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dom or in sequence independent of the automatic timer, with switches or other types of selectors.

(6) A master switch, sometimes called a "rain switch," which can be set to prevent the automatic watering cycle from starting during periods when watering is not required or wanted. Use of the master switch should not affect the pre-set program.

(7) Station omit whereby, at discretion of operator, any station or stations can be omitted from the automatic or semi-automatic watering cycle.

(8) Designed so that all programming and operational settings can be easily made on the face of the controller with switches, knobs, etc.

(9) A safety device, such as a solenoid, for hydraulic systems using normally-open remote control valves to shut the system off in the event of electrical power failure.

(10) Instructions for field servicing.

(11) Availability of repair parts.

Optional Controller Features. Many brands of automatic controllers also provide optional features. (Note: some brands may provide some of these features as standard.)

(1) A master valve circuit to provide for operation of a "master" remote control valve at the entrance to the entire system. The master valve automatically opens when any controller station is energized. It is intended to be used in conjunction with certain types of backflow prevention devices.

(2) A pump control circuit to energize a pump whenever a station is energized. Some brands of controllers also provide a means of operating the pump for purposes other than sprinkling.

(3) Dual programming which allows any preselected station to be omitted from the automatic or semi-automatic cycle on any day or days of the calendar program. This feature is generally used to allow less frequent watering of shrubbery areas. With some controllers, stations watered on the secondary program must be selected at time of installation. For all-electric systems, a separate, special wire is required for all remote control valves on the secondary program. Valves cannot be added to or eliminated from this program after installation. However, some brands of controllers do not require the extra wire. And, valves can be added to or eliminated from the program at any time. Re-programming is accomplished by a simple rewiring procedure at the terminal block in the controller. This versatility is preferred in most cases.

(4) In addition, specialized controllers are available for very large area watering such as golf course, park, etc.

Note: On larger systems, more than one controller is often used. Some reasons for using multiple controllers are:

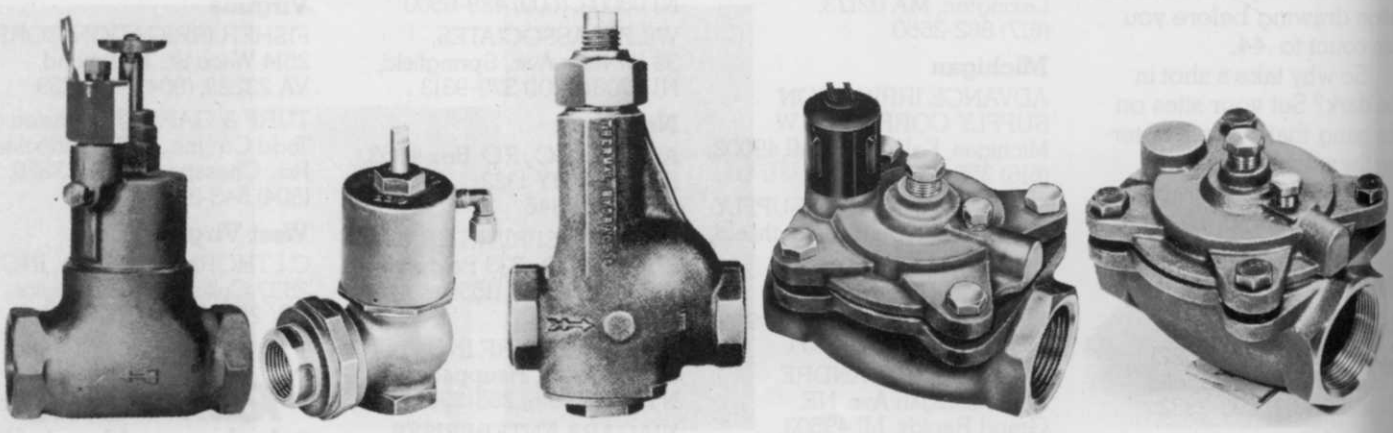
(1) Number of zones exceeds the capacity of a single controll.

(2) Different equipment is used in some areas being sprinkled and separate control is desired for each.

