May 18, 1954 E. H. FITTER 2,678,845

AUTOMATICALLY ADJUSTABLE HYDRAULIC MECHANISM

Filed May 29, 1952 3 Sheets-Sheet 1

Fig. 1

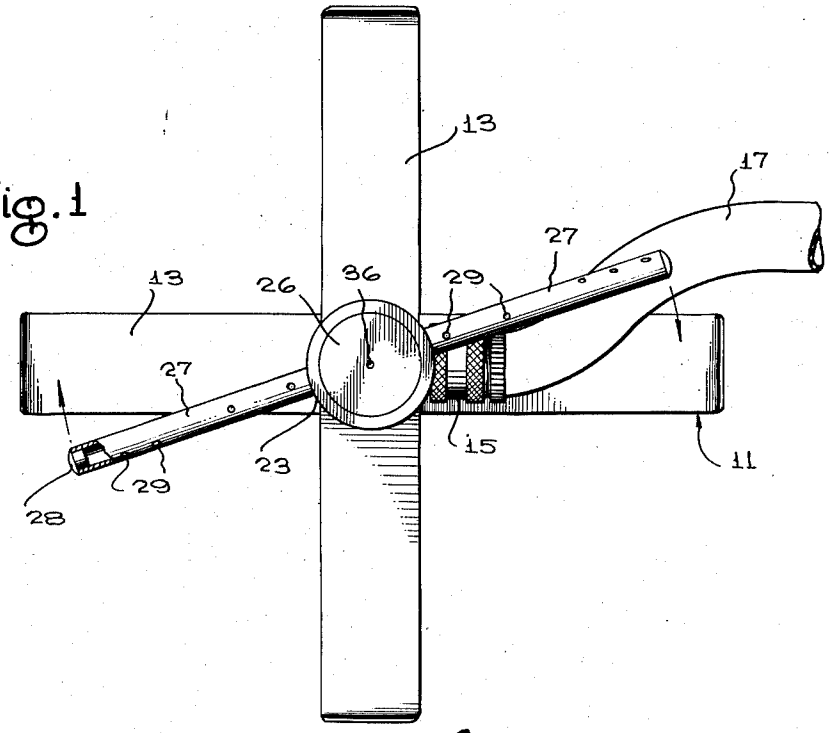
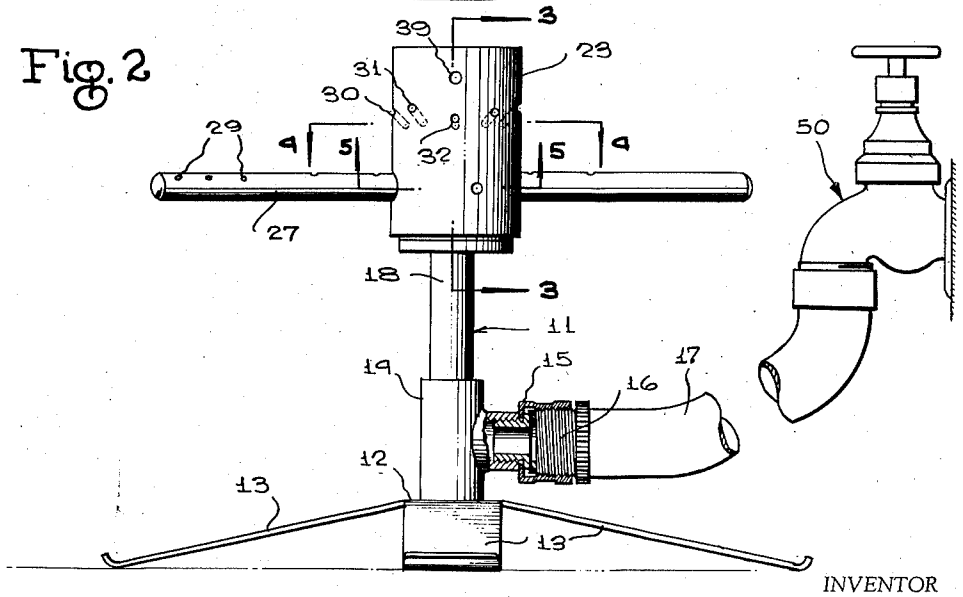


