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Chow

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[54] **POP-UP SPRINKLER**

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[52] **U.S. Cl.** **239/205,** 239/206

[51] **Int. Cl.** **B05b 3/06,** B05b 3/08

[58] **Field of Search** 239/201, 203–206, 239/210

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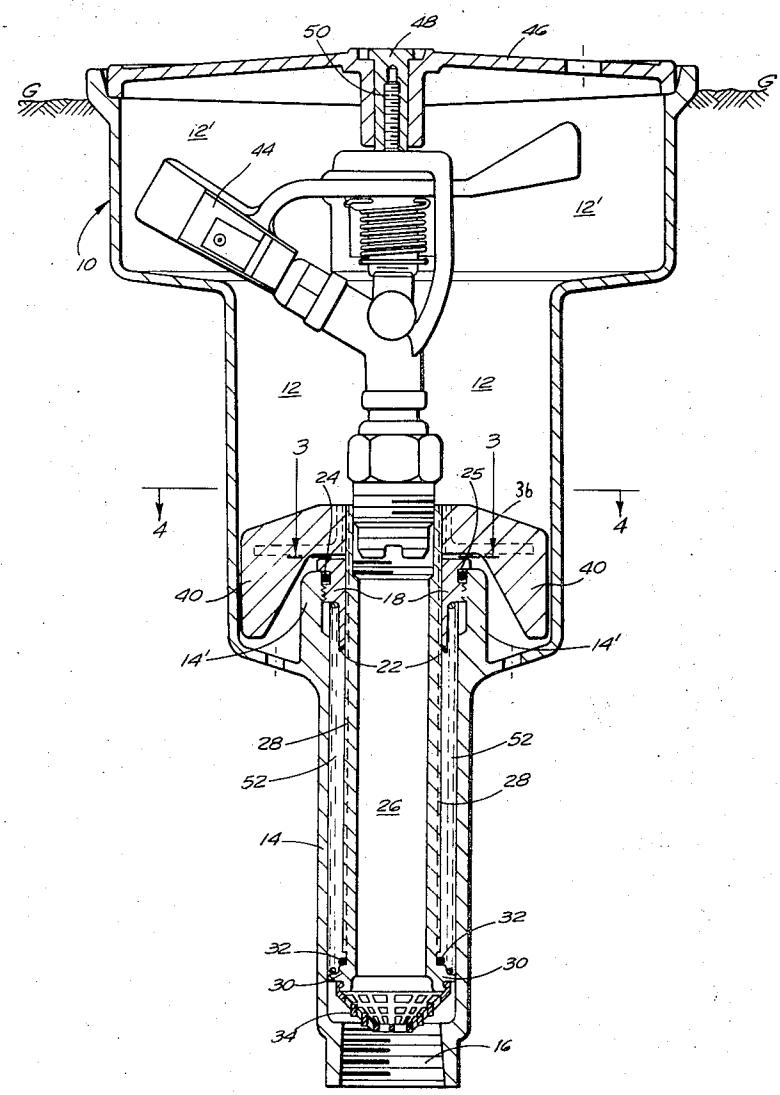
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Primary Examiner—Robert S. Ward, Jr.

[57] **ABSTRACT**

A pop-up sprinkler comprising a housing having an upper relatively wide chamber and a lower guide chamber of reduced diameter. The sprinkler head is mounted on a stem which is in turn mounted in said upper and lower chambers for vertical movement. The stem is provided with stabilizer means vertically slidable with said stem, located in the upper chamber, and shaped to cooperate with walls of that chamber to stabilize the stem, and prevent wobble, significant tilting or lateral movement of the stem, in all vertical positions of the stem.

