April 4, 1967 J. F. CLEARMAN 3,312,400

POP-UP SPRINKLER HAVING A ROTATING HEAD

Filed Sept. 15, 1964

FIG. 1

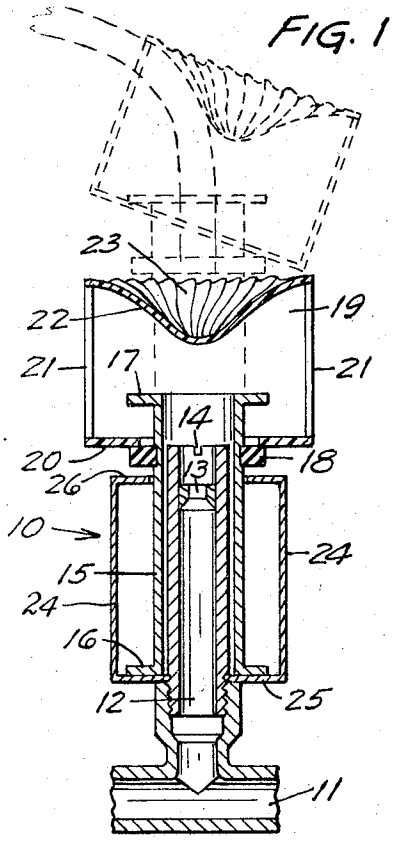


FIG. 3

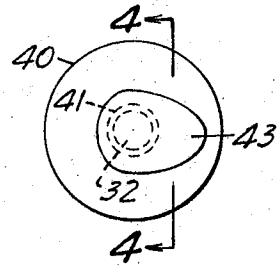


FIG. 4

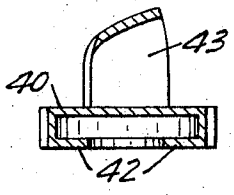


FIG. 2

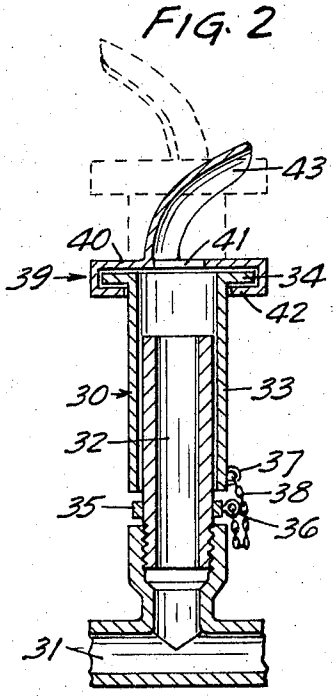


FIG. 6

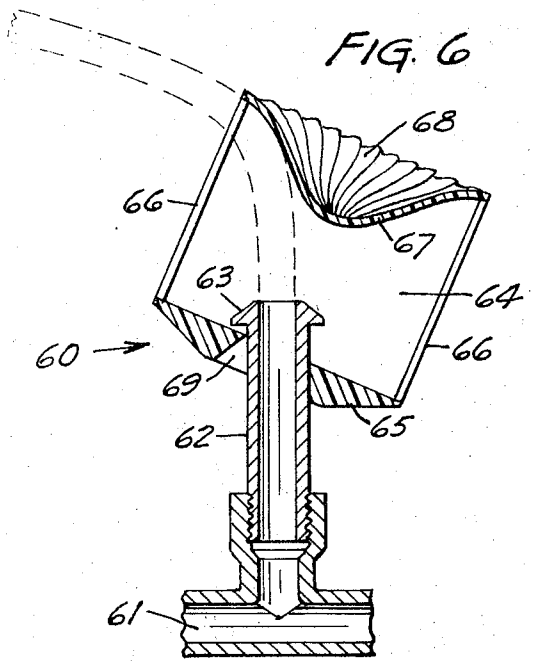
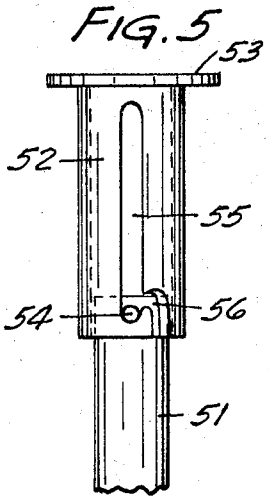


FIG. 5



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POP-UP SPRINKLER HAVING A ROTATING HEAD

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4 Claims. (Cl. 239—206)

This invention relates to sprinklers, especially those having heads which are extended when in use and retracted when inactive. The invention is particularly useful for underground lawn sprinkling installations.