Fig. 2



INVENTOR
EMIL H. FITTER

BY
McMorrow, Berman & Davidson
ATTORNEYS

May 18, 1954 E. H. FITTER 2,678,845

AUTOMATICALLY ADJUSTABLE HYDRAULIC MECHANISM

Filed May 29, 1952 3 Sheets-Sheet 2

Fig. 3

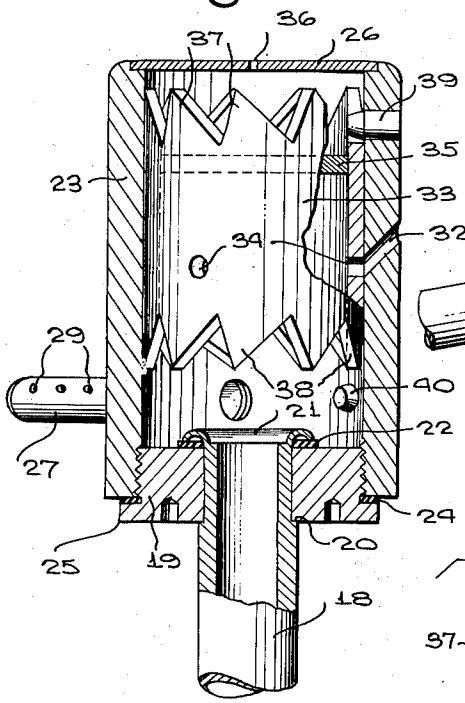


Fig. 4

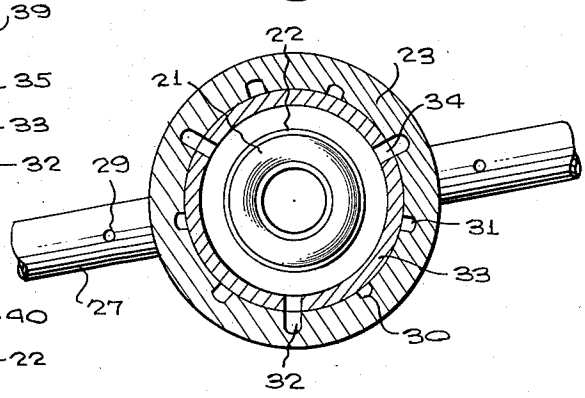


Fig. 6

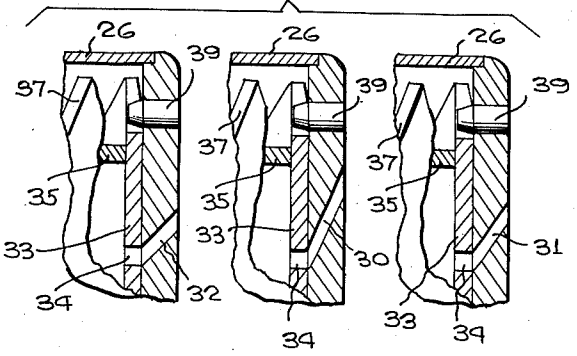


Fig. 5

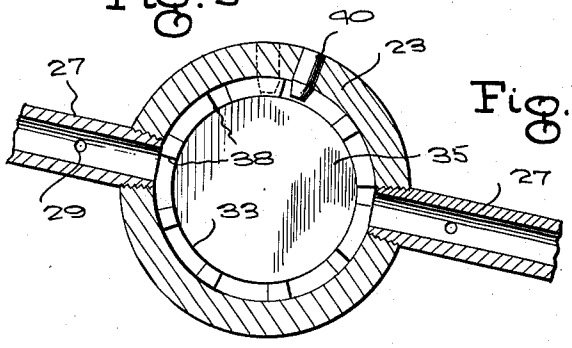
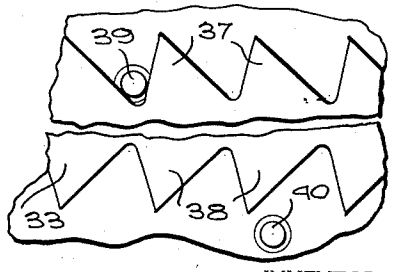


