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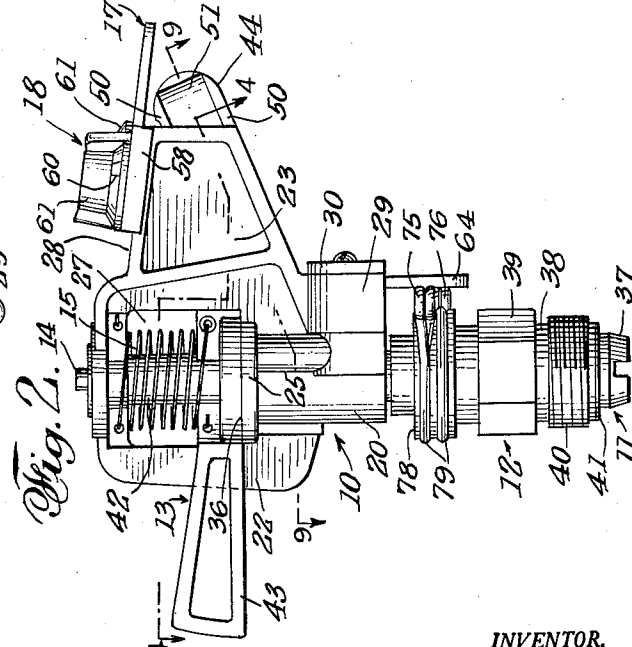
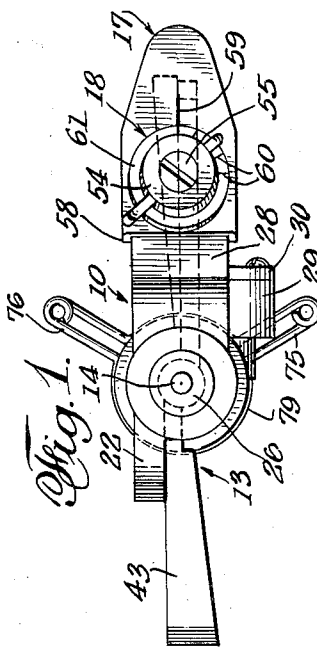
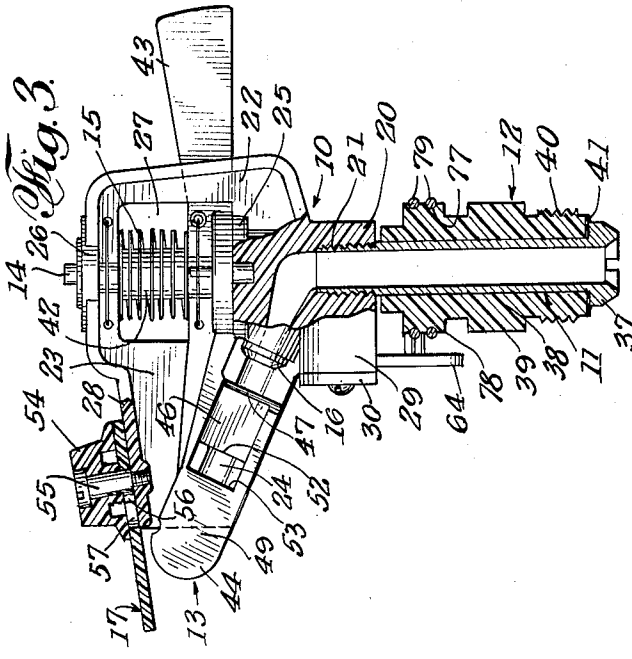
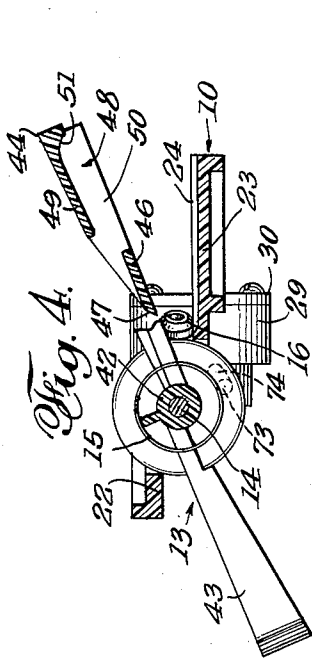
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3,070,314

