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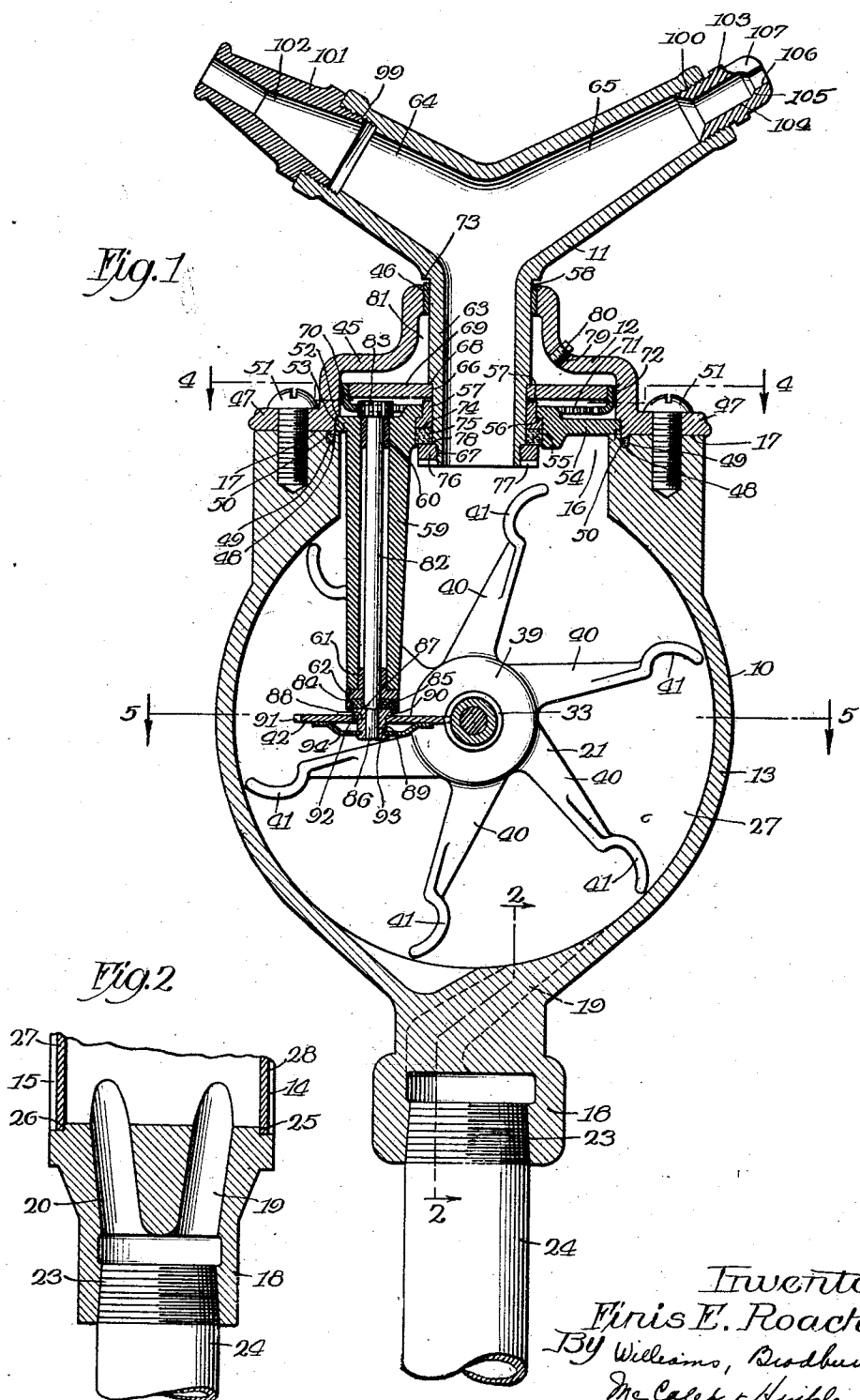
F. E. ROACH

1,779,983

SPRINKLER

Filed March 9, 1927

2 Sheets-Sheet 1



Oct. 28, 1930.

