United States Patent

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[54] **POPUP SPRINKLER**
9 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **239/204**
[51] **Int. Cl.** **B05b 15/10**
[50] **Field of Search** 239/201, 203, 204, 206

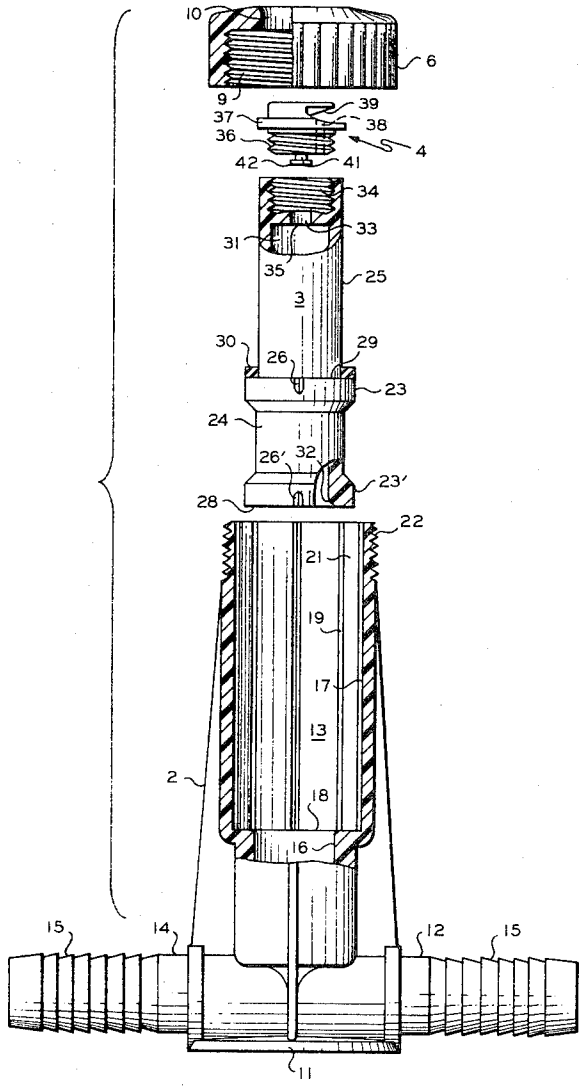
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ABSTRACT: A popup sprinkler unit is provided for use in watering lawns, gardens, and the like which comprises an elongated casing the majority of which is located beneath the surface of the ground, a riser, and a removable cap having an opening therein, the riser extending through the opening in the cap when water pressure is applied to the unit. The riser is provided with a spray head having adjustable pressure means therein, and the configuration of the riser and casing is such that the riser can be removed from the casing.



