Nov. 6, 1956 D. L. SPENDER 2,769,667

REACTION TYPE SPRINKLERS

Filed July 22, 1954

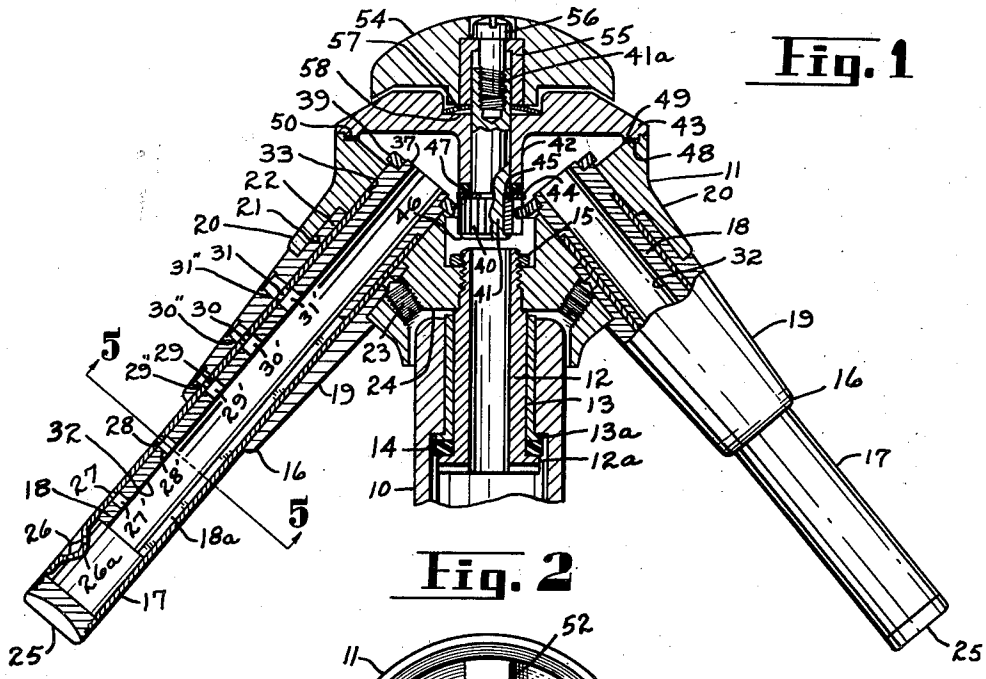


Fig. 1

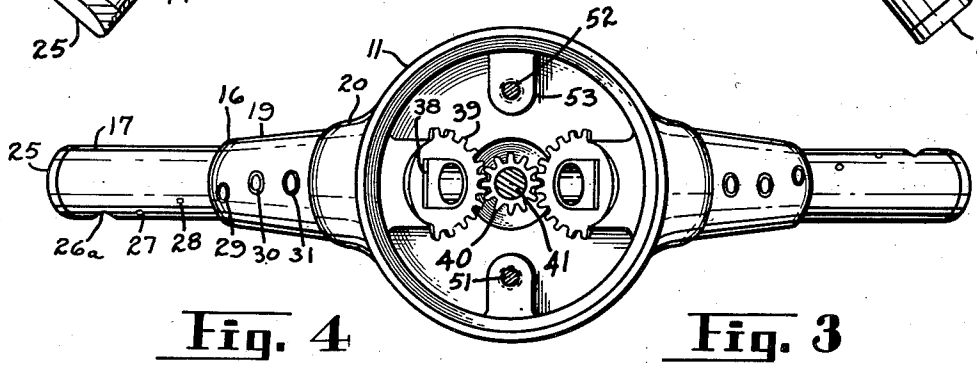


Fig. 2

Fig. 4

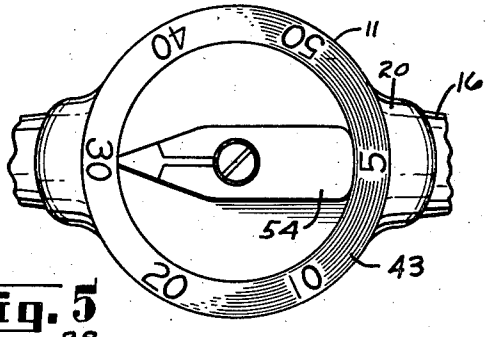


Fig. 3

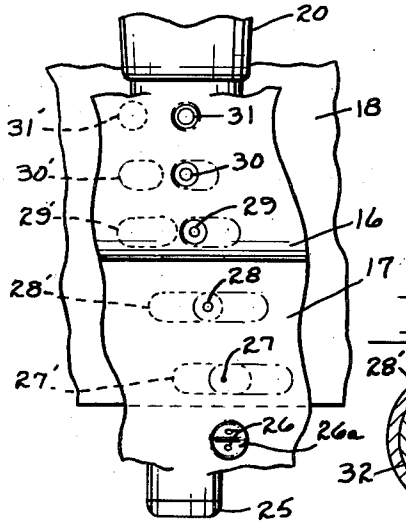
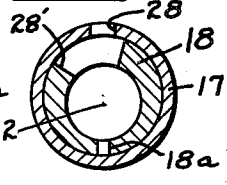


Fig. 5



INVENTOR
Donald L. Spender
BY H. F. Johnston
ATTORNEY

United States Patent Office

2,769,667

Patented Nov. 6, 1956

2,769,667

REACTION TYPE SPRINKLERS

Donald L. Spender, Wolcott, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn., a corporation of Connecticut

Application July 22, 1954, Serial No. 445,100

7 Claims. (Cl. 299—69)

This invention relates to lawn sprinklers and more particularly to a sprinkler of the reaction type in which the nozzles can be adjusted for varying the size of the area to be sprinkled.

For several years there has been on the market a sprinkler having a pair of inclined tubular nozzles which are turned on their own axes by a center control knob so as to change the angles of the jet deliveries. This accomplishes a variation in the range of water distribution from a low limit of a five to ten foot circle to a maximum of a fifty foot circle. Such sprinklers have the great disadvantage that the rate of flow of water is the same whether the sprinkler is adjusted for a small area or a large area. Attempts to solve the problem in this type of sprinkler by valving off certain openings at the lower ranges have heretofore been entirely unsuccessful.

The object of my invention is to provide an improved sprinkler of the tubular nozzle type which will vary the amount of water delivered approximately in proportion to the variation in area of coverage provided by the area adjusting control.