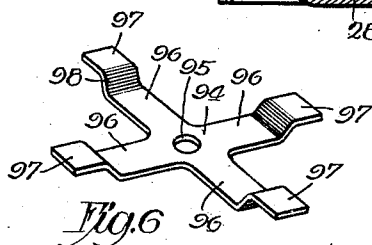
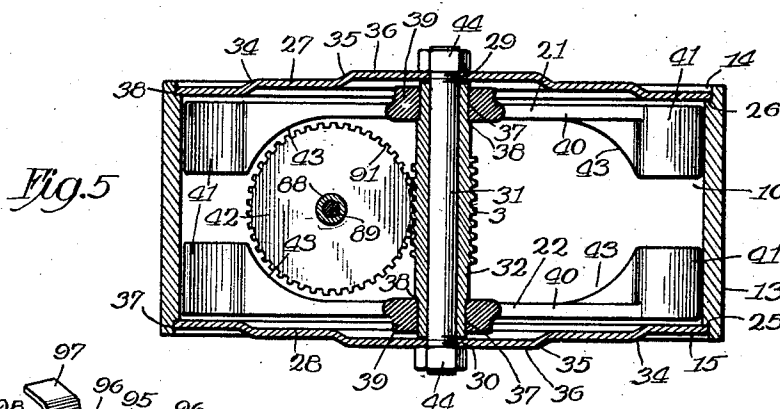
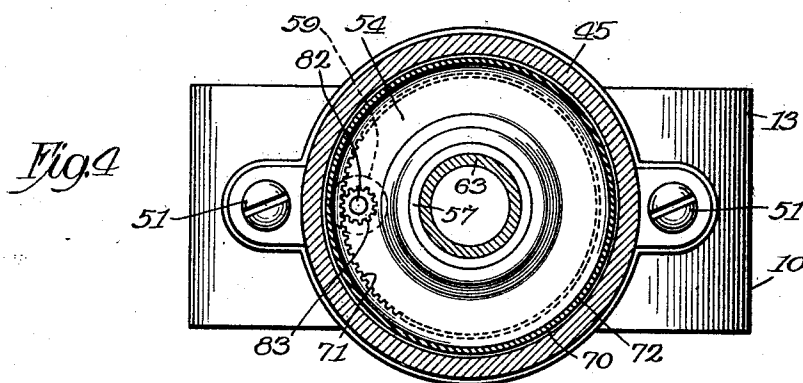
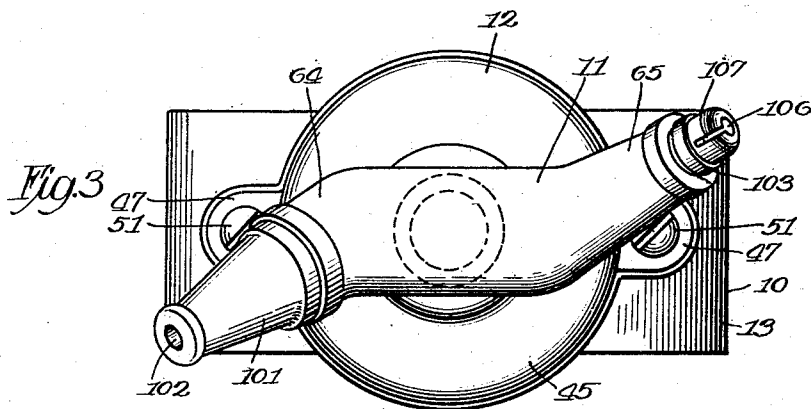
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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SPRINKLER

Application filed March 9, 1927. Serial No. 173,803.

My invention relates to improvements in sprinklers, being more particularly concerned with that type of sprinkler having a rotating sprinkler head which is impelled by the reaction of the liquid issuing from the nozzles of the sprinkler head.

