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SELF-ARIGHTING SPRINKLER HEAD

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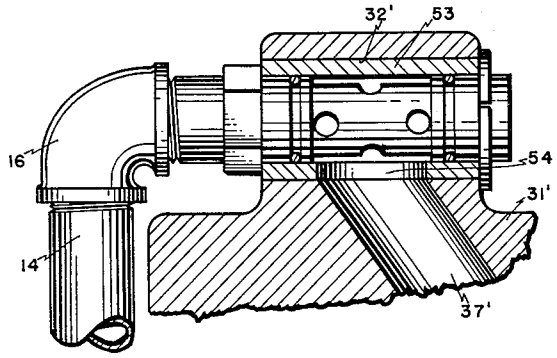


FIG. 3

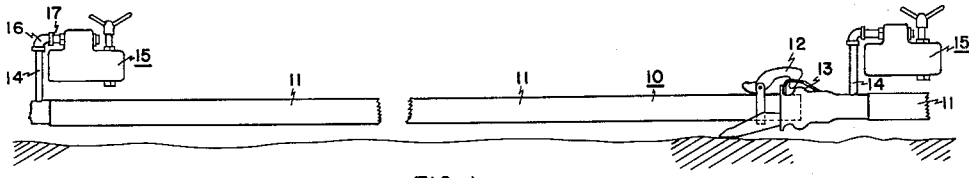


FIG. 1

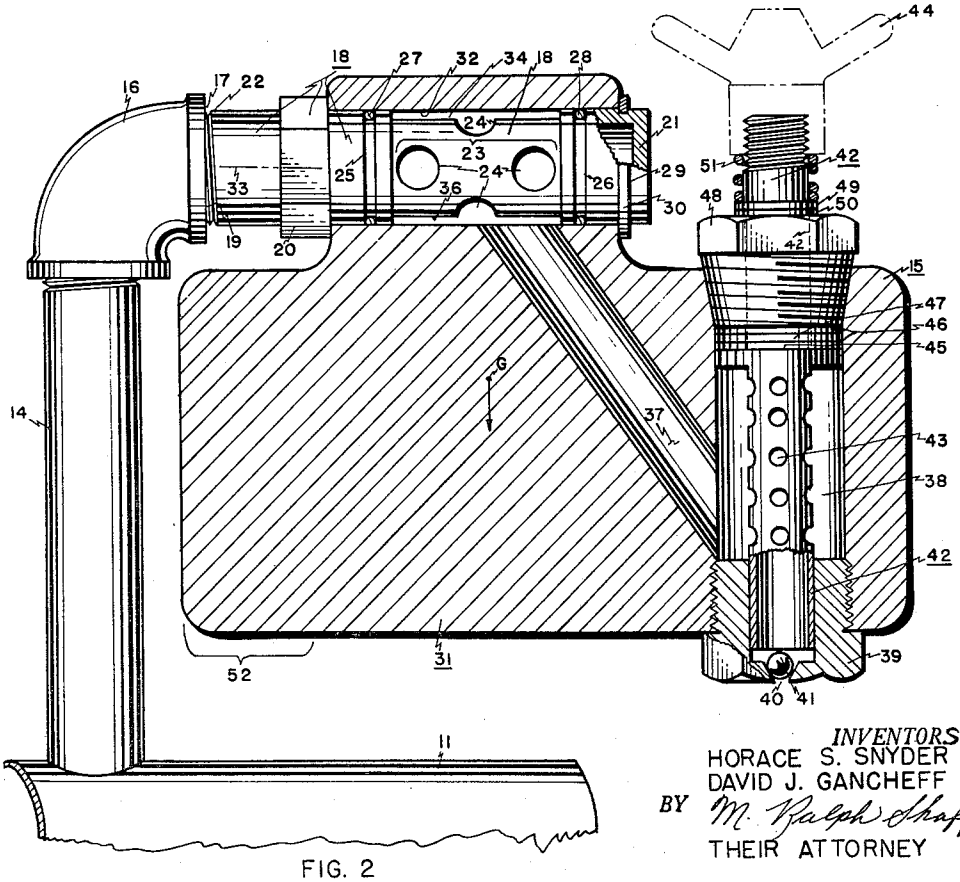


FIG. 2

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SELF-ARIGHTING SPRINKLER HEAD