In my improved sprinkler the nozzles are fixed to the head so that the angles of jet deliveries are not changed. The nozzles are provided with a series of orifices, the smaller of water are arranged to provide restricted delivery of water but maximum reaction effect so that the sprinkler head is turned at high speed for the smaller ranges. As the setting is increased for larger ranges other orifices come into play for higher angles of jet delivery and lesser reaction effect. In fact, the larger orifices, which are open along with all of the others at the maximum range setting preferably have no reaction effect. However, the reaction effect of the smaller orifices when the setting is maximum is greatly lessened because the water flowing through the larger openings will relieve the pressure from the smaller openings which are preferably at the outer ends of the nozzles. This accomplishes the desired slower rotating speed when the sprinkler is set for the maximum range.

More particularly this invention contemplates a sprinkler with a rotary head supporting a pair of downwardly inclined tubular nozzles. Since the nozzles themselves are stationary relative to the head, my improved sprinkler provides movable valve means inside the nozzles for controlling the orifices as desired. This preferably takes the form of tube-like valve members which are connected to a common means inside the head adjustable by a knob or the like on the outside of the head. This feature presents a real problem because of the detrimental effect of corrosion, dirt and the like, which tends to cause jamming of any valve member inside the metal tubular nozzle.

According to my invention I employ a novel tubular member, preferably of nylon, or at any rate a material having the essential characteristics of nylon. This member is formed in such a way that it has always a nice fit against the wall of the nozzle and it has the advantage that it is comparatively free from the possibility of galling

or seizing on the mating member under water-lubricated operation, and also has a low coefficient of friction under such conditions.

