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Hayes et al.

[11] **3,921,910**

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[54] **POP-UP SPRINKLER WITH MULTIPLE-PURPOSE ONE-PIECE SEAL**

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[52] **U.S. Cl.** **239/205**; 92/108

[51] **Int. Cl.²** **B05B 15/10**

[58] **Field of Search** 239/203–205, 239/206, 110, 106, 108; 92/108, 110

[56] **References Cited**

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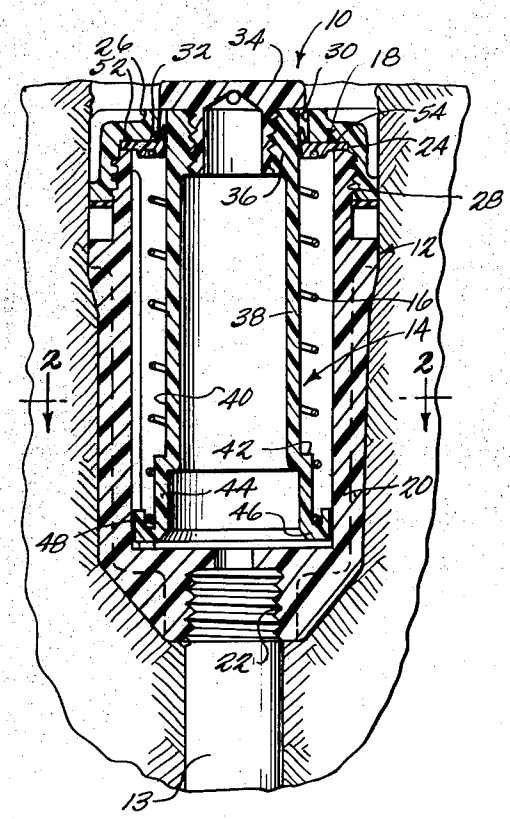
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Primary Examiner—Robert S. Ward, Jr.
Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

A pop-up sprinkler having a multiple-purpose one-piece annular seal which performs the following specified functions: (1) provides a static seal between separable parts of the sprinkler housing assembly, (2) provides a spring seat for one end of the retracting coil spring, (3) provides a pressure responsive leakage path between the fixed housing assembly and movable sprinkler head assembly for passage of water upwardly and outwardly therethrough when the water source is initially communicated with the housing assembly to thereby remove contiguous debris and prevent the passage of debris downwardly therethrough during the extending movement of the sprinkler head assembly, (4) provides an operative static seal between the fixed housing assembly and the sprinkler head assembly when the latter is in its operative extended position, and (5) provides a wiping and centering action on the sprinkler head assembly during the retracting movement thereof.

