RETRACTABLE STOP FOR A ROTARY SPRINKLER

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The present invention relates to a retractable stop for a rotary sprinkler and, more particularly, to a rotary reversible or oscillatory sprinkler including a retractable stop having an extended portion engageable with a second stop for limiting movement of the sprinkler during normal operation thereof but being yieldably retractable to avoid damage and maladjustment.

The retractable stop of the subject invention is excellently suited for use in sprinklers of the type disclosed in U.S. Patents Nos. 2,816,798 and 2,928,608. In fact, certain problems encountered by such sprinklers prompted development of the subject stop, which, however, is not limited to use in these particular operational environments.

The problems overcome by the subject invention are best explained after certain structure of such sprinklers is briefly summarized. A commercial embodiment of a sprinkler disclosed in one of the above cited patents includes a tubular bearing having a lower externally threaded end and an external hex-nut portion, and a fluid distributing head providing an elongated tubular shank rotatably mounted in the bearing. Ears are adjustably rotatably fitted on the bearing and radially outwardly extended therefrom in circumferentially spaced relation.

A stop finger is downwardly extended from the head between the ears for engagement therewith during rotation of the head to limit movement thereof in opposite directions. The ears are independently rotatably mounted on the bearing for adjusting the circumferential spacing therebetween to thereby adjust the arc of travel of the sprinkler head. For this purpose, collars including closely, circumferentially spaced teeth are fixedly mounted on the bearing individually adjacent to the ears. Detents are extended from the ears and selectively engaged between adjacent teeth on their respective collars. A coiled compression spring circumscribes the bearing and yieldably urges the ears toward their respective collars. In order to simplify manufacture and minimize cost, it has been the practice to mold the collars out of plastic material.

When a sprinkler of the construction outlined above is installed, the teeth on the collars have frequently been broken because of inattention to the proper manner of threading the bearing into the socket of a standpipe or coupling. Whereas a wrench should be fitted onto the hex-nut portion of the bearing to screw the latter into the socket, workmen have carelessly grasped the distributing head and attempted to screw it into the socket by hand. Torque is thus applied to the bearing because of the engagement of the finger with one of the ears and because of engagement of the corresponding dent with one of the teeth. The teeth are not intended to resist the forces required to thread the bearing tightly into the coupling and, accordingly, have frequently broken. With one or more of the teeth broken on the collars, full adjustment of the ears is no longer possible. Therefore, the collars must be replaced. This results in undesirable inconvenience and expense and is avoided by the stop of the present invention.

Accordingly, it is an object of the present invention to provide a retractable stop for rotary sprinklers.

Another object is to provide a rotary reversible or oscillatory sprinkler with a retractable stop having an extended position engageable with a second stop for limiting movement of the sprinkler during operation thereof but being yieldably retractable out of said limiting position when the stops are urged against each other with predetermined force.

Another object is to preclude damage to the teeth of an ear positioning collar as employed in rotary sprinklers of the type described above.

Another object is to minimize the expense and inconvenience resulting from repair and/or replacement of such collars.

Another object is to mount a retractable stop finger in such a manner as to retract when necessary but without interfering with the normal function of the stop in limiting movement of the sprinkler.

Other objects are to provide a retractable stop of the nature described which is adaptable for use in various sprinklers wherein problems similar to those described above are present, which is dependable in operation, and which is durable in construction.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawing, in which:

FIG. 1 is a side elevation of a rotary sprinkler incorporating a retractable stop which embodies the principles of the present invention.

FIG. 2 is a somewhat enlarged, horizontal section taken on line 2—2 in FIG. 1.

FIG. 3 is a somewhat enlarged, vertical section taken on line 3—3 in FIG. 1 and showing the stop in full lines in a limiting position and in dashed lines in a retracted position.

FIG. 4 is a somewhat enlarged, fragmentary section taken on line 4—4 in FIG. 2.

FIG. 5 is a somewhat enlarged, exploded, perspective view of the retractable stop of the present invention.

Referring more particularly to the drawing, a rotary sprinkler is generally indicated by the numeral 10. Except for the features of the present invention, this sprinkler is of the type disclosed in United States Patent No. 2,816,798. Detailed reference is made only to those parts of the sprinkler having particular relation to the subject invention. For a description of the construction and operation of this type of sprinkler, reference is invited to the cited patent.

The sprinkler 10 includes a tubular bearing 11 having a lower externally threaded end 12, an intermediate hex-nut portion 13, an upper and lower annular shoulders 14 in longitudinally spaced relation to each other, and a cylindrical bearing portion 15 between the shoulders. A standpipe 17 is fragmentarily illustrated in FIG. 1 is an upright position and provides an upwardly opening, internally threaded socket, not specifically shown. As is well-known, the threaded end of the bearing is adapted to be screw-threaded into the socket of the standpipe thereby to mount the bearing in an axially upright position. It is assumed in the following description that the sprinkler is operated in an axially upright position, but it is understood that the invention is not limited to this precise attitude.

