

Feb. 8, 1966

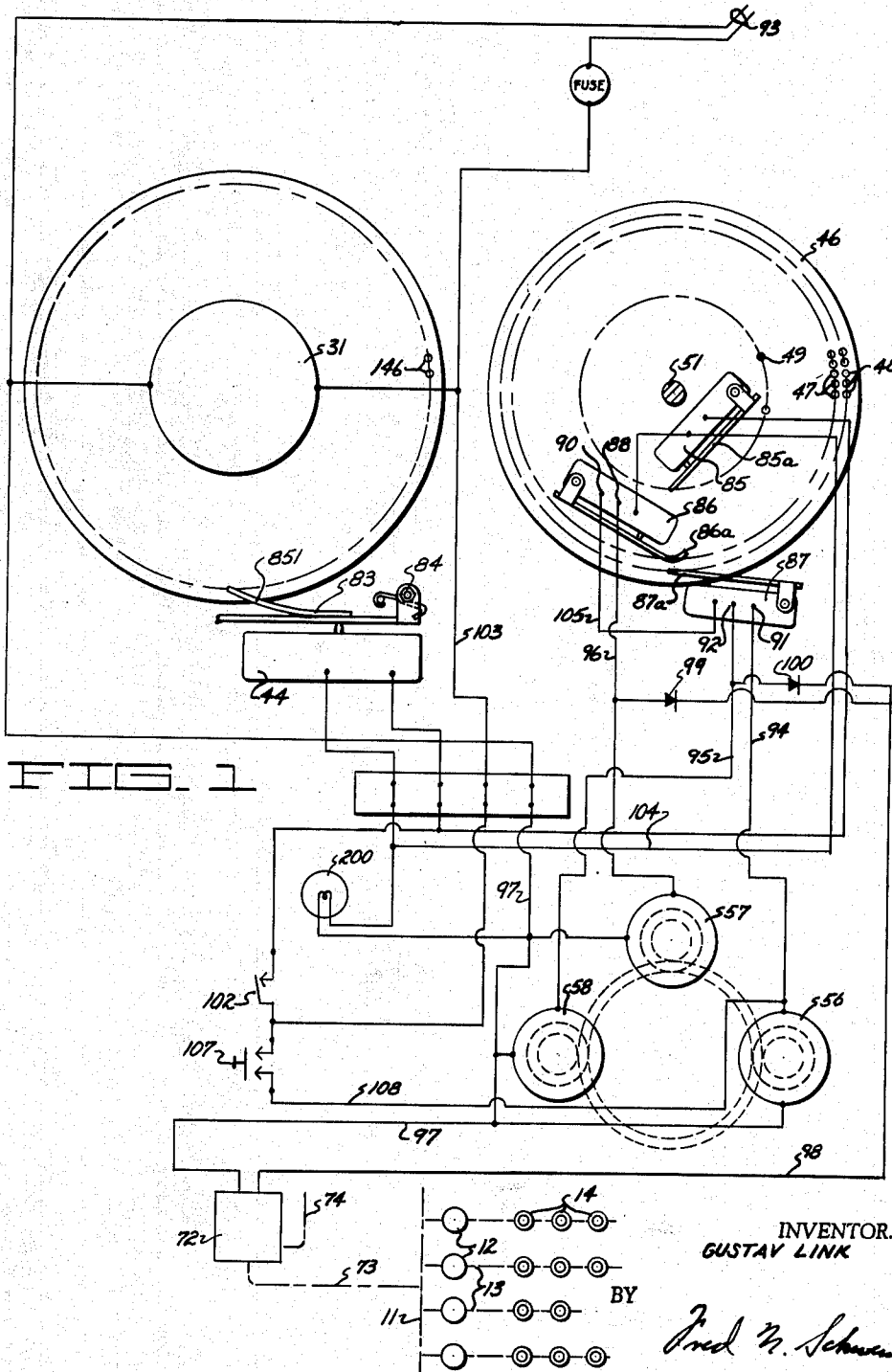
G. LINK

3,234,448

SPRINKLER CONTROL SYSTEM

Filed Dec. 26, 1961

3 Sheets-Sheet 1



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SPRINKLER CONTROL SYSTEM