One of the objects of my invention is the provision of a novel retarding and controlling unit for sprinklers of the type above mentioned.

Another object of my invention is the provision of such a sprinkler having means for retarding the same and clutch means to prevent the destruction of the control mechanism by the application of external force.

Another object of my invention is the provision of a sprinkler of the class described which is capable of efficiently and uniformly sprinkling a much larger area than that heretofore served by a single sprinkler.

Another object of my invention is the provision of a novel sprinkler head unit comprising an assembly of parts and mechanism permanently held in assembled relation by a close frictional fit between said parts, and having a closed chamber about said mechanism to be filled with lubricant.

Another object of my invention is the provision of a sprinkler which is cheaply manufactured and permanently assembled in such manner as to make the same tamper proof.

Other objects and advantages of my invention will appear more fully from the following description and from the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, Figure 1 is an elevational cross-sectional view taken on a medial vertical plane through my sprinkler.

Fig. 2 is a detailed elevational cross-sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the sprinkler head and casing of my invention.

Fig. 4 is a cross-sectional plan view taken on the line 4—4 of Fig. 1.

Fig. 5 is a cross-sectional plan view taken on the line 5—5 of Fig. 1.

Fig. 6 is a view in perspective of the clutch mechanism employed in my sprinkler.

Referring to Fig. 1, 10 indicates in its entirety my controlling and retarding device for the rotating sprinkler head 11 which is rotatably mounted in the hollow cover plate 12. The casing 13 consists of a cast metal member, preferably of brass, or some other non-corrosive metal of similar properties, having a substantially cylindrical shape open at each end as at 14 and 15 and provided with a third aperture 16 at the top which is bounded by the flat flange 17 of substantial thickness to permit the insertion of screws to hold the cover member 12.

The casing 13 is provided at one side, preferably the bottom, with an integral threaded nipple 18 communicating with the interior of the casing by a pair of ports 19 and 20, formed in the casing, and the ports 19 and 20 are preferably directed tangentially of the working circle of the water wheels 21 and 22 further to be described. The ports 19 and 20 may be formed according to the best nozzle practice, but it is sufficient to provide openings which taper gradually toward the interior of the casing so as to form an impelling current within the casing.

The nipple 18 may be provided with standard piping threads 23 to receive the end of a stand-pipe 24 which may supply water or other liquid to the sprinkler and also support the same. In the case of the use of the sprinkler for lawns, the stand-pipe 24 is preferably quite short, but if it is desired to sprinkle a larger area or to use the sprinkler for trees, the stand-pipe 24 may be made of corresponding length to support the sprinkler at the height desired.

The casing 13 terminates at each end in openings 14 and 15, and while the casing may be of any exterior shape, it is preferably formed with a substantially cylindrical interior to avoid the formation of eddy currents, and in order to save material the exterior surface is also preferably made cylindrical. The openings 14 and 15 may be provided with annular shoulders 25 and 26, and these openings are closed by the end plates 27 and 28. The end plates 27 and 28 are centrally bored as at 29 and 30 to re-

ceive a shaft 31, which pivotally supports a sleeve 32, provided with a worm 33.

The end plates 27 and 28 may be stamped from the sheet metal to the conformation shown, having a plurality of concentric rings 34 and 35, about a central cupped portion 36 for the purpose of providing additional space for the water wheel hubs and giving the end plates increased rigidity. In order to permanently assemble my casing in such manner that it is tamper proof, I prefer to provide end plates 27 and 28 having a very close fit in the apertures 14 and 15 so that the plates will be retained frictionally within the walls 37 and 38 of the casing 13.

By employing the corrugated end plates as shown, the end plates may even be made larger, by a slight amount, than the apertures into which they are pressed, and when the end plates are pressed into the apertures 14 and 15 by means of hydraulic presses or otherwise, their final position will be determined by the shoulders 25 and 26 against which the end plates lie in the casing 13.