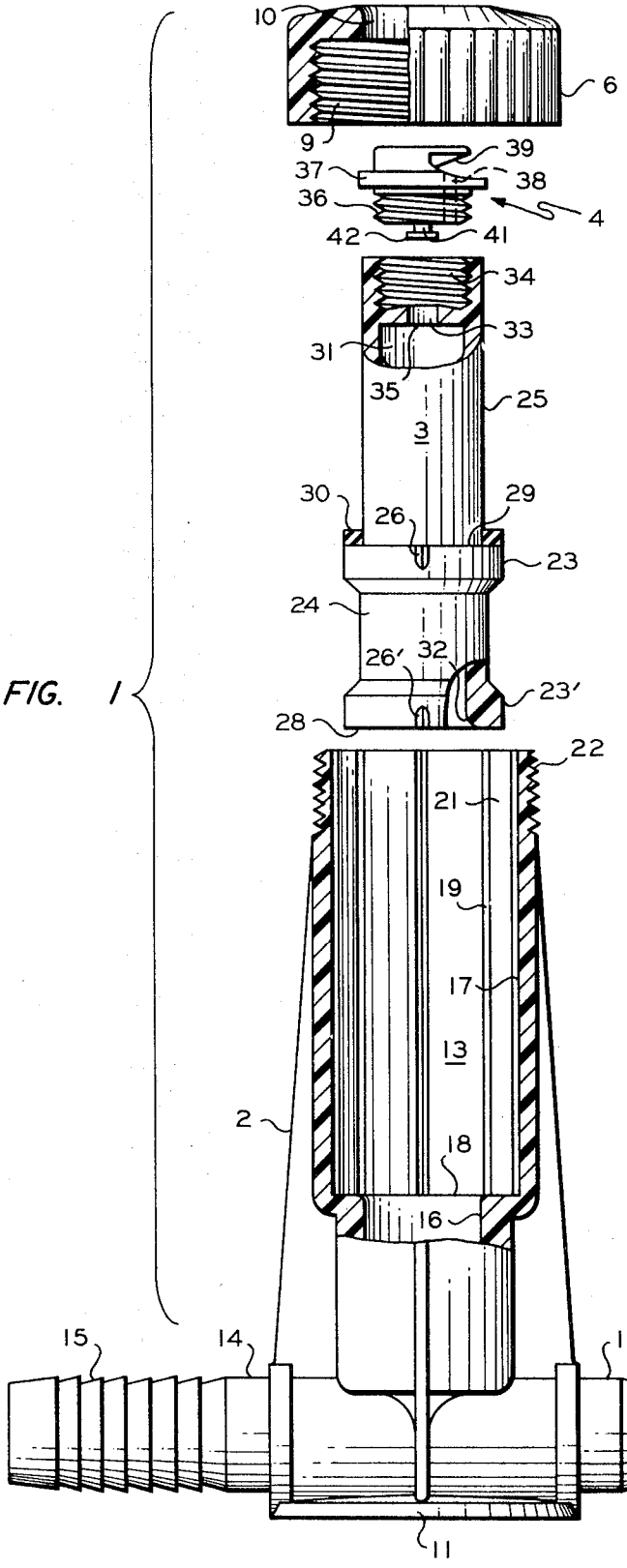


FIG. 1

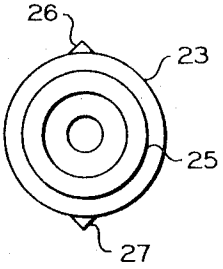


FIG. 2

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POPUP SPRINKLER

FIELD OF INVENTION

This invention relates to a popup sprinkler unit which can be used to water lawns, gardens, and the like. In another aspect, this invention relates to a popup type of sprinkler unit having a directional spray device which allows change in the direction of the spray without removal of the entire sprinkler unit from the ground. In another aspect, the invention relates to a popup sprinkler head having a simplified construction which permits the removal of dirt, gravel, and the like which tends to impair the function of the popup unit without removal of the unit from the ground.

BACKGROUND OF THE INVENTION

For many years there has existed a demand for underground sprinkler systems which are of low cost, easy installation, ease of maintenance, and which have relatively long useful lives in serving the purpose of watering lawns, gardens, and the like. However, the devices which have been utilized heretofore to provide underground sprinkler system units have suffered from the fact that they have limited utility for the average homeowner, are of high cost, and difficult to maintain. In particular, the art has recognized a need for a spraying unit of the popup type which would allow maintenance by the average homeowner, to provide ease of operation and practical utility for such a consumer. The instant invention is designed to meet this need.

DESCRIPTION OF THE PRIOR ART

Heretofore, popup sprinklers have been of such design that a number of problems has resulted in the use of these units. The units of the prior art have been relatively complicated in construction, and, accordingly, it has been difficult for the individual homeowner to repair when the unit becomes silted in with gravel or dirt or grass. Furthermore, failure of one of the component parts of the popup sprinklers has required a competent mechanical artisan to repair such a unit. Such repair is expensive and detrimental to the ground area immediately surrounding the prior art units in that they must be removed from the ground to facilitate repairs. Furthermore, since the popup risers of the prior art sprinkler are not removable therefrom without removal of the entire sprinkler unit from the ground, it is impossible for the consumer to change the direction of spray which emanates from the sprinkler head. A suitable example of a popup unit wherein the riser of the sprinkler unit is not removable without removing the entire unit from the ground is U.S. Pat. No. 2,989,246, issued June 20, 1961, filed June 15, 1959, G. L. Sloane.

OBJECTS OF THE INVENTION

Accordingly, it is an object of this invention to provide a popup sprinkler unit of simplified design and construction which has as a feature ease of maintenance.

It is another object of the invention to provide a popup sprinkler unit having a directional spraying means which can be repaired or oriented to alter the position of the spraying pattern by the user of the unit, without removal of the unit from the ground.

It is a further object of this invention to provide a popup sprinkler unit which can be easily cleaned subsequent to silting by removal of the riser and cap portion structures of the unit by flowing water through the casing structure without removal of the unit from the ground.