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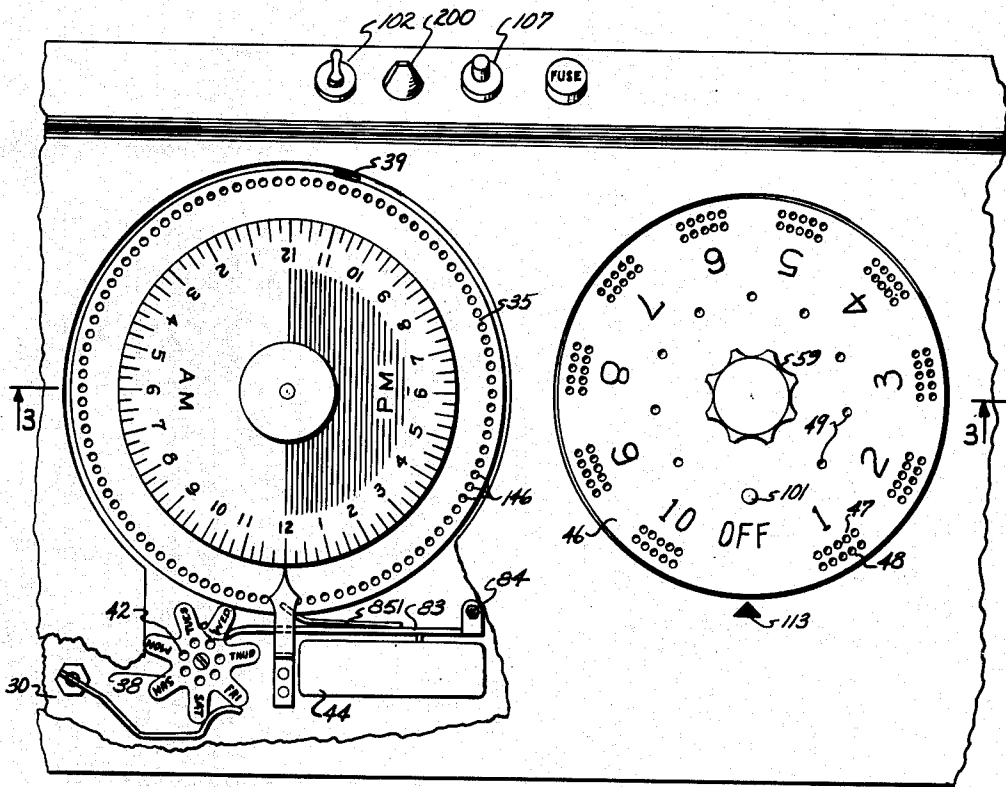


FIG. 2

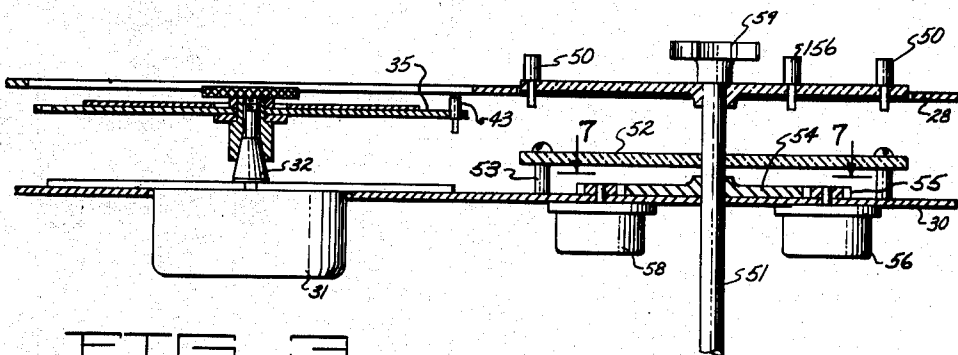


FIG. 3

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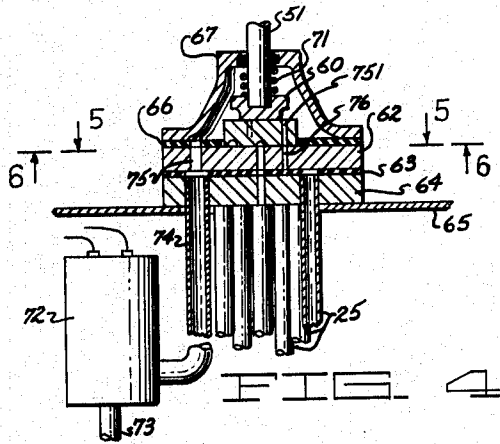