Circular collars 20 are fitted on the bearing portion 15 individually against the shoulders 14. The collars have a plurality of relatively closely, circumferentially spaced teeth 21 in opposed relation to the teeth on the opposite collar. The collars are interconnected by a sleeve 23 circumscribing the bearing portion and fixed against rotation relative thereto, as by extension of a key, not shown, on the sleeve into a keyway, not shown, in the bearing portion, as is known in the art. It is to be noted that the collars and the sleeve are usually molded out of a suitable hard plastic.

Ears 26 including annular hubs 27 rotatably circumscribe the sleeve 23 so that the ears extend substantially radially outwardly from the bearing 11. Detents 28 are
respectively upwardly and downwardly extended from the hubs for releasable extension between adjacent pairs of teeth 21 in their corresponding adjacent collars 20. A collar compression spring 30 is coiled around the sleeve and bears against the hubs for yieldably urging corresponding ears and collars against their respective shoulders 14. Also, the sprinkler maintains the detents between selected pairs of teeth so that the ears extend outwardly from the bearing in selected, circumferentially spaced relation to each other, as best illustrated in FIG. 2. In order to adjust the ears, they are pressed away from their respective collars to release their detents from between the teeth, and are then rotated on the sleeve to the desired angular position of adjustment wherein the spring again urges their detents between another adjacent pair of teeth.

The sprinkler 10 also includes a fluid distributing head 35 having an elongated, cylindrical shank 36 journeled in the bearing 11 and having a shoulder 38 upwardly spaced from the bearing. A coiled head spring 39 encircles the shank and is positioned between the upper shoulder 14 of the bearing and the shoulder 38 of the shank. The head also has an angularly upwardly extended, fluid ejecting nozzle 41 and a reciprocating arm 42 pivotally mounted on the nozzle for reciprocation during operation of the sprinkler. Further, the sprinkler has a direction reversing mechanism, generally indicated by the numeral 45 in FIGS. 1, 2 and 3, which includes a ring 46 loosely circumscircling the shank 36.

The reversible stop of the subject invention is generally indicated by the numeral 50. This stop includes a cylindrical boss 51 borne by the direction reversing ring 46 and outwardly extended therefrom. The boss has an outer flat face 52 and an elongated bore 53. A pair of elongated V-shaped tongues 55 is outwardly extended from the face of the boss in diametric relation to each other and are extended longitudinally of the shank 36. A pivot pin 60 provides an elongated stem 61 axially slidable extended through the bore 53 in the boss 51. The stem has an end 62 extended inwardly of the ring 46 and providing an annular groove 63. An enlarged head 64 is provided on the opposite end of the stem in outwardly extended relation to the face 52. A lock washer 66 is fitted in the groove of the stem in partially circumscircling relation thereto and bears against the inner surface of the ring 46 for limiting outward movement of the pin relative to the ring.

A fluid distributing portion 70 includes a tubular mounting portion 71 having an inner wall 72 rotatably mounted on the stem 61 of the pin 60 between the boss 51 and the head 64 of the pin. The mounting portion is extended axially of the pin toward the head in substantially spaced relation to the stem. The mounting portion thus provides an internal bore 74 which is slightly diametrically larger than the maximum diameter of the pin head. The bore provides an outer opening 75 which is immediately adjacent to, and adapted to receive, the head of the pin.

The inner wall 72 of the mounting portion 71 provides a flat inner face 77 in opposed relation to the outer face 52 of the boss 51. The outer face 77 is provided with a diametrically related pair of V-shaped notches 78 and 79 adapted complementarily to receive the tongues 55. A pair of notches 78 is in longitudinal alignment with the longitudinal dimension of the finger while the other pair of notches 79 is extended transversely of the finger 70. The finger also provides an elongated, substantially flat, stop portion 80 integrally extended from the mounting portion 71. A coiled stop spring 81 circumscibes the stem 61 within the mounting portion 71 and has opposite ends bearing against the inner wall 72 and the pin head 64. The spring yieldably urges the faces 77 and 52 of the notched bosses against each other. The finger is pivotal between a motion limiting position with its longitudinally extended pair of notches 78 fitted over the tongues 55, as shown in full lines in FIG. 3, and fully retracted positions with its transversely extended pair of notches 79 shown in FIG. 4. The longitudinal notches 78 are in registration with the tongues 55 and the finger 70 is extended downwardly in its limiting position between the circumferentially spaced ears 26. When sufficient pressure is placed against the stop portion 89 of the finger, the notches 78 are moved out of registration with the tongues, it being noted that the spring 81 compresses to allow such movement. The force required to pivot the finger in this manner is a significant factor in the present invention and is related to the tongue configuration and to the size of the sprinkler. It is a lesser force and is the force with which the finger is urged against the ears during normal operation of the sprinkler 10. The second force is greater and is the force or torque necessary to be applied against either ear in order to break a tooth 21 of the corresponding collar 20.