SUMMARY OF THE INVENTION

In accordance with the invention, the popup sprinkler of the invention comprises a casing unit having suitable fluid inlet means therein, a popup riser which is positioned within a bore of the casing, the bore being in communication with the fluid inlet means, and a cap having an opening therein with suitable

connecting means for attachment of the cap to the upper portion of the casing. The riser is extendable through the opening in the cap.

Further in accordance with the invention, positioned on the uppermost extent of the riser, there is provided a spray device having suitable connecting means for connecting the spray device with the upper portion of said riser. The spray device can be directional if desired.

Further in accordance with the invention, the bore of the casing is provided with a plurality of grooves which thereby forms lands within the perimeter of the casing bore. The riser is equipped with ribs on the outermost surface of the riser which are designed to be coincidentally fitted with the grooves in the casing bore. The main outer perimeter of the riser is therefore positioned in spaced relation with the lands of the bore.

Further in accordance with the invention, the riser is provided with a fluid passageway running throughout its longitudinal length, and having at the upper portion thereof, immediately below the directional spray head, an opening which is in space relation to a downwardly extendable plate which is positioned within the directional spray head.

Further in accordance with the invention, the bottom portion of the riser passageway has an outwardly extending surface from the interior of the passageway to the exterior of the outer surface of the riser thereby providing a pressure-responsive surface to lift the riser to the extendable spraying portion when fluid flows into the bore of the casing.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be better understood with reference to the drawing wherein:

FIG. 1 is a side view of the component parts of a sprinkler unit of the invention partially in cross section to reveal the internal aspects of the sprinkler unit.

FIG. 2 is a top view of the riser removed from the casing which has the directional spray head removed therefrom.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. 1 of the drawing, the popup sprinkler unit of the instant invention comprises a casing 2, riser 3, spray head 4, and cap 6. With regard to casing 2, there is provided a base 11 which is preferably flat which provides a support means upon which the unit rests when suitably inserted in a depression in the ground. Immediately above base 11 there is provided a fluid inlet means 12 which communicates internally with a bore 13 of the casing. Optionally, there can also be provided a fluid outlet means 14 to provide a suitable flow path for fluid to additional sprinkler units.

The fluid inlet means 12 and 14 as depicted in the drawing comprises a conduit having on the outer surface thereof integral ribs 15 which provide a suitable connecting means for insertion of pipe over the ribs. The pipe utilized to provide the fluid source to the casing has an internal diameter which is only slightly greater than the outer diameter of the ribs 15. Accordingly, the pipe can be slipped over ribs 15 and fastened by a suitable ring-type clamp. However, it is to be understood that the fluid inlet means is not limited to the conduit having the rib-type projections as shown. It is within the scope of the invention to provide other conventional types of couplings for the inlet and outlet connections which are required to provide a source of fluid to the unit.

As mentioned above, inlet conduit 12 communicates with casing bore 13. Bore 13 at its lower extent has a reduced diameter as shown by reference number 16. The upper portion of bore 13 has a greater diameter as shown by reference number 17. The reduction of the diameter of the bore in the lower extent of the casing provides a seat 18 upon which the lowermost extent of riser 3 rests when riser 3 is in a retracted position.

The upper portion of the bore extending above seat 18 is provided with a plurality of grooves 19. The grooves 19 within

casing bore 13 are oppositely disposed one from the other. That is to say, the grooves are stationed within the bore so that their position one from the other lies on a straight line traversing the diameter of the bore. The plurality of grooves provides a raised surface between each successive member of the grooves, these being designated as lands by reference number 21. Preferably, the casing bore is provided with at least six grooves positioned so as to provide three pairs, each member of a pair being disposed in a straight line one from the other.

Casing 2 at its uppermost extent is provided with a connecting means 22 for cap 6. Preferably, connecting means 22 comprises suitable threads which are provided on the outer surface of the upper portion of casing 2. However, it is within the scope of the invention to provide other suitable closure means for cap 6 such as a snap-fitted arrangement between the outer surface of casing 2 and the internal edges of cap 6. The essential requirement with regard to the connecting means 22 is that it be sufficiently strong to withstand fluid pressure as it is exerted upon cap 6 by the flow of fluid through casing bore 13 and riser 3. In particular, when fluid pressure is exerted upon the riser forcing it to extend into the popup position as explained hereinafter, riser 3 will exert an upward pressure upon cap 6. In order to form a seal which prevents substantial amounts of water from flowing through opening 10 within cap 6 it is necessary that connecting means 22 be of sufficient strength to withstand the force exerted upon cap 6 by the impact of riser 3.