FIG. 4

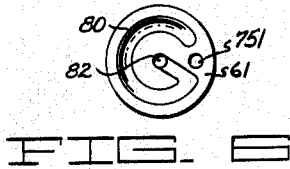


FIG. 6

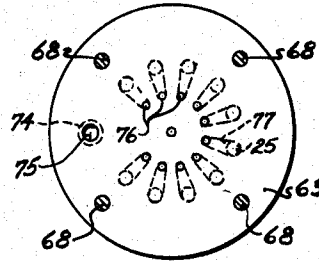


FIG. 5

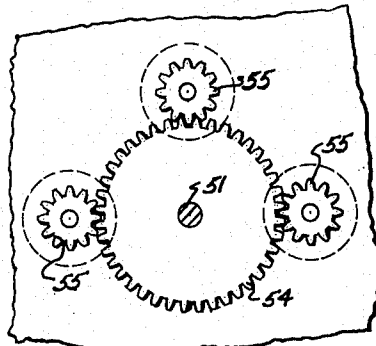


FIG. 7

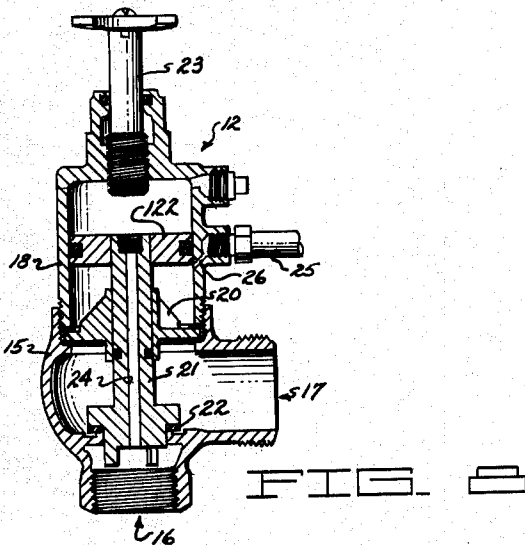


FIG. 8

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SPRINKLER CONTROL SYSTEM

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Filed Dec. 26, 1961, Ser. No. 162,097

7 Claims. (Cl. 318-443)

This invention relates to fluid distributing systems and has particular reference to water sprinkler control systems for automatically controlling sprinkling of lawns, etc.

When sprinkling large areas, such as golf courses, it is desirable to sprinkle or water different sections thereof at a time in order to maintain sufficient water pressure so that each sprinkler head may cover an adequate area. Also, it is often desirable to sprinkle certain sections more or less than others. For example, lawns that are normally shaded require less water than those which are exposed to the sun. Also, it may be desirable to sprinkle certain sections at certain times of the day only. Thus, those sections which are normally walked on in the morning would be sprinkled only at night or in the afternoon. Again, it may be desirable to skip sprinkling of certain sections on different days of the week.

It therefore becomes a principal object of the present invention to provide a fluid control system which is effective to successively distribute fluid to different branch pipes at different times.

Another object is to provide a fluid control system of the above type in which the duration of time in which fluid is directed to different branch pipes may be varied as desired.

Another object is to provide a fluid control system in which the system does not have to operate successively through a complete cycle in any one day or other time period.

Another object to provide a water sprinkling control system effective to springle certain sections of an area on one day and certain other areas on any other day of the week.

A further object is to provide a relatively simple and inexpensive water sprinkling control system which will automatically control the time and duration of sprinkling of different sections.

The manner in which the above and other objects are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic view illustrating the control circuitry embodying preferred form of the present invention.