The broad concept of a sprinkler having a head which is raised by the fluid supplied to it is extremely old; in fact, an entire subclass of patents is specifically concerned with this feature. Although some extremely ingenious devices have been disclosed, none has ever attained widespread commercial acceptance with the general homeowning public, at least so far as I am aware. I believe that this fact is directly attributable to a basic weakness which is common to almost all such devices.

Most sprinkling heads operate on the principle of dividing a stream of water into numerous fine streamlets by forcing it, while under pressure, through a perforated head of some sort. When it is desired to elevate such a head by means of the water supplied to it, it is typical to employ a pair of telescoping tubes, one of which remains fixed while the other, carrying the sprinkling head, slides upward. Because the water is under pressure, it is imperative that the seal between the tubes be snug to avoid seepage and decreased efficiency. Making a tight seal requires careful machining of parts; even so, there is a pronounced tendency for the tubes to bind and either fail to elevate the head when the water is turned on or fail to allow the head to fall when the water is turned off. Sand and dirt often contact the exposed extended tube, further complicating the problem by causing scratching and scarring.

I have now devised an elevating sprinkler which overcomes the defects inherent in all the prior art devices of which I am aware. My sprinkler does not require carefully machined parts; in fact, I generally prefer to use a substantial number of molded plastic parts, which are inexpensive and light weight. There is little or no wear, and there are no seals in the elevating portion of the apparatus. There are no holes to clog and reduce the efficiency of the sprinkler. The device is simple to install and it is extremely easy to replace one sprinkler head with another of a different size, range, or directional character.

My novel sprinkler operates on a principle which has been conspicuously avoided by those who have heretofore attempted to devise elevating or "pop-up" sprinklers. Rather than subdivide a large stream by forcing it through a perforated plate under pressure, I direct a large stream through the open air, that is, under zero pressure, against a diverter head, preferably a head which can be rotated through the arc which it is desired to sprinkle. The impact of the unconfined stream of water against the head serves to force the head upward; by mounting the head on a member which loosely surrounds the water supply tube, I have achieved a structure where the stream of water raises the head and the head in turn diverts the stream of water.

My invention will be better understood by reference to the following illustrative drawings, in which:

FIGURE 1 is a view in elevational cross-section of a presently preferred embodiment of my invention;

FIGURE 2 is a view in elevational cross-section of another embodiment of my invention;

FIGURE 3 is a plan view, seen from above, of the device of FIGURE 2;

FIGURE 4 is a view in elevational cross-section of the

diverter head shown in FIGURE 3, taken along section line 4—4 and looking in the direction of the arrows;

FIGURE 5 is an alternate form of the elevating feature of my invention, seen in elevation; and

FIGURE 6 is a view in elevational cross-section of another embodiment of my invention, requiring a minimum number of parts, and showing the device in operation.

In the drawings, referring first to FIGURE 1, water is supplied to sprinkler unit **10** through T **11**. Tubular vertical water supply member **12** is screwed into T **11**, constriction **13** being located at the upper end of water supply member **12** to provide the desired rate and velocity of water discharge. The upper end of member **12** has a slot **14** to facilitate screwing it into T **11**. Loosely surrounding water supply member **12** is tubular elevating member **15**, which is provided with lower flange **16** and upper flange **17**. A rubber ring **18** is seated in a groove around elevating member **15**, spaced somewhat below flange **17**, ring **18** and flange **17** thus defining spaced limiting means. Positioned at the upper end of elevating member **15** is water diverter head **19**, which in this case is of the type described and claimed in my U.S. Patent 2,848,276.

Water diverter head **19** is made up of wobble plate **20**, which has a central hole somewhat greater in diameter than the outer diameter of elevating member **15**. Affixed to wobble plate **20** and extending upward therefrom are struts **21**, to the upper ends of which is affixed diverter plate **22**, which has the general shape of an inverted cone and which has spiral grooves **68** extending generally radially along the lower surface thereof. A stream of water supplied to the lower portion of diverter plate **22** is directed into one of the spiral grooves, the impact simultaneously canting the diverter head. The spiral nature of the grooves **23** causing head **19** to gradually "wobble," the lower surface of wobble plate **20** rolling about the upper outer edge of ring **18** and the upper surface of wobble plate **20** simultaneously contacting the lower outer edge of flange **17**. The water stream, channeled in one or more grooves, is thus directed to first one area, and then another, throughout the area to be sprinkled. The action of this diverter head (which will sometimes hereinafter be referred to as a "Clearman head") is described in greater detail in my said Patent No. 2,848,276.