The sleeve 33 may be provided with a pair of turned down portions 37, one at each end, terminating in the annular shoulders 38. The water wheels 21 and 22 comprise a central hub 39 and a plurality of radially extending arms 40, terminating in substantially flat curved blades 41. In order to clear the worm gear 42, further to be described, the blades are cut away toward the center of the wheel as at 43, leaving the outer flattened and curved portion 41 disposed in the path of the water currents issuing from the ports 19 and 20.

In order to fix the water wheels 21 and 22 upon the sleeve 32, the apertures in the hubs 39 are preferably made a very close fit upon the reduced portions 37 of the sleeve 32, and the reduced portions 37 may be slightly tapered, if so desired. The method of assembly of the parts so far described is as follows.

The water wheels 21 and 22 have their hubs forcibly pressed upon the ends of the sleeve 32 by a hydraulic press, or otherwise, and one of the end plates 28 having been pressed into position within the casing 13, the shaft 31, sleeve 32, and water wheels 21 and 22 are assembled within the casing, after which the other end plate 27 may be pressed into place and the nuts 44 may be threaded upon the ends of the shaft 31 to hold the shaft in fixed relation to the casing, to prevent the end plates from swelling, and otherwise to strengthen the ensemble.

The sprinkler head 12 comprises a substantially cup shaped cover member 45, having a central aperture 46 and an outwardly extending flange 47 adapted to fit upon the flange 17 of the casing 13. In order to provide a water tight joint, the flange 17 may be provided with an annular groove 48

which may be filled with packing 49 consisting of a compressible ring of leather, or similar material, and the flange 47 may be provided with a downwardly extending annular ring 50 which is adapted to fit within the groove 48 to compress the packing 49 and to provide a water tight joint. The cover plate 45 may be fixed to the casing 13 by means of a plurality of screw bolts 51, or other convenient fastening means.

The cover plate 45 is provided upon its interior with an annular shoulder 52 and an enlarged portion 53 which is accurately machined to receive the exterior edge of a supporting plate 54 and form a close frictional fit therewith. The supporting plate 54 has a centrally flanged aperture 55 having an annular shoulder 56, and the aperture 55 is lined with a bushing 57 of brass, or other bearing metal, which may be of the shape shown and pressed into place within the aperture 55 by a hydraulic press. The final position of the bearing 57 is determined by the shoulder 56 which is adapted to resist the thrust of the water pressure upon the sprinkler head, and the bearing 57 is aligned with a similar bearing 58 which may be pressed into the aperture 46 by the same method to form a close frictional fit. It will be observed that the bearing 58 need have no retaining shoulder as it does not resist the thrust of the water pressure.

The supporting plate 54 is provided with a downwardly extending cylindrical boss 59, which may be provided at the upper end with a bearing 60 of babbitt or other metal pressed into close frictional fit by a hydraulic press, and at its lower extremity with a bearing 61 of the same metal, having an outwardly extending shoulder 62 to bear against the end of the boss 59 and resist the thrust of the water pressure. The supporting plate 54 may be cast from metal similar to the casing 13 and the other parts, having its exterior edge machined to form a close frictional fit with the edge of the aperture 53, the plate being preferably forced home against the shoulder 52 by a hydraulic press.

The sprinkler head 11 comprises a cast metal tubular body of substantially T shape, having a downwardly extending tubular stem 63 and a plurality of outwardly extending tubular arms 64 and 65 communicating therewith. The tubular arms 64 and 65 are bent upward at a slight angle, preferably about 30 degrees, in order to provide sufficient elevation to throw the streams to the distance desired, and in order to provide means to rotate the sprinkler head 11, the arms 64 and 65 are preferably bent backward at an angle of about 30 degrees, as shown in Fig. 3.