Fig. 7



INVENTOR.
EMIL H. FITTER

BY
McMorrow, Berman & Davidson
ATTORNEYS

May 18, 1954 E. H. FITTER 2,678,845

AUTOMATICALLY ADJUSTABLE HYDRAULIC MECHANISM

Filed May 29, 1952 3 Sheets-Sheet 3

Fig. 8

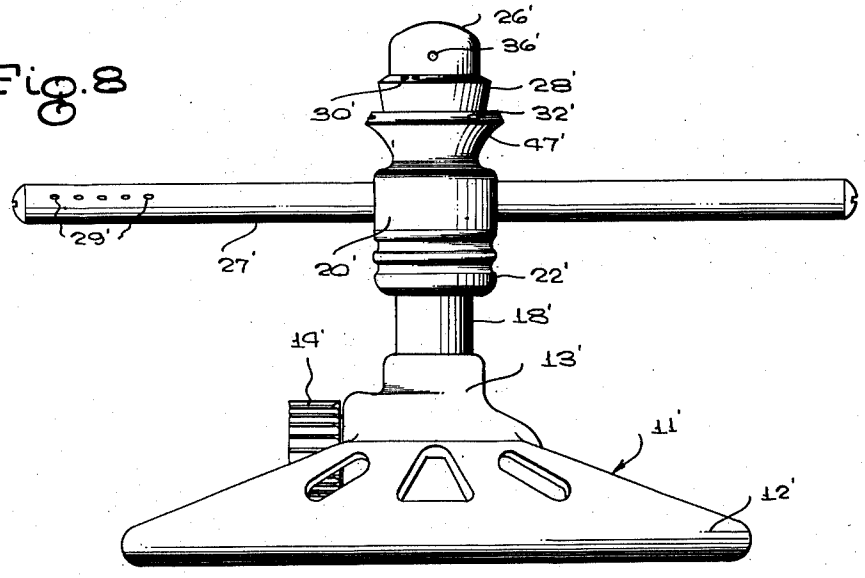


Fig. 9

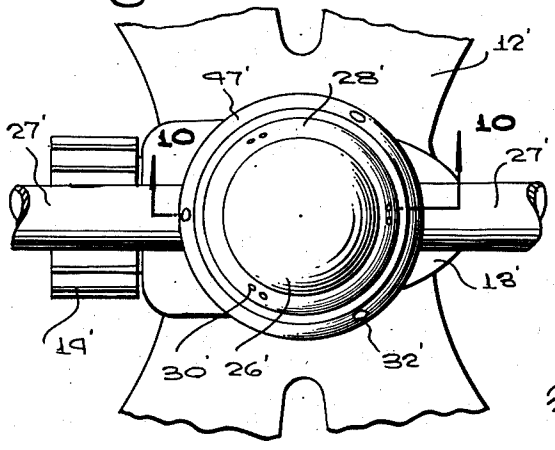


Fig. 10

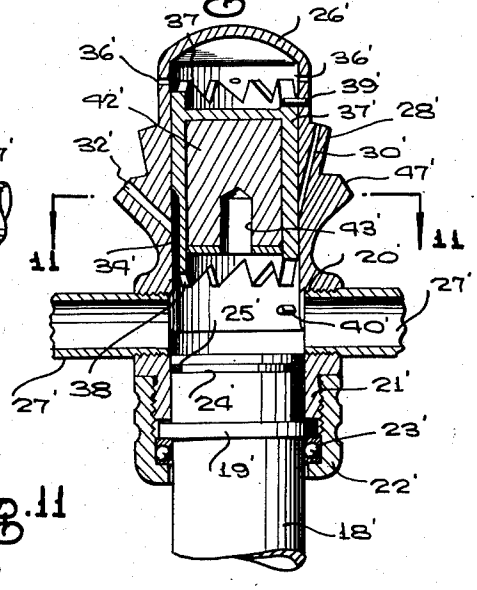
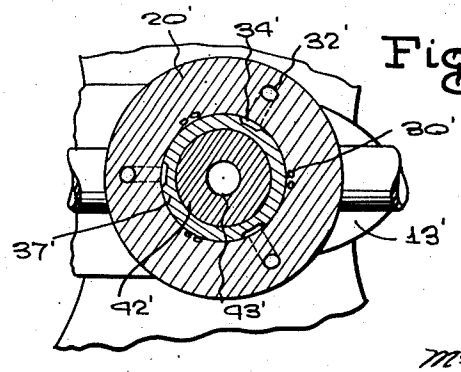