(3) Separate programs of watering are desired or required for certain areas of property. For example, greens and fairways of golf courses.

REMOTE CONTROL VALVES. Valves specifically manufactured for automatic turf irrigation systems are completely buried, therefore less conspicuous. However, there had been a definite trend in recent years to enclose the valves in specially-made boxes, particularly those of larger systems. Such installation makes it easier to locate and service the valves when required.

The most important reason for installing remote control valves in burial boxes is to simplify servicing and operation inspection of the sprinkler heads. Most valves have a "bleed-plug" or other device incorporated in the top to permit



Electric Piston | Hydraulic Piston | Electric Thermal Motor | Electric Diaphragm | Hydraulic Diaphragm

An assortment of valve types used in turf sprinkler systems.

Now from Elanco

Spike® granular

for broad spectrum Vegetation Control that lasts MONTH

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For the past several years, Spike granular has been tested in actual field situations. When applied in accordance with label directions, Spike will result in a high level of long lasting broad spectrum vegetation control at low costs.

Test plot demonstrates dramatic result of single application of Spike.

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- Does your herbicide get the tough weeds?
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Does your herbicide measure up to Spike? Maybe you should compare your herbicide with Spike granular in some other ways too.

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manual opening and closing. This feature eliminates wasted service time for trips back and forth to the controller location.

Most remote control valves are constructed entirely of brass and bronze. Some have a body casting and bonnet of cast iron which is subject to considerable rusting. However, brass functional parts tend to reduce the overall effect. Recently, some manufacturers have begun to produce plastic remote control valves.

Remote control valves are made on the globe valve pattern almost entirely; the straight type being the most prevalent.

Diaphragm-Type Valves. The most commonly used remote control valves for both electric and hydraulic control are the diaphragm type. For the controller to operate these valves, a water pressure differential must be maintained between the top-side and under-side of the diaphragm. For trouble-free operation, a quality diaphragm is required which won't allow uncontrolled leakage from one side to the other. Quality diaphragms made of such materials as Buna-N reinforced with nylon webbing are practically indestructable.

There is practically no wear in diaphragm valves. Therefore, parts seldom require renewal. There is no swivel motion on seats to cause leakage as in the case of most types of globe valves. Because of this factor, the seat disc can be molded as a part of the diaphragm to further simplify the valve and reduce the number of parts. See Figure 14 and Figure 16. In addition, diaphragm valves do not have stem packing, a frequent source of valve leakage.

Piston Valves. As the name implies, these valves utilize a vertically moving "piston" to open and close the valve. Like diaphragm valves, a pressure differential must be maintained between the top and bottom of the piston for proper operation. Leather or composition cup washers or "O" rings around the piston prevent leakage past the piston (similar to operation of piston rings in an automobile engine).

Leather cup-washers have a tendency to dry out between seasons and shrink away from the "cylinder" walls. When this condition occurs, pressure by-passes the cup-washers causing the valve to become inoperative. "O" rings tend to roll and twist when the valve opens and closes. Excessive wear and deformation caused by this malfunction requires frequent replacement of the "O" rings. Valves using leather cup-washers or "O" rings are also subject to "sticking" after long periods of non-use.

Electric Thermal Motor Valves. This type valve does not use water pressure to open or close. Rather, a thermal (heat) motor directly operates the valve.

Flow Adjustment. Most sprinkler system remote control valves include a flow adjustment device. With some valves, this is an optional feature; others provide it standard. This feature is used to reduce flow and pressure to small zones in order to balance them hydraulically with larger zones. Most flow adjustment devices can be used for complete manual shut-off of the valve.

ELECTRIC AUTOMATIC SYSTEMS. Turf sprinkler systems using electricity transmitted from the controller by wires to operate the valves are classified as "Electric Automatics."

Typical controller operational panel.

Wiring. Electrically operated valves manufactured specifically for turf sprinkler systems require less than 30 volts to operate; usually 24 volts. Direct underground burial of UF or TW wires (UF is preferred) without conduit is safe with less than 30 volts. However, always check local electric codes before designing systems.

