United States Patent

[11] 3,592,388

[72] Inventor **Richard F. Friedlander**
P.O. Box 847, Moultrie, Ga. 31768

[21] Appl. No. **838,080**
[22] Filed **July 1, 1969**
[45] Patented **July 13, 1971**

[54] **PART-CIRCLE SPRINKLER HEAD WITH BALL BEARING SWIVEL, ADJUSTABLE CAMS FOR DEFLECTION SPOON AND OSCILLATING SPRAY DEFLECTOR**
5 Claims, 10 Drawing Figs.

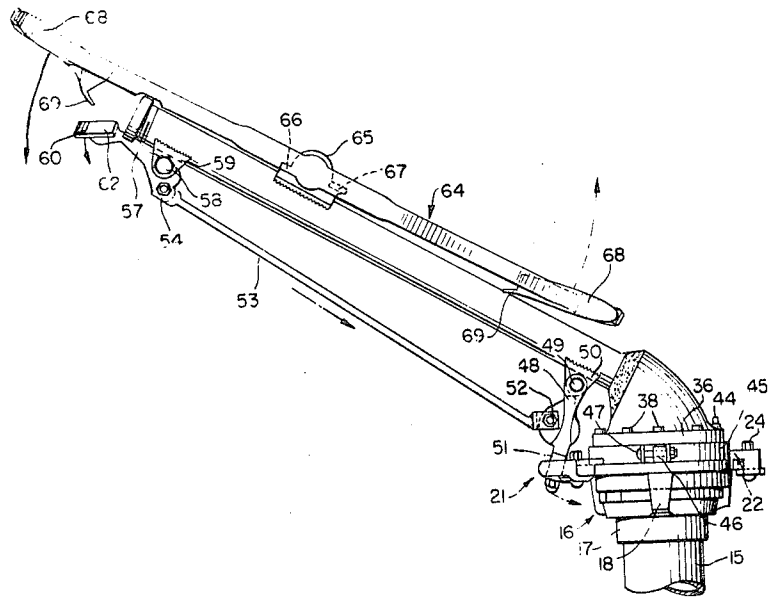
[52] **U.S. Cl.** **239/233,** 239/264
[51] **Int. Cl.** **B05b 3/08**
[50] **Field of Search** 239/230, 231, 232, 233, 261, 264

[56] **References Cited**
UNITED STATES PATENTS

1,025,410	5/1912	Lindner	239/233
1,598,541	8/1926	Orr	239/233
1,726,986	9/1929	Horten	239/231 X
2,631,061	3/1953	Nelson	239/264 X
2,649,268	8/1953	Stein	239/230
2,983,452	5/1961	Lindbloom	239/231 X
2,992,781	7/1961	Howard, Sr.	239/261 X

Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—John J. Love
Attorney—B. P. Fishburne, Jr.

ABSTRACT: A rugged and durable, lightweight sprinkler head features a ball bearing swivel of simplified and and economical construction without the usual expensive machining. An improved camming system enables part-circle operation through any chosen angle with a very rapid return movement. The sprinkler head is easily convertible to full-circle operation. Bearing lubrication is provided.



PATENTED JUL 13 1971

3,592,388

SHEET 1 OF 4

Fig. 1.