During normal operation of the sprinkler 10, water is forced upwardly through the shank 36 and outwardly through the nozzle 41 whereupon the nozzle is oscillated through a predetermined range determined by the spacing between the ears 26. When the finger 70 engages one of the ears, the reversing mechanism 45 causes the nozzle to rotate in a reverse direction until the finger strikes the other ear, all in a manner well known in the art.

During such normal operation of the sprinkler 10, the finger 70 does not retract when it strikes either of the ears 26 since such normal operation does not urge the finger against either of the ears with sufficient force to cause retraction. Thus, incorporation of the subject invention in a conventional sprinkler does not interfere with the normal operation of the sprinkler.

It is now assumed, however, that the sprinkler 10 is separated from the standpipe 17 and is to be coupled there to. The finger 70 is also assumed that the distributing head 35 is grasped and employed as means for threading the end 12 of the bearing 11 into the socket of the standpipe. Rotation of the shank 36 relative to the bearing 11 moves the finger 70 into engagement with one of the ears 26. With the end 12 of the bearing 11 in the socket of the standpipe 17, continued twisting of the head threads the bearing into the socket. As the connection is tightened, the stop portion 89 is urged against such ear with sufficient pressure to pivot the finger into an intermediate retracted position rearwardly extended relative to the direction of rotation of the head during said coupling of the head to the standpipe. Therefore, the finger simply slides past the ear before sufficient force is applied against the ear to break one or more teeth of the corresponding collar 20. If it is desired to tighten the bearing into the socket, the hex-nut portion 13 may be grasped and turned, and the parts threaded together in the proper manner. When the bearing is connected in fluid-tight relation in the standpipe, the finger is pivoted back into its motion limiting position between the ears and the sprinkler is ready for normal operation.

If it is desired to use the sprinkler as a full circle sprinkler, rather than a part circle sprinkler as described above, the finger 70 is pivoted into one of its fully retracted positions with the transverse notches 79 fitted over the tongues 55. It is evident that the provision of the notches 78 and...
79 and the tongues enables rapid positioning of the finger and maintenance of the finger in the desired position.

From the foregoing, it is believed understood that a rotary reversible or oscillatory sprinkler has been provided with a retractable stop which retracts to protect the teeth of the ear adjusting collars against breakage. The retractable stop of the subject invention does not allow the sprinkler to be threadably tightened into a socket by turning the distributing head. Instead, the subject invention requires the sprinkler to be coupled to the fluid supply pipe in the intended way by use of a wrench on the hexnut portion of the bearing. The retractable stop offers the desired protection but is connected to the sprinkler so that it serves to limit the arc of travel of the sprinkler in the usual manner.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a sprinkler, a relatively stationary, tubular, mounting member circumscribing an axis of reference; a relatively movable, fluid conducting member rotatably received in the mounting member for rotation about said axis; a stop ear connected to the mounting member and outwardly extended substantially radially of said axis; a reversing member mounted on said fluid conducting member having a boss extended outwardly therefrom, a tongue extended from the boss in spaced substantially parallel relation to said axis; and a retractable stop including a mounting portion connected to the fluid conducting member and a retractable portion extending from the mounting portion longitudinally of said axis, said mounting portion having a notch therein longitudinally aligned with said retractable portion to receive said tongue and to position the retractable portion for engagement with the ear during rotation of the fluid conducting member, said retractable portion being movable axially relative to the direction of rotation of the fluid conducting member when the retractable portion is urged against the ear with predetermined pressure thereon to disengage said tongue from the notch to permit movement of the retractable portion of the stop slidably past the ear.

2. In a sprinkler including a relatively stationary, tubular, mounting member circumscribing an axis of reference; a relatively movable, fluid conducting member rotatably received in the mounting member for rotation about said axis; and a stop ear connected to the mounting member and outwardly extended substantially radially of said axis; a reversing member mounted on said fluid conducting member for movement therewith having a boss outwardly extended therefrom; a retractable stop comprising a pivot pin borne by the reversing member and outwardly extended therefrom substantially radially of said axis, a stop finger pivotally mounted on the pin having an outer notched surface adapted slidably to engage said boss permitting swinging movement of the stop finger between a limiting position extended longitudinally of said axis wherein the finger is engageable with the ear during rotation of the movable member, and a retracted position rearwardly angularly extended from the pin with respect to the direction of rotation of the fluid conducting member; and a tongue on said boss engaging said notched surface yieldably to resist movement of the finger from its limiting position to its retracted position.