Figure 13 illustrates the electric wiring between the controller and electric remote control valves. One "hot" wire is required to each valve from the "station" terminal that controls it. A "common" wire to all valves is the second "leg" of the electrical circuit. Wire sizes depend on the length of wire to the valve and the current requirements of the valve.

The electric current "draw" of different brands of valves and the current requirement of different controllers vary. Therefore, wire sizes must be carefully calculated. Most manufacturers furnish tables or other recommendations to simplify controller to valve wire sizing.

Extreme caution should be exercised when "mixing"different brands of controllers and valves. Be sure the controller can supply enough power for the valve and use care in sizing wiring. Brand "mixing" of controllers and valves is normally not recommended.

Some systems (usually large ones) are designed with one station of the controller operating more than one remote control valve. Before designing such a system, check the capabilities of the equipment that will be specified.

Many controllers for electric automatic systems have this capacity, but the number of valves which can be operated varies from model to model. Multiple valves on a single station require larger wire than for a single valve. And, wire sizing is more critical. Again, follow the manufacturer's recommendations.

Operation: Electric Solenoid Diaphragm Valves.

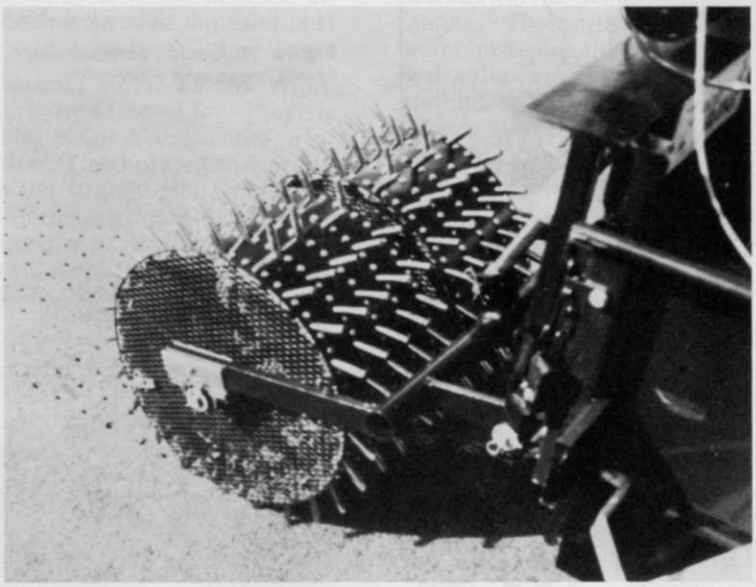
THREE INCH PENETRATION

with either 3/8″ pointed tine or 3/4″ regular tine, with a 1/2″ regular tine also available.
Dedoes TCA-551 with 240 tines on spacing close to

2″ CENTERS

Improved TCA-551 has two drums welded in the middle and only one door to open to dump the cores.

Tines enter straight in turf and come out straight. Leaves your green in playable condition. Aerate a 5000 square foot green in less than 15 minutes. Cores are collected in the drum. No costly clean-up.



The hydraulic principle utilizes the weight of the vehicle for down-pressure giving you needed hole depth.

Designed and ruggedly built to cut maintenance costs.

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QUICKLY MOUNTS to any all-purpose vehicle you may already have.
BACKWARDS OR FORWARDS you have complete mobility. No special attachments necessary.

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WE HAVE A DISTRIBUTOR IN YOUR AREA.

Our economy model TCA-450 costs 20% less than the regular models — has 120 tines on 2 drums.