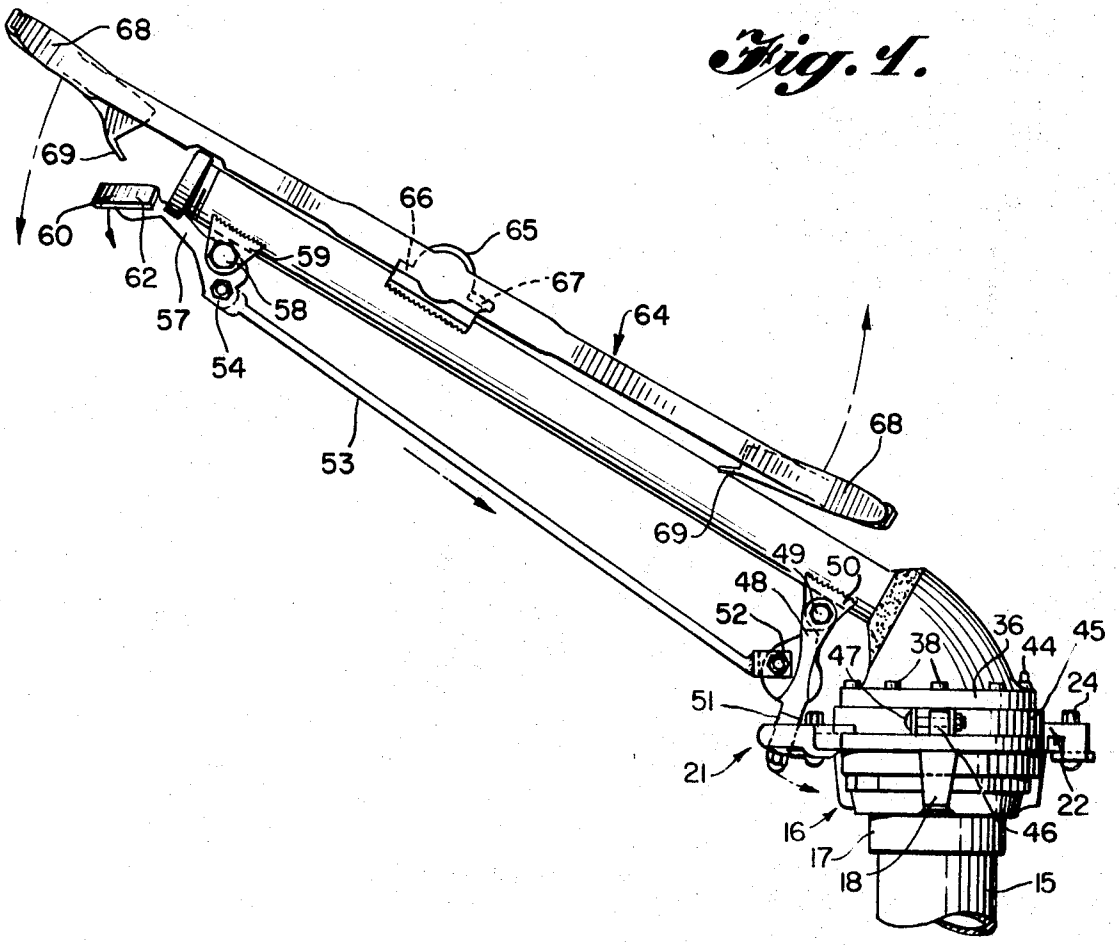
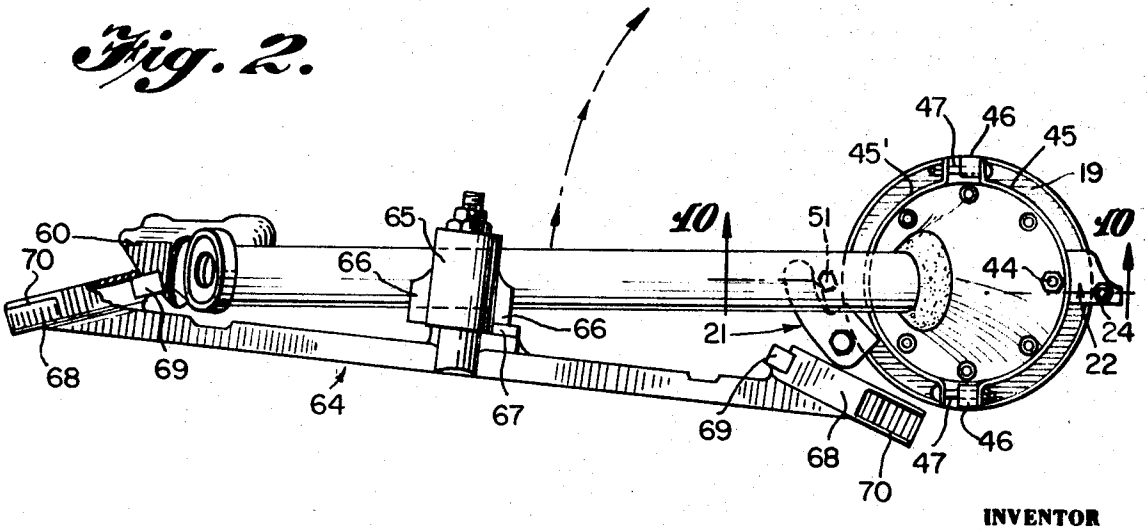


Fig. 2.



INVENTOR

RICHARD F. FRIEDLANDER

BY B. P. Dillman, Jr.

ATTORNEY

Fig. 3.

