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2,853,342

IMPULSE OPERATED SPRINKLER

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Fig. 1

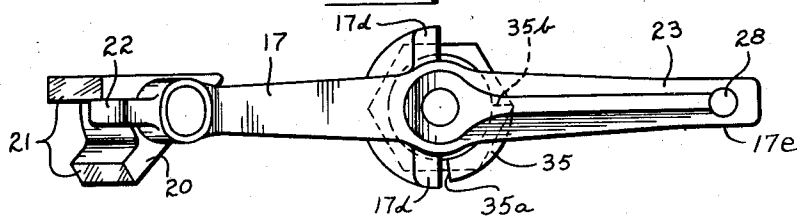


Fig. 2

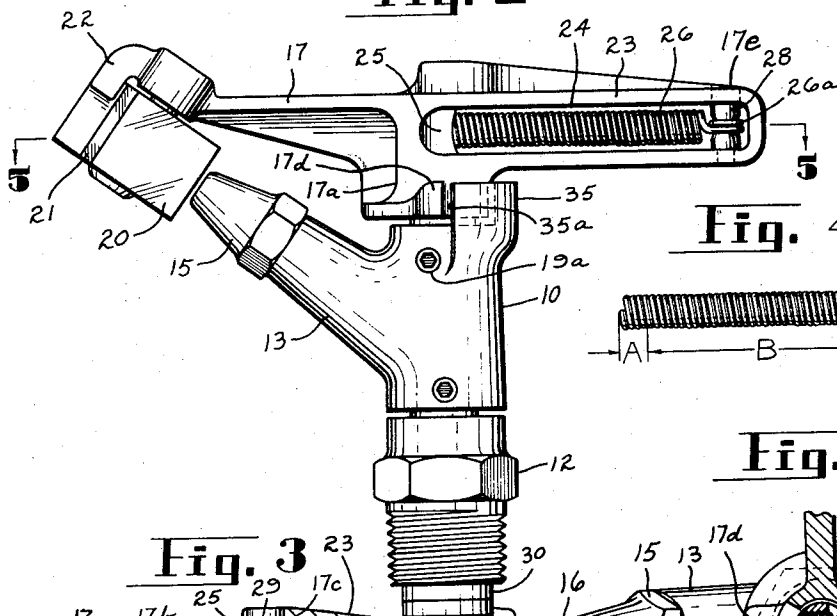


Fig. 4

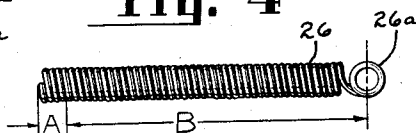


Fig. 5

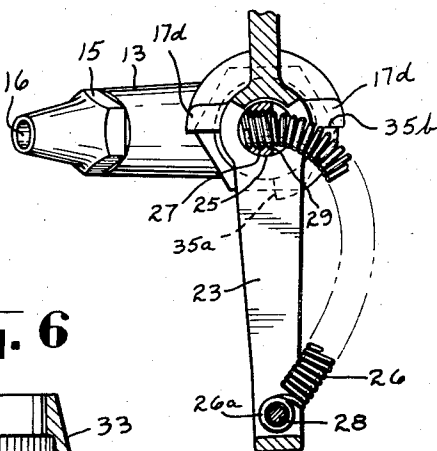
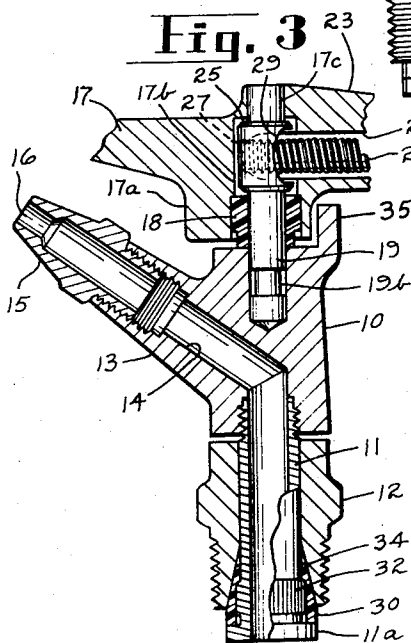
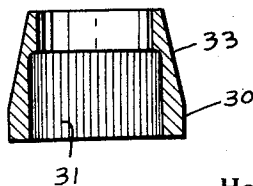


Fig. 6



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IMPULSE OPERATED SPRINKLER

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5 Claims. (Cl. 299—69)

This invention relates to sprinklers having intermittent rotary movement in which the sprinkler head is operated in step-by-step fashion by an impulse arm which is oscillated by a stream of water issuing from the sprinkler head. More particularly the invention is an improvement upon the sprinkler disclosed in application Serial No. 407,233, filed February 1, 1954, which has now matured into Patent Number 2,769,666.