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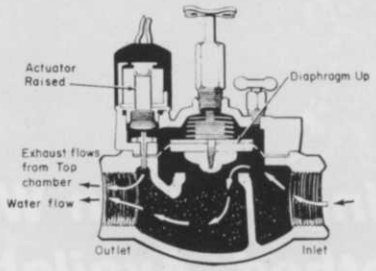
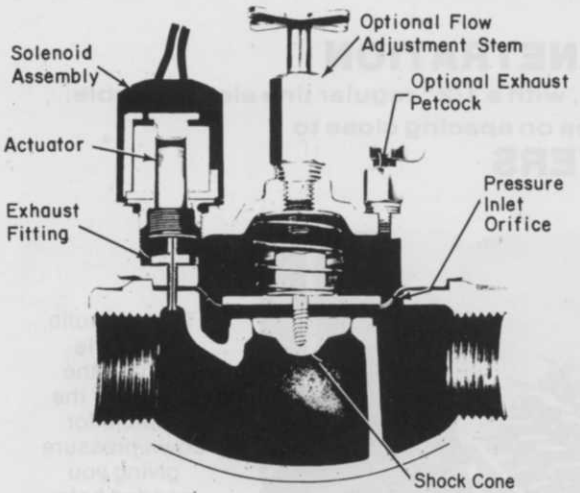


OPEN POSITION



CLOSED POSITION

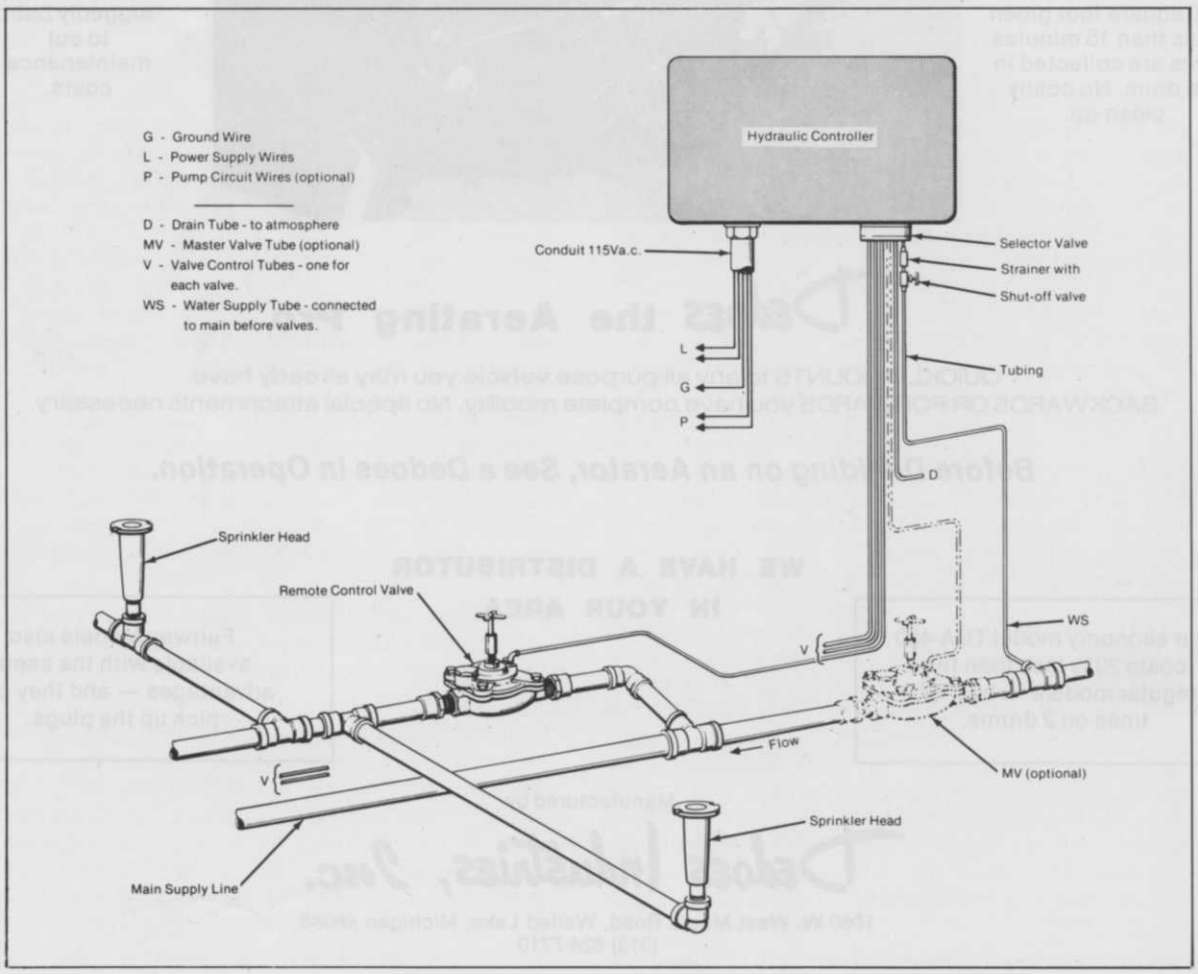
When a valve is not being operated (Figure 14, closed position), water under pressure from the sprinkler system "main" pipe line holds the valve closed.