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The present invention relates to self-arighting sprinkler heads for lateral lines for field irrigation systems, for example, and, more particularly, to a new and improved, self-arighting sprinkler head wherein the same is adapted for easy coupling to the riser of any lateral line section through an appropriate elbow in a convenient manner and which, further, is assured of long life and efficient performance.

The principal object of the present invention is to provide a new and improved, self-arighting sprinkler head for any one of a variety of sprinkler systems.

A further object of the invention is to provide a self-arighting sprinkler head which will be assured of long bearing life, both at the swivel mounting connection and the rotator connection, so that long, continuous and faithful performance can be assured.

A further object of the invention is to provide an improved, self-arighting sprinkler head which can be manufactured at relatively low cost.

A further object is to provide a sprinkler head of the type described wherein by means of the provision of a unique eccentric bearing block, the center of gravity thereof will be disposed not only beneath the axis of the swivel connection of the sprinkler head, but will also lie at a medial position with respect thereto and therebeneath.

A further object is to provide an eccentric bearing block wherein an oblique passageway is provided between the horizontal and vertical bores thereof, which passageway may be provided for in the casting operation such that the core involved may be removed from the vertical bore aperture.

A further object of the invention is to provide an improved sprinkler head wherein drain and clean-out means are provided the vertical rotator stem bore area.

An additional object is to provide in a self-arighting sprinkler head spaced bearing means for journalling the rotator stem of the water discharge head so that the reactive forces exhibited at the water discharge head which are inherent in the sprinkler operation will not interfere with long life of the equipment.

An over-all object of the invention is to compensate for riser deviation from the vertical of lateral or other lines, which deviations may be caused by water hammer, torsional jar, ground contour, labor inefficiency in sectional assembly, or perhaps for other reasons.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which:

FIGURE 1 is an elevation of a lateral line of the ground supported type, illustrating the self-arighting sprinkler head of the present invention as being supported by and suspended from the riser thereof.

FIGURE 2 is an enlarged view, partially in section, of the self-arighting sprinkler head of the present invention and illustrates its attachment to a respective lateral line riser.

FIGURE 3 is a fragmentary view reduced in scale but similar to a portion of FIGURE 2, illustrating a modification of the sprinkler head of the invention.

In FIGURE 1 lateral line 10 includes one or more lateral line sections 11 which are connected together in end-to-end fashion. To facilitate coupling and uncoupling of the sections 11, present coupling designs include some kind of loose fitting connection which itself includes a gasket which, under pressure, is caused to expand or flatten out and thus seal the coupling connection. In the absence of water pressure the gasket (not shown) will resume its original shape and thus permit the coupling to be unhooked, in one form of coupler, by the selective raising of hook 12 from its seat 13. There are many types of designs of lateral-line section couplers, double couplers, ball couplers, and so forth. The particular type of coupling used for the lateral line, and whether or not the lateral line is engineered to rest upon the ground or otherwise, forms no part of the present invention.

Whatever the form of inter-section coupling, the possible rotational displacement of one lateral line section with respect to other sections, or the presence of other distortional phenomena which may be involved, is compensated for by the present invention so that whatever the displacement of the lateral line risers from the vertical, the self-arighting sprinkler heads 15 will maintain an erect position with respect to the vertical so that the sprinkling operation may be accomplished as efficiently and as satisfactorily as possible.

With reference to the self-arighting sprinkler head 15 of FIGURE 1, the lateral section 11 includes riser 14 and elbow 16 having discharge mouth 17 and may be considered as being an external fluid source for the self-arighting sprinkler head 15.