12 Claims, 5 Drawing Figures



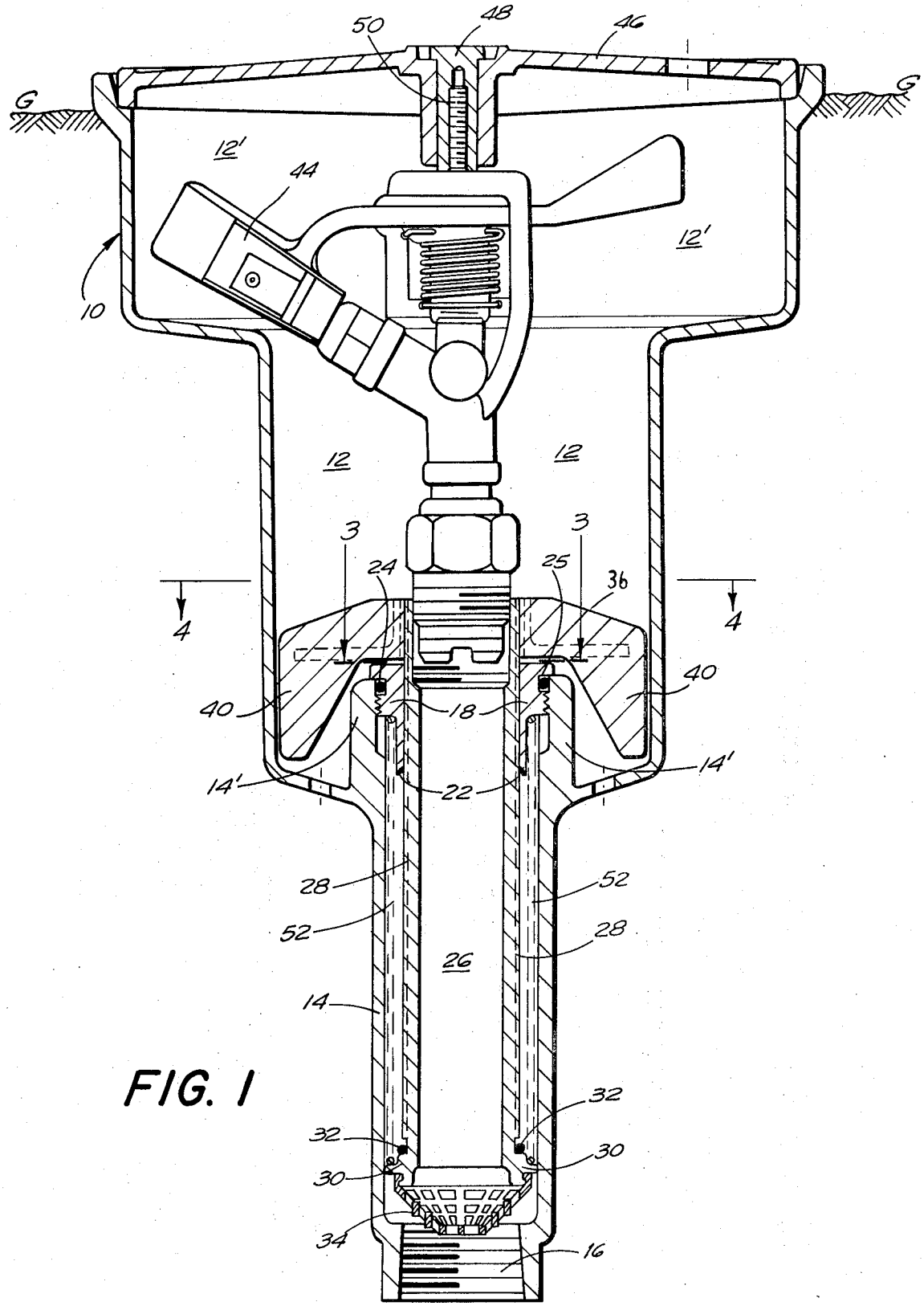

50
48
46
G
G
12'
44
12'
10
12
12
3
3
24
25
36
4
4
40
40
18
14'
14'
22
28
52
52
28
26
14
32
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30
34
16