One of the objects of the invention is to provide an improved spring mechanism for controlling the impulse arm which will function at low pressures as well as higher pressures, which is simple in construction, economical to manufacture and reliable in operation under various conditions and over long periods.

Another object is to provide an improved braking element which will permit operation of the sprinkler without stalling under comparatively light blows from the impulse arm, as when the water pressure is comparatively low.

In the accompanying drawings I have shown for purposes of illustration one embodiment which my invention may assume in practice, and wherein:

Fig. 1 is a top plan view of the sprinkler device showing the impulse arm in neutral or centralized position.

Fig. 2 is a side elevation of the same.

Fig. 3 is a vertical sectional view through the body and a portion of the swinging arm of the device.

Fig. 4 is a side view of the spring, per se.

Fig. 5 is a sectional view through the tail end of the impulse arm showing the curve that the spring assumes when the sprinkler head is swung to one side, and

Fig. 6 is a side view of the frictional bushing partially in section.

Referring more particularly to the drawing, the reference numeral 10 designates a rotary sprinkler head or body having a depending tubular spindle 11 rotatably mounted in a support, which herein is a threaded nipple 12 by means of which the sprinkler can be mounted on the end of a pipe or a suitable stand. The head 10 is integrally formed with a lateral upwardly directed nozzle 13 having a central passage 14 communicating with the tubular spindle 11. A nozzle tip 15 is threadedly secured to the end of the nozzle 13 and is formed with a reduced outlet port 16 through which the fluid is discharged.

The sprinkler head 10 is adapted to be intermittently moved about its axis at a comparatively slow rate of speed so that the stream of water issuing from the nozzle tip 15 will slowly move over different portions of the area to be sprinkled, and as herein shown, the means by which the sprinkler head is moved is one operated by the water flowing through the sprinkler member after it issues from the nozzle tip 15. This means comprises an impulse arm 17 having a central hub 17a within which is secured a bearing bushing 18 rotatable on a spindle shaft 19 projecting axially upwardly and secured to the body 10. The shaft 19 is removably secured within the body 10 and held there-in-place by a set screw 19a engaging in a re-

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cess 19b in said shaft. The bushing 18 is preferably made of nylon material so as to reduce friction between the movable parts and provide longer life.

Pivotally supported on the outer end 17e of the arm 17 and adapted to oscillate between predetermined limits is a wedge-shaped driver or water deflector vane 20 positioned to have its apex facing the nozzle tip 15 and operating in a manner well known in this type of sprinkler, it being understood that the vane reverses its position each time it passes through the stream. The oscillating movement of the vane 20 is limited by a pair of integral projections 21 on said vane opposite from its apex, and these projections 21 are adapted to laterally butt against a rigid stop lug 22 on the arm 17.

A counter-balancing tailpiece 23 extends from the hub 17a directly opposite the arm 17. The tailpiece 23 is provided with a transverse slot 24 extending substantially the entire length of said tailpiece and well into the area of the hub 17a. The spindle shaft 19 is formed with an intermediate enlarged portion 25 disposed in the bore 17b of the hub 17a and also intercepts the inner end of the transverse slot 24. As noted in Fig. 3 a portion of the spindle shaft extends above the enlarged section 25 and has a second bearing engagement with the arm 17 as at 17c.

The means for returning the impulse arm to its normal central position with the vane 20 in line with the nozzle 15 is a special coiled spring 26. One end of the spring 26 is tightly threaded into a tapped opening 27 in the enlarged portion 25 of the spindle 19 thus anchoring that end of the spring firmly to the sprinkler head. It is important that the spring be anchored in a fixed manner to the sprinkler head so that it will not hinge or pivot on the head. Thus the spring will act in a cantilever fashion and return the arm to the central or neutral position when displaced to either side thereof. The opposite end of the spring 26 is attached to a vertical pin 28 traversing the end of the slot 24 and secured to the outer end of the tailpiece 23. This attachment is made by forming the terminal portion of the spring into one or more transverse coils 26a loosely surrounding the pin so that this outer end of the spring can hinge on the pin 28.