The stem 63 of the sprinkler head 11 may be turned down at its lower end as at 66 forming a shoulder 68, and it may also be provided with a reduced threaded portion 67 at

the extreme lower end. The plate 69 comprises a circular metal plate having a central bore which is adapted to form a close frictional fit with the portion 66 of the stem 63, being pressed into place as previously described and seating upon the shoulder 68. Supported upon the plate 69 is the internal gear member 70, comprising a sheet metal plate having a central aperture 71 formed with gear teeth and an upwardly extending flange 72. The flange 72 is adapted to form a close frictional fit with the exterior edge of the plate 69 so that both the plate 69 and the internal gear 70 are fixed upon the stem 63 and adapted to rotate therewith.

The stem 63 is journaled in the bearings 57 and 58, and when not under water pressure may be supported upon the bearing 58 by the shoulder 73 at the upper end of the stem 63. The aperture 55 in the plate 53 is not completely filled by the bearing 57, but leaves a groove 74 of substantially rectangular cross section which is adapted to receive a leather washer 75, and the stem 63 is provided with a threaded nut 76 having a kerf 77 for insertion of a turning tool. The nut 76 may be screwed tightly against the shoulder 78 and when the casing 13 is filled with water under pressure, the thrust of the water upon the sprinkler head 11 will cause the nut 76 to bear against the washer 75, compressing the same to form a substantially water tight joint between the rotatable sprinkler head 11 and the supporting plate 54.

The cover plate 12 may also be provided with an aperture 79 having a screw plug 80 for the purpose of the insertion of lubricant within the chamber 81 formed by the cover plate 12 and the supporting plate 54. The internal gear 70 will, therefore, be constantly covered with lubricant which will furnish an additional oil seal about the rotating stem 63 and protect these parts against wear.

The downwardly extending boss 59 supports in its bearings 60 and 61 a shaft 82 having a pinion 83 fixed to its upper end to rotate with said shaft, and the pinion 83 may also be pressed upon the shaft 82 in such manner that the close frictional fit between these parts substantially keys them together. The pinion 83 has its teeth in engagement with the internal gear 70 so that when the sprinkler head 11 is actuated by the water issuing therefrom, the shaft 82 is also rotated at a reduced speed.

The bearing 62 is formed with a cup like aperture 84 in its lower side which is adapted to receive a compressible washer 85 of leather or the like, and the shaft 82 may be turned down as at 86 to form an annular shoulder 87. The sleeve 88 comprises a metal member having a smooth cylindrical surface 89 and an annular shoulder 90. The annular shoulder 90 is adapted to bear against the washer 85 when the interior of the casing 13 is filled

with liquid under pressure, thereby forming a substantially water tight joint about the shaft 82, and the shoulder 90 is likewise adapted to limit the upward movement of the worm gear 42 which comprises a sheet metal plate which is provided with teeth 91 adapted to mesh with the worm 33 upon the sleeve 32. The worm gear 42 has a central bore 92 which is adapted to freely rotate upon the cylindrical surface 89 of the sleeve 88.

The sleeve 88 may also be provided at its lower end with a reduced portion 93 shown in Fig. 1 as a groove, for the reason that the clutch spring 94 has been placed upon the reduced portion 93 and riveted thereon. The clutch spring 94 comprises a resilient sheet metal member, preferably constructed of some noncorroding resilient metal such as phosphor bronze, having a central aperture 95 and a plurality of radially extending resilient arms 96. The arms 96 terminate in substantially flat shoes 97 slightly offset from the balance of the arm as at 98 in such manner that the shoes 97 of the clutch spring are adapted to bear resiliently against the lower surface of the worm gear 42, the shoes 97 providing the required area of frictional surface necessary to resist the torque placed upon the shaft 82 by the rotating sprinkler head 11. The sleeve 88 may be pressed upon the reduced portion 86 of the shaft 82 against the shoulder 87 with a very close frictional fit so that these parts are substantially keyed together.

The tubular arms 64 and 65 of the sprinkler head may be provided with internally threaded nipples 99 and 100, the length of the arms being determined by the type of nozzle which it is desired to employ in the arm. In the embodiment shown, the arm 64 is shorter, being provided with a nozzle 101 threaded in the nipple 99, the nozzle 101 having its interior 102 formed according to the best nozzle practice, so that it is adapted to throw a stream of water to a considerable distance.