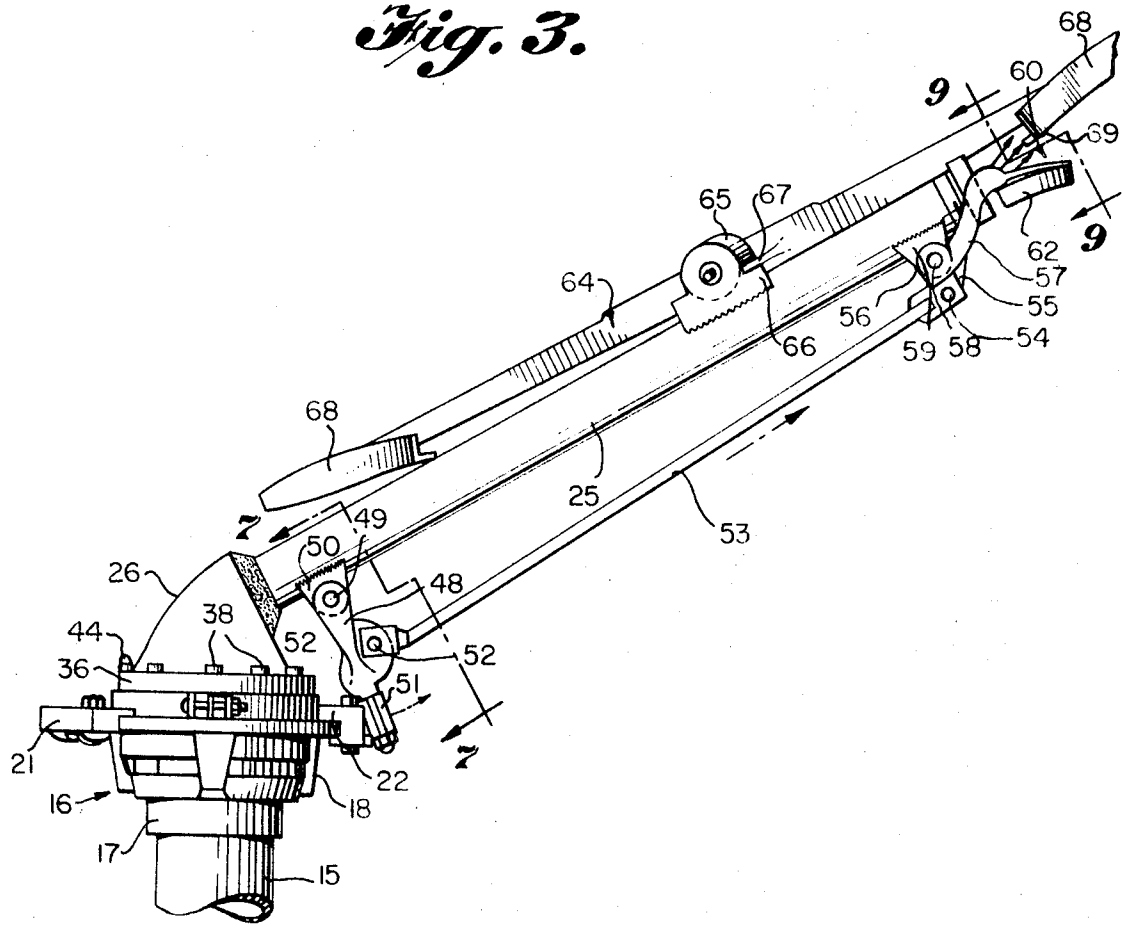
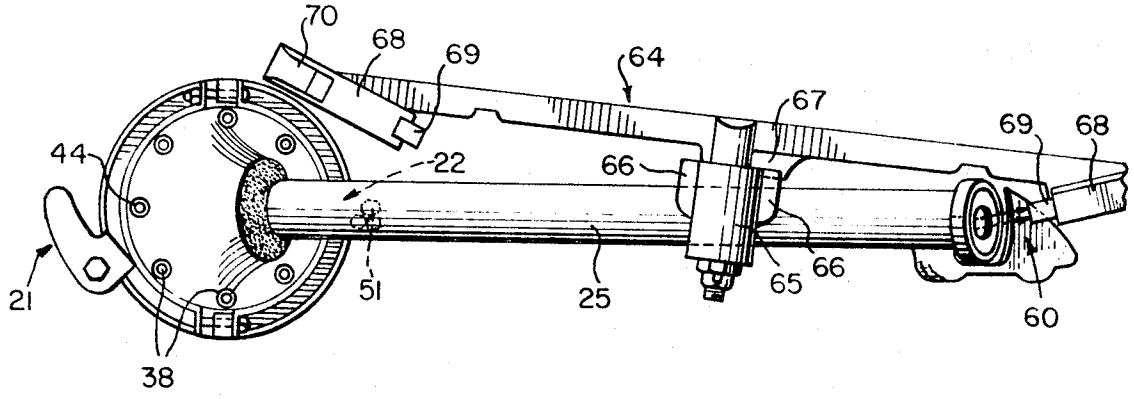


Fig. 4.