4 Claims, 5 Drawing Figures



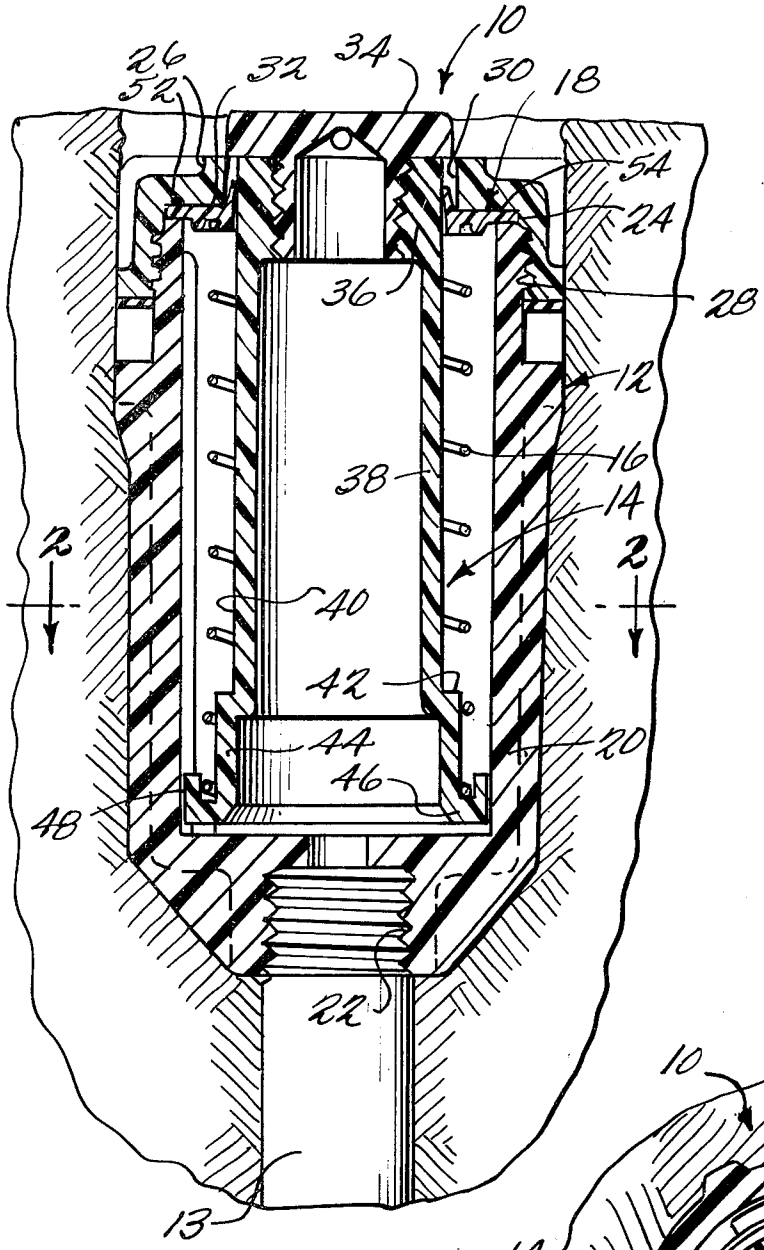

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Fig. 1

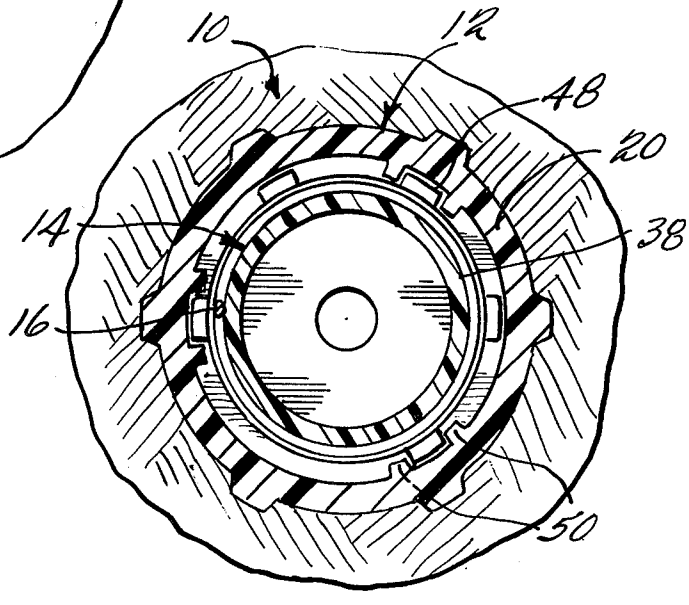

10
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Fig. 2

Fig. 3

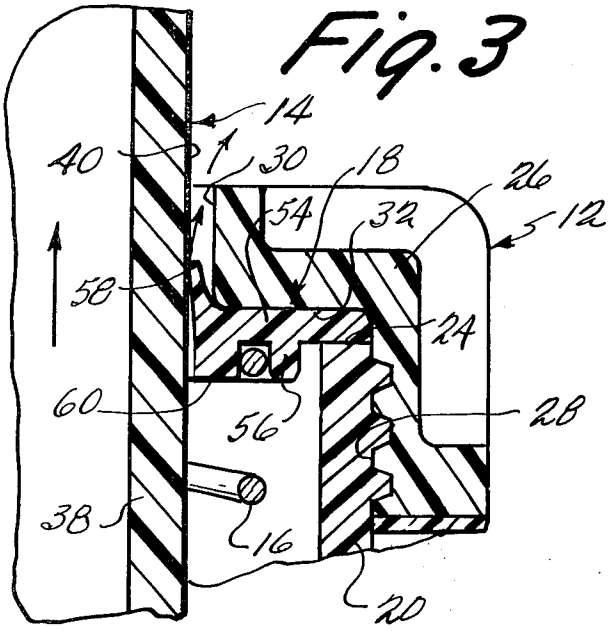


Fig. 4

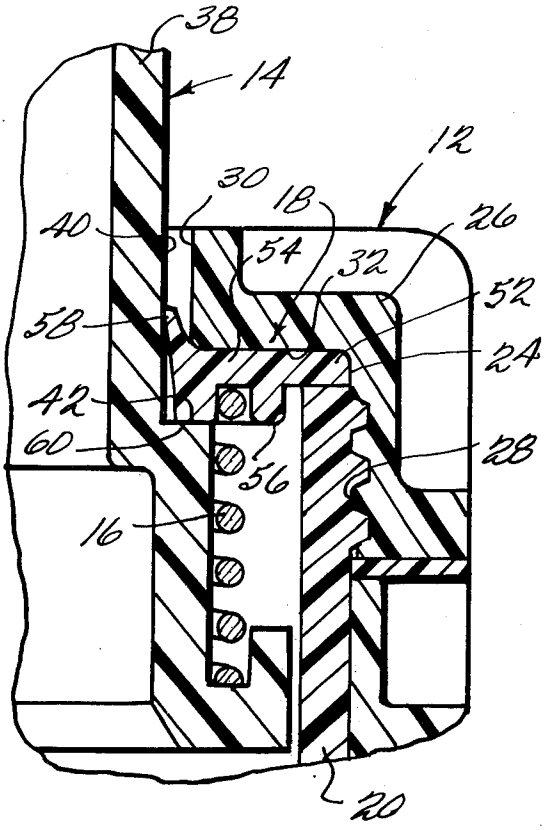
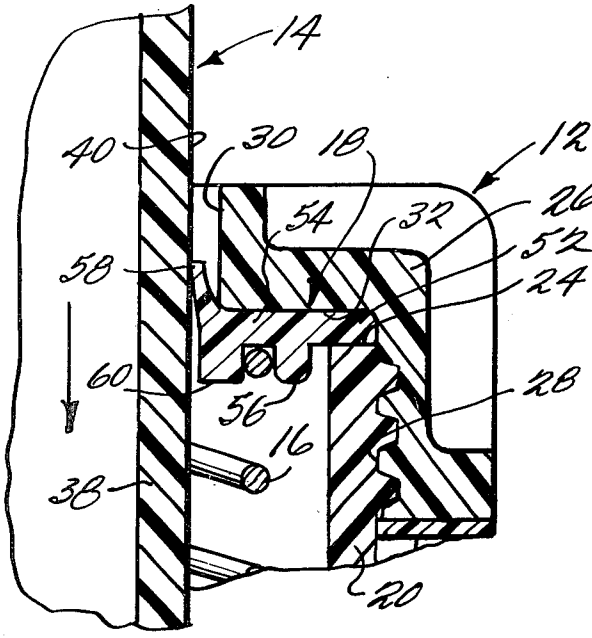


Fig. 5



POP-UP SPRINKLER WITH MULTIPLE-PURPOSE ONE-PIECE SEAL

This invention relates to sprinklers and more particularly to sprinklers of the pop-up type.

Pop-up sprinklers are well known and are used extensively in in-ground sprinkler system installations. The usual pop-up sprinkler includes a housing assembly adapted to be stationarily mounted within the ground and to be connected at its lower end with an in-ground supply pipe through which a controllable source of water under pressure is communicated with the housing assembly. A sprinkler head assembly normally disposed in a retracted storage position within the housing assembly is adapted to extend into an operative position in response to the communication of the water source. In many instances coil spring means is provided between the two assemblies to insure that the sprinkler head assembly retracts into its storage position when the communication of the water source is closed off.

One source of difficulty encountered in the cyclical operation of these sprinklers resides in the sealing functions provided. Various different sealing constructions have been proposed in the prior art. See for example U.S. Pat. Nos. 2,909,325; 3,335,959; 3,434,664; 3,454,225; 3,724,757; and 3,713,584.