Fig. 11



INVENTOR
EMIL H. FITTER

BY
McMorrow, Berman & Davidson
ATTORNEYS

Patented May 18, 1954

2,678,845

UNITED STATES PATENT OFFICE

2,678,845

AUTOMATICALLY ADJUSTABLE HYDRAULIC MECHANISM

Emil H. Fitter, Omaha, Nebr.

Application May 29, 1952, Serial No. 290,767

6 Claims. (Cl. 299—69)

1

This invention relates to hydraulically operated devices, and more particularly to an automatically adjustable sprinkling mechanism.

A main object of the invention is to provide a novel and improved automatically adjustable, hydraulically operated sprinkler mechanism of the rotary type, which is simple in construction, which is reliable in operation, and which is designed to project water under pressure in a plurality of fine streams to preselected distances over selected circular areas.

A further object of the invention is to provide an improved rotary sprinkling mechanism which involves inexpensive components, which is sturdy in construction, and which is arranged to enable the user to vary the area covered by the sprinkler from a remote position and to change the area covered by the sprinkler by merely successively turning the water on and off until the sprinkler arranges itself to deliver water to provide the desired coverage.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

Figure 1 is a top view, partly in cross section, of an improved rotary water sprinkler embodying an improved hydraulically operated mechanism in accordance with the present invention.

Figure 2 is a side elevational view, partly in cross section, of the rotary sprinkler of Figure 1.

Figure 3 is an enlarged cross sectional detail view taken on the line 3—3 of Figure 2.

Figure 4 is an enlarged cross sectional detail view taken on the line 4—4 of Figure 2.

Figure 5 is an enlarged cross sectional detail view taken on the line 5—5 of Figure 2.

Figure 6 is a group of cross sectional detail views showing the valve member of the lawn sprinkler of Figures 1 to 3 in three different positions, providing three different sprinkler coverage areas.

Figure 7 is a fragmentary developed view of top and bottom peripheral portions of the valve of the water sprinkler of Figures 1 to 3 and the cooperating camming pin elements for rotating the valve member responsive to the turning on and off of the water supply to the sprinkler.

Figure 8 is a side elevational view of a modified form of lawn sprinkler embodying the hydraulically operated mechanism of the present invention.

Figure 9 is an enlarged fragmentary top plan detail view of the head portion of the sprinkler of Figure 8.

2

Figure 10 is a vertical cross sectional view taken on the line 10—10 of Figure 9.

Figure 11 is a horizontal cross sectional view taken on the line 11—11 of Figure 10.

Referring to the drawings, and more particularly to Figures 1 to 7, one form of water sprinkler according to the present invention is designated generally at 11 and comprises a base 12 having a plurality of downwardly and outwardly inclined resilient supporting arms 13 adapted to engage the ground. Centrally secured to the base 12 is a vertical conduit 14 provided with a conduit fitting 15 which is adapted to threadedly receive the end fitting 16 of a garden hose 17. The garden hose 17 is adapted to be connected to a water faucet or the like which is provided with the usual valve 50 for turning the water on and off.

The conduit member 14 includes the reduced upper portion 18 on which is rotatably mounted the plug member 19, said plug member being rotatably engaged on a shouldered portion 20 at the top end of the reduced conduit member 18 and being retained on said shouldered portion by the outwardly extending curved annular flange 21 provided at the top end of conduit portion 18, as shown in Figure 3, a sealing washer 22 being interposed between the flange 21 and the plug member 19. Threadedly engaged on the plug member 19 is the cylindrical sprinkler chamber 23, an annular sealing gasket 24 being interposed between the bottom flange 25 of plug member 19 and the bottom edge of the cylindrical chamber 23, as shown in Figure 3. Secured to the top of the cylindrical sprinkler chamber 23 is the centrally apertured cover plate 26.

