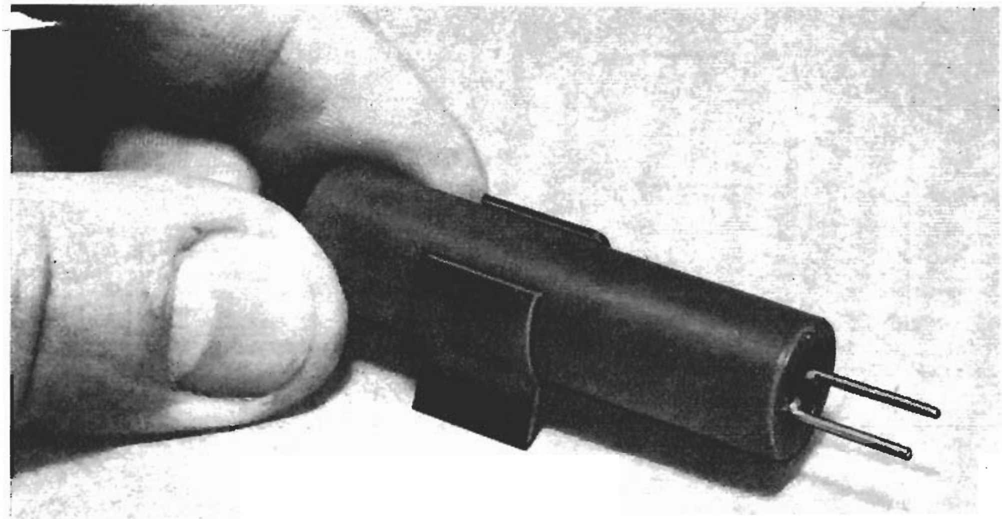


Build A Moisture Sensor

DETECT LIQUID OF ANY KIND IN ANY LOCATION

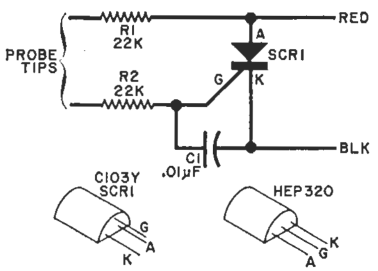
BY H. ST. LAURENT

DETECTING leakage or overflow in any system involving liquid storage or transmission is not as easy as it sounds without spending a lot of money. Detection devices on the market range in price from $40.00 to $100.00 (or more) depending on the packaging. On the other hand, the sensor described here can be built for about $3.00. The sensor itself is the heart of an efficient and accurate detection system. The cost of the external warning and power components will vary depending on how the sensor is applied.

Applications for the moisture sensor are myriad. It can detect water leaks in aquariums, basements, boats, freezers, humidifiers, sprinkler systems, boilers, etc. It will locate moisture in lumber, silos, or any stored material susceptible to moisture damage. Another important use is in the detection of condensation in fuel tanks since, in this sensor, no power is present at the probe tip (even when activated) so that there is no danger of an explosion.

One of the best features of this sensor is that it uses no power when on standby. This makes it possible to use dry cells such as lantern batteries to monitor remote, hard-to-reach areas. The sensor is not voltage sensitive; operating voltage can be varied as much as 25% without adversely affecting the operation. A number of sensors can be coupled to a central control panel for covering wide areas.

Theory of Circuit Design. The circuit of the moisture sensor is shown in Fig. 1. When any moisture is present between the probe tips, a low-level positive voltage passes from the red lead, through the two resistors, to the gate of the SCR. This fires the SCR and causes it to appear as a very low resistance across the two power leads.



PARTS LIST

C1—0.01-μF miniature capacitor
R1,R2—22,000-ohm, ½-watt resistor
SCR1—Silicon controlled rectifier (GE C103Y or Motorola HEP320)
Misc.—Plastic tube, perf board, non-corrosive wire, cable, potting compound, solder, etc.
Note—A complete set of parts including perf board, plastic tube and matching mounting clip, but excluding potting compound, is available for $3.00 from Lectromek Co., Box 824, Warwick, RI 02888.

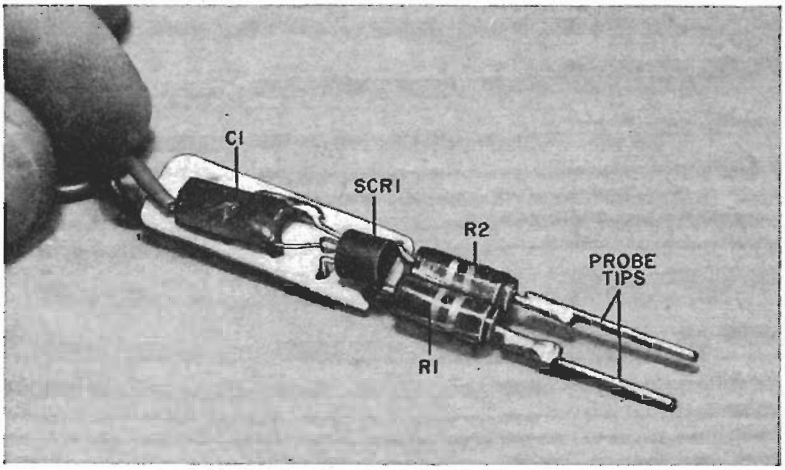
Fig. 1. The moisture sensor is a simple circuit that operates very readily. Color-coded leads indicate the applied dc voltage, red for positive, black for negative.