In FIGURE 2 the structure of the self-arighting sprinkler head 15 is illustrated in detail. Sprinkler head 15 is shown to include a number of important components among which is the swivel coupler 18 which is threaded at 19 to thread into elbow 16, is provided with a wrench engageable portion 20, and largely resembles a stub tube or pipe having a closed end 21 and an opened end 22. The swivel coupler 18 is provided with a medial perforated region 23 having, as shown, one or more perforations 24. The swivel coupler 18 preferably includes exterior grooves 25 and 26, accommodating O-rings 27 and 28, and also an exterior groove 29 for retainer 30. The O-rings 27 and 28 supply liquid seals with respect to the perforated region 23. It will be noted that eccentric bearing block 31 is supplied and is provided with a bore 32 symmetrical about horizontal axis 33. While it is desired, of course, that O-ring seals or suitable substitutions such as "chevron" gaskets or any other type seals, be effective as liquid seals, yet, to preserve long life, there should be some metal-to-metal contact between swivel coupler 18 and eccentric bearing block 31 at bore 32.

Likewise preferably included in the design is an annular cavity 34 which is formed by the bore 32 and the annular, indented area 36 of swivel coupler 18. This provides a liquid well or reservoir for providing the most satisfactory communication for liquid from mouth 17 to passageway 37 of eccentric bearing block 31.

Rotator stem bore 38 is also supplied eccentric bearing block 31, and passageway 37 provides inter-communication between bores 32 and 38. Preferably for fabrication purposes, it is desirous that passageway 37 be obliquely oriented, as shown, between the two aforementioned bores and also be such that its projection will be through bore 38 to the exterior. This is for the purpose of casting eccentric block 31, if such is cast (as will generally be the case), in order that the core may be removed satisfactorily from the passageway 37 so that the part may be completed.

Threaded into the lowermost region of rotator stem

bore 38 is a lower bearing nut or plug 39. The latter is preferably fabricated from bronze and, in addition to serving as an optionally included drain port by virtue of aperture 40, constituting a ball seat, and ball 41, the same may interiorly receive and offer a bearing engagement for rotator stem 42. This rotator stem is supplied with at least one or a plurality of perforations 43 which receive liquid (i.e. water) from passage 38 and transfers the same to water discharge head 44, of a self-rotating, conventional design, to be ejected therefrom.

Rotator stem 42 includes an upwardly facing thrust shoulder 45 which is disposed against a fiber washer or, as shown, a washer sandwich comprising fiber washers 46 and a plastic washer 47 preferably fabricated from the material known in the trade as "Teflon." These washers offer bearing support and cooperation between a rotator stem 42 and the upper bearing nut or plug 48. Disposed about rotator stem 42 above bearing nut 48 are a pair of washers 49 and 50 which offer a liquid seal at washer 50 and bearing engagement at washer 49 for compression spring 51.

It will be noted that there is a lateral extension portion 52 of the eccentric bearing block 31. This portion 52 serves to counterbalance the rotator stem and discharge structure to the right of retainer 30 so that the center of gravity G, in addition to being disposed beneath the axis 33 by virtue of the eccentrically positioned bore 32, will also lie medially of the swivel coupler 18. Thus, the weight of the bearing block 31 and its associated structure will be carried evenly by swivel coupler 18 without gravity produced torque by virtue of the weight of water discharge head 44, rotator stem 42 and the related equipment. Hence, bearing life at the journal of swivel coupler 18 within its journal will be preserved.

The structure of FIGURE 3 is shown in fragmentary view only and is substantially identical to the structure of FIGURE 2, save for the inclusion of a bearing sleeve 53 which is pressed into bore 32′ of eccentric bearing block 31′. Otherwise, the structure of eccentric bearing block 31′ and its related equipment is identical to the block 31 of FIGURE 2. Sleeve 53 will of course include an aperture 54 which registers with passage 37′ (similar to 37 in FIGURE 2). The pressed sleeve 52 will be used where, for example, the bearing block 31 is of cast iron and, to avoid rust problems and preserve the bearing life, a bronze sleeve 53 is desired where the bearing block 31 in FIGURE 2 is cast from aluminum or non-ferrous material, then no rust problem is present and no sleeve required.