When water is supplied to the interior of member **12**, it is directed axially through constriction **13**, striking the bottom central portion of diverter plate **22**. The impact simultaneously induces the wobbling effect described in the preceding paragraph and lifts head **19** and therewith elevating member **15**, as shown in dashed lines. The height to which elevating member **15** will rise is limited by the cooperative restraining means created when the upper surface of flange **16** encounters the lower surface of the upper grip portion **26** of spring grip **24**. Spring grip **24** is held in place about water supply member **12** by having a base **25** which is internally threaded and mounted on the threads at the lower portion of member **12**. If desired, this device can be readily disassembled. Elevating member **15** and head **19** are removed by spreading the upper portions of spring grips **24**; removal of flange **17** (which is desirably an annular piece threaded on the upper end of elevating member **15**) permits removal of head **19**. Vertical water supply member **12** is removed from the T **11**, as previously indicated, by inserting a screwdriver in slot **14**.

FIGURES 2, 3, and 4 illustrate a modified form of the device shown in FIGURE 1. Water is supplied to sprinkler unit **30** through T **31**; threaded into T **31** is vertical water supply member **32**, which in turn is surrounded by loosely fitting elevating member **33**, having flange **34** at the upper end thereof. Surrounding the

lower portion of water supply member **32** is clamp **35**, having an eye **36** incorporated therein. A similar eye **37** is incorporated into the lower outer portion of elevating member **33**, by casting or otherwise, and chain **38** is used to connect the two and thereby cooperatively restrain the height to which elevating member **33** can rise. At the upper end of elevating member **33**, and partially surrounding flange **34**, is diverter head **39**. Head **39** comprises annular base plate **40**, the center hole **41** of which is axially aligned with the bore of water supply member **32**. Lip **42** extends below flange **34** so that diverter head **39** loosely fits thereabout. Extending upward from base plate **39** from the area immediately adjacent center hole **41** is diverter spoon **43**. In order to obtain rotation of diverter head **39**, spoon **43** is constructed so that a cross-section (as particularly shown in FIGURE 4) is not parallel to base plate **40**. In order to avoid splattering of the stream of water coming from supply member **32**, it is desirable for the angle at which the stream strikes spoon **43** to be maintained at less than about 15°. For maximum efficiency it is also desirable for the width and depth of spoon **43** to be approximately the same as, or slightly larger than, the diameter of the stream of water projected from supply member **32**.

In operation, sprinkler unit **30** functions as follows: a stream of water emanating from the upper end of supply member **33** strikes the lower surface of spoon **43**. The impact serves to raise diverter head **39** (and therewith elevating member **33**) as shown in dashed lines, to direct a stream of water generally radially outward following the contours of spoon **43**, and to cause a slow rotation of diverter head **39**. Chain **38** prevents elevating member **33** from rising so far that its lower end extends above the upper end of supply member **32**.

Sprinkler unit **30** can be modified in various ways, as will be apparent to any skilled mechanic. For example, base plate **40** can be made integral with flange **34**, and a cooperative restraining means employed which permits elevating member **33** to rotate.

FIGURE 5 illustrates another type of cooperative restraining means which may be employed to limit the height to which the elevating member can rise. In this arrangement vertically positioned water supply member **51** is surrounded by elevating member **52**, which is shown with an upper flange **53** (thereby adapting the device for substitution in either sprinkler unit **10** or sprinkler unit **30**). Extending from the outer wall of supply member **51** is pin **54**, which extends through and slides within longitudinally extending groove **55** in the wall of elevating member **52**. This construction is simple, and it will be noted that elevating member **52** is readily removed by twisting it so that the pin follows groove **55** through opening **56**.

The elevating members described herein are themselves subject to numerous modifications without departing from the spirit of my invention. To illustrate, either the outer surface of the water supply member or the inner surface of the elevating member may be ribbed, an arrangement which, while still minimizing friction, limits any tendency which the elevating member may have to deviate greatly from a vertical attitude when elevated.