INVENTOR
RICHARD F. FRIEDLANDER

BY B. P. Fishburne, Jr.
ATTORNEY

Fig. 5.

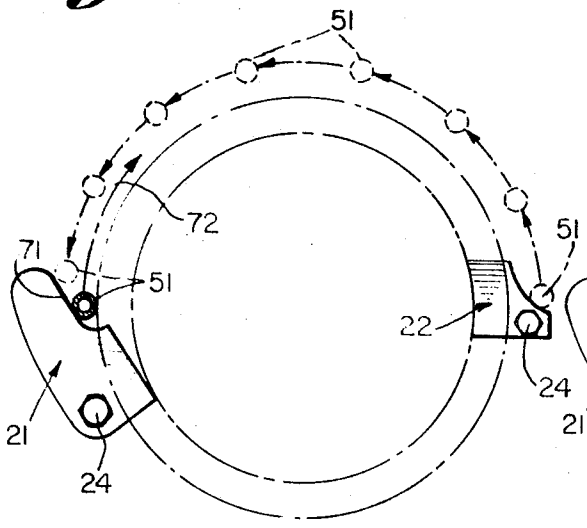


Fig. 6.

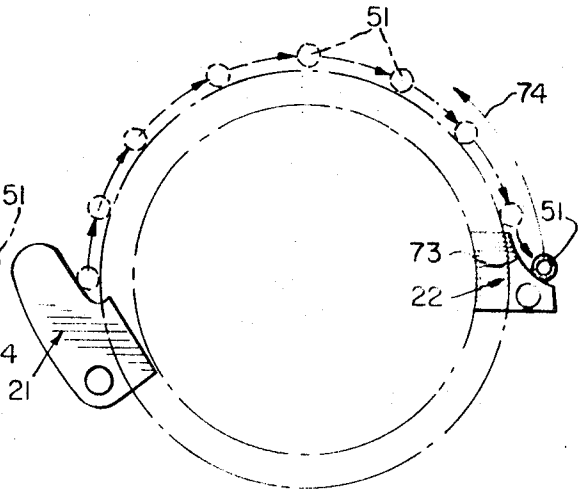


Fig. 7.

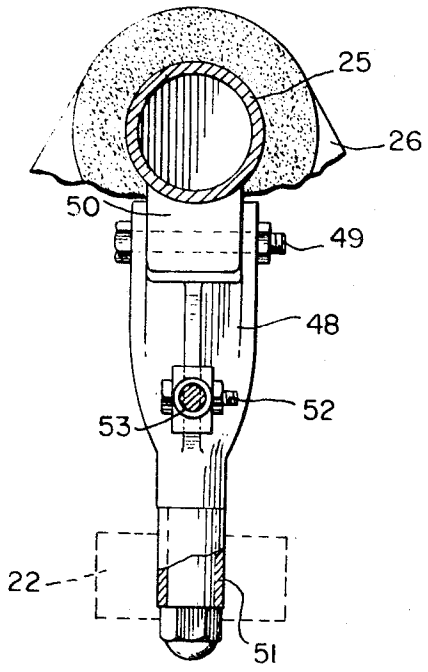


Fig. 8.

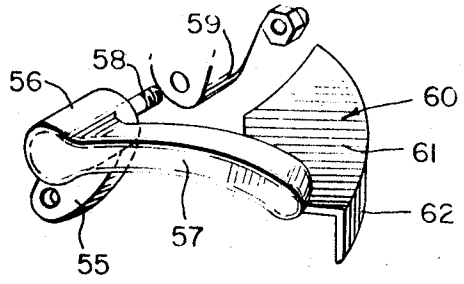
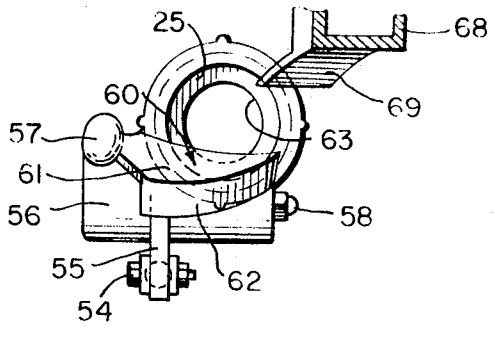