Secured to the chamber 23 and in communication therewith are the radially extending, diametrically opposite tubular arms 27, 27, the ends of said arms being closed by plug elements 28, as shown in Figure 1. The arms 27 are formed along their length with spaced apertures 29, said apertures being spirally arranged on the arms 27, and being adapted to discharge water under pressure therethrough in a manner providing a reaction tending to cause the arms and sprinkler chamber 23 to rotate. For example, the apertures 29 may be arranged in the manner shown in Figure 1, whereby a reaction will be developed resulting from the discharge of the water spray through said apertures which tends to rotate the sprinkler chamber 23 in a clockwise direction, as viewed in Figure 1.

The cylindrical sprinkler chamber 23 is formed with three sets of similarly spaced apertures 30,

31 and 32 which are inclined upwardly and outwardly at respectively different angles. For example, the apertures 30 may be inclined upwardly and outwardly at an angle of 25°, the apertures 31 may be inclined upwardly and outwardly at an angle of 35°, and the apertures 32 may be inclined upwardly and outwardly at an angle of 45°. Designated at 33 is a cylindrical valve member which is rotatably and slidably mounted inside the cylindrical sprinkler chamber 23, said valve member being formed with a set of apertures 34 which are selectively registrable with any one of the sets of apertures 30, 31 and 32, as will be subsequently explained.

Secured in the upper portion of the cylindrical valve member 33 is a partition wall or disc 35. When water enters the sprinkler chamber 23, the pressure of the water forces the valve member 33 upwardly, the upper portion of the sprinkler chamber 23 being vented to atmosphere through the central aperture 36 in the top cover 26 of the sprinkler chamber. The top and bottom peripheral edges of the valve member 33 are formed with the asymmetrical triangular cam teeth 37 and 38, the top cam teeth 37 being directed to the left, as viewed in Figure 3 and the bottom cam teeth being similarly directed to the left, as viewed in Figure 3, for the front portion of the valve, as viewed in Figure 3, the cam teeth 37 being substantially similar in shape to the cam teeth 38. Secured in the upper portion of the wall of the sprinkler chamber 23 is an inwardly projecting pin element 39 which is cammingly engageable with the upper cam teeth of the valve member 33 when the valve member is elevated under water pressure, and secured in the lower portion of the wall of the sprinkler chamber 23 is a second inwardly projecting pin member 40 which is cammingly engageable with the lower teeth 38 of the valve member when said valve member descends as a result of the shutting off of the water supply. When the water is turned on, the valve member 33 is elevated by the pressure of water entering the sprinkler chamber 23 through the conduit 14 and the upper cam teeth 37 are engaged by the pin element 39, causing the valve member 33 to be rotated to a position wherein the pin element 39 engages the lowermost notch portion between a set of teeth 37. In this position, one of the sets of exhaust apertures 30, 31 or 32 is in registry with the apertures 34 of the valve member 33, allowing water to be ejected from the sprinkler chamber 23 at an angle determined by the angularity of the exposed apertures 30, 31 or 32. For example, if the apertures 30 are in registry with the aperture 34, the water will discharge from the sprinkler chamber 23 at an angle of 25° from the vertical, and will cover a relatively small area as the sprinkler rotates, because of the steep angle of inclination of the apertures 30. As above stated, the apertures 30 may be inclined at an angle of 25° to the vertical, whereas the apertures 31 are inclined at an angle of 35° to the vertical and the apertures 32 are inclined at an angle of 45° to the vertical to cover a relatively wide area as the sprinkler rotates.

