best suits your needs.

You can buy the PE-10 for $15, plus 25 cents for a mounting clip from: Hamlin, Inc., Lake and Grove Streets, Lake Mills, Wisconsin. Complete data and applications sheet also available upon request. —30—