A SIMPLE STEP PROGRAMMER[1]

Roger Paquin[2] and **Jacques Caron**[3]

[2]*Research Station, Research Branch, Agriculture Canada, Ste-Foy, Quebec G1V 2J3 and* [3]*Engineering Research Service, Research Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6*

Received 14 June 1976

Paquin, Roger and **Jacques Caron.** 1977. A simple step programmer. Can. Agric. Eng. 19: 43-44.

A simple step programmer was developed which uses a punched 16-mm program film to operate a microswitch. The film is driven by a modified 24-h commercial timer. Substitution of one program film by another takes only a few seconds.

A frequent requirement is to automatically program test equipment or machines to follow and repeat a preselected cycle of events with time. Commercial devices are available to do this but they are expensive, particularly if it is necessary to quickly interchange different programs without error. A simple inexpensive solution is described that was developed for a plant winterhardiness cabinet (Timbers and Caron 1970; Voisey and Moulton 1969). It is suitable for applications requiring on-off electrical control at predetermined times.

The programmer is based on a commercial timer used with tabs as switch actuators (Fig. 1A). The 24h dial was replaced with a drum to drive standard 16-mm film (Fig. 1B). Two idle rollers ensure that the film feeds on and off the drum and engages the 64 drive pins on its periphery (Fig. 1D). A microswitch above the drum (Fig. 1C) is operated by holes, 3 mm square, punched in the film (Fig. 1B), which allow the microswitch roller actuator to drop into a groove in the drum face. The drum moves the film at 2 cm/h. Up to three on-off operations can be programmed per hour. The electronic and electric circuits of the temperature programmer and timer were not modified so that their performance remains the same.

The film is spliced to form a continuous loop having a length corresponding to any required multiple of 24 h. The square holes are made in the film with a modified hand punch. These holes are positioned along the film length at distances corresponding to the required operating times. Different actuation periods can be arranged by overlapping the holes.

The advantages of the programming tape over the tab system can be easily assessed: simplicity, accuracy and reliability. Substitution of one tape by another one takes a few seconds. It can be done at any time without stopping the clock, and is quicker than tab insertion and easier on the clock mechanism. Moreover, the temperature controller can be programmed for several months or years avoiding errors that were common to the old system. The system repeatability was determined with on-off operations every 45 min during two 7-h runs. A maximum deviation in time of actuation was ± 7 sec over any 45-min period. Improved resolution could be obtained by increasing the clock speed, leaving more space between holes on the tape.

The timer, microswitch and punch can be purchased at a price of about $75, but the drum, idle rollers and accessories were custom-machined and installed at an estimated cost of $90, including parts and labor.

TIMBERS, G.E. and J. CARON. 1970. Controlled temperature cabinet for winterhardiness studies. Eng. Spec. 6802, Eng. Res. Serv., Agric. Can., Ottawa, Ont.

VOISEY, P.W. and F. MOULTON. 1969. Precise temperature control for a domestic freezer. Can. J. Plant Sci. **49:** 107.

[1]Contribution no. 76 from Ste-Foy Research Station and no 605 from Engineering Research Service.

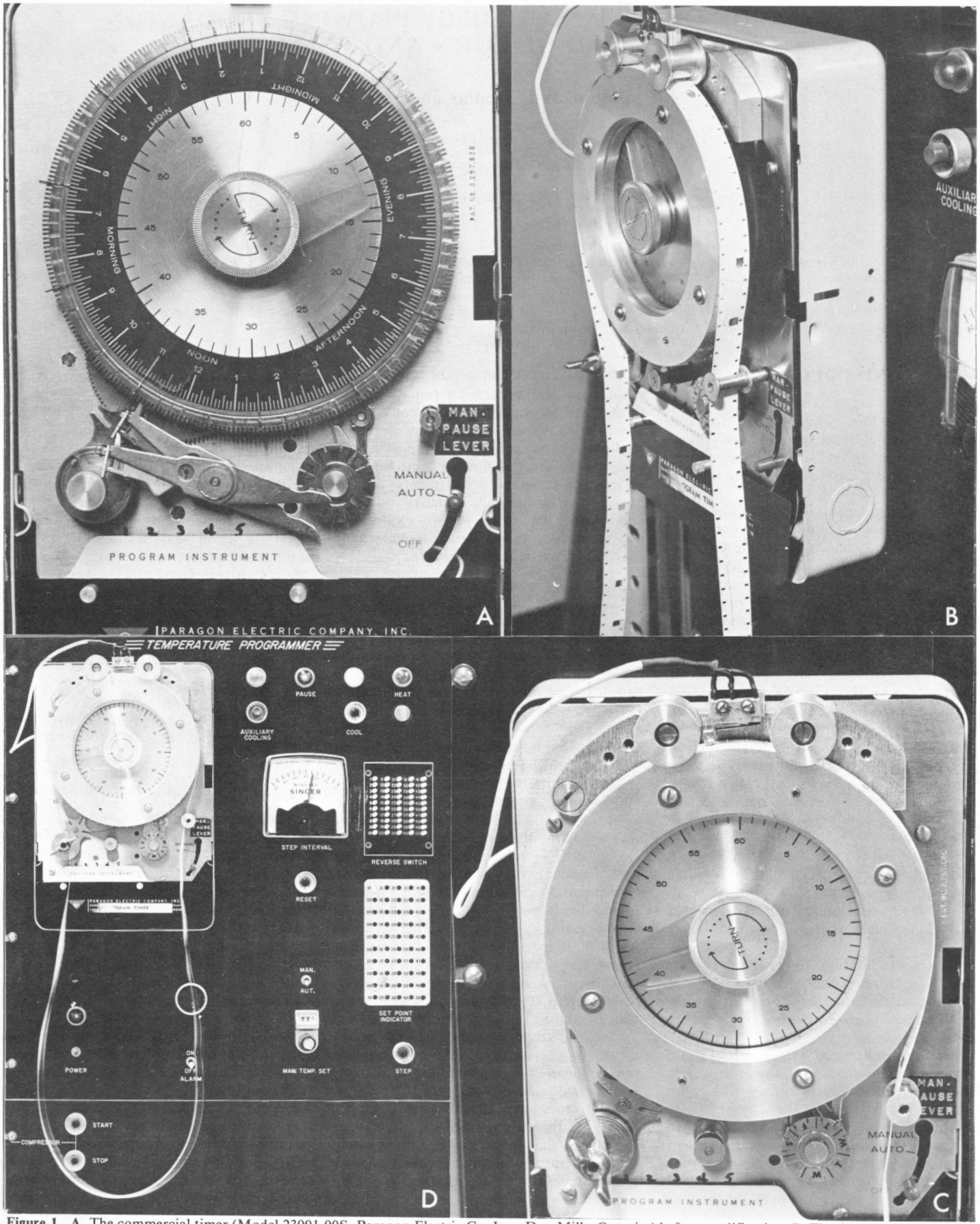

Figure 1. **A.** The commercial timer (Model 23001-00S, Paragon Electric Co. Inc., Don Mills, Ontario.) before modification. **B.** The drum replaces the dial and carries a loop of film — note the holes punched at intervals in the film. **C.** View showing micro-switch installation. **D.** The programmer installed on a winterhardiness test cabinet temperature control system (Timbers and Caron 1970).