When the supply of water is cut off, the valve member 33 descends by gravity and the lower teeth 38 engage the pin element 40. The pin element 40 is arranged so that when said lower teeth 38 engage the pin element 40, the valve member 33 is advanced by the camming action

of the teeth 38 with said pin element through substantially one-half of the angle required to bring the apertures 34 into registry with the next set of apertures in the sprinkler chamber 23, around the vertical axis of said sprinkler chamber. When the water is again turned on, the pressure of water elevates the valve member 33 causing the upper teeth 37 to come into camming engagement with the upper pin element 39, and causing the valve member 33 to be again rotated through the remainder of the necessary angle to bring the aforesaid next set of apertures of the sprinkler chamber into registry with the apertures 34 of the valve member. For example, assuming the steep apertures 30 to first be in registry with the apertures 34, when the water supply is turned off and then turned on again, the camming action provided successively by the engagement of teeth 38 with pin element 40 when the valve member 33 descends and then by the engagement of teeth 37 with pin element 39 as the valve member is raised, rotates the valve member 33 through the angle necessary to bring the apertures 34 into registry with the apertures 31 of the sprinkler chamber. The water then discharging through the apertures 31 leaves the sprinkler chamber at an angle of 35° to the vertical, whereby a wider area is covered by the sprinkler, as it rotates, than the area covered by the water discharging through the steep apertures 30 previously thereto. Similarly, when the water is again turned off and then turned on again, the apertures 32 are brought into registry with the discharge apertures 34 of the valve member 33, providing a greater trajectory of the water discharged from the sprinkler head than in either of the two previous stages of operation of the sprinkler, as described above.

It is therefore apparent that the relative area covered by the sprinkler may be adjusted by turning the water on and off until the desired sets of apertures 30, 31 or 32 are in registry with the apertures 34 of the valve member 33.

If it is desired to obtain intermediate areas of coverage, this may be accomplished by reducing the volume of water admitted to the sprinkler head.

In a typical design, the teeth 37 and 38 are arranged so that when the water is turned off, the descent of the valve member 33 advances the valve member 20°, and the subsequent engagement of the upper teeth 37 with the pin element 39 advances the valve member another 20°, the complete cycle causing the valve member to advance 40°. In the above typical design, there is a 40° spacing between the successive apertures 30, 31 and 32.

Referring now to the form of the invention shown in Figures 8, 9, 10 and 11, 11' designates the water sprinkler generally, said sprinkler comprising a base 12' of generally conical shape adapted to engage the ground and having rigidly secured thereto the central, vertical fitting 13' provided with the connection conduit 14' adapted to threadedly receive the end fitting of a garden hose. Rigidly secured to the fitting 13' is the upstanding vertical conduit 18' formed near its top end with the annular flange 19'. Designated at 20' is a head member which is rotatably mounted on the top end of the conduit 18', said head member having an externally threaded bottom portion 21' which slidably and rotatably engages over the top end of the conduit 18' and which is rotatably secured thereto

by an annular cap member 22' provided with the annular ball bearing assembly 23' disposed between the bottom of the cap 22' and the collar element 19'; as shown in Figure 10. The top end portion of the conduit 18' is formed with an annular groove 24' containing a sealing gasket 25' of resilient deformable material, providing a water tight seal between the conduit member 18' and the lower portion 21' of head 20'.

The head 20' is provided with the dome-like top wall 26' and is provided with a plurality of vent ports 36' adjacent said top wall 26'. The upper portion of body 20' is formed with a plurality of upwardly flaring annular rib formations 47' and 28', and the side walls of the head member 20' are formed with a plurality of sets of upwardly and outwardly inclined passages 32' and 30', inclined upwardly at different angles, as in the previously described form of the invention, and terminating respectively at the top marginal portions of the rib formations 47' and 28'. For example, as shown in Figures 8 to 11, there may be three passages 32' spaced apart 120° and similarly there may be three passages 30' spaced apart 120°, the passages 30' being located between the passages 32' and being spaced 60° therefrom.

Designated at 37' is a cylindrical valve member which is slidably mounted in the cylindrical interior of the head 20', as shown in Figure 10, said valve member being formed at its top rim with the inclined teeth 37' and being formed at its bottom rim with the inclined teeth 38, as in the previously described form of the invention. The interior of the head 20' is provided below the teeth 38 with the inwardly directed pin member 40' and the upper portion of the head 20' is provided adjacent the teeth 37 with the inwardly directed pin member 39'. The valve member 37' may be filled with a suitable weighting material 42' such as lead or the like to bias the valve member downwardly. The bottom end of the valve member may be formed with the axial, vertical bore 43', as shown in Figure 10. The side surface of the valve member 37' is formed with the spaced vertical grooves 34' spaced apart so as to be registrable either with the passages 32' or the passages 30'. As shown in Figure 11, the vertical grooves 34' are spaced apart 120° so that they may be selectively moved into registry either with the three passages 32' or with the three passages 30'. As shown in Figure 10, the grooves 34' extend from the bottom of the valve member 37' for a substantial distance upwardly on the external side surfaces thereof.