FIG. 1

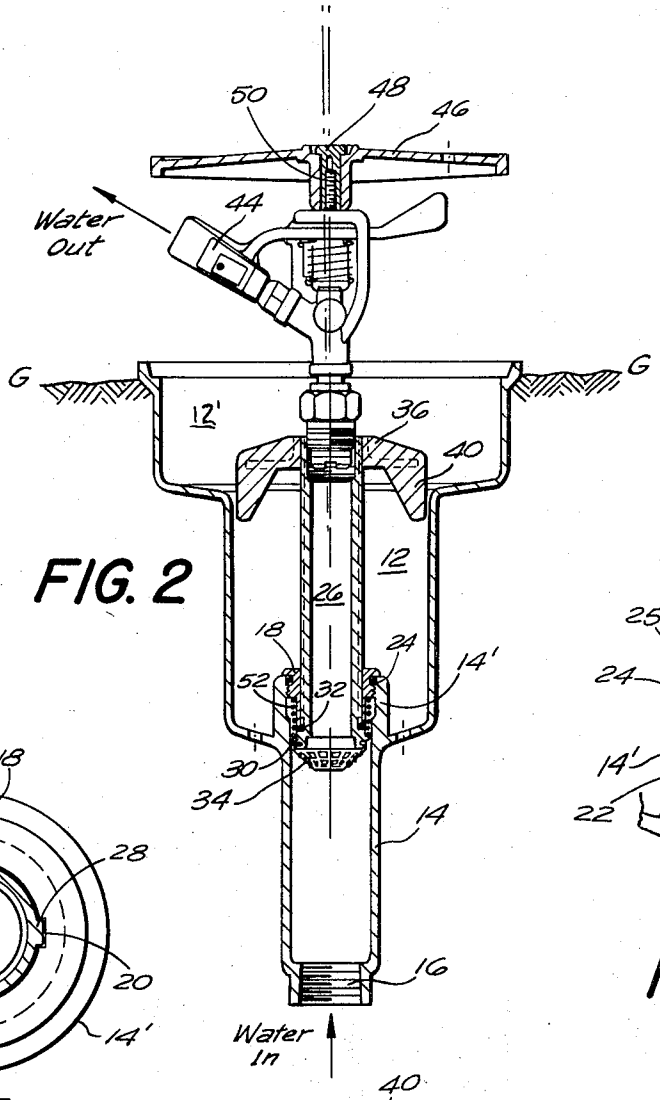


FIG. 2

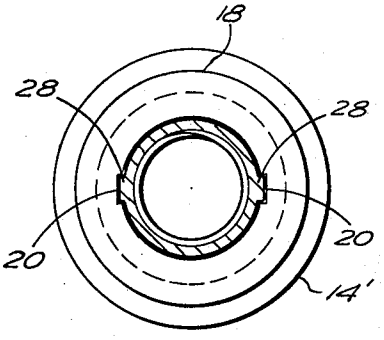


FIG. 3

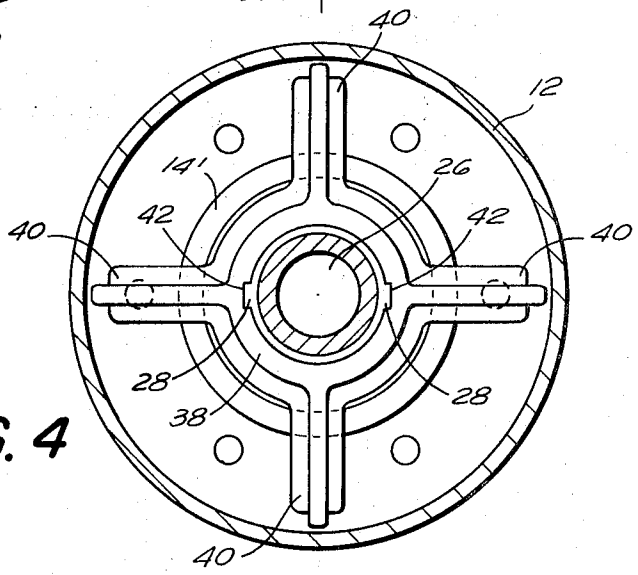


FIG. 4

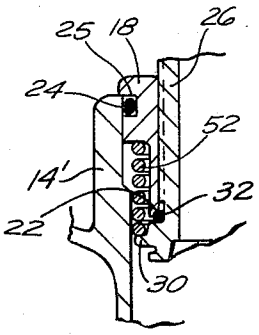


FIG. 5

POP-UP SPRINKLER

This invention relates to a pop-up sprinkler which contains an improved, multi-functional stabilizer assembly.