The full nature of this invention, along with other objects and various advantages thereof, will be more apparent from a consideration of the following description when read in connection with the accompanying drawing, in which,

Fig. 1 is a vertical sectional view through the rotary head of a sprinkler unit.

Fig. 2 is a plan view of the same showing the cap and control knob omitted.

Fig. 3 is a plan view of the cap and control knob.

Fig. 4 is a layout view showing the relative position of the discharge ports in one of the arms and also schematically showing the relative position of the valving openings in two different settings, and

Fig. 5 is a cross sectional view of one of the arms, the view taken along the line 5—5 of Fig. 1 with the nozzle set to cover a 20 foot circle.

Referring now to the drawings, numeral **10** designates a standard in the form of a hollow upright that may be mounted on any suitable base not shown. On the upper end of the standard is mounted a rotary head **11** adapted to spin about the vertical axis of the standard **10**. For this purpose the head **11** is screw threaded to a hollow spindle **12** having bearing engagement in a bushing **13** fitted into the upper hollow portion of the standard **10**. Between the flanged inner ends **12***a* and **13***a* of the spindle **12** and bushing **13**, respectively, is interposed a sealing and thrust washer **14**. The head **10** may be locked to the threaded end of the spindle **12** as by a lock nut **15**.

Mounted on the head **11** is a pair of tubular nozzle arms **16** having their axes arranged at an angle of approximately 40° to the vertical axis of the spindle. The nozzle arms **16** cause rotation of the head by reason of the reaction forces of the water passing through jet orifices or ports in the nozzle arms as will be fully explained later. Since both nozzle arms are of the same construction, it will be considered sufficient to describe only one in detail. Specifically each nozzle arm consists of an outer tube **17** and a tube support sleeve **19**. The rotary head is formed with a pair of diametrically opposed embossments **20** each having a double diameter bore **21** into which is fitted the nozzle arms **16**. The outer tube **17** may be secured to the support sleeve **19** as by soldering. The support sleeve **19** in turn is formed with a reduced neck **22** that fits into the larger diameter of said bore **21** and held thereinplace by a set screw **23**. The set screw **23** is made accessible through a large recess **24** in the bottom of the rotary head **11** and into which recess is received the upper end of the standard **10**. The lower end of the outer tube **17** is closed by a screw plug **25** threaded into the end of said tube and may be removed if desired for cleaning out the nozzle arms.

The manner in which I obtain a uniform and proportionate distribution of water over large and small areas is determined by the position and character of the several discharge ports or jet orifices in the nozzle arms and the manner in which these are selectively closed off by an interior valve member. The relative arrangement and position of the discharge ports in relation to a vertical plane passing through the axes of the nozzle arms and the head, is generally to lie in the path of a long drawn out helix scribed on the surface of the arm tube **17**. Specifically there are seven ports in the outer tube **17**, the two lower ones **26** are identical in size and are angled the farthest away from the vertical plane of the arms, preferably about 80° from the vertical. The ports **26** are the reaction ports that serve to produce the maximum driving force for rotating the head and are intended to

cover the smallest area to be sprinkled, namely, 5 feet. Preferably the outer tube is dimpled or angled inwardly in the area around the ports **26** as at **26***a* so that the ports **26** are angled toward each other for the purpose of producing a fan spray to the water discharging through said ports. The other ports **27**, **28**, **29**, **30** and **31** are positioned upwardly of the outer tube and progressively approach closer to the vertical plane, the axes of the last two ports lying in said vertical plane, and thus producing no reaction effect.