The spring 26 is of special construction in order to operate the arm 17 so that the transverse bending action of the spring will not be localized in that section adjacent the spindle but will be more or less distributed along its entire length. In the manufacture of the spring 26 the lead angle of the wire as it is wound on the arbor progressively changes from one end of the spring to the other so that the coils will gradually diminish in tightness from one end to the other of the spring. If desired that portion of the spring marked "A" in Fig. 4 which is threaded into the spindle may be of uniform tightness while the working portion of the spring marked "B" is of gradually diminishing tightness from the inner or anchored end to the other end. The result is a spring which when subjected to a cantilever loading will flex or work throughout its entire length. The spring will assume some such curve as shown in Fig. 5 when subjected to maximum bending. It is to be noted that the enlarged portion 25 of the spindle 19 in which the inner end of the spring 26 is anchored is provided with a transverse cut 29 across the tapped opening 27 into which the spring is fitted. This is to bring the start of the bending action of the spring 26 as close as possible to the center line of spindle 19 about which the impulse arm swings.

The mechanism for transmitting the kinetic energy of the swinging arm on its return movement to neutral position for intermittently turning the head about its pivot axis will now be described. The hub 17a of the arm 17 is formed with a pair of diametrically opposed projections 17d, and the body 10 is formed with an integral stop

lug 35 extending upwardly above the upper surface of said body. The lug 35 has a vertical abutment face 35a against which one of the arm projections is adapted to abut to transmit motion to said head. The abutment face 35a is positioned so that the return movement of the arm can pass slightly beyond its neutral position. The lug 35 also has opposite abutment face 35b against which the other arm projection may abut in case the arm 17 is swung too far in the opposite direction. This is a safety feature to prevent the hub 17a from striking the spring 26 with a tendency to shear it off where it enters the spindle enlarged portion 25.

In order to provide a suitable braking action to the sprinkler head so as to retard the speed and the length of movement of each intermittent rotary action of the sprinkler head, a frictional bushing 30, preferably made of nylon, is placed between the spindle 11 and the nipple 12. Specifically this bushing 30 rests upon a shoulder 11a at the lower end of the spindle 11. The inner bore of the bushing 30 is formed with a series of longitudinal teeth 31 that interengage with similar broached teeth 32 on the spindle 11 so that the bushing 30 will be made secure to said spindle and rotate therewith. The outer surface of the bushing 30 is formed with a conical surface 33 of about 12½° to the bushing axis. This conical surface of the bushing has frictional engagement with a complementary conical recess 34 provided in the lower end of the stationary nipple 12. It will be apparent that while the sprinkler is operating the stem 11 will be lifted by water pressure to bring the conical surface 33 of the bushing 30 into contact with the nipple recess 34 and the greater the water pressure to the sprinkler the tighter will the bushing 30 be forced into the nipple recess 34 and proportionately increase the braking action therebetween.

The combination of my novel spring control of the impulse arm and the improved braking principle in this type of sprinkler results in a sprinkler which will operate reliably with a wide range of water pressures. Since the spring 26 acts in cantilever fashion the initial torque required to deflect the impulse arm from its neutral position is very small so that the arm will oscillate with low water pressures. The comparatively light blows imparted to the head at low pressures however would not be sufficient to move the head except that the frictional resistance at the bushing 30 is also light at low pressure. The resistance automatically increases at higher pressures so that the stronger blows from the impulse arm at such pressures will not cause excessive movement of the sprinkler head.

I claim:

1. A sprinkler comprising a support, a sprinkler head rotatably mounted on said support, a discharge nozzle on the head for lateral discharge of water therefrom, an impulse arm pivoted on said sprinkler head, a water deflector vane mounted on one end of said arm which in neutral position is in line with the said nozzle and serving to swing said arm away from said neutral position, an elongated spring having its inner end anchored in a fixed manner to the sprinkler head and having its outer end attached to the impulse arm a substantial distance from the axis of said arm whereby the spring acts in cantilever fashion when the arm is swung to one side of the neutral position, an abutment on the sprinkler head in the line of the return movement of a portion of the impulse arm, and means interengaging between said sprinkler head and the support dependent upon the pressure of water entering the sprinkler head for imparting frictional resistance to rotary movement of the head.

2. In a sprinkler as defined in claim 1 wherein said spring is a helical coil with its inner end anchored in a fixed manner to the sprinkler head adjacent the pivot axis of the impulse arm and the outer end hingedly connected to the impulse arm.

3. In a sprinkler as defined in claim 1 wherein said spring has progressively increasing strength against transverse bending from its outer end toward its inner anchored end.

4. In a sprinkler as defined in claim 1 wherein said spring is a helical coil spring with its anchored inner end having threaded connection with the sprinkler head adjacent the pivot axis of the impulse arm and wherein the successive coils of the spring gradually diminish in tightness from the anchored end to the outer end.

5. A sprinkler as defined in claim 1 wherein the means for imparting frictional resistance to rotary movement of the head comprises a conical friction bushing between the sprinkler head and support.

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