Referring now to the riser 3, it is a cylindrical member having an outside diameter at its lower portion 23 which is greater than the outside diameter at its upper portion 25. The diameter 23 is less than the diameter of the upper portion 17 of casing bore 13. The spaced relationship between the outer surface 23 and that of the lands 21 within bore 13 is such that there exists vertical freedom of motion with respect to the surface 23 and the lands 21. However, the space between the outer diameter 23 of the riser and that of the lands 21 is sufficient to allow a certain amount of the fluid flowing into bore 13 of casing 2 to bypass the outer diameter of the riser. Specifically, the space is sufficient to provide a flow of a certain amount of fluid between the lands 21 and the outer diameter 23 of the riser thereby providing a certain amount of lubricating effect as the riser is forced into an extendable position. This lubricating effect is enhanced by the relationship of surface 24 to the surface 23. Surface 24 has a diameter which is less than that of 23 but which is greater than the outer diameter of the upper portion 25 of riser 3. When the flow of fluid is instigated into bore 13 thereby forcing the riser to begin to rise, a certain amount of the fluid bypasses the space between surface 23 and the lands 21, the flow of fluid throughout being aided by the grooves 19 in casing 2 thereby effecting a lubricating and cleaning effect with regard to the motion of riser 3 as it extends upwardly. However, it is within the scope of the invention to have a riser of the design wherein the reduced diameter occasioned by surface 24 between surface 23 is omitted therefrom.

Provided on surface 23, opposite one from the other, are a pair of projections which are designed to be fitted within the grooves 19 of casing bore 13. Projections 26 and 26' are shown in FIG. 1, these being one member of the pair of ribs which are oppositely disposed. Ribs 26 and 26' are considered one member of the pair of ribs because of the embodiment mentioned above wherein the riser 3 does not have a reduced diameter 24. When this latter embodiment is considered, it is clear that the ribs could be continuous on surface 23 from the bottom of riser 3 to the area of reduced diameter 25. The opposite nature of the ribs is shown in FIG. 2 wherein rib 26 is seen to be opposite rib 27. The arrangement of ribs 26 and 27 with their oppositely disposed members provides a means of preventing rotational movement of the riser within casing bore 13. In addition, since as defined above the plurality of grooves are in oppositely spaced relationship one from the other within the interior surface of bore 13, the arrangement of the ribs 26 and 27 and their oppositely disposed members upon the surface 23 and 23' provides a method of alteration of the directional spray head 4 which is mounted in the upper portion of riser 3. Further explanation of this feature of the invention will be provided when the operation of the unit is discussed in more detail hereinafter.

The increased diameter of surface 23 in relationship to the surface 25 of riser 3 provides a seat 29 upon which a sealing ring 30 is positioned. The sealing ring can be made of natural or synthetic rubbers or plastic. The ring provides a seal between riser 3 and the interior surface of cap 6 when the riser is in the extendable spraying position thereby preventing substantial amounts of fluid to flow through the opening 10 in cap 6.

Riser 3 has positioned therein an interior passageway 31 having a diameter less than that of surfaces 23, 24 and 25. At its lowermost portion, passageway 31 extends outwardly to provide a sloping annular surface 32. The outwardly tapering surface 32 terminates at its outermost extent with the lower surface of 23' thereby providing an annular edge 28 which rests upon seat 18 of casing 2 when the riser is in the retracted position. The upper portion of bore 31 terminates in annular surface 35 and an opening 33 of reduced cross section extending from the upper portion of bore 31 into a threaded opening 34 which is adapted to receive spray head 4. Fluid from inlet means 12 flows through the reduced diameter 16 of bore 13, contacts the interior of bore 31 and annular surfaces 32 and 35, thereby providing an enhanced lifting force on riser 3 to project it into the upwardly extended spraying position.