The structure of FIGURES 1–3 operates as follows. (Since the structure in FIGURE 3 operates in an identical manner as that shown in FIGURE 2, FIGURE 3 will not be discussed separately.) Whether riser 14 has a strictly vertical disposition or is slightly displaced from its vertical by virtue of the angular displacement of lateral line section 11, the eccentric bearing block 31 will always be displaced in a vertical plane. This phenomena is made possible by the rotational displacement of eccentric bearing block 31 about swivel coupler 18 in accordance with gravity acting on the center of mass or gravity at G which is disposed below axis 33. The materials used for bearing block 31, etc. will be such that the friction drag by the metal-to-metal contact of swivel coupler 18 with bore 32 (and O-rings 27 and 28 with bore 32) is overcome for the slightest displacement (for example, of the order of four degrees or more) of riser 14 from the vertical. Apertures 24 should be as large as possible, without of course weakening the swivel coupler part (18) so that a maximum of water flow will be insured through apertures 24, the cavity area 34, and through passageway 37 to rotator stem bore 38. Again, where passageway 37 is obliquely oriented as shown in FIGURE 2 of the drawing the casting operation is facilitated by the casting core being removable in a direct line through the lower end of bore 38.

The perforations 43 of rotator stem 42 should be much smaller and more numerous than perforations 24. When so constituted the perforations 43 serve as a screen to screen out debris passing through riser 14 so that, when a sprinkling operation is completed, the used may simply remove the lower bearing plug 39 (or possibly the upper bearing nut or plug 48 or both) so as to clean out the rotator stem bore 38. In this manner, the foreign particles will not be passed through water discharge head 44 so as to clog the same.

In being provided with bearing means (39 and 48) which are spaced apart, rotator stem 42 will be assured long bearing life and which will be much superior to the situation where the bearing means are simply disposed proximate the water discharge head 44 only. Spring 51 lifts upwardly upon water discharge head 44 so that an appropriate contact is shared between shoulder 45 and the lowermost one of fiber washer 46. The water discharge head 44 in itself may take any one of several forms, being of such a design as to rotate under its own water pressure in a conventional manner. It is to be noted that there will be no interference between the water discharge head and the swivel coupler 18.

Lower bearing plug 39 serves not only as a bearing and a drain means but also as a means for lowering the center of gravity of eccentric block 31 which is desired.

In summary, the present, self-arighting sprinkler head serves in accomplishing a number of operational advantages as hereinbefore set forth, is inexpensive to manufacture, and accommodates, thus, for angular displacements of lateral line sections, whether a ground or other type lateral is involved, so as to compensate for the deviations of risers 14 in FIGURE 1 from the vertical whenever such exists and for whatever reasons.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

We claim:

1. A self-arighting sprinkler head including, in combination, a horizontally disposed, swivel coupler having a horizontal axis, said swivel coupler being hollow, open at one end, closed at the remaining end, provided with a perforated region medially disposed between said ends, and adapted for coupling to an aligned, rigid mouth of an external fluid source at said open end; an eccentric bearing block provided with a horizontal, eccentrically disposed bore, said bearing block being eccentrically journalled upon said swivel coupler over said perforated region thereof for rotation about said horizontal axis, said eccentric bearing block being provided with a vertical, rotator stem bore proximate said closed end of said swivel coupler, said eccentric bearing block also being provided with a passageway interconnecting said eccentrically disposed bore and said vertical, rotator stem bore; bearing means disposed within said rotator stem bore; a rotator stem having a perforated portion communicating with said passageway, said rotator stem being journalled within said bearing means; and a water discharge head affixed to said rotator stem and adapted to rotate without obstruction with respect to said swivel coupler, the center of gravity of the eccentric bearing block and all that is affixed thereto to rotate therewith about said horizontal axis of said swivel coupler being disposed below said horizontal axis thereof.