FIGURE 6 illustrates, in operation, a sprinkler unit **60** which maintains the advantages of the Clearman head shown in sprinkler unit **10** while greatly reducing the number of parts required and thereby reducing the cost of the assembly. Water is supplied through T **61** to vertical supply member **62**, which is provided at the upper end with a shoulder **63**, and threaded into T **61**. Surrounding water supply member **62** is a modified Clearman head **64**, including a wobble plate **65**, struts **66**, and generally inverted cone-shaped diverter plate **67**, having spiral grooves **68** on the lower surface and affixed to the upper end of struts **66**. Head **64** does not have a lower support on which wobble plate **65** rotates, but features a modification of wobble plate **65** to achieve that end.

Wobble plate **65** is relatively thick, especially at the center, and contains a center hole which is tapered, the narrow end of the taper being uppermost. Water supplied through the interior of supply member **62** shoots upward, contacting the lower surface of diverter plate **67**, which is simultaneously forced upward and canted to one side. Water striking the spiral grooves **68** causes head **64** to rotate slowly, the bearing surface being the tapered inner surface of center hole **69** against the upper outer surface of supply member **62** and the inner upper surface of wobble plate **65** against the outer lower surface of shoulder **63**. In this embodiment of my invention head **64** performs the combined functions of diverting head and elevating member, struts **66** being somewhat longer than would otherwise be customary for Clearman heads.

What I claim is:

1. A disappearing lawn sprinkler which can be installed flush with or slightly below ground level and which will automatically rise above ground level when water is supplied thereto under pressure, comprising in combination: a vertically positioned stationary tubular water supply member, a generally tubular elevating member concentrically mounted about said water supply member and freely axially slidable with respect thereto, cooperative restraining means on said members for limiting the height to which said elevating member can rise, spaced limiting means at the upper end of said elevating member, and an annular wobble plate freely mounted on said tubular elevating member between said spaced limiting means, a diverter element rigidly supported by said wobble plate in a position spaced from one end of said elevating member and in registry therewith, said wobble plate and said diverter element adapted to effect distribution of water in a plurality of directions responsive to the impact thereof, said elevating member being lifted above ground level, in operation, by the impact of an unconfined stream of water directed through said supply member against the lower surface of said diverter element.

2. A disappearing lawn sprinkler which can be installed flush with or slightly below ground level and which will automatically rise above ground level when water is supplied thereto under pressure, comprising in combination: a vertically positioned tubular water supply member, a generally tubular elevating member concentrically mounted about said water supply member and freely slidable with respect thereto, said elevating member having a flanged shoulder at its lower end, a plurality of stiff but resilient shoulder-engaging restraining members positioned about said elevating member, rigidly mounted at their lower ends but radially displaceable at their upper ends, and a water diverter mounted at the upper end of said elevating member.

3. A lawn sprinkler which automatically rises when water is supplied thereto under pressure, comprising in combination: a vertically positioned stationary tubular water supply member having a shoulder at its upper end, positioned loosely about said tubular member an elevating number comprising a wobble plate having a tapered central generally circular opening, the narrower opening at the upper face of said wobble plate being larger than said tubular member but smaller than said shoulder, supporting means extending upward from said wobble plate, and a diverter plate mounted on said supporting means, said elevating member being lifted, when said sprinkler is in operation, by the impact of an unconfined stream of water directed through said supply member against the lower surface of said diverter.

4. A lawn sprinkler which automatically rises when water is supplied thereto under pressure, comprising in combination: a vertically positioned stationary tubular water supply member having a shoulder at its upper end, positioned loosely about said tubular member an elevating member approximately the same height as said supply member and comprising a wobble plate whose thickness is on the order of at least half the outer diameter of said

tubular member and which has a central generally circular opening which is significantly larger than said tubular member but smaller than said shoulder, supporting means extending upward from said wobble plate, and a diverter plate mounted on said supporting means, said elevating member being lifted along the greater part of the height of said water supply member, when said sprinkler is in operation, by the impact of an unconfined stream of water directed through said supply member against the lower surface of said diverter, said wobble plate slowly rotating in operation while the upper surface of that portion of the wobble plate which defines said central opening bears against the upper portion of said tubular supply member and the lower surface of that portion of the wobble plate

which defines said central opening bears against a lower portion of said tubular supply member.

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