FIG. 2 is a plan view of the time clock and area control dial.

FIG. 3 is a sectional view taken along line 3-3 of FIG. 2.

FIG. 4 is a sectional view through the distributor unit.

FIG. 5 is a sectional plan view taken along the line 5-5 of FIG. 4.

FIG. 6 is an inverted sectional plan taken along the line 6-6 of FIG. 4.

FIG. 7 is a sectional plan view taken along the line 7-7 of FIG. 3.

FIG. 8 is a sectional view through a control valve.

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This invention is an improvement over that disclosed in the Link Patent No. 3,000,398, issued on September 19, 1961.

Referring to FIG. 1 in particular, a main water supply line carrying water under pressure is diagrammatically indicated at 11, the latter being connected through a plurality of control valves 12 to branch lines 13. Each of the latter is provided with a plurality of sprinkler heads 14. As will appear later, the system of the present invention is adapted to control ten such branch lines although any lesser number may be employed. Also, the system could be readily modified to increase the number of branch lines served.

Each branch line 13 and its sprinkler heads is intended to water a different area.

Referring to FIG. 8, the control valve shown therein is representative of each of the valves 12 shown in FIG. 1 and comprises a valve body 15 having an inlet 16 for connection to the main supply line 11 and an outlet 17 for connection to one of the branch lines 13. A cylinder 18 is threadably attached to the valve body and is effective to clamp a guide bushing 20 therebetween. A valve member 21 is slidably mounted in the bushing and carries at its lower end a resilient sealing ring 22 which is engageable with an annular valve seat on the body to control the flow of water. The upper end of the valve member is attached to a piston 122 which is slidably fitted within the cylinder. A stem 23 is threaded in the upper end of the cylinder 18 and may be adjusted to control the vertical movement of the valve member and consequently the rate of flow of water through the valve.

A passage 24 is formed throughout the length of the valve member and a control tube 25 is attached at one end to the cylinder, the tube communicating with the interior of the cylinder through a passage 26.

Normally, when no fluid pressure is applied to the tube 25 water pressure from the inlet 16 is applied to both the bottom of the valve member and the top of the piston, and since the area of the piston is greater than the area of the bottom of the valve member the latter will be forced downward to close the valve. However, when water under the same pressure as the inlet water pressure, i.e., from the same supply line, is applied to the tube 25 the upward force exerted thereby will be sufficient to force the valve open.

The system comprises a main control apparatus shown generally in FIGS. 2 and 3 which is mounted in a suitable frame including two spaced frame plates 28 and 30.

A twenty-four hour clock motor 31 is mounted on the plate 30 and has an output shaft 32 to which is attached a time disk 35. The disk is divided into twenty-four hour sections and each hour section is further divided by indicia 45 indicating fifteen minute periods. A row of holes 146 is arranged around the periphery of the disk, the holes being alined with the indicia 45 to facilitate proper insertion of control pins 43.

To the right of the disk 35 is an area control disk 46, forming part of a rotatable control unit, which is divided into ten area indicating stations numbered from 1 to 10. Two concentric rows 47 and 48 of holes are formed in the disk, there being five holes in each row at each station. Such holes are arranged to receive pins 50 for controlling the length of time that a sprinkling operation is to occur

in the corresponding areas. An additional row of holes 49 are provided in the disk, there being one such hole intermediate each two adjacent stations. Such holes are adapted to receive "OFF" control pins 156.

The disk 46 is attached to a shaft 51 along with a knob 59 permitting manual rotation of the shaft to any desired position. The shaft is rotatably mounted in bearings in the plate 30 and in a sub-plate 52 supported above the plate 30 by spacers 53.

A large gear 54 is attached to shaft 51 and meshes with gears 55 attached to the drive shafts of three synchronous clock motors 56, 57 and 58. The latter motors are mounted on the plate 30 and operate at different speeds. For example, the motor 56 rotates at one revolution per minute, the motor 57 at one revolution per hour and the motor 58 at one revolution per six hours.