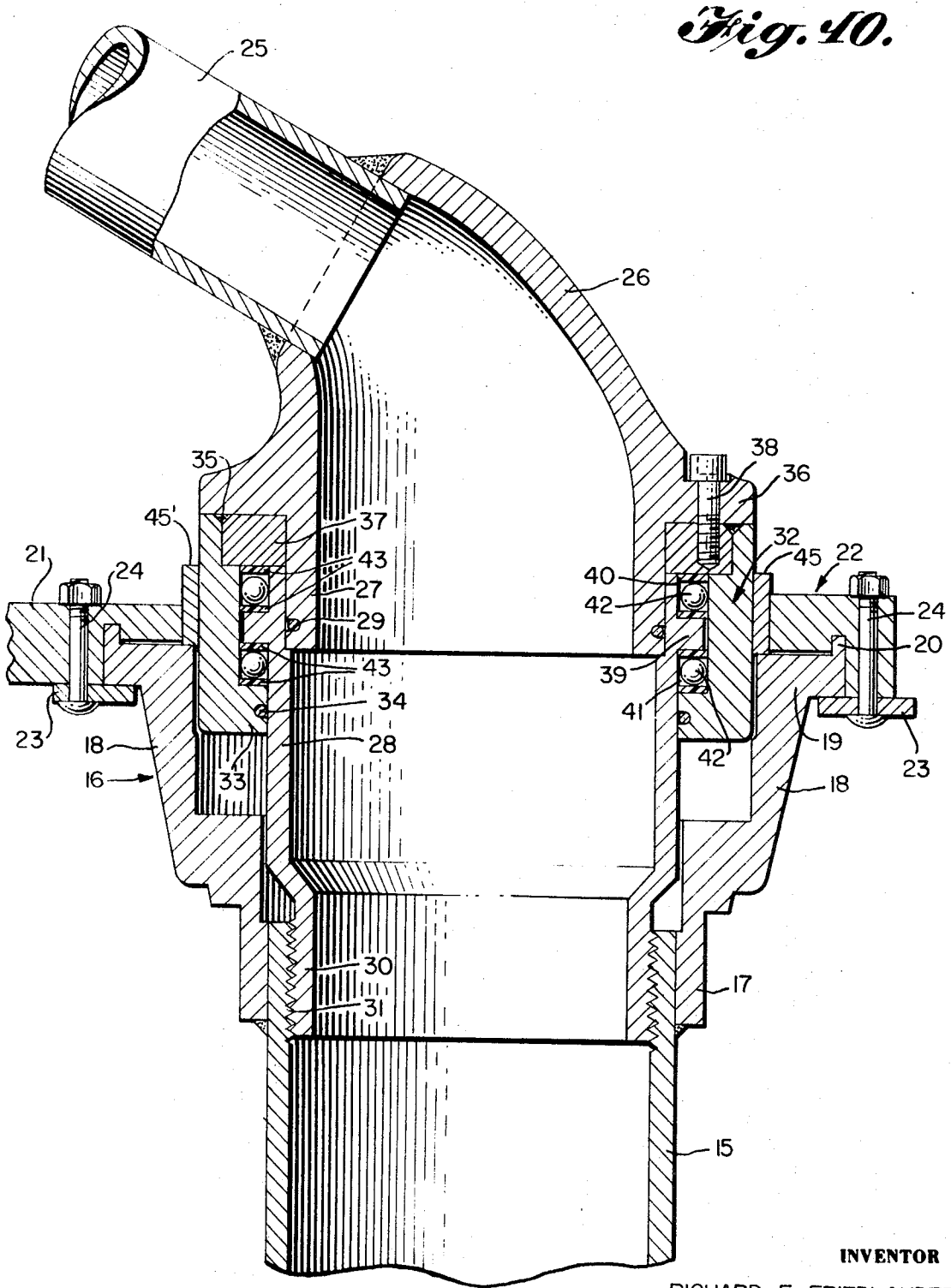
Fig. 9.



INVENTOR
RICHARD F. FRIEDLANDER

BY B. P. Fishburne, Jr.
ATTORNEY

Fig. 40.



INVENTOR

RICHARD F. FRIEDLANDER

BY B. P. Williams, Jr.

ATTORNEY

PART-CIRCLE SPRINKLER HEAD WITH BALL BEARING SWIVEL, ADJUSTABLE CAMS FOR DEFLECTION SPOON AND OSCILLATING SPRAY DEFLECTOR

Part-circle and full-circle rotary sprinklers for agricultural and home lawn usage are known in the art and these devices have in general tended to be unduly complicated and without a sufficient range of adjustment. Additionally, the prior art sprinklers have frequently embodied certain delicate components which do not stand up under normal rough usage and this has caused faulty operation of the sprinklers sometimes after only a short period of usage. A major area of trouble in the prior art has been the swivel bearing for the rotary sprinkler head without proper lubrication or of a type which does not sufficiently reduce friction or is subject to corrosion.