Pop-up sprinklers are well known. They occupy a concealed, retracted position below ground level when not in use and assume a raised position for sprinkling in response to the introduction of water under pressure. In addition to containing properly functioning component parts, such sprinklers should exhibit only minimal vibration or lateral movement during operation in order to avoid disruption of the spray pattern and to minimize the undesirable effects which such vibration exerts on the internal components of the sprinkler. It is also essential to provide such sprinklers with effective and long-lived internal seals so as to avoid water leakage and to prevent damage which may be caused by the solids carried in the water. It is also desirable that the component parts of the sprinkler be readily removable for maintenance and replacement without the need for resorting to inconvenient and cumbersome procedures and/or the use of special tools.

It is therefore the prime object of this invention to provide a pop-up sprinkler of novel construction which incorporates mans readily responsive to water pressure so as to raise the sprinkler head above ground level for sprinkling operation.

It is a further object to provide means therein for substantially elimimating undesirable vibration and lateral movement during operation.

It is still a further object to provide seal means therein to avoid internal leakage and the possible damage resulting therefrom.

It is another object to provide a sprinkler construction wherein the component parts are readily removable without the need of special tools.

It is still another object to provide a single assembly for use in the sprinkler which functions to eliminate the vibration, to effect the formation of internal seals and to facilitate the ready removability of the component parts.

An additional object is to secure the stem which receives the sprinkler head to the sprinkler in such a manner as to reinforce its strength.

These objects are achieved in accordance with the present invention by providing the pop-up portion of the sprinkler with a stabilizing means which may contain a plurality of arms radially extending toward the inside wall of the sprinkler housing. During sprinkling operation, the arms of the stabilizing means engage the inside wall and in so doing perform a number of valuable functions. Thus, such engagement substantially eliminates the vibration and lateral movement which is generally exhibited by the pop-up portion, thereby insuring maintenance of the desired spray pattern and minimization of the adverse effect such vibration may exert against the component parts of the sprinkler. The stabilizing means also serves to position other component parts so as to provide an internal seal which assures leak-proof performance. The stabilizing means is also interrelated with the other component parts of the pop-up portion so as to facilitate the manual removal and disassembly of the interior structure without having to use special tools and techniques, the latter characteristic being a particular advantage in such sprinklers which are positioned below ground level. The stabilizing means is also circumferentially positioned around the section of the pop-up stem which receives the sprinkler head, thereby providing greater strength and rigidity to this somewhat weaker area, and reinforcing its ability to engage the sprinkler head solely by threaded engagement. The stabilizing means is preferably connected to the stem near its upper end and moves up and down with the stem, thereby maximizing its stabilizing effect in all vertical positions of the sprinkler head.

It is thus seen that the construction and multifunctional nature of the stabilizing means represents a major improvement over the prior art. Of particular significance is the fact that the stabilizing means, a single component, is directly responsible for providing a number of the characteristics that are essential to the proper functioning of a pop-up sprinkler. For example, the substantial reduction in vibration and lateral movement in the pop-up portion and the formation of an internal leak-proof seal are directly attributable to the positioning of the stabilizing means during the sprinkling operation. Thus, the force of the water leaving the sprinkler head results in a lateral movement of the pop-up portion. This lateral movement causes the stabilizing means to contact the inner housing wall, thereby immediately preventing any greater lateral movement. Simultaneously, the slightly tilted configuration of the pop-up portion places the stem section thereof immediately adjacent the housing so that the presence of a simple sealing ring therebetween assures the formation of a leak-proof seal.

To the accomplishment of the above, the present invention relates to the construction of a pop-up impulse sprinkler as defined in the appended claims and as described in this specification, taken together with the accompanying drawings in which:

FIG. 1 is a view partly in cross-section and partly in elevation depicting a typical sprinkler of this invention in retracted, non-operational position;

FIG. 2 is a view partly in cross-section and partly in elevation depicting the sprinkler of FIG. 1 in popped-up, operational position;

FIG. 3 and FIG. 4 are transverse sectional views taken respectively along lines 3—3 and 4—4 of FIG. 1; and

FIG. 5 is a fragmentary sectional view showing the seal formed between the bushing and the tubular stem during the sprinkling operation.