The shaft 51 is splined at its lower end to a member 60 which is pinned to a distributor disk 61. The latter, forming part of the rotatable control unit, is rotatably mounted on a stationary plate 62 which rests on a gasket 63 mounted on a second plate 64 which is attached to a sub-plate 65 of the frame of the apparatus. A gasket 66 is interposed between the plate 62 and an end bell 67 which is suitably clamped against the gaskets and plates by bolts 68 (FIG. 5) to prevent leakage of water. A compression spring 71 between the end bell and the member 60 holds the disk 61 in intimate contact with the plate 62.

A normally closed solenoid operated valve 72 is provided having its inlet connected by a tube 73 to the main water supply line 11 and its outlet connected by a tube 74 to a passage 75 in the plate 62 to communicate with the interior of the end bell.

The disk 61 has a passage 751 therein adapted to communicate with any of a circular row of holes 76 formed in the plate 62 (see also FIG. 5). The gasket 63 has radially extending openings 77 therein communicating the holes 76 with the respective upper ends of a series of tubes 25 connected to the various control valves 12.

As seen in FIG. 6, the disk 61 has a circular groove 80 formed on its underside which communicates with a centrally located vent passage 82 leading to the atmosphere.

Referring to FIGS. 1 and 2, a switch 44 is suitably mounted on the plate 30 and is controlled by a rigid switch arm 83 pivoted at 84 and having its free end lying directly in back of a row of holes 42 formed in a star wheel 38. The latter is pivotally supported adjacent the disk 35 and has an arm for each day of the week.

An ear 39 on the disk 35 is arranged to advance the star wheel one seventh of a revolution upon each revolution of the disk. The holes 42 in the wheel are adapted to receive pins similar to the pin 43 and when such pin is opposite the arm 83 it blocks the same against closing the switch 44.

Attached to the arm 83 is a spring arm 851 which, when a pin 43 on the disk 35 engages the same, is normally effective, in the absence of a blocking pin 42 under the arm 83, to rock the latter and thus close switch 44.

Three additional switches 85, 86, and 87 are suitably mounted on the sub-plate 52 directly below the disk 46. The switch 85 is normally closed and is opened when a pin 156 in one of the holes 49 engages a control arm 85a of the switch. The switch 86 is of the class C type and has a normally open terminal 88 and a normally closed terminal 90 which are changed to close and open terminals, respectively, when a pin 50 in the inner row of holes 47 of disk 46 engages a switch control arm 86a. Likewise, the switch 87 has a normally open terminal 92 and normally closed terminal 91 which are reversed in condition when a pin in the outer row of holes 48 engages a control arm 87a therefor.

The circuitry is connected to an A.C. supply circuit 93, the latter being connected across the clock motor 31.

It will be noted that the NC terminal 91 of switch 87

is connected by line 94 to one terminal of motor 56. The NO terminal 92 of such switch is connected by line 95 to one terminal of motor 58 and the NO terminal 88 of switch 86 is connected by line 96 to one terminal of motor 57, the opposite terminals of the motors being connected through line 97 to the left hand side of the power circuit. Also, the coil of the solenoid valve 72 is connected in circuit with line 97 and with the normally opened terminals 88 and 92 through a line 98 and rectifiers 99 and 100.

The circuit becomes inoperative upon opening of the switch 85 by a permanently mounted pin 101 (FIG. 2) depending from disk 46 and aligned with row of holes 49. Now, assume the switch 85 to be held open by pin 101 and a settable switch 102 to be closed and switches 86 and 87 to be in their normal conditions. When a pin 43 on the time disk 35 closes switch 44 (providing a pin in the star wheel 38 is not blocking the same) a circuit will be completed from the right hand line 103 of the power circuit, through switch 102, switch 44, line 104, switch 86, terminal 90, line 105, switch 87, terminal 91, and line 94 to the relatively high speed motor 56. The latter will now rotate shaft 51 bringing the station No. 1 opposite a reference index 113 and moving the passage 75 into registry with the tube 25 connected with the control valve 12 for the area designated No. 1. If a pin 50 is provided, for example, in the row 47 of station 1 of disk 46 the motor 56 will advance the disk until such pin trips switch 86, opening the circuit to motor 56 and completing the circuit through line 96 to the intermediate speed motor 57. In the meantime, and before the pin 43 on the disk 35 releases the switch 44, the pin 101 will have passed the switch 85, allowing the same to close. A circuit will now be made through rectifier 99 and line 96 to energize solenoid valve 72, causing water to be admitted under pressure to the interior of the distributor and through passage 751 and tube 25 to open the control valve in the No. 1 area so that sprinkling will occur in such area only.