The operation of the form of the invention shown in Figures 8, 9, 10 and 11 is substantially similar to that described previously in connection with the form of the invention illustrated in Figures 1 to 7. The valve member 37' is elevated by the force of water directed upwardly thereagainst and the teeth 37 engage the pin 39', defining a first position wherein the grooves 34' register with one of the upwardly and outwardly inclined sets of water discharge passages. When the water pressure is relieved, the valve descends, whereby the teeth 38 engage the pin 40', causing the valve to be rotated through an additional increment, whereupon when the water pressure is again applied to the valve member, the valve member is elevated into a position providing registry of the grooves 34' with a different set of discharge passages, whereby the water leaves the sprinkler device at a different angle.

Radially secured to the intermediate portion of the head 20' and communicating with the space below the valve member 37' are the horizontal sprinkler arms 27' formed near their ends with the discharge apertures 29' and arranged so that the reaction of the water discharging from the apertures 29' rotates the head 20'. Therefore, when the water pressure is applied the arms 27' and the head 20' rotate and water is delivered through the discharge apertures 29', as well as through the upwardly and outwardly inclined exhaust apertures formed in the upper portion of the head, the angle of discharge from said upwardly inclined passages being determined by the adjusted position of the valve member in the head, as previously described.

While certain specific embodiments of an improved hydraulically operated mechanism have been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. In a hydraulically operated mechanism of the character described, a base, a vertical conduit secured to said base, a chamber rotatably mounted on said conduit, said chamber being formed with a plurality of respective water discharge apertures inclined upwardly at different angles, said apertures being spaced evenly around a vertical axis, a vertically movable valve member rotatably mounted in said chamber and arranged to be elevated by the pressure of water admitted into said chamber from said conduit, said valve member being formed with a passage communicating with its lower end and selectively registrable with the discharge apertures in the chamber, and cooperating means on said valve member and chamber arranged to rotate the valve member successively through angles equal to the angular spacing of the discharge apertures to bring the passage of said valve member successively into registry with the respective inclined apertures of the chamber responsive to the successive elevation and descent of the valve member resulting from intermittent admission of water under pressure into said chamber and shutting off of the water, whereby the angle of discharge of the water from said inclined discharge apertures is varied.

2. In a hydraulically operated mechanism of the character described, a base, a vertical conduit secured to said base, a cylindrical vertical chamber rotatably mounted on said conduit, said chamber being formed with a plurality of respective water discharge apertures inclined upwardly at different angles, said apertures being spaced evenly around a vertical axis, a vertically movable cylindrical valve member rotatably mounted in said chamber and arranged to be elevated by the pressure of water admitted into said chamber from said conduit, said valve member being formed with conduit means establishing communication between the lower end of the valve member and its external side surface, said conduit means being selectively registrable with the discharge apertures in the chamber when the valve member is elevated under water pressure in said chamber, and cooperating cam means on said valve member and chamber arranged to rotate the valve member successively through angles equal to the angular spacing of the discharge apertures to bring the conduit means of said valve member successively into registry with the re-

spective inclined apertures of the chamber responsive to the successive elevation and descent of the valve member resulting from intermittent admission of water under pressure into said chamber and shutting off of the water, whereby the angle of discharge of the water from said inclined discharge apertures is varied.