An object of the present invention is to provide a pop-up sprinkler having an improved one-piece seal capable of performing a multiplicity of essential and desirable functions in the various stages of cyclical operation of the sprinkler. In accordance with the principles of the present invention this objective is obtained by providing a one-piece annular seal having means for performing the following specified functions: (1) providing a static seal between separable parts of the housing assembly, (2) providing a spring seat for one end of the retraction spring, (3) providing a pressure responsive leakage path between the housing assembly and sprinkler head assembly for passage of water upwardly and outwardly therethrough when the water source is initially communicated with the housing assembly to thereby remove contiguous debris and prevent the passage of debris downwardly therethrough during the extending movement of the sprinkler head assembly, (4) provide an operative seal between the housing assembly and the sprinkler head assembly when the latter is in its extended operative position and (5) provide a wiping and centering action on the sprinkler head assembly during the retracting movement thereof.

Another object of the present invention is the provision of a pop-up sprinkler of the type described which is simple in construction, effective in operation and economical to manufacture.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

FIG. 1 is a vertical sectional view of a pop-up sprinkler embodying the principles of the present invention showing the same in its retracted storage position installed in the ground;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary view of the seal area of the pop-up sprinkler illustrating the function thereof during extending movement of the sprinkler head assembly;

FIG. 4 is a view similar to FIG. 3 illustrating the function of the seal when the sprinkler head is in its extended operative position; and

FIG. 5 is a view similar to FIG. 3 illustrating the function of the seal during the retracting movement of the sprinkler head assembly.

Referring now more particularly to the drawings, there is shown in FIG. 1 thereof a pop-up sprinkler, generally indicated at **10**, embodying the principles of the present invention. The pop-up sprinkler **10** includes a housing assembly, generally indicated at **12**, which is adapted to be installed within the ground, as shown in FIG. **1**, so that its upper end is substantially level with the surface of the ground and extends downwardly therefrom. The lower end of the housing assembly **12** is connected to a supply pipe **13** through which a controllable source of water under pressure is communicated with the housing assembly **12**. A sprinkler head assembly, generally indicated at **14**, normally disposed in a retracted storage position within the housing assembly, as shown in FIG. **1**, is adapted to extend into an operative position in response to the communication of the water source. A coil spring **16** is provided between the two assemblies to insure that the sprinkler head assembly **14** retracts into its storage position when the communication of the water source is closed off. The pop-up sprinkler **10** also includes a multiple purpose one-piece seal, generally indicated at **18**, which is cooperatively engaged with the housing assembly **12**, sprinkler head assembly **14**, and coil spring **16**.

It will be understood that the housing assembly **12** may assume any desired configuration. As shown, the housing assembly **12** includes a first housing member **20** of generally cup-shaped configuration, preferably molded of a suitable material such as plastic or the like. The first housing member has a lower end portion formed with an interiorly threaded tubular section **22** for connection with the supply pipe **13** as shown and an open upper end portion terminating in an upwardly facing annular end surface **24** which, as shown, is a flat annular surface disposed in a radial plane with respect to the vertical axis of the housing member **20**. The housing assembly **12** also includes a second housing member **26** which includes a tubular sleeve portion formed with interior threads **28** adapted to threadedly engage cooperating exterior threads formed on the upper end portion of the first housing member **20**. The second housing member **20** also includes a radially inwardly extending flange portion which terminates in a generally cylindrical interior surface **30**. The flange portion of the member **26** includes a downwardly facing surface **32** extending radially from the sleeve portion to the cylindrical surface **30**. As shown, the surface **32** is a flat annular surface disposed in a radial plane.

The sprinkler head assembly **14** may likewise assume any desirable configuration. As shown, the sprinkler head assembly **14** is of the spray head type although it will be understood that other known types are contemplated, such as rotaries, etc. A part-circle spray head **34** is threadedly mounted within an interiorly threaded upper end wall **36** of a vertically movable tubular member **38**. The movable member **38** includes a cylindrical exterior periphery **40** of a size slightly less than the interior cylindrical surface **30** which extends downwardly

from the spray head **34** throughout a major portion of the member and terminates in a radially outwardly extending upwardly facing surface **42.** The surface **42** is formed on an enlarged open lower end portion **44** of the member **38** which terminates in a radially outwardly extending flange **46.** The upwardly facing surface of the flange provides a lower seat for the spring **16.** It will be understood that a separate annular cushioning member may be utilized as the seat defining means, if desired, rather than the integral surface of the flange **46.**