The tubular arm 65 is likewise provided with a short nozzle 103 threaded into the nipple 100, and the nozzle 103 may be of cylindrical shape internally as at 104, terminating in a conical reducing portion 105 and a cylindrical bore 106 so that the bore 106 throws a stream to a lesser distance than the nozzle 101 with a slightly greater spreading effect. The nozzle 103 may also have a slot cut in the upper corner thereof as at 107, the slot being cut through to the bore 106 and conical portion 105 so that the nozzle 103 will throw a flat fan shaped spray which is adapted to cover and sprinkle substantially all of the area near the sprinkler which is not served by the nozzle 101 and the bore 106. It will be observed that by providing arms of different length upon the sprinkler head, a balanced structure having nozzles of substantially

equal length and equal reactive force may be provided.

The method of assembly of my sprinkler head unit is as follows. The cover plate 12 may be provided with a bearing 46 and the supporting plate 54 with the bearings 57, 60 and 61, all of which may be pressed into place as previously described. The shaft 82 may be assembled with its pinion 83, then journalled in the bearings 60 and 61, after which the washer 85 may be put in place and the sleeve 88, which has been previously assembled with the clutch plate 94, may be pressed upon the end 86 of the shaft 82. It will be obvious that the order of assembly of some of these parts may be varied to suit the convenience of the manufacturer.

The stem 63 having been inserted in its bearing 58, the plate 69 and internal gear 70 are mounted thereon, after which the supporting plate 54 may be forced into the aperture 53 in the cover plate 12. It will thus be observed that when the sprinkler head unit is assembled as described, it cannot be disassembled by means of ordinary tools, and the mechanism is, therefore, tamper proof. The sprinkler head unit may be placed upon the flanged opening 17 of the casing 13, the worm gear 42 meshing with the worm 33 between the water wheels 21 and 22, and these parts may be held in assembled relation by the screws 51 passing through the flanges 47 upon the cover plate 12.

The operation of my sprinkler is as follows. When the water is turned on at a source leading to the standpipe 24, the water passes through the ports 19 and 20 filling the casing 13, and soon thereafter begins to issue from the nozzles 101 and 103. The water from the ports 19 and 20 impinging upon the blades 41 of the water wheels tends to actuate the water wheels in a counter-clockwise direction, as shown in Figure 1, and to rotate the water wheels at a steady rate depending on the rate of consumption of the water. The means of propulsion for my sprinkler head, however, consists of the backwardly turned nozzles 101 and 103 against which the water reacts as it issues therefrom, and tends to rotate the sprinkler head in a clockwise direction, as shown in Figure 3.

The sprinkler head 11 carries with it the internal gear 70 which actuates the pinion 83, shaft 82, clutch spring 94 and worm gear 42 due to the friction between the clutch spring and the worm gear. It will be observed, however, that the mechanism is not capable of transmitting motion from the worm gear 42 to the worm 33, it being a characteristic of the usual type of worm and worm gear that this mechanism will only transmit motion in one direction. The sprinkler head 11, therefore, cannot rotate unless the water wheels and worm 33 are also

in motion, and the worm 33 thus acts after the manner of an escapement mechanism which permits rotation of the worm gear 42 only at the rate at which the water wheels are moving. It results, therefore, that the sprinkler head 11 has its rotation controlled and retarded by the water wheels and operative connecting mechanism in such manner that the sprinkler head may be made to rotate at any desired speed within a very wide range of speeds.

It will also be observed that if the sprinkler head 11 is turned by hand by any person, the sprinkler head will actuate the internal gear 70, pinion 83, shaft 82 and clutch spring 94, but the clutch spring is adapted to slide over the surface of the worm gear 42 thereby permitting relative motion between these parts. As the worm gear 42 and worm 33 are not capable of transmitting reverse motion, the turning of the sprinkler head by hand would otherwise irreparably damage the mechanism, and by means of the clutch the device is made incapable of being injured by the application of external rotative force.