The instant pop-up sprinkler comprises a housing **10** having an upper chamber **12** and a lower chamber **14** of reduced diameter. The housing **10** serves the dual function of protecting the component parts of the sprinkler from the elements encountered in their underground location and or providing a means for mounting these parts. The sprinkler head **44** is mounted on a stem **26** which in turn is mounted in said upper and lower chamber **12, 14** for vertical movement. When water under pressure is delivered to guide chamber **14**, stem **26** is forced upward and correspondingly raises sprinkler head **44** above ground level. The water passes through stem **26** into sprinkler head **44** for appropriate discharge in the desired pattern and range. Stem **26** is also provided with stabilizing means **36** vertically slidable with stem **26**, located in the upper chamber **12**, and shaped to cooperate with the walls of chamber **12** to stabilize stem **26** when in pop-up posi-

tion. Stabilizing means **36** is so constituted as to provide the advantages described hereinabove.

In detail, the pop-up sprinkler of this invention, as depicted in FIG. **1**, includes a housing **10** preferably of a molded plastic material defining an enlarged upper chamber **12** and a lower guide chamber **14** of reduced diameter. The chamber **12** may have an upper even more enlarged extension chamber **12'**. The bottom of guide chamber **14** is provided with a fitting **16** for attachment to a water supply pipe, not shown.

The upper end **14'** of guide chamber **14**, which projects slightly within the sprinkler-receiving chamber **12**, is internally screwthreaded to receive bushing **18** which has a corresponding externally screw-threaded portion. Bushing **18** is provided with at least one, and preferably two, axially extending diametrically opposed key slots **20** (see FIG. **3**). It is also provided at its lower end with an annular seat **22**, which is generally conical in shape. As an optional feature, a sealing ring **24** may be inserted into a recess **25** in bushing **18** so as to provide an improved seal between bushing **18** and housing **14'** when they are in threaded engagement.

Bushing **18** is adapted to receive a tubular stem **26** which is provided with at least one, and preferably two, axially extending diametrically opposed key ribs **28** that mate with the key slots **20** in bushing **18.** This configuration permits tubular stem **26** to slide axially in bushing **18** in response to the introduction of water pressure but prevents stem **26** from engaging in rotating movement in relation to bushing **18.** The lower extremity of tubular stem **26** is provided with an external flange **30** which is sized to engage the annular seat **22** on bushing **18** when stem **26** is in extended, pop-up position, thereby to limit the upward movement of stem **26.**

The key ribs **28** may be notched at a point above flange **30** in order to receive and retain sealing ring **32** which contacts bushing **18** when stem **26** is in upwardly extended position. The seal formed between bushing **18** and stem **26** insures leak-proof performance and, particularly, prevents dirt or other foreign matter from entering the bearing surfaces between bushing **18** and stem **26.** Filtering means **34** may be affixed to the lower end of stem **26** in order to further prevent the introduction of dirt and other foreign matter into the system.

The upper end of tubular stem **26** is adapted to externally receive stabilizing means **36.** Stabilizing means **36,** as specifically depicted in FIG. **4,** comprises a central collar **38** with a plurality of arms **40** radially extending therefrom, four arms equally spaced from one another being preferred in order to readily control the free movement of stem **26** in all directions. Stabilizing assembly **36** is generally provided with key slots **42** that mate with key ribs **28** on tubular stem **26** so as to restrain the stabilizer **36** against rotation relative to stem **26.** The inner diameter of collar **38** is dimensionally related to the outer diameter of tubular stem **26** in order to permit stabilizing means **36** to be fitted over stem **26** and secured thereto in light press fit fashion. This positioning of stabilizing means **36** reinforces the strength of the upper end of stem **26** to subsequently receive the sprinkler head **44** by means of threaded engagement. Thus, there is in prior art constructions the possibility that a stem prepared from molded plastic material will crack upon threaded insertion of the sprinkler head **44.** The circumferential positioning of means **36,** however, provides greater rigidity to the stem and exerts inward pressure against the stem so as to substantially eliminate this possibility.