When a suitable power source and alarm are connected to the power leads as shown in Fig. 2A, the alarm is activated when the SCR fires. The particular SCR used in this sensor operates best with supplies between 6 and 18 volts. The maximum current drawn by the SCR when fired is about 800 mA.

Either dc or ac may be used for the power supply. If dc is used, once the SCR fires, it must be reset (with the probes in the clear) by disabling the power source momentarily. If ac is used, (a 6- or 12-volt filament transformer works well) then reset occurs automatically when the probes are in the clear and the ac waveform passes through zero.

Construction. The sensor can be housed in any type of narrow plastic tube—even a small pill bottle. Cut a piece of perf board shorter in length than the plastic tube to be used and just wide enough to fit within the tube. Mount the components on the perf board, making sure that only one end of each of the resistors is attached to the board (see photo). If the sensor is to be used in a corrosive atmosphere, cut the loose ends of *R1* and *R2* short and solder about ¾ to 1″ lengths of 0.040″ Monel (or other type of non-corrosive wire) to the loose ends. For non-corrosive use, leave the loose ends of the resistors their natural lengths. These are the probe tips.

Connect lengths of red and black wires to the appropriate points on the board. A con-



The plastic circuit board should fit snugly within a plastic tube. The probe tips are either the resistor leads or small lengths of any type corrosion-proof wire.

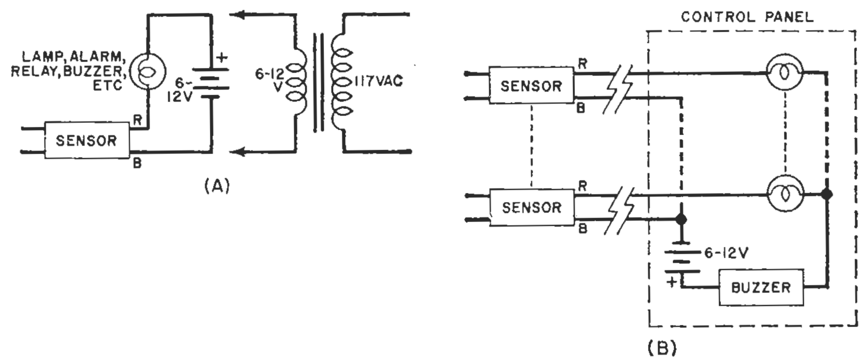


Fig. 2. The probe can be powered either from a battery or an ac source (A). A multi-sensor system (B) can activate either visual or aural indicators as desired.

nector can be used to join the sensor to a longer set of leads to run back to the power supply and control panel.

Slide the finished board into the plastic tube so that the two tips protrude about ¾". Connect the sensor to the test circuit shown in Fig. 2A and wet your fingertips and jumper the two probe tips. The alarm should operate when the contact is made.

Once you know the probe is operating, remove it from the test circuit and plug both ends of the tube using paraffin, sealing wax, or any commercially available non-conducting potting compound which will harden to make a liquid-tight seal.

Operation. Mount the sensor using a suitable clip so that the probe tips are in the area of interest: bilge of a boat, slightly off of a basement floor, near the top of a storage tank, or any place where the presence of moisture or liquid is to be detected. The circuit shown in Fig. 2B shows how to couple a number of sensors to a control panel. You can use either visual or audio signaling, or both. —30—

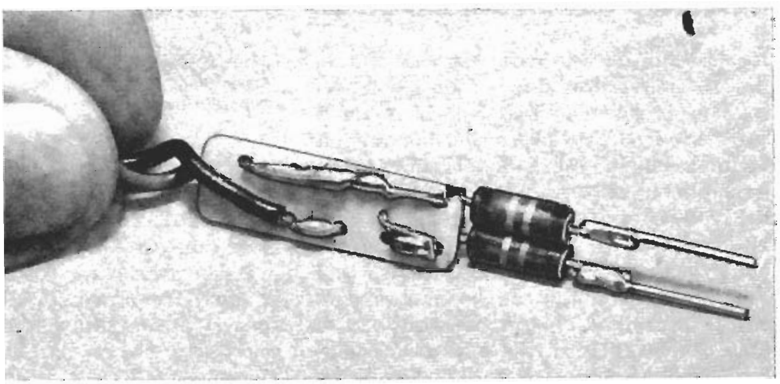


Photo of underside of the sensor plastic board shows how component leads are soldered together both to form the circuit and provide a solid physical mounting.