Since the particular type of head shown is a part-circle spray head the fixed angular position of which determine the location of the pattern area, it is important to insure that the latter and, hence the movable member **38** which fixedly carries the same, does not move angularly during its vertical movement. To this end, a plurality of circumferentially spaced guide lugs **48** are integrally formed on the outer periphery of the flange **46.** As best shown in FIG. **2,** one or more of the guide lugs **48** are between cooperating pairs of axially extending guide ribs **50** formed on the interior periphery of the first housing member **20.** It will be understood that while the lug and guide rib arrangement prevents angular or rotational movement of the spray head such as an arrangement is not essential in many types of heads other than the part-circle spray head **34** as shown.

As previously indicated, the present invention is particularly concerned with the multiple-purpose one-piece seal **18.** The seal **18** is preferably molded of a suitable moldable sealing material such as resinous or rubber materials, a preferred example being a polyester elastomer produced by E. I. duPont deNemours & Co., Inc. under the trade name HYTRIL. Another exemplary material is urethane.

As best shown in FIGS. **3–5,** the seal includes a radially outer portion **52** disposed between and forming a static seal with the first member end surface **24** and the flat range portion downwardly facing surface **32.** An intermediate portion **54** is disposed in engagement with the surface **32** and defines a downwardly facing upper spring seat receiving the upper end of the coil spring **18.** As shown, in order to center the spring end on the seat, the seal includes an annular depending ridge or projection **56.** The radial inner portion of the seal **18** provides an annular flexible lip **58** which extends upwardly within the flange portion cylindrical surface **30** and inwardly into engagement with the cylindrical periphery **40** of the movable member **38.** A downwardly facing annular surface **60** is also provided on the radially inward portion of the seal which is engageable with the upwardly facing surface **42** of the movable member **38** when the latter reaches its extended position.

The sprinkler head assembly is shown in FIG. **1** in its retracted inoperative position installed within the ground and connected with an inlet pipe. As shown, a controllable source of water under pressure has been shut off from communication with the inlet pipe so that the spring **16** resiliently biases the member **38** into the retracted position shown. In this position the outer portion **52** of the seal **18** forms a static seal between the housing member **20** and **26** by engagement with surfaces **24** and **32** thereof respectively. This static seal remains throughout the cyclic operation of the sprinkler. The intermediate portion **54** provides a spring seat for the upper end of the spring **16** with the annular projection providing a centering function on the spring. The lip **58** extends upwardly within the interior peripheral surface **30** into engagement with the exterior peripheral surface **40** thus providing a resilient centering action on the retracted housing member and a seal preventing debris from entering the interior of the sprinkler head.

When the controllable source of water under pressure is turned on, this water is communicated with the bottom interior of fixed housing member **20** by the inlet pipe. As the interior of the sprinkler housing member fills up with water, the air is displaced outwardly through the spray head **34.** When the water initially reaches the seal **18,** its pressure acting on the interior of the lip **58** tends to deflect the same permitting an upward water leakage thereby which positively tends to prevent debris from entering the interior of the housing member. When the water has completely filled the housing members **20** and **38,** the differential pressure thereof acts upon the movable housing member **14** as a piston with the fixed housing member **12** acting as a cylinder and the lip acting as an annular seal therebetween to establish an upward force on the member **14** which overcomes the bias of the spring **16.** As best shown in FIG. **3,** during the resultant upward or extending movement of the member **14,** the lip continues to provide a centering action as well as the aforesaid one way sealing action. The upward movement of member **14** is halted by the engagement of the upwardly facing annular surface **42** thereof with the downwardly facing annular surface **60** of the seal **18** as shown in FIG. **4.** The inter-engagement of these two surfaces provides an effective water-tight seal which prevents leakage and insures flow of water outwardly of the housing only through the spray head **34** as is desired.