The valve member is preferably in the form of an inner tube **18** made of a suitable plastic material such as nylon and has a cylindrical bore **32** that is eccentric to the outer diameter of said tube, and the inner valve member is so positioned within the outer tube that the thicker portion of said valve member wall will be normally in the uppermost position. A series of circumferential openings or slots **27'**, **28'**, **29'**, **30'** and **31'** are formed in the thicker wall of the inner tube **18** and line up respectively with the ports **27**, **28**, **29**, **30** and **31** of the outer tube. The valve member **18** does not extend the full length of the outer tube and therefore does not in any way affect the lower ports **26**. The upper end of the valve member is formed with an enlargement that is rotatably engaged in the smaller diameter of the bore **21** in head embossment **20** and provides a shoulder **33** engaging the end of the outer tube **17** to properly align the slots **27'–31'** with respect to the ports **27–31** inclusive, in the outer tube. In the thinner portion of the valve tube **18** opposite the slots **27'–31'** a longitudinal slot **18***a* is provided that extends along that portion of the tube **18** that serves to valve the port openings **27–31** in the outer tube **17**. The slot **18***a* provides for a greater flexibility of the valve tube **18** and allows it to fit into the outer tube with a resiliently snug fit. Furthermore, water pressures in the valve tube **18** will exert a radial force on said tube to increase its sealing effect within the outer tube **17**.

Three of the ports **29**, **30** and **31** in the outer tube are registered with three ports **29''**, **30''** and **31''** in the support sleeve **19**. It is to be noted that the wall thickness of the support sleeve **19** is considerably greater than the wall thickness of the outer tube **17** and that the ports **29''**, **30''** and **31''** are of a tapering form with the smaller diameter at the discharge end of said ports. This is for the purpose of providing a better stream effect to the water issuing from these particular discharge ports and serves to project the stream of water farther than would be the case if the ports were merely pierced through the outer tube **17**.

In order to manually control the operation of the inner valve tubes **18**, the upper ends of the latter are provided with collars **37** having flattened sides **38** and over which collars are slipped sector gears **39** having complementary shaped openings to fit the collars **37** so as to prevent relative rotation. Gears **39** are driven by a pinion **40** secured to the inner end of a spindle **41** rotatably mounted in a tubular sleeve **42** depending from and formed as an integral part of a cap **43** that serves to close off the upper open end of the rotary head **11**. Specifically the pinion **40** is anchored to the spindle **41** by having one end abutted against a metal washer **44**, the latter in turn seated against a shoulder **45** on spindle **41**, the outer end of the spindle being riveted over against the pinion **40** as indicated at **46** to hold the parts together as a unit. A sealing washer **47** is interposed between the metal washer **44** and the end of the tubular sleeve **42**.

The upper end of the head **11** is formed with a stepped seat **48** and the cap **43** likewise is formed with a comparable seat **49** between which is compressed a sealing washer **50**. The cap **43** is held upon the head **11** by a pair of screws **51** having their heads seated in suitable recesses in the cap **43** and their shanks threaded into tapped holes **52** formed in embossments **53** projecting inwardly from the head **11**.

To adjust the inner valve tubes **18** relative to the nozzle arms **16**, a control knob **54** is non-rotatably secured to the spindle **41** by means of an insert bushing **55** having a drive fit upon a knurled section **41***a* of spindle **41**. A knob **54** is held against axial displacement from the end of the spindle **41** by a screw **56** threaded into the end of said spindle. A friction washer **57** is interposed between the control knob **54** and the base of a recess **58** formed in the upper surface of the cap and serving to impart a frictional effect to the turning of the knob **54**, and also cause the pinion washer **44** always to seat tightly against the sealing washer **47**. In order to set the sprinkler to the particular sizes of the area that one desires to sprinkle, the upper conical surface of the cap **43** is provided with suitable indicia and the knob **54** may be formed with a pointer that may be registered with the indicia to the area desired.