Spray head 4 is a unit having a lower portion 36 which is adapted to be threaded into threaded opening 34. With spray head 4 is provided an annular flange 37 which sets itself upon the uppermost surface of riser 3 thereby forming a seal in conjunction with threads 36 to prevent any substantial amount of fluid from bypassing spray head 4. Spray head 4 has a fluid passageway 38 which is located off center from the axis of spray head 4. Passageway 38 passes throughout the length of spray head 4 and terminates immediately below a curved ridge 39. Curved ridge 39 is such that when fluid passing through passageway 38 impinges upon surface 39 under high pressure, the impinging force causes the fluid flowing from passageway 38 to develop into a directional spray pattern of approximately 45°.

The regulation of fluid passageway 38 is accomplished by means of a threaded stem 41 located on the center axis of spray head 4, having at its lower end a check plate 42. The upper end of threaded stem 41 is provided with a slot, not shown, which is adapted to be actuated by a conventional screwdriver. When spray head 4 is situated within the threaded section 34 of riser 3, check plate 42 on stem 41 is positioned immediately above opening 33. By turning the threaded stem 41 by means of the conventional screwdriver, the space between check plate 42 and opening 33 can be varied, thereby regulating the amount of fluid which is allowed to pass from the interior passageway 31 through opening 33 and thus through passageway 38 to form the fluid spray which exits the sprinkler unit.

Cap 6 of the unit is provided with threads 9 and opening 10. Opening 10 is of a greater diameter than that of the upper diameter 25 of riser 3, but of a smaller diameter than the diameter of the lower portion 23 of riser 3. The threads 9 are designed to fit coincidentally with the threaded section 22 of casing 2.

In operation, the sprinkler unit of the invention is suitably connected by means of conduits 12 and 14 to a fluid source which is located beneath the surface of the ground. The unit is conveniently buried in the ground up to and including the level of the upper portion of cap 6. When fluid is forced through conduit 12 into passageway 13, it impinges upon the surfaces 32 and 35 of riser 3. Fluid pressure thereby forces riser 3 upwardly through the opening 10 in cap 6 to an extended position to the point where rubber seal 30 impinges against the outer edges of opening 10 in cap 6. The extended

riser thereby receives flow of fluid through casing bore **13**, bore **31**, opening **33**, passageway **38**, and spray device **4**, thereby causing spray to exit the spray head and to provide fluid to the surface of the ground at an approximate 90° pattern from the position of the sprinkler unit.

Among the many salient features of the invention are the operation of the system with regard to seasonal changes in weather in more nontemperate climate zones wherein seasonal weather changes prevent the use of the system during exceptionally cold weather. After such seasonal changes, it is most common to find that sprinkler units of the prior art are in such condition that no sufficient amount of water is available to completely unsilt the sprinkler units of the prior art. The sprinkler unit of the instant invention, however, is of such simplified construction and design that it enables any ordinary consumer to easily free the underground sprinkler units without removal of the unit from the ground.

This operation simply involves removal of cap **6** by unscrewing the threads **9** and **22**, and removing the riser which contains a directional device **4** from casing **2**. Any silt which is accumulated within grooves **19** or between the surface **23** of riser **3** and the lands **21** of bore **13** can easily be removed by simply turning on the fluid force and flushing out the casing bore **13**. Additionally, this method of operation also provides a simple way of cleaning pipes which are utilized to transport fluid into and out of the unit. The removed riser can easily be cleaned by simply running water into passageway **31** from a conventional faucet. Additionally, directional spray device **4** can easily be unscrewed and openings **33** and **34** cleaned thereby.

Another of the salient features of the sprinkler unit of the invention resides in the ease of changing the direction of the spray which emanates through sprinkler head **4** without necessitating removal of the unit from the ground. Once again cap **6** is simply unscrewed and the riser is removed from casing **2**. The ribs **26** and can may then be positioned within different grooves **19** of casing **2** thereby orienting the spray head to a different direction. The riser is therefore inserted into a separate pair of grooves, the cap screwed on and the flow of fluid restored to the unit. This allows the user to vary the 90° spray pattern within a 360° arc depending upon the desired spraying area. It is often encountered when watering lawns and gardens that certain areas thereof require more water to maintain the appearance of that area than others. Accordingly, the sprinkler unit of the instant invention provides an easy method of altering the directional spray to provide more or less water to various areas within the coverage of the spraying device. Moreover, the ability to change the direction of the spraying zone involves a savings to the user in that a more efficient use can be made of the available water supply. Furthermore, it is often encountered when watering lawns in windy areas that changes in wind direction will occasion the waste of water because of the spray's being blown out of the desired area. Accordingly, an economic savings on water use is occasioned to the user by varying the direction of the spray in accordance with the invention.