A pin in row 47 is adapted to maintain the switch 86 tripped for approximately $2\frac{1}{2}$ minutes and therefore the sprinkling would occur for that length of time in the No. 1 area. However, if two or more pins were inserted in the holes 47 of station 1, the motor 57 would continue for a similar additional time and sprinkling would likewise occur for that time. If a pin were placed in the outer row of holes 48 the latter would trip switch 87 completing a circuit to the slow speed motor 58. Such pin would hold the switch 87 closed for approximately 15 minutes, causing a sprinkling operation to occur for that length of time. If, for example, five pins were located in the outer row of holes of station No. 1, they would cause sprinkling for 75 minutes. During rotation of motors 57 and/or 58 the disk 61 would rotate slowly but it would not move sufficiently to move passage 75 out of communication with hole 76 for controlling the No. 1 area valve.

Now, as the last pin in station No. 1 releases one or the other of switches 86 and 87, the switch circuits would be returned to normal and valve 72 would be allowed to close. Thus, motor 56 would be reenergized, causing it to move the shaft 51 toward the next control station position, i.e. station No. 2. If a pin 50 were located in the hole 49 intermediate stations Nos. 1 and 2 the latter would open switch 85, thereby rendering the system inoperative. In such event, no further sprinkling would occur until the next pin 43 on disk 35 closed switch 44 to thereby advance the shaft 51 to control station No. 2, providing one or more pins 50 were located in that station of the disk 46. The above noted cycling would reoccur after which the motor 56 would be reenergized to advance the shaft 51 to station No. 3 and so on.

It will be noted that if no control pins 50 are provided in a station of disk 46, sprinkling operation in the corresponding area will be skipped.

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If the system is rendered inoperative by virtue of opening the switch 85 by the pin 101 or by a pin 156 in any of the holes 49, sprinkling can be initiated at any time independently of the clock disk 35 by closing a pushbutton switch 107 thereby completing a circuit from line 103 through a line 108 to motor 56, thereby rotating the shaft 51 and disk 46 sufficiently to allow switch 85 to close.

If it is desired to prevent sprinkling on a certain day, for example Sunday, a pin is placed in the appropriate hole 42 of the star wheel. On Sunday, such pin will be positioned under the control arm 83 so that the time clock will be unable to start the sprinkling cycle until the next day.

It will be noted that the solenoid operated valve 72 will become effective, in the event of power failure, to stop the sprinkling operation and thus prevent flooding in the event the power failure occurred while sprinkling was occurring in any area. Also, such valve prevents momentary sprinkling in any area which is to be skipped by the omission of one or more pins in the corresponding station of the disk 46. However, the solenoid valve may be removed from the system with a corresponding omission of its function.

A lamp 200 is connected in circuit with the motors to indicate when a sprinkling operation is in progress.

Also, in lieu of the A.C. power circuit, a D.C. power circuit obtainable, for example, from batteries, could be substituted in which case direct current motors would be substituted for the motors 31, 56, 57 and 58.

It will be noted that the tips of the switch control arms 85a and 86a are offset about the shaft 51 relative to each other so as to permit sequential control thereof by the pins in the two rows 47 and 48 of holes.

The flexibility of the system can be seen by the fact that the disk 46 can be set to cause sprinkling of the different areas for different lengths of time or any one or more areas can be skipped. Also, instead of sequentially sprinkling the different areas in a continuous cycle, the system can be readily set to cause different areas to be sprinkled at different times under control of the time clock by appropriate setting of the pins 43 and setting of pins in the star wheel 38. For example, areas Nos. 1 to 3 could be controlled to sprinkle consecutively starting at 4:00 p.m. on Monday only, area No. 5 to sprinkle at 6:30 p.m. on that day and areas Nos. 6 and 8 consecutively starting at 5:00 p.m. on Thursdays only.