When a controller "station" wired to a valve energizes the solenoid, the magnetic force lifts its actuator off the exhaust port. The pressure of water in the upper (hydraulic) chamber is relieved through the exhaust port which allows the "main" pipe line pressure to force the flexible diaphragm up, opening the valve. (Figure 14, open position).

Because a loss of water pressure occurs as water flows through the body of the valve, pressure is greater at the entrance of the inlet port to the upper chamber than at the chamber outlet port. The sizes of the two ports are correlated so water can flow out the exhaust faster than it can enter the upper hydraulic chamber. Therefore, service technicians should be cautioned to never tamper with

Figure 14: Electric solenoid diaphragm valves, open and closed.

Figure 15: Tubing installation for a hydraulic controller.



the port sizing for any reason.

When the controller "station" and solenoid are deenergized, the actuator drops, closing the exhaust port. Pressurized water entering the upper (hydraulic) chamber forces the diaphragm down, closing the valve.

Sprinkler system water must be clean of debris that could cause the inlet port to be blocked. If this should happen, water could not flow into the upper (hydraulic) chamber and the valve would remain open. Some valves use an inlet port strainer to keep out larger debris. However, screens can be blocked by build-up of fine debris.

Other valves utilize an inlet port directly through the diaphragm. Large debris that could block the port is normally dislodged as the diaphragm flexes during valve opening and closing. Debris smaller than the inlet port is free to pass through. Since the outlet port is larger than the inlet port, any debris passing through the inlet port will pass through the outlet port.

Operation: Electric Thermal Motor Valves. While wiring requirements are the same as for "Electric Solenoid Diaphragm and Piston Valves," the principle of valve operation is completely different. The valve is made on the straight-globe pattern.

When the valve is not being operated, a strong spring forces the seating disc against the body seat, holding the valve closed. A shaft is attached at the bottom to the seating disc and at the top to the motor.

When the valve is electrically energized by the controller, the motor extends the shaft forcing the seating disc away from the body seat, opening the valve.

When the controller "station" is de-energized, the valve spring forces the seating disc against the body seat, closing the valve.

Normally-Closed. Electric remote control valves are a "normally-closed" type. This definition means that should the electricity to the valve be interrupted for any reason, such as a power failure, broken wire, etc., the valve will automatically close itself. This feature is of considerable importance.

HYDRAULIC AUTOMATIC SYSTEMS. Turf sprinkler systems using water as the "actuator" for remote valves are classified as "hydraulic automatics." Hydraulic controllers apply or release water pressure through "hydraulic tubing" to the hydraulic remote valves. There is more than one method by which the controller operates remote valves. However, since all are quite similar only the most commonly used method is outlined in detail.

Tubing. Pressurized water is brought into the controller by a tube connected to the "main" pressure pipeline of the sprinkler system. This tube must be connected to the "main" in front of all remote valves. Occasionally, an independent water source

with pressure as great or greater than that in the system is used.

Water pressure is applied, or released, through tubes connected between the controller and the remote valves. The individual "stations" control this function with a special "selector" valve; or with a bank of individual small, electric solenoid valves commonly referred to as "pilot" valves.

As shown in Figure 15, a separate control tube is required for each "station" to operate its valve or valves. Control tubing, often referred to as "hydraulic" tubing, is usually small — ¼ or ⅜ inch nominal size — and flexible soft-annealed copper or plastic. Always check equipment manufacturer's recommendations for size. Also, larger tube may be required when one tube controls more than one valve.