The present invention structure has as its aim to overcome the above-enumerated problems of the prior art by providing a sprinkler formed of lightweight materials, such as aluminum, which is exceedingly durable in construction and has a wide range of adjustment and which can be produced in almost any desired size as for major agricultural operations and small home lawns. The invention features a simplified ball bearing swivel which is lubricated and which eliminates costly inner and outer races usually found in such bearings. The sprinkler also embodies unique adjustable cams which positively regulate the operation of a deflector spoon relative to the nozzle stream, rendering reverse or return operation of the nozzle quick and positive. An oscillating spray deflector moves into and out of the nozzle stream during normal forward operation to impart a step-by-step movement to the sprinkler head.

Other features and advantages of the invention will become apparent during the course of the following description.

BRIEF DESCRIPTION OF DRAWING FIGURES

FIG. **1** is a side elevation of a rotary sprinkler embodying the invention in a normal forward turning mode.

FIG. **2** is a plan view of the sprinkler as shown in FIG. **1**.

FIG. **3** is an opposite side elevation of the sprinkler in a reverse or return mode after completion of its forward rotation or arc.

FIG. **4** is a plan view of the same.

FIG. **5** is a partly diagrammatic plan view showing deflector spoon retracting and engaging cams and associated elements.

FIG. **6** is a similar view with a cam-engaging roller at a second operative position on the engaging cam.

FIG. **7** is a transverse vertical section taken on line **7–7** of FIG. **3**.

FIG. **8** is a fragmentary perspective view of a deflector spoon and associated elements.

FIG. **9** is a view similar to FIG. **7** taken on line **9–9** of FIG. **3**.

FIG. **10** is an enlarged central vertical section through the sprinkler head and its swivel bearing, taken on line **10–10** of FIG. **2**.

DETAILED DESCRIPTION

Referring to the drawings in detail, wherein like numerals designate like parts throughout the same, the numeral **15** designates a suitable standpipe, either fixed or mobile, for delivering water to the sprinkler head of the invention. A cam cage or support **16** includes a lower ring portion **17** fixed to the standpipe **15** in any suitable manner as by clamping or welding, and plural circumferentially spaced arms **18** rise from the ring portion **17** and support an upper cam ring **19** integral therewith having a marginal flange **20**. The cam ring **19** and its flange **20** support adjustably deflector spoon retracting and engaging cams **21** and **22** whose function will be fully described. Underlying clamp plates **23** and bolts **24** render the two cams independently circumferentially adjustable around the circumference of the ring **19** so that the rotational arc of the sprinkler head may be varied. The two cams are releasably lockable in selected adjusted positions. The cam cage **16** and the two cams are fixed to the pipe **15** and do not rotate during the operation of the sprinkler head, as will be described.

The rotary sprinkler head proper comprises an elongated tubular nozzle **25** of a suitable size to supply a stream of water to satisfy the needs of a given installation. The nozzle **25** is held at an angle of about 30° above the horizontal with its lower end socketed within a rotary elbow head **26** and secured therein by welding or the like, FIG. **10**. The head **26** has a vertical sleeve extension **27** extending rotatably into the upper bore of an intermediate nonrotatable sleeve **28** and sealed to this bore by an O-ring seal **29**. The intermediate sleeve **28** has a lower end reduced threaded extension **30** coupled with screw threads **31** on the interior of the stand pipe **15**.

An outer bearing ring **32** surrounds the sleeve **28** between it and the arms **18** and has a lower flange **33** sealed to the periphery of sleeve **28** by another O-ring seal **34**. The upper end of the bearing ring **32** may be welded at **35** to a flange **36** of the head **26** to make up an integral rotary assembly. A filler ring **37** is disposed under the flange **36** and inwardly of the bearing ring **32** and between the bearing ring and sleeve extension **27**. Screws **38** are provided to connect the flange **36** and the ring **37**. The intermediate sleeve **28** has an exterior annular shoulder **39** formed thereon near its upper end facing the bore of bearing ring **32**. Annular chambers **40** and **41** for groups of ball bearings **42** are formed above and below the shoulder **39** and bounded by the filler ring **37** at the top and the flange **33** at the bottom. Teflon bearing washers **43** are preferably provided as shown above and below the groups of ball bearings. A grease fitting **44** is also provided on the flange **36** between any chosen pairs of the screws **38** to admit lubricant to the chambers **40** and **41**, as required. It may be seen that a sturdy, low-friction thrust-type bearing for the sprinkler head is provided and is effectively sealed and lubricated. The usual ball bearing structure involving inner and outer bearing races and extremely close machining tolerances is fully avoided by the simplified ball bearing swivel of the invention shown particularly in FIG. **10** and this forms an important feature of the sprinkler enabling it to operate substantially without friction and to have a long life without substantial wear and corrosion of the bearing parts.