It will thus be observed that I have invented a sprinkler which is adapted to be actuated by the reactive force of the water issuing from the nozzles and which includes means for retarding and controlling the rotation of the sprinkler head, and clutch means interposed between these elements. The sprinkler head shown may be replaced by other sprinkler head units having more or less nozzle arms, or having other characteristics, provided the sprinkler heads are adapted to be used with the controlling mechanism shown.

While I have illustrated and described a specific embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim is new and desire to secure by Letters Patent of the United States is:

1. In a sprinkler, the combination of supporting means, with movable sprinkling means impelled by the reaction of the fluid issuing therefrom, retarding means controlled by the flow of fluid through said sprinkling means, and clutch means disposed between said sprinkling means and said retarding means adapted to slip when said sprinkling means is moved at a greater rate than said retarding means.

2. In a sprinkler, the combination of supporting means, with sprinkling means rotatably supported thereon and actuated by the reaction of fluid issuing therefrom, screw means operatively connected to said sprink-

5 kling means, fluid impelled means connected with said screw means to impart rotation thereto, and friction clutch means interposed in the connection between said sprinkling means and said screw means.

3. In a sprinkler, the combination of a casing having an upper flanged opening, a hollow cover closing said opening, a sprinkler head rotatably supported in said cover, mechanism connected with said sprinkler head and carried within said cover, and closing means for said cover having a close frictional fit therewith to retain the same in assembled relation.

15 4. In a sprinkler, a controlling unit comprising an open casing having an attaching flange for a sprinkler head and a nozzle in its wall, closing means for said casing comprising a plurality of pressed metal plates, each having a close frictional fit within the walls on said casing to retain the same in assembled relation, a shaft supported by said plates, a sleeve rotatably mounted on said shaft and confined by said plates, and
20 a wheel having a plurality of radial vanes supported on said sleeve by a hub having a close frictional fit with said sleeve.

5. In a sprinkler, a sprinkler head unit comprising a hollow flanged cover having a supporting plate to close the same and a sprinkler head journaled therein, a downwardly projecting boss on said supporting plate for journalling a shaft, a shaft having a pinion on the same and an internal
35 gear on said sprinkler head to engage said pinion.

6. In a sprinkler, a sprinkler head unit comprising a hollow flanged cover having a supporting plate to close the same and a sprinkler head journaled therein, a downwardly projecting boss on said supporting plate for journalling a shaft, a shaft having a pinion on the same and an internal gear on said sprinkler head to engage said pinion,
45 said internal gear comprising a sheet metal plate having a close frictional fit with said sprinkler head, and an internally toothed plate having an extending flange in close frictional fit with said sheet metal plate.

50 7. In a sprinkler head unit, a flanged cover having a sprinkler head journaled therein, a shaft rotatably carried by said cover and having operative mechanical connections with said sprinkler head, a worm gear rotatably mounted on said shaft, and a friction spring fixed on said shaft and having a plurality of points of frictional engagement with said worm gear.

8. In a sprinkler head unit, a flanged cover having a sprinkler head journaled therein, a shaft rotatably carried by said cover and having operative mechanical connections with said sprinkler head, a worm gear rotatably mounted on said shaft, a friction spring fixed
65 on said shaft and having a plurality of points

of frictional engagement with said worm gear, a casing adapted to be closed by said cover, a plurality of wheels having radially extending vanes rotatably mounted in said casing, and a worm connected with said wheels and engaging said worm gear. 70

9. In a sprinkler head, the combination of a cup-shaped cover member having a bore centrally located therein, a supporting plate closing said cup-shaped cover and forced therein with a close frictional fit, said supporting plate having a bore aligned with said first-mentioned bore, a nozzle fitting having its stem rotatably supported in said bores, a compressible washer about said stem against the outer side of said supporting plate, a thrust bearing supported by said stem against said washer, a gear supporting plate pressed upon the stem of said nozzle fitting and a sheet metal member having a substantially cylindrical flange engaged with said gear supporting plate and having a flange substantially parallel with said gear supporting plate forming an internal gear. 75 80 85