Operation. In the non-operating position, pressurized water from the supply fills the supply tube and valve tubes through the open selector valve or the individual, 3-way solenoid pilot valves. This pressure forces the diaphragm (or piston) seating disc down and against the body seat, holding the valve closed. (Figure 14, closed position).

When a controller "station" activates the selector valve, the water supply to the remote valve controlled by that "station" is shut off and pressure in its control tube is relieved through a drain tube. (Figure 16, open position.) Relieving pressure in the control tube also relieves pressure in the upper

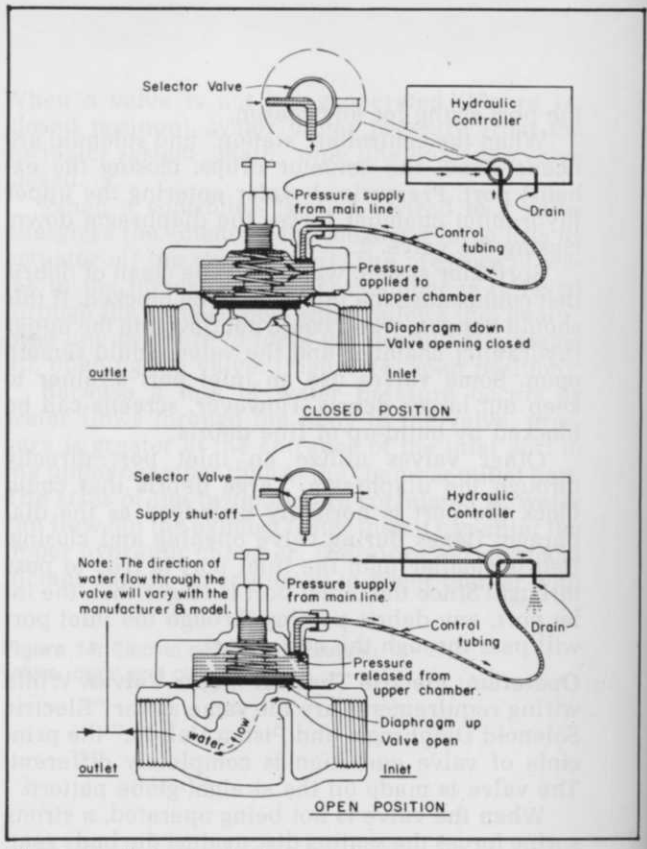
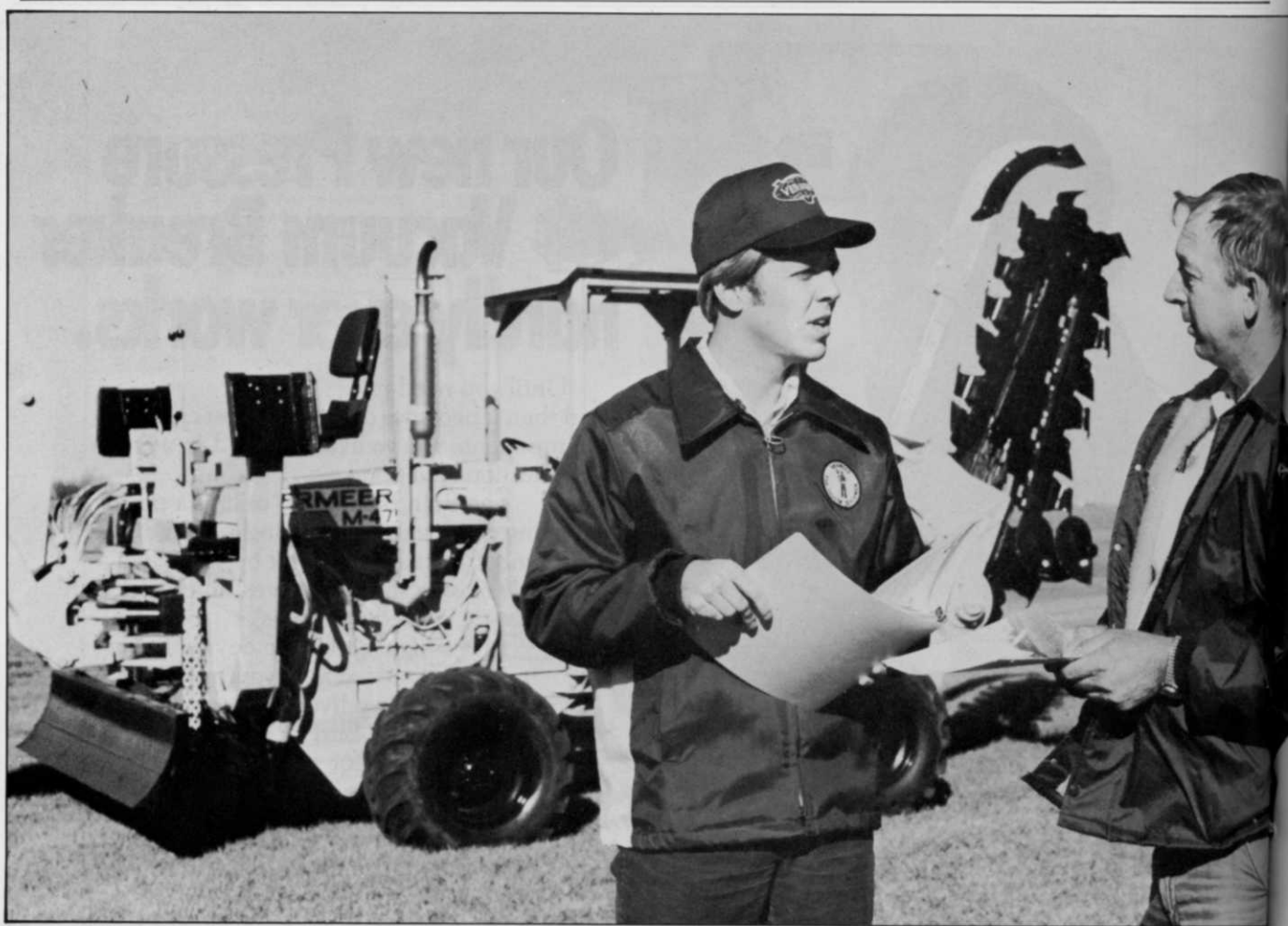