3. In a hydraulically operated mechanism of the character described, a base, a vertical conduit secured to said base, a cylindrical vertical sprinkler chamber rotatably mounted on said conduit, said chamber being formed with a plurality of respective water discharge apertures inclined upwardly at different angles, said apertures being spaced evenly around a vertical axis, a vertically movable hollow cylindrical valve member rotatably mounted in said chamber and arranged to be elevated by the pressure of water admitted into said chamber from said conduit, said valve member being formed with means defining a passageway between the lower end of the valve member and the intermediate portion of the external side surface of the valve member, said means being selectively registrable with the discharge apertures in the chamber when the valve member is elevated under water pressure in said chamber, said valve member being formed at its top and bottom peripheral edges with asymmetrical triangular cam teeth, and inwardly projecting pin elements in the chamber arranged to cammingly engage said teeth and arranged to rotate the valve member successively through angles equal to the angular spacing of the discharge apertures to bring said means successively into registry with the respective inclined apertures of the chamber responsive to the successive elevation and descent of the valve member resulting from intermittent admission of water under pressure into said chamber and shutting off of the water, whereby the angle of discharge of the water from said inclined discharge apertures is varied.

4. In a hydraulically operated mechanism of the character described, a base, a vertical conduit secured to said base, a cylindrical vertical sprinkler chamber rotatably mounted on said conduit, a plurality of radial apertures tubular arms connected to said chamber and arranged to rotate said chamber by the reaction of water discharged from said arms, said chamber being formed with a plurality of respective water discharge apertures inclined upwardly at different angles, said apertures being spaced evenly around a vertical axis, a vertically movable cylindrical valve member rotatably mounted in said chamber and arranged to be elevated by the pressure of water admitted into said chamber from said conduit, said valve member being formed with conduit means establishing communication between the lower end of the valve member and its external side surface, said conduit means being selectively registrable with the discharge apertures in the chamber when the valve member is elevated under water pressure in said chamber, said valve member being formed at its top and bottom peripheral edges with triangular cam teeth, and inwardly projecting pin elements in the chamber arranged to cammingly engage said teeth and arranged to rotate the valve member successively through angles equal to the angular spacing of the discharge apertures to bring the conduit means of said valve member successively into registry with the respective inclined apertures of the chamber responsive to the successive elevation and descent of the valve member resulting from intermittent admission of water under pressure into said chamber and shutting off of the water, whereby the angle of discharge of the water from said inclined discharge apertures is varied.

5. In a hydraulically operated mechanism of the character described, a base, a vertical conduit secured to said base, a chamber rotatably mounted on said conduit, said chamber being formed with a plurality of respective water discharge apertures inclined upwardly at different angles, said apertures being spaced evenly around a vertical axis, a vertically movable valve member rotatably mounted in said chamber and arranged to be elevated by the pressure of water admitted into said chamber from said conduit, said valve member being provided with conduit means establishing communication between the lower end of the valve member and its external side surface, said conduit means being selectively registrable with the discharge apertures in the chamber, and cooperating means on the valve member and chamber arranged to rotate the valve member successively through angles equal to the angular spacing of the discharge apertures to bring the conduit means of the valve member successively into registry with the respective inclined apertures of the chamber responsive to the successive elevation and descent of the valve member resulting from intermittent admission of water under pressure into said chamber and shutting off of the water, whereby the angle of discharge of the water from said inclined discharge apertures is varied.

6. In a hydraulically operated mechanism of the character described, a base, a vertical conduit secured to said base, a sprinkler chamber rotatably mounted on said conduit, said chamber being formed with a plurality of respective water discharge apertures inclined upwardly at different angles, said apertures being spaced evenly around a vertical axis, a vertically movable valve member rotatably mounted in said chamber and arranged to be elevated by the pressure of water admitted into said chamber from said conduit, said valve member being formed with a groove in its side surface communicating with its lower end and being selectively registrable with the discharge apertures in the chamber, and cooperating means on said valve member and chamber arranged to rotate the valve member successively through angles equal to the angular spacing of the discharge apertures to bring the groove of said valve member successively into registry with the respective inclined apertures of the chamber responsive to the successive elevation and descent of the valve member resulting from intermittent admission of water under pressure into said chamber and shutting off of the water, whereby the angle of discharge of the water from said inclined discharge apertures is varied.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
690,762	Papenfus	Jan. 7, 1902
2,090,284	Carlson	Aug. 17, 1937
2,526,958	Landis	Oct. 24, 1950
2,545,745	Newton	Mar. 20, 1951
2,550,451	Burnam	Apr. 24, 1951

FOREIGN PATENTS

Number	Country	Date
547,477	Germany	Apr. 4, 1932