Greenhouse watering—a simple control circuit for boom sprinklers

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The increasing use of greenhouses for the accelerated production of forest tree seedlings emphasizes the need to employ labor-saving devices for such routine tasks as watering, fertilizing, etc. Hand-watering is especially time consuming, and in large greenhouse operations can tie up labor for long periods each day. Consequently, many nurserymen are looking to various types of irrigation equipment as a means of automating this essential operation.

Uniformity of application is a key factor in selecting an irrigation system, particularly where, as in many container nurseries, nutrients are applied with the irrigation water. In this regard, systems based on fixed or oscillating sprinkler heads with overlapping spray patterns are the least desirable because it is impossible to arrange them in any layout that will give uniform coverage. The most efficient system for greenhouse applications is the traveling sprinkler boom; it moves over the area to be watered at a uniform rate and, provided the nozzles apply water evenly over the full greenhouse width, ensures uniform distribution with no dry or over-watered spots.

A traveling boom sprinkler has been installed at the Great Lakes Forest Research Centre for use in the production of paperpots. The sprinkler is equipped with a simple mechanical reverse system, and will travel back and forth on rails down the center of the greenhouse until the transport motor is switched off. An automatic control system was required, and the one described below was designed with a view to providing relatively cheap, yet flexible, control for small to medium-sized greenhouse operations. It incorporates a delayed-start feature to permit priming of the spray lines before activation of the boom transport motor. This is necessary to avoid uneven application while pressure builds up at the spray nozzles, and consequent loss of effective growing space in the start-up zone.

The control system (figure 1) was designed for a single sprinkler unit, although with suitable modification

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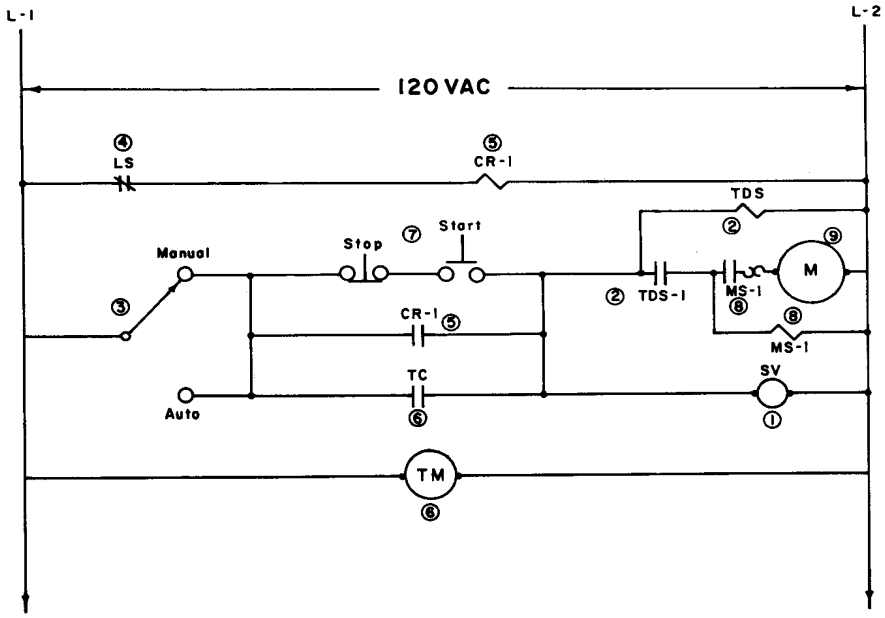

①	SOLENOID VALVE	
②	TIME - DELAY SWITCH	(A.B.-849ZOD32)*
③	MANUAL - AUTOMATIC CONTROL	(A.B.-800T-H2)*
④	LIMIT SWITCH - normally closed	(A.B.-802X-WS14)*
⑤	CONTROL RELAY - normally open	(A.B.-700BR200)*
⑥	TIME CLOCK	
⑦	MANUAL START / STOP PUSHBUTTON CONTROL	(A.B.-800T-XA Series B)*
⑧	MOTOR STARTER CONTROL - C/W THERMAL OVERLOAD	(A.B.-709-AAT)*
⑨	TRANSPORT MOTOR	

* IDENTIFICATION IS FOR GUIDANCE ONLY; ANY COMPONENT OF SIMILAR SPECIFICATIONS WOULD BE SUITABLE.

Figure 1.—Schematic control circuit for boom sprinkler.

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it might be used for multi-greenhouse applications also. When activated, the controller first opens the solenoid valve (1) , allowing water to flow into the sprinkler unit. Water passes either directly into the sprinkler supply hose or, where fertilizers are to be applied, via an inexpensive Cameron bucket diluter. After the solenoid valve is opened, an adjustable time-delay switch (2) allows water pressure in the sprinkler system to build up to the working level before starting the transport motor. Although a delay of approximately 5 seconds is required in our installation, it will vary with the size of sprinkler unit and length of supply hose for other applications, and must be determined by trial and error.

With our sprinkler installation there is a requirement both for daily watering and, during the critical germination phase, for frequent light waterings at regular intervals. The control system therefore provides for either manual operation or automatic activation through a time clock. With the control switch (3) in the manual position, depressing the "start" button opens the solenoid valve and activates the time-delay switch. At this point the limit switch (4) is still in the open position; it is therefore necessary to keep the "start" button depressed until the sprinkler system is fully pressurized and the transport motor moves the boom off the limit switch, allowing the contacts to close. The motor is then held by the control relay (5) until the boom completes its traverse of the greenhouse, causing the circuit to be broken once again at the limit switch.

In the automatic mode the sprinkler system is controlled by a 24-hour time clock (6) (Intermatic Model V 48171)[1] having a minimum operating interval of 5 minutes, and with an output signal fully adjustable between 4 and 60 seconds per operation. In the same manner that the "start" button must be kept depressed for several seconds during manual operation, so too the output signal from the clock must be adjusted to maintain a closed circuit between activation of the system and the time at which the sprinkler boom moves off the limit switch.

The system described has proven useful in simplifying the watering and fertilizing of containerized seedlings at various stages in the production cycle. One man can operate the equipment and leave it unattended during spraying operations, while automatic control permits frequent spray cycles or other programmed operation. Electrical components for this control circuit cost $354.

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[1]Identification is for information only. Any time clock of similar specifications and having an adjustable output signal would be suitable.