Stabilizing means **36** when secured to tubular stem **26** is positioned in sprinkler-receiving chamber **12** with its arms **40** radially extending toward and close to the wall of chamber **12.** Arms **40** preferably do not actually contact the wall of chamber **12** but, rather, are spaced therefrom. The clearance between arms **40** and the wall will necessarily be small inasmuch as this distance is indicative of the amount of lateral movement which can be tolerated in tubular stem **26.** The slight tilt of stabilizing means **36** when a small clearance is provided between the arms **40** and the chamber wall assures the proper positioning of sealing ring **32** to form a leak-proof seal between bushing **18** and tubular stem **26.** The clearance also permits the free rotation of stabilizing means **36** in disengaging the interior component parts of the sprinkler from the housing **10.**

The upper end of tubular stem **26** is internally screwthreaded to receive a sprinkler unit **44.** Any conventional sprinkler unit may be utilized, with the oscillating, impulse type being preferred. It should be noted that the nature of the sprinkler unit does not form part of the instant invention. A typical oscillating sprinkler unit is provided with an orifice directed upwardly and radially and, in addition, is provided with a mechanism which effects the movement of the sprinkler within the boundaries of a predetermined arc of travel. The sprinkler will also contain an oscillating deflector which is positioned in the path of the stream of water. The sprinkler unit **44** is normally received in chamber **12'**, and may be at least partially received in chamber **12.**

Since the sprinkler assembly of this invention is beneath ground level G when not in use (FIG. **1**), it will have a protective cover **46** which is secured to the sprinkler head **44** by means of a bushing nut **48** which is threaded onto a threaded shaft **50** anchored in sprinkler head **44** and extending above the top thereof. Cover **46** thus extends and retracts in accordance with the movement of sprinkler head **44.**

Operation of the pop-up sprinkler of this invention proceeds as follows:

When the supply of water is shut off, the entire unit occupies its retracted position as illustrated in FIG. **1.** When water under pressure is delivered to guide chamber **14,** tubular stem **26** is forced upward until flange **30** sealingly engages annular seat **22** on bushing **18,** as shown in FIG. **2.** The vertical travel of stem **26** is sufficient to raise the sprinkler head **44** above ground level G so that the water may be appropriately discharged in the desired pattern and range. During the operation of the sprinkler, there is a virtually total absence of rotational or lateral movement on the part of tubular stem **26.** Thus, the mating of key ribs **28** on stem **26** and key slots **20** on bushing **18** prevents the rotational movement of stem **26.** The lateral movement is prevented by the action of stabilizing means **36.** Thus, the reaction force of the water leaving the sprinkler head **44** will cause a corresponding lateral movement of the stem **26** and stabilizing means **36** secured thereto (note center lines in FIG. **2**). This lateral movement causes the arms **40** of stabilizing means **36** to traverse the slight distance that they are separated from the wall of chamber **12** and to contact the wall, thereby immediately preventing any further lateral movement. The slight sidewise tilting movement of stabilizing means **36** also enables sealing ring **32** to engage bushing **18** so as to effect a

leak-proof seal between bushing 18 and tubular stem 26. The seal thus formed is illustrated in FIG. 5. Since stabilizing means 36 is located adjacent the upper end of stem 26, and rises vertically with it, the stabilization effect is maximized, the stem 26 being supported at its lower end by bushing 18 and at its upper end by stabilizing means 36.

When the water pressure is discontinued, the tubular stem 26, weighted by sprinkler head 44, falls freely to its retracted position as depicted in FIG. 1. The return of tubular stem 26 to its retracted position may also be effected by means of a compression-type spring 52 which is inserted between flange 30 of stem 26 and bushing 18. It is to be noted that spring 52 contacts bushing 18 above seal 22 in order to provide adequate room for containing spring 52 when it is in compressed configuration.

A further advantage derived from the use of the improved stabilizing means 36 is the elimination of the need for special tools to remove the component parts of the sprinkler when maintenance or replacement of these parts is desired. Thus, it is merely necessary to raise cover 46 and turn stabilizing means 36 in a counterclockwise direction. Such rotation will be translated to tubular stem 26 in view of the mated relationship between key ribs 28 and key slots 42 which, in turn, will be translated to bushing 18 in view of the mated relationship between key ribs 28 and key slots 20. Accordingly, bushing 18 will be unthreaded from housing 10 to enable the user to remove as a unit the entire internal assembly of the sprinkler including stem 26, stabilizing means 36, bushing 18, filtering means 34, and sprinkler head 44. The sprinkler may be reassembled merely by refersing this sequence of steps.