Figure 16: Hydraulic diaphragm valve, open and closed.



(hydraulic) chamber of the remote valve. Pressure in the sprinkler system main supply pipe forces the diaphragm (or piston) up, opening the remote valve.

When that "station" is de-activated, the process is reversed and pressure in the control tube forces the diaphragm (or piston) down, closing the valve. (Figure 16, closed position).

Alternate Method of Operation. In one of the other methods of hydraulic automatic systems operation, the pressurized water (from the upstream sprinkler main line) required to close remote valves enters the upper hydraulic chamber of the valve through an internal port. These inlet ports are located exactly the same as those in electric diaphragm valves; either through the valve body or the diaphragm. In piston valves, the port is through the center of the piston.

To operate, two-way selector or pilot valves are used to relieve the pressure in the upper (hydraulic) chamber. This allows the system pressure to force up the diaphragm (or piston), opening the valve. During system operation, there is a constant small bleed of water through the common drain tube of the controller. This bleed tube is commonly serrated every few inches and buried in a shrubbery bed. It can also be connected to a shrub head, if desired.

When the pilot valve in the controller closes, water pressure again builds up in the upper (hydraulic) chamber of the valve, closing it.

Clean Control Water. The water used to operate remote valves in a hydraulic system must be clean. Most manufacturers specify that a strainer be installed in the supply tube to the controller to avoid clogging of the pilot valve (or valves). Such clogging can prevent the supply of pressurized water to the remote valves, in which case they would not close.