Means are provided for retarding the rotation of the sprinkler head including the head member **26**, bearing ring **32** and associated parts. This means comprises a two-part brake band **45** and **45'** surrounding the bearing ring **32** and resting on the nonrotatable cam ring **19**. A pair of lugs **46**, FIG. **2**, on opposite sides of the cam ring **19** receives brake band adjusting bolts **47** which allow the frictional engagement of the band sections **45** and **45'** with the ring **32** to be adjusted. By this means, the precise rotational freedom of movement desired for the sprinkler head may be obtained.

In cooperation with the two cams **21** and **22**, mechanical means are provided on the sprinkler to regulate its rotational movement between angular limits established by the circumferential placement of the cams. Such means comprises a yoke **48** disposed under the nozzle **25** near its inner end and pivoted at **49** to a rigid lug **50** which depends from the nozzle. The lower end of the yoke **48** carries a cam-engaging roller **51** which, upon rotation with the nozzle, moves into engagement cyclically with the cams, as will be further described. The forward side of the yoke is pivoted as at **52** to an elongated connecting rod **53** which extends beneath the nozzle **25** toward its forward end and has another pivotal connection at **54** with a depending lug **55** on the hub **56** of a deflector spoon arm **57**. The hub **56**, in turn, is pivotally connected at **58** to another fixed lug **59** on the bottom of the nozzle **25** near its forward end. The arm **57** carries a deflector spoon **60** rigid therewith having an oblique upper plate portion **61** and a marginal curved deflector portion **62** at right angles to the plate **61** and adapted under certain conditions of adjustment to lie diagonally across the stream emitting from the nozzle bore **63**, FIG. **9**. Under other conditions of adjustment, the deflector spoon **60** is retracted away from the stream emitting from the nozzle. Such retracted position of the spoon is shown in FIGS. **1** and **2**, whereas FIGS. **3**, **4** and **9** show the deflector spoon **60** in or across the nozzle stream. As will be further discussed, the

reverse or counterclockwise movement of the sprinkler head takes place very quickly when the deflector spoon **60** is cammed into the nozzle stream and then pulled completely therein by the force of the stream itself. When the spoon is retracted from the stream, the sprinkler head and nozzle turn in the opposite or clockwise direction through an arc established by the spacing of the cams **20** and **21**.

A further element of the sprinkler consists of an elongated deflector arm **64** arranged upon one side of the nozzle **25** and somewhat angled with respect to the axis of the nozzle and converging toward its discharge end. The arm **64** is rotatably mounted intermediate its ends on a transverse axis bearing **65** welded or otherwise rigidly secured to the top of the nozzle between its end. The arm rotates or oscillates in a vertical plane back and forth approximately 180° between limit stops **66** on opposite sides of the bearing **65**, the arm being equipped with a single cooperating stop element **67** to limit its movement in either direction. Each end of the arm **64** carries an oblique spray deflector **68** in the form of a rectangular tube having a rear lip extension **69** and a forward notch or cutout **70** on the side of the deflector remote from the lip extension.

The arrangement is such that upon each 180° oscillation of the arm **64** the rear open end of the rectangular tubular deflector **68** on one end of the arm moves into the nozzle stream, the stream impinging first on the extension **69** and then being deflected into and through the rectangular tubular structure. This interrupts and deflects the nozzle stream somewhat angularly and correspondingly interrupts the forward or clockwise rotational movement of the sprinkler head so that, in effect, it moves forwardly in a step-by-step manner due to the continuous swinging of deflector arm **64** and the intermittent engagement of the stream by the oblique rectangular tubular deflectors **68**. The stream acts on the deflectors to motivate the arm **64** which swings back and forth between the two stops **66**.