2. Structure according to claim 1 wherein said bearing means comprise first and second bearing means spaced and disposed on opposite sides of the region where said passageway communicates with said rotator stem bore, said first bearing means being disposed at a lowermost region of said rotator stem bore, said second bearing

means being disposed at an uppermost region of said rotator stem bore.

3. Structure according to claim 1 wherein said sprinkler head includes a sleeve disposed within said horizontal bore for journalling said swivel coupler.

4. Structure according to claim 1 wherein said bearing block is configured to self-contain counterweighting laterally to dispose said center of gravity medially of said swivel coupler.

5. Structure according to claim 2 wherein said eccentric bearing block is provided with drain means communicating with said rotator stem bore.

6. Structure according to claim 2 wherein said first bearing means comprises a drain plug threaded into said eccentric bearing block and interiorly receiving and journalling said rotator stem.

7. Structure according to claim 2 wherein said second bearing means comprises a bearing plug threaded into said eccentric bearing block and interiorly journalling said rotator stem.

8. Structure according to claim 2 wherein said sprinkler head includes a compression spring, said rotator stem having an upwardly facing shoulder disposed beneath said second bearing means, washer means disposed about said rotator stem above said second bearing means, said spring being disposed between and engaging said washer means and said water discharge head, and bearing washer means disposed between and engaging said rotator stem shoulder and said second bearing means.

9. A self-arighting sprinkler head including, in combination, a horizontally disposed, swivel coupler having a horizontal axis, said swivel coupler being hollow, open at one end, closed at the remaining end, provided with a perforated region medially disposed between said ends, and adapted for coupling to an aligned, rigid mouth of an external fluid source at said open end; an eccentric bearing block provided with a horizontal, eccentrically disposed bore, said bearing block being eccentrically journalled upon said swivel coupler over said perforated region thereof for rotation about said horizontal axis, means for retaining said bearing block about said perforated region; means for liquid sealing said perforated region of said swivel coupler with respect to said eccentric bearing block, said eccentric bearing block being provided with a vertical, rotator stem bore proximate said closed end of said swivel coupler, said eccentric bearing block also being provided with a passageway interconnecting said eccentrically disposed bore and said vertical, rotator stem bore; bearing means disposed within said rotator stem bore; a rotator stem having a perforated portion communicating with said passageway, said rotator stem being journalled within said bearing means; and a water discharge head affixed to said rotator stem and adapted to rotate without obstruction with respect to said swivel coupler, the center of gravity of the eccentric bearing block and all that is affixed thereto to rotate therewith about said horizontal axis of said swivel coupler being disposed below said horizontal axis thereof.

10. A self-arighting sprinkler head including, in combination, a horizontally disposed, swivel coupler having a horizontal axis, said swivel coupler being hollow, open at one end, closed at the remaining end, provided with a perforated region medially disposed between said ends, and adapted for coupling to an aligned, rigid mouth of an external fluid source at said open end; an eccentric cast bearing block provided with a horizontal, eccentrically disposed bore, said bearing block being eccentrically journalled upon said swivel coupler over said perforated region thereof for rotation about said horizontal axis, said eccentric bearing block being provided with a vertical, rotator stem bore proximate said closed end of said swivel coupler, said eccentric bearing block also being provided with an oblique passageway the projection to the block exterior of which passes through and interiorly of said rotator stem bore, said passageway interconnecting said eccentrically disposed bore and said vertical, rotator stem bore; bearing means disposed within said rotator stem bore; a rotator stem having a perforated portion communicating with said passageway, said rotator stem being journalled within said bearing means; and a water discharge head affixed to said rotator stem and adapted to rotate without obstruction with respect to said swivel coupler, the center of gravity of the eccentric bearing block and all that is affixed thereto to rotate therewith about said horizontal axis of said swivel coupler being disposed below said horizontal axis thereof.

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