A more complete description of the relative position of the elongated openings **27'–31'** of the inner tube **18** to the openings **27–31** of the outer tube will now be given. First, it is to be noted that the lower openings **26** which serve to cover the space area of about 5 feet are never closed by the valve tube **18**. The relative position of the ports and shut-off openings is diagrammatically shown in Fig. 4 and the position of the valve tube openings **27'–31'** relative to the outer tube ports **27–31** for a setting of a 20 foot diameter coverage is represented by dotted outline for the openings **27'–31'**. This setting shows that the slots **27'** and **28'** are positioned to open the 10 foot and 20 foot ports **27** and **28** respectively, while the 30, 40 and 50 foot ports **29**, **30** and **31** are still closed. As the larger areas 30 and 40 feet are required to be sprinkled the inner tube obviously can be turned so that the slots **29'** and **30'** align with the outer tube ports **29** and **30**. The 50 foot diameter setting is diagrammatically shown by dot and dash outlines in Fig. 4 for the openings **27'–31'** respectively, and in this setting it is to be noted that all the ports **26–31** in the outer tube **17** are open.

While the form of the invention herewith shown and described embraces a preferred embodiment of the same, it is to be understood that the construction may be varied as to mechanical details without departing from the spirit of the invention and the scope of what is claimed.

I claim:

1. A sprinkler having a head mounted to rotate about a vertical axis, tubular nozzles fixedly mounted on the head at opposite sides of said axis, each nozzle arranged so that its longitudinal axis is in acute angle relation to said vertical axis, a series of orifices of different size in each nozzle spaced lengthwise of the nozzle and arranged in differing angular relation about the nozzle axis, the angle of elevation of the larger of said orifices being such as to provide a maximum range of jet delivery, while the angle of elevation of the other orifices is progressively smaller to provide progressively lower ranges of jet delivery, the larger of said orifices being in substantially a vertical plane passing through the axes of the head and nozzle and the others of said orifices being arranged at progressively larger angles about the nozzle axis to one side of said plane as they diminish in size, and control means inside said tubular nozzle for progressively opening or closing said orifices to control the range of water distribution.

2. A sprinkler as defined in claim 1 wherein the control means inside each of said nozzles is a tube-like valve member fitting closely inside the nozzle and being rotatable about the axis of the nozzle, said member having ports arranged to open or close said orifices.

3. A sprinkler as defined in claim 2 wherein each of said tube-like valve members consists of nylon and having a smooth outer surface in contact with the inner wall of the nozzle.

4. A sprinkler as defined in claim 2 wherein said tube-like valve member is made of nylon and is slotted for a portion of its length to provide for a springy contact between the valve and nozzle.

5. A sprinkler as defined in claim 2 wherein said valve member has a lengthwise extending hole therethrough which is eccentric to the nozzle whereby the wall of the valve member is thicker on one side than on the other, and wherein the ports in the valve member are arranged in said thicker portion.

6. A sprinkler having a head mounted to rotate about a vertical axis, tubular nozzles projecting outwardly from said head and fixed against rotation relative to the head, a series of orifices arranged along the length of each nozzle and having differing characteristics as to the range and angle of jets delivered therefrom, valve means in each of said nozzles for selectively opening or closing various of said orifices, and a manually operable valve control member mounted externally of said head and having an operating connection to said valve means.

7. A sprinkler having a head mounted to rotate about a vertical axis, tubular nozzles projecting outwardly from said head and fixed against rotation relative to the head, a series of orifices arranged along the length of each nozzle and having differing characteristics as to the range and angle of jets delivered therefrom, a tube-like valve member fitting inside each of said nozzles and being rotatable about the axis of said nozzle, said valve member having ports adapted to be brought selectively into registry with the orifies in said nozzle, and manually operable means for controlling the angular position of said valve members in said nozzles.

References Cited in the file of this patent

UNITED STATES PATENTS

935,071	Vossler	Sept. 28, 1909
960,393	Peters	June 7, 1910
1,677,485	Nelson	July 17, 1928
2,335,332	Wright	Nov. 30, 1943
2,591,073	Jepson	Apr. 1, 1952
2,596,577	McBride	May 13, 1952
2,619,381	Jepson	Nov. 25, 1952
2,641,278	Eplett	June 9, 1953
2,678,845	Fitter	May 18, 1954

FOREIGN PATENTS

137,550	Australia	Aug. 19, 1948