Controller Freeze Protection. Hydraulic controllers must be protected against any freezing, if the control tube and/or valves are located in the controller. Also, when the earth freezes to the depth of buried tubing, all tubing must be drained. The small control tubing cannot be drained with the normal methods of draining system piping. The only successful way of removing water from the control tubes is to blow it out with an air compressor.

Special Note. Unlike electric automatic systems, when the "actuator" source to the hydraulic remote valves — pressurized water — is interrupted, the remote valves will open and remain open until pressure is returned. Such failure can be caused by a leak occurring in the control tube, a break in the tube, or a clogged or malfunctioning pilot valve. **WTT**

BOARD VIEWS BUSINESS SKILLS, COMMUNICATION AS KEYS TO GROWTH

Dale K. Manbeck

Dale K. Manbeck has been president of Manbeck Nurseries, Inc., in New Knoxville, Ohio, since 1971. He is also serving his second term as president of the National Landscape Association.

Manbeck received a Bachelor of Science in Landscape Horticulture in 1965 from Ohio State University, Columbus. He has always specialized in the business aspects of landscaping and nursery management.

In addition to his role at NLA, he is past president of the Ohio Nurserymen's Association and is a member of the Member Development and Dues Committee of the American Association of Nurserymen. Manbeck is also on Ohio State University's Citizens Advisory Board and the St. Marys City Board of Education.

He lives in St. Marys, Ohio, with his wife and two children. Hobbies include racquetball, tennis and golf.

The future of the nursery industry, I feel, is very bright. As we move forward the demands on our business will continue to increase partly from the government (taxes, reports, consumer groups) and partly from the management needs of our own businesses.

Not long ago, it was felt that to succeed in our industry the most important factor for success was to be a good plantsman, however, I do not believe this to be as important as management skills. We must know what our costs are and be able to fiscally manage them as well as to project them into the future.

Under management we must consider personnel management and the important part it plays in our organizations. Don't misunderstand, knowledge of plants is still important and will continue to be as the consumer becomes more and more aware of what they want from us. Proper management will help us serve our clients more professionally.

As we pursue the discretionary dollar, which we must do, we as individuals and organizations have an opportunity to participate in an advertising program that will help us achieve that goal. The Nursery Marketing Council is being initiated by the American Association of Nurserymen. The Nursery Marketing Council is established to supply the nursery industry with professional market research and analysis and the resulting advertising and public relations to increase the sale of plant materials and related products. The Nursery Marketing Council is funded solely by voluntary contributions of the retailer and wholesaler together. Its activities are performed for the benefit of the entire nursery industry and those businesses that serve to support and enhance nursery products.

This will have a very positive impact on our industry and its continued growth.

Roger Funk

Roger Funk, Ph.D., is director of research for the Davey Horticultural and Lawnscape Institutes, both divisions of Davey Tree Expert Co., in Kent, Ohio.

Funk holds the patent for Arbor Green, a slow release organic fertilizer for hydraulic application, and is credited for a no-drift nozzle used by lawn care companies.

He received his Ph.D. from West Virginia University in 1973. Funk is active in many state turf associations and is often a speaker on their programs. He is also a member of the International Society of Arboriculture, the International Horticultural Society, and the Institute of Biological Sciences.

It is our opinion and conviction that the arborist industry has, particularly in the last ten years, experienced a gradual and progressive upgrading of standards resulting in a high degree of professionalism. Horticultural science and research has developed technology to assure quality materials and procedures for the health, vigor and remedial care of trees and shrubs. Engineering has continued to improve tools and all types of power equipment in our industry to achieve greater production and improved safety to the workmen with no sacrifice to quality.

Government regulation has been costly to companies but has increased safety and quality standards. The Occupational Safety and Health Act (OSHA) established safety procedures and equipment that all companies must use. Federal pesticide regulations as well as state licensing of companies and certification of applicators has provided a standard base of technical understanding and responsibility for the industry.

Personnel development has been established as a key requirement by all governmental agencies engaged in horticultural services with excellent study material and instructors involved in seminars and work study programs. In the educational section, it has been our observation that colleges are improving on the curriculum to assure that graduating students have both theoretical and practical application backgrounds.