The materials which are employed in the construction of the unit and its component parts are not critical to the invention, with the exception that they be sufficiently strong and sturdy to withstand exposure to water, normal variations in temperature, and contact with soil and conventional fertilizer materials. Preferably, the casing, riser and cap are made of high density polyethylene having a density between 0.94 and 0.96. The spray head **4** is preferably made of brass. The casing **2**, riser **3** and cap **6** of the invention can easily be made by conventional molding techniques well known to those skilled in the art.

Reasonable variations and modifications of the invention will be apparent to one skilled in the art from a study of the disclosure, drawing and appended claims. The instant invention encompasses a popup sprinkler device having an elongated casing, a popup riser having a spray device mounted thereon, and removable cap having an opening therein through which the riser can pass when extended. The casing is provided with a plurality of grooves which are designed to be coincidentally fitted with a pair of oppositely disposed ribs on the outer surface of the riser thereby preventing rotational movement and provide a means of adjusting the directional spray emanating from the spray head. The instant invention provides a unique combination of features which enables the user to maintain the unit in operation without the necessity of removal of the unit from the ground.

I claim:

1. A popup sprinkler which comprises

1. an elongated casing having a passageway throughout its length and communicating therewith at least a fluid inlet means, the passageway being provided with at least two pairs of grooves positioned longitudinally along said passageway and arranged so that one member of a pair is positioned directly opposite from the position of the other member of the pair, and the upper portion of the casing having suitable means to receive a cap;
2. a riser having a passageway throughout its length and having an outer perimeter at its lower portion which is greater than the outer perimeter at its upper portion, the lower portion being designed to be placed in nonrotatable upwardly movable relationship with the passageway of the casing by means of ribs which are fitted within at least one pair of the grooves of the casing, the riser having at its uppermost extent means to receive a sprayhead; and
3. a cap having an opening therein which allows the passage of the upper portion of the riser therethrough and having suitable removable connecting means for the placement of the cap on the upper portion of the casing whereby the spray pattern may be altered by removal of said riser from said at least one pair of grooves and rotating said riser to fit in said other pair of grooves.

2. A sprinkler according to claim **1** which also includes a sealing means which is positioned about the outer perimeter of the upper portion of the riser immediately above the lower portion of the riser thereby preventing the flow of fluid through the opening in the cap when the riser is in an extended position.

3. A sprinkler according to claim **2** wherein the upper portion of the passageway of the riser immediately below the spray head connecting means comprises a passageway of reduced perimeter which in combination with an adjustable stem within the spray head provides regulation of the amount of fluid which flows through the spray head.

4. A sprinkler according to claim **3** wherein the spray head is directional.

5. A sprinkler according to claim **2** wherein the passageway throughout the casing has a reduced perimeter at its lower portion which is in communication with the fluid inlet means, and immediately above the lower portion of the passageway of the casing the upper portion of the passageway has a perimeter greater than the lower portion wherein said grooves are positioned, the arrangement thus providing a seat upon which the lower portion of the riser rests when in a retracted position.

6. A sprinkler according to claim **5** wherein the lower portion of the riser comprises three sections, the first section having a perimeter which is removably placed in space relationship with the passageway of the casing and which has positioned thereon a pair of oppositely disposed ribs which are nonrotatably fitted into one of the pair of grooves of the passageway of the casing, a second section located immediately above the first section having a reduced perimeter in relationship to the first section, and a third section located immediately above the second section having a perimeter which is substantially the same as the first section and having located thereon oppositely disposed ribs which are nonrotatably fitted in one of the pair of grooves of said casing in cooperation with the ribs located on the surface of the first section.

7. A sprinkler according to claim **6** wherein the passageway within the casing communicates with both a fluid inlet and a fluid outlet means, said inlet and outlet means being provided

on the outer surface thereof with a plurality of integral ribs which in conjunction with a suitable clamp are designed to attach a fluid conveying means to said fluid inlet and outlet means.

8. A sprinkler according to claim 7 wherein the cap, riser, and the casing are made of polyethylene having a density of between 0.94 and 0.96.

9. A sprinkler according to claim 5 wherein the connecting means of the casing and the cap comprises threaded means located on the upper portion of the casing and on the internal surface of the cap thereby providing a seal which prevents fluid from flowing past said threaded means.