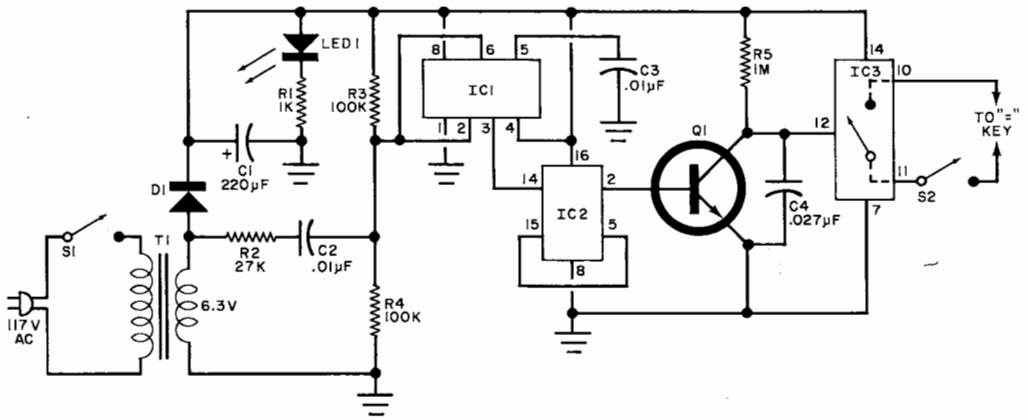

Fig. 4. Accessory for a pocket calculator to permit the latter's use as a simple stopwatch.

the series-pass Darlington automatically to maintain the preset output voltage despite changes in the line voltage or load current. At the same time, the load current is sampled by means of a series diode and amplified to serve as a limit control on the CA3140's operation. With the component values specified and a 30-volt dc source, the regulator's output voltage can be adjusted from approximately 0.1 V to 24.0 V at adjustable maximum current limits from 10 mA to 1 A. The design offers better than 0.02% load regulation (from zero to full output) and a line regulation of 0.1% per volt.

When using the CA3140 in practical circuits, reasonable care should be exercised to avoid damage. Although the device is comparatively rugged and includes diode gate protection, it should be handled as any other MOS device. Soldering iron tips and the metal parts of tools or fixtures should be grounded. The device should not be inserted into or removed from circuits while energized. Signals should not be applied to the input terminals when the device's power source is OFF. Finally, all maximum ratings must be observed, including storage and operating temperatures.

Readers' Circuits. Commenting on the random 4-digit number generator circuit contributed by Michael S. Pyska and featured in last September's column, Michael M. Lacefield (1008 Turnbull Drive, Metairie, LA 70001) suggests that the circuit can be simplified considerably by using the self-generated strobe signal available in the counter/driver IC instead of a separate pulse oscillator as the counting signal source. Mike Lacefield's modified circuit is illustrated in Fig. 3. As in the original design, the counter/driver (*IC1*) is a National Semiconductor type MM74C925, the readouts are 7-segment common-cathode types, the driver transistors, *Q1* through *Q4*, are type 2N2222 general-purpose npn devices, and the power supply, *B1*, consists of three or four series-connected penlight or flashlight cells. Power switch *S1* is a spst toggle, slide, or rotary unit, with the *latch* switch, *S2*, a spdt spring-return pushbutton or lever type. All resistors are one-quarter or one-half-watt types, with the series readout current limiters (*Rs*) 100-to-220-ohm units (the exact value is not critical). In operation, *IC1* counts at its strobe rate (approximately 1 kHz) continuously while *S2* is in the RUN position. When *S2* is depressed, the instantaneous count in *IC1*'s register, essentially a random number, is displayed on the readouts. As the original design, the random number generator can be assembled using any desired construction technique from perf board to a specially designed pc board, and can be used in games, ESP experiments and similar applications.

Submitted by Will Hobbs (656½ W. 22nd, Eugene, OR 97405), the circuit shown in Fig. 4 was developed as an accessory for a pocket calculator to permit the latter's use as a simple stopwatch. It is basically a repetitive switch operating at a 10-Hz rate. Easily duplicated in the home workshop using either perf board or pc wiring techniques, the design uses standard, readily available components. The active devices required for the project are a 555 type timer (*IC1*), a CD4022 counter/divider (*IC2*), a CD-4016 quad bilateral switch (*IC3*), a 2N2222 general-purpose npn transistor (*Q1*), and a 1N4001 general-purpose rectifier (*D1*). Diode *LED1* and associated current limiting resistor *R1* are optional. All resistors are one-quarter or one-half-watt units and, except for 12-volt electrolytic capacitor *C1*, all capacitors are small, low-voltage ceramic or plastic film types. Power switch *S1* is a spst toggle or slide type while *S2* is a spst alternate action (push on/push off) pushbutton switch. A small 6.3-volt filament transformer is used for T1.

In operation, a 60-Hz signal derived from *T1* through series limiting resistor *R2* and blocking capacitor *C2* is applied to *IC1*, connected as a modified Schmitt trigger. The 60-Hz trigger pulses from *IC1* are divided by 6 by *IC2* to deliver a 10-Hz signal through buffer amplifier *Q1* to one section of the quad bilateral switch, *IC3*. Driven by *T1*'s secondary, a simple half-wave rectifier (*D1*) and capacitive filter (*C1*), monitored by *LED1*, serves as the circuit's dc power supply.

Although Will developed the design primarily for use as a calculator stopwatch adaptor, the circuit can be used in virtually all applications requiring low-level repetitive switching at a reasonably accurate fixed rate. For stopwatch applications, the adaptor must be used with calculators capable of constant operations using the "equals" key. The circuit output leads are connected in parallel with the calculator "=" key terminals. Next, the decimal point, "1," and " + " keys are depressed to enter "0.1" and the addition function. Alternate action pushbutton *S2* is then pressed once to start the timing cycle, a second time to stop timing. The calculator display will indicate the number of seconds and tenths of seconds that have elapsed during the interval.

Device/Product News. A new single-chip CMOS IC that requires only two external resistors, two capacitors, and a single voltage reference to form a modified, dual-slope, analog-to-digital converter is now available from Motorola Semiconductor Products, Inc. (Integrated Circuit Division, 3501 Ed Bluestein Blvd, Austin, TX 78721). Designed for DVM/DMM, digital thermometer, digital scale, and µP applications, the 3½-digit circuit, designated type MC14433, has a multiplexed BCD output format and an intrinsic full scale range of ±199.9 mV (200 mV reference) or ±1.999V (2 V reference), with an input impedance of more than 1000 megohms. Dissipating very little power, the device can be used with both LED and LCD displays. Combining both linear and digital functions on one chip, the MC14433 is supplied in a 24-pin plastic ("P" suffix) or ceramic ("L" suffix) DIP. ◇