Having thus described the invention, what I desire to secure by United States Letters Patent is:

1. In a multiple station timing system, the combination comprising a movable control unit having a plurality of stations movable past a reference point, a first motor for moving said control unit through a path to carry said stations successively past said reference point, a second motor operable at a slower speed than said first motor for moving said control unit through said path, a third motor operable at a slower speed than said second motor for also moving said control unit through said path, a circuit for energizing said first motor, said circuit including a first switch means effective to deenergize said first motor and energize said second motor, said circuit including a second switch means effective to deenergize said first motor and energize said third motor, and selectively settable means on said control unit for operating either of said first and second switch means when said control unit is moving through one of said stations.

2. In a multiple station timing system, the combination comprising a movable control unit having a plurality of stations movable past a reference point, a first motor for moving said control unit through a path to carry said stations successively past said reference point, a second motor operable at a slower speed than said first motor for moving said control unit through said path, a circuit for energizing said first motor, said circuit including switch means operable to deenergize said first motor and to ener-

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gize said second motor, selectively settable means on said control unit for operating said switch means for different periods of time when one of said stations is moving past said reference point, said circuit including a second switch means in series therewith, selectively settable means on said control unit for opening said second switch means when one of said stations has passed said reference point, a third normally open switch means connected in parallel with said second switch means, a time clock including a rotatable timer disk, and selectively settable switch operating elements on said disk effective to close said third switch means at different times whereby to complete said circuit.

3. In a control system for controlling the flow of fluid from a main supply pipe to a plurality of branch pipes through control valves connected to respective ones of said branch pipes including a control unit movable through a path passing successively through different stations and effective at each station to control a respective said valve to effect flow of fluid therethrough, the combination comprising a first motor for moving said control unit through said path from one station to the next, a second motor operable at a slower speed than the first motor for moving said control unit through said path, a first circuit for energizing said first motor, a first normally closed switch in series with said circuit, a second circuit for energizing said second motor, a normally opened second switch in series with said second circuit, and selectively settable means on said second switch when said unit is moving adjacent a said station.

4. The combination according to claim 3 wherein said selectively settable means includes means for controlling the length of time said first switch is opened and said second switch is closed.

5. In a control system for controlling the flow of fluid from a main supply pipe to a plurality of sprinkler pipes through control valves connected to respective ones of said sprinkler pipes including a rotatable control unit including a disk having a plurality of stations therearound, said control unit being effective when different said stations are adjacent a reference point to control different said valves to pass fluid therethrough, the combination comprising a first motor for rotating said control unit, a second motor for rotating said control unit at a slower speed than said first motor, a first circuit for energizing said first motor, a normally closed first switch in series with said circuit, a second circuit for energizing said second motor, a normally opened second switch in series with said second circuit, and selectively settable members on said disk effective when a said station is passing said reference point to open said first switch and close said second switch for a predetermined period of time.

6. In a control system for controlling the flow of fluid from a main supply pipe to a plurality of sprinkler pipes through control valves intermediate said supply pipe and respective ones of said sprinkler pipes including a rotatable control unit having a plurality of stations therearound, said control unit being effective when different said stations are adjacent a reference point to pass fluid therethrough, the combination comprising a first motor for rotating said control unit, a second motor for rotating said control unit at a slower speed than said first motor, a third motor for rotating said control unit at a slower speed than said second motor, a circuit for energizing said first motor, a normally closed first switch in said circuit, a second circuit for energizing said second motor, a normally opened second switch in said second circuit, a third circuit for energizing said third motor, a normally opened third switch in said third circuit, a selectively settable member on said control unit effective when a said station is passing adjacent the reference point for opening said first switch and closing said second switch for a predetermined period of time, and a second selectively settable

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member on said control unit effective when a said station is passing adjacent to said reference point to open said first circuit and close said third switch for a predetermined period of time, and a third settable element on said control unit effective to deenergize said circuits when one of said stations is passing from said reference point. 5

7. The combination according to claim 6 comprising a time clock and presettable means controlled by said time clock for energizing said circuits.

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