Referring to the cams **21** and **22** in FIGS. **5** and **6**, when the roller **51** of yoke **48** rides onto the spoon retracting cam **21**, the roller will travel inwardly along the angular face **71** of the cam and in so doing the yoke **48** is swung rearwardly toward the head **26** and this pulls the connecting rod **53** rearwardly in the direction of the arrow in FIG. **1** and pulls the deflector spoon **60** entirely out of the nozzle stream. This frees the sprinkler head and nozzle to turn forwardly or clockwise in the direction of the arrow **72**, FIG. **5**, and the movement will take place step-bv-step due to the described action of the oscillating arm **64**. When the sprinkler head has turned clockwise on its ball bearing structure through the prescribed arc of a circle established by the initial spacing of the cams **21** and **22**, the roller **51** will encounter the curved sloping face **73** of cam **22**, FIG. **6**, and the yoke **48** will swing forwardly and away from the head **26**. This will push the connecting rod **53** forwardly, FIG. **3**, and swing the deflector spoon **60** into the stream of water emitting from the nozzle **25**. Immediately, the water will impinge on the diagonal deflector portion **62** and the force of the stream will pull the right-angular spoon entirely into the stream where it will serve as a rudder and the reactive force will cause the sprinkler head to move in reverse or counterclockwise with a very fast motion, as indicated by the arrow **74**, FIG. **6**. This return movement of the sprinkler head back toward the cam **21** will take place even before the arm **64** can complete one oscillation through 180°. The roller **51** will again encounter the retracting cam **21** which in turn will pull the spoon **60** out of the nozzle stream so that the sprinkler can commence again its normal step-by-step clockwise movement toward the engaging cam **22** which moves the spoon **60** into the stream.

It is now apparent that an efficient rotary sprinkler is provided which has a stream-induced quick-return movement and a controlled step-by-step forward movement through any selected arc established by adjusting the cams **21** and **22** on the cam ring **19** where they are slidably mounted and lockable, as described. Smooth low-friction rotation is provided by the simplified ball bearing for the sprinkler head, FIG. **10**, and further control, if needed, is available through the adjustable brake band **45–45'**. If desired, the sprinkler can easily be converted to a full-circle rotary sprinkler by simply removing the linkage including yoke **48**, the spoon **60** and the cams **21** and **22**.

The numerous advantages and features of the invention are now thought to be fully apparent without the need of further description and it is to be understood that various changes in the shape, size and arrangement of parts may be resorted to.

I claim:

1. A rotary sprinkler comprising an intermediate sleeve adapted for mounting on a standpipe or the like and having an annular shoulder formed thereon externally, a bearing ring surrounding the intermediate sleeve rotatably and forming therewith annular ball bearing compartments above and below said shoulder, plural ball bearing elements disposed loosely within said annular compartments, a sprinkler head carried by the bearing ring and rotating therewith as a unit upon said intermediate sleeve, said sprinkler head including a base portion secured to the bearing ring and an inclined sprinkler nozzle projecting from the base portion, a cam-support ring anchored to said standpipe and surrounding the bearing ring, circumferentially spaced engaging and retracting cams on said cam-support ring, a pivoted cam follower member on the sprinkler head extending into the planes of said cams, a pivoted deflector spoon on the nozzle forwardly of the pivoted follower, and a link interconnecting the deflector spoon and follower so that the same will move in unison when the follower engages said cams to move the spoon into the nozzle stream and retract it therefrom.

2. A rotary sprinkler comprising an intermediate sleeve adapted for mounting on a standpipe or the like and having an annular shoulder formed thereon externally, a bearing ring surrounding the intermediate sleeve rotatably and forming therewith annular ball bearing compartments above and below said shoulder, plural ball bearing elements disposed loosely within said annular compartments, a sprinkler head carried by the bearing ring and rotating therewith as a unit upon said intermediate sleeve, and a cam-support ring surrounding the sprinkler head and adapted to be anchored to the standpipe, engaging and retracting cams circumferentially adjustably mounted on the support ring and adapted to be clamped in selected adjusted positions, a deflector linkage on the sprinkler head including a pivoted yoke, and a cam-engaging roller on said yoke extending into the circumferential planes of the cams and engageable cyclically with the cams during turning of the sprinkler head.

3. The structure of claim **1**, and an oscillating elongated deflector arm pivoted to the nozzle at an angle to the nozzle intermediate the ends of the arm and nozzle and including angled tubular spray deflectors on the ends of the arm adapted cyclically to move into and out of the nozzle stream as the arm oscillates through approximately 180°.

4. The structure of claim **3**, and said tubular deflectors are each rectangular in cross section and disposed at acute angles to the arm at the ends of the arm, said deflectors having nozzle-stream-engaging lip extensions at their rear ends and being cut away in one side wall at their ends remote from the lip extensions and in the sides of the deflectors opposite from the lip extensions.

5. The structure of claim **4**, and a pair of positive stop elements for the arm on the nozzle spaced approximately 180° apart and a coacting stop element on the arm engageable with said spaced-apart stop elements.