It should also be noted that many of the component parts of the sprinkler assembly can be prepared from molded plastic materials thereby increasing the ease of assembling the sprinkler while simultaneously decreasing the expense of manufacturing such a sprinkler.

Summarizing, it is thus seen that this invention provides an improved pop-up sprinkler having novel stabilizer means which serves to prevent lateral movement in the assembly, to effect leakproof seals during the operation of the sprinkler, and to facilitate the removal of the component parts of the sprinkler.

While the invention has been described in terms of the specific embodiments herein, it should be apparent that variations may be developed without departing from the spirit or scope of the invention.

I claim:

1. A pop-up sprinkler comprising:

a housing defining an upper, relatively wide chamber and a lower, relatively narrow chamber, and conduit means in said housing for connection to a water supply and communicating with said lower chamber;

a tabular stem extending into said lower chamber from said upper chamber;

means for mounting said stem in said lower chamber to permit movement of said stem axially of said lower chamber between upper and lower positions;

stabilizing means operatively connected to said stem for axial movement therewith, located in said upper chamber, and extanding radially out from said stem to a location close to said housing walls but inwardly spaced therefrom, thereby to be slidable relative to said walls while providing lateral support for that portion of said stem in said upper chamber; and

a sprinkler head mounted on said stem and movable therewith between said upper and lower positions;

said stem, said mounting meand, said stabilizing means and said sprinkler head being readily removable without tools as an internal assembly unit from said housing.

2. The pop-up sprinkler of claim 1, wherein the means for mounting said tubular stem in said lower chamber comprises a bushing secured to the upper end of said lower chamber.

3. The pop-up sprinkler of claim 2, wherein said bushing contains at least one key slot which mates with at least one corresponding key rib on said tubular stem to effect said axial movement.

4. The pop-up sprinkler of claim 2, wherein said bushing has a conical seat at its lower end.

5. The pop-up sprinkler of claim 4, whrein said tubular stem contains means at its lower end sized to engage said seat on said bushing when said tubular stem is in extended position.

6. The pop-up sprinkler of claim 1, wherein said stabilizing means contains at least one key slot which mates with at least one corresponding key rib on said tubular stem.

7. The pop-up sprinkler of claim 1, wherein said stabilizing means comprises a plurality of radially extending arms spaced from one another.

8. The pop-up sprinkler of claim 2, wherein said tubular stem contains an annular groove with sealing means disposed therein, said sealing means engaging said bushing when said tubular stem is in said upper position.

9. The pop-up sprinkler of claim 5, wherein said tubular stem contains an annular groove positioned above said lower end engaging means with sealing means disposed therein, said sealing means engaging said bushing when said tubular stem is in said upper position.

10. The pop-up spinkler of claim 5, wherein spring means are positioned between said lower end engaging means and said bushing to effect the return of said tubular stem to its lower position.

11. A pop-up sprinkler comprising:

a housing defining an upper chamber and a lower guide chamber having conduit means at its lower end for connection to a water supply;

a bushing secured to the upper end of said guide chamber having a seat at its lower end and at least one axially extending key slot;

a tubular stem extending downwardly from said upper chamber through said bushing into said guide chamber and axially slidable in said bushing, said stem containing at least one axially extending key rib fitting said key slot to provide slidable, nonrotatable movement of said stem, an external flange at its lower end sized to engage said seat on said bushing when said tubular stem is in extended position, and an annular groove positioned above said flange with sealing means disposed therein, said sealing means cooperating with said bushing when said tubular stem is in extended position;

stabilizer means positioned in said upper chamber and secured to the upper end of said tubular stem, said stabilizer means containing at least one key slot which engages the key rib on said stem, and a

plurality of arms spaced from one another radially extending toward and slightly spaced from the wall of said upper chamber;

a sprinkler head mounted on said tubular stem movable between a retracted position related thereto; and

a cover for said housing carried by said sprinkler head.

12. The pop-up sprinkler of claim **11**, wherein said bushing, said stem, said stabilizer means, said sprinkler head and said cover form an internal assembly removable as a unit from said housing after appropriate manual rotation of said stabilizer means relative to said housing.

* * * * *