10. In a sprinkler, the combination of a metal casing member of substantially cylindrical form having open ends and recessed at its ends to form an annular shoulder in each end and walls extending outward from said shoulders, dished metal plates having a close frictional fit against said walls, and a shaft extending transversely of said plates and provided with means for reinforcing said plates against outward pressure. 90 95

11. In a sprinkler, the combination of a metal casing member of substantially cylindrical form having open ends and recessed at its ends to form an annular shoulder in each end with walls extending outward from said shoulders, dished metal plates having a close frictional fit against said walls, a shaft carried by said plates and reinforcing said plates against outward pressure, a sleeve carried by said shaft, and a worm carried by said sleeve. 100 105 110

12. In a sprinkler, the combination of a metal casing member of substantially cylindrical form having open ends and recessed at its ends to form an annular shoulder in each end with walls extending outward from said shoulders, dished metal plates having a close frictional fit against said walls, a shaft carried by said plates and reinforcing said plates against outward pressure, a sleeve carried by said shaft, a worm carried by said sleeve, and a waterwheel carried by said sleeve, said casing member having inlet ports for directing water currents against said wheel. 115 120 125

13. A controlling unit for a sprinkler, comprising an open ended casing having annular shoulders at each end, a closure for each end of said casing comprising an outwardly dished plate having a close fit within said 130

casing, and a centrally located shaft carried by said plates and reinforcing said plates against outward pressure.

14. In a sprinkler, a sprinkler head unit comprising a hollow flanged cover having an aperture therein, a journal having a close frictional fit in said aperture, a supporting plate having a close frictional fit within said cover, an aligned journal supported by said plate, a sprinkler head having a stem rotatably mounted in said journals, and an internally toothed gear carried by said stem.

15. In a sprinkler, a sprinkler head unit comprising a hollow flanged cover having an aperture therein, a journal having a close frictional fit in said aperture, a supporting plate having a close frictional fit within said cover, an aligned journal supported by said plate, a sprinkler head having a stem rotatably mounted in said journals, an internally toothed gear carried by said stem, and means for introducing lubricant into said hollow cover.

16. In a sprinkler, the combination of a supporting means, with sprinkling means rotatably mounted thereon and actuated by the reaction of fluid issuing therefrom, with a one-way mechanism connected to said sprinkling means for retarding the same, means actuated by fluid for actuating said one-way mechanism, and a clutch interposed between said one-way mechanism and said actuating means.

17. In a sprinkler, the combination of supporting means, with sprinkling means rotatably mounted thereon and actuated by the reaction of fluid issuing therefrom, with a one-way mechanism connected to said sprinkling means for retarding the same, means actuated by fluid for actuating said one-way mechanism and a releasable connection between said sprinkling means and said one-way mechanism.

18. In a sprinkler, a sprinkler head unit comprising a hollow flanged cover having an aperture therein, a journal having a close frictional fit in said aperture, a supporting plate having a close frictional fit within said cover, an aligned journal supported by said cover, a sprinkler head having a stem rotatably mounted in said journals, an internally toothed gear carried by said stem, a compressible washer about the inner end of said stem, and a thrust bearing on said stem to cooperate with said washer.

19. In a sprinkler, the combination of a supporting means with sprinkling means rotatably mounted thereon and actuated by the reaction of fluid issuing therefrom, with a one-way mechanism connected to said sprinkling means for retarding the same, actuating means actuated by the fluid for actuating said one-way mechanism, said actuating means being adapted to lag behind said mechanism to control the movement of said sprinkling

means, and a clutch interposed between said one-way mechanism and said actuating means.

In witness whereof, I hereunto subscribe my name this 2nd day of March, 1927.

FINIS E. ROACH.

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