When the water source is again shut off, the upwardly acting pressure force of the water is reduced so that the downward bias of the spring **16** becomes dominant thereby resulting in a downward movement of the movable member **14** from its extended operative position into its retracted inoperative position. As the member **14** moves from its extended position the surface **42** thereof moves away from seal surface **60** thus breaking the operative seal therebetween. During the downward movement of the member **14,** the engagement of the lip **58** with the exterior periphery **40** thereof provides a centering and wiping action thereon as best shown in FIG. **5.**

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing preferred specific embodiment has been shown and described for the purpose of illustrating the functional and structural principles of this invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

What is claimed is:

1. A pop-up sprinkler comprising:

a housing assembly including separable parts adapted to be stationarily mounted in the ground and to be communicated with a source of water under pressure,

a sprinkler head assembly carried by said housing assembly for movement from a retracted storage position therein into an extended operative position in response to the communication of said water source with said housing assembly,

coil spring means between said housing assembly and said sprinkler head assembly for resiliently urging

said sprinkler head assembly into said retracted storage position in response to the closing of communication of said water source with said housing assembly, and

a multiple-purpose one-piece annular seal cooperatively engaging said housing assembly, said sprinkler head assembly and said coil spring means,

said annular seal having means for performing the following specified functions: (1) provide a static seal between said separable parts of said housing assembly (2) provide a spring seat for one end of said coil spring means, (3) provide a pressure responsive leakage path between said housing assembly and said sprinkler head assembly for passage of water upwardly and outwardly therethrough when the water source is initially communicated with said housing assembly to thereby remove contiguous debris and prevent the passage of debris downwardly therethrough during the extending movement of said sprinkler head assembly, (4) provide an operative static seal between said housing assembly and said sprinkler head assembly when the latter is in its operative extended position, and (5) provide a wiping and centering action on said sprinkler head assembly during the retracting movement thereof.

2. A pop-up sprinkler comprising:

a housing assembly adapted to be stationarily mounted in the ground and to be communicated with a source of water under pressure,

a sprinkler head assembly carried by said housing assembly for movement from a retracted storage position into an extended operative position in response to the communication of said water source with said housing assembly;

coil spring means between said housing assembly and said sprinkler head assembly for resiliently urging said sprinkler head assembly into said retracted storage position in response to the closing of communication of said water source with said housing assembly, and

a multiple-purpose one-piece annular seal cooperatively engaging said housing assembly, said sprinkler head assembly and said coil spring means,

said housing assembly including (1) a first vertically extending annular housing member having a lower end portion provided with means for receiving water under pressure therein and an open upper end portion terminating in an upwardly facing annular end surface and (2) a second annular housing member including a tubular portion detachably secured to the exterior of said first member upper end portion and a flange portion extending radially inwardly therefrom and terminating in a generally cylindrical surface, said flange portion having a downwardly facing annular surface extending radially between said tubular portion and said cylindrical surface,

said sprinkler head assembly including (1) a vertically movable member having an exterior cylindrical periphery of a size slightly less than the cylindrical surface of said flange portion terminating at its lower end in an upwardly facing radially outwardly extending annular surface and (2) means on said movable member defining a lower annular spring seat receiving the lower end of said coil spring means disposed vertically below and radially outwardly with respect to said annular surface,

said annular seal including (1) a radially outer portion disposed between and forming a static seal between said first member end surface and said flange portion downwardly facing surface, (2) an intermediate portion defining an upper spring seat receiving the upper end of said coil spring means, and (3) a radially inner portion having (a) an annular flexible lip extending upwardly within said flange portion cylindrical surface and inwardly into engagement with the cylindrical periphery of said movable member so that when the water source is initially communicated with said housing assembly water will leak upwardly and outwardly between said cylindrical peripheral and said annular lip through pressure responsive deflection of the latter to remove contiguous debris therefrom and prevent the passage of debris downwardly therethrough during the extended movement of said sprinkler head assembly, (b) a downwardly facing annular surface engageable with the upwardly facing surface of said movable member when the latter reaches its extended position to provide an operative seal between said second housing member and said movable member, and (c) sufficient flexure strength to enable said annular lip to provide a wiping and centering action on the cylindrical periphery of said movable member during retracting movement thereof.

3. A pop-up sprinkler as defined in claim **2** wherein the intermediate portion of said seal includes a depending annular ridge engaging the upper end of said coil spring means to center the same.

4. A pop-up sprinkler as defined in claim **2** wherein the downwardly facing annular surface of said seal is disposed within a radial plane.

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