3. The stop of claim 2 wherein the finger provides a tubular mounting portion rotatably fitted in engagement relation to the pin wherein the mounting portion of the finger has an inner face spaced inwardly of said outer notched surface and an opposite open end, wherein the pin provides a stem concentrically extended through said mounting portion and a head secured to the stem adjacent to and receivable within said open end, wherein said boss includes a bore concentrically disposed therein slidably to receive the stem of the pin; locking means mounted on said stem and engaging the boss for limiting movement of the head away from the boss; and a compression spring within said mounting portion having opposite ends bearing against the head and the inner face for yieldably urging the outer notched surface against the boss.

4. In a reversible rotary sprinkler including a tubular bearing circumscribing an axis of reference, a fluid conducting member rotatably received in the bearing for rotation about said axis, and a pair of stop ears connected to the bearing and substantially radially outwardly extended therefrom in circumferentially spaced relation to each other; a reversing ring mounted on said fluid conducting member in circumscribing relation thereto having a boss outwardly extended therefrom, said boss including a diametrically disposed tongue thereon, and a bore concentrically formed therethrough; a retractable stop comprising a pivot pin extended through said bore and outwardly extended therefrom transversely of said axis; a stop finger pivotally mounted on the pin for movement between a limiting position extended longitudinally of said axis between the ears and retracted positions upwardly angularly spaced from said limiting position, and said stop finger providing a surface having a pair of diametrically related notches disposed in crossing relation to each other to receive said tongues at positions corresponding to said limiting and retracted positions of the stop finger; and a spring carried on the pin being compressible between the pin and the finger for yieldably maintaining the tongue in the notches corresponding to said limiting position incident to engagement of the finger with the ears during rotational movement of the fluid conducting member in the bearing during normal operation of the sprinkler but being yieldable to permit movement of the finger into retracted position when the finger is urged against one of the ears with predetermined pressure greater than that encountered during said normal operation.

5. In a reversible, rotary sprinkler including a bearing circumscribing a predetermined axis and adapted to be mounted in axially upright position, a fluid distributing head including an elongated shank rotatably received in the bearing for reversible rotation about said axis between predetermined circumferentially spaced positions, an elongated stop finger, a pivot pin pivotally mounting the finger on the head for movement about the pin between a limiting position extended longitudinally of the shank and retracted positions outwardly angularly extended in opposite directions from said limiting position whereby the finger travels in an arcuate path substantially concentric to said axis during reversible rotary movement of the head, collars non-rotatably mounted on the bearing providing rows of teeth circumscribing said axis with the teeth in each row being in circumferentially spaced relation to each other, hubs rotatably mounted on the bearing individually adjacent to the collars, ears outwardly extended from the hubs in circumferentially spaced relation to each other on opposite sides of the finger and transversely of the path of movement thereof, detents secured to the hubs and removably extended between adjacent pairs of teeth of the corresponding collars for maintaining the ears in selected circumferentially spaced positions to each other, and a coiled compression spring circumscribing the bearing between the hubs for urging the same against their respective collars, the teeth of the collars being subject to breakage incident to application of excessive pressure imposed thereagainst by their respective detents as a result of the application of predetermined movement movement to the ears, the improvement wherein said pin is substantially radial to the axis of the bearing; and wherein means is associated with the finger, the pin and the fluid distributing head for maintaining the finger in said limiting posi-
7 tion as long as the finger is urged against either of the ears with a force less than said predetermined torque during normal reversible rotary movement of the head but allowing pivotal movement of the finger into a retracted position if the finger is urged against either one of the ears with a force greater than said predetermined torque whereby the finger slides past the ear.

6. The sprinkler of claim 5 wherein the distributing head includes a ring circumscribing the shank, wherein the finger has a tubular mounting portion concentrically circumscribing the pin and including an inner wall and an open end in opposed relation to each other, wherein the pin includes a stem axially extended through the tubular portion and a head secured to the stem in covering relation to said open end, and wherein said associated means includes a boss borne by the ring and slidably receiving the stem, a lock washer bearing against the boss and connected to the stem for limiting movement of the head away from the boss, diametrically related tongues transversely outwardly extended from the boss toward the finger and extended longitudinally of the shank, said inner wall having pairs of diametrically related, longitudinally and transversely extended notches registrable with the tongues in said limiting position of the finger and one of the retracted positions of the finger, respectively, and a coiled compression spring circumscribing the stem within said tubular portion and having opposite ends individually bearing against said inner wall and the head for yieldably urging the inner wall against the boss.

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