WATER SPRINKLER

Filed Dec. 8, 1960

2 Sheets-Sheet 1



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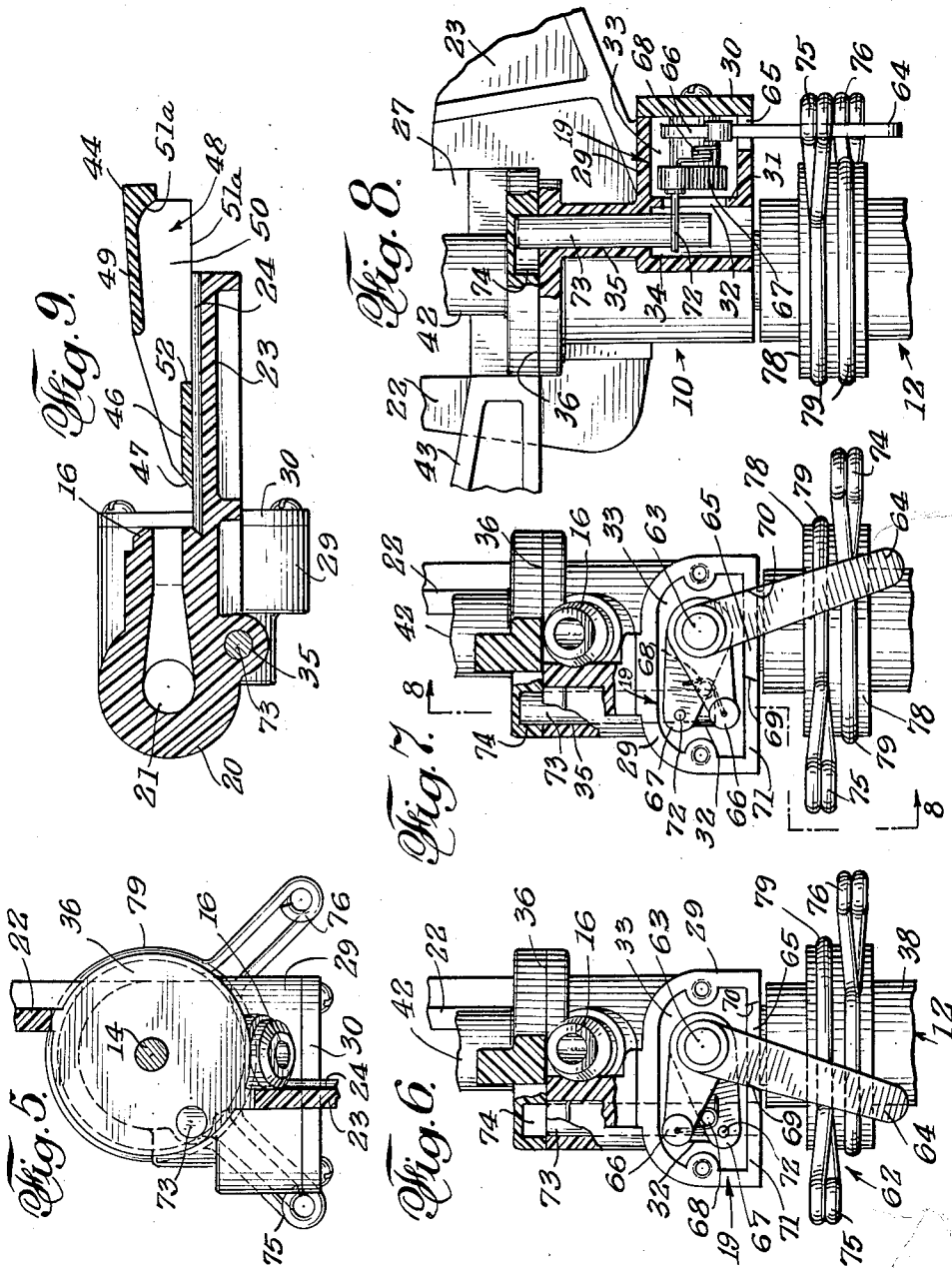
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WATER SPRINKLER

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2 Sheets-Sheet 2



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WATER SPRINKLER

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This invention relates to a water sprinkler of the impulse-driven type.

An object of the present invention is to provide an impulse-driven water sprinkler that is highly resistant to the corrosive action of water impurities and has high impact strength and resistance to wear.

Another object of the invention is to provide a water sprinkler of the character referred to that comprises lightweight non-metallic components of low inertia characteristics and, therefore, is capable of successful operation under conditions of low water pressure.

A further object of the invention is to provide, in a water sprinkler of the impulse-driven type, a novel oscillating impulse arm having high operating efficiency.

A still further object of the invention is to provide such a water sprinkler with accurately settable and controllable stream-deflecting means to vary the range of the stream with easy facility.

A yet further object of the invention is to provide simple and effective means for reversing the direction of the sprinkler stream of water.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description, which is based on the accompanying drawings. However, said drawings merely show, and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a top plan view of an impulse-driven water sprinkler according to the present invention.

FIG. 2 is a side elevational view thereof.

FIG. 3 is a partial side elevational and partial sectional view as seen from the opposite side of FIG. 2.

FIG. 4 is a cross-sectional view as taken on the line 4-4 of FIG. 2, showing the sprinkler in one of its operative positions.

FIG. 5 is an enlarged and fragmentary plan sectional view taken on a plane slightly below the plane of FIG. 4.

FIG. 6 is a fragmentary elevational view, partly in section, of the portion of the sprinkler shown in FIG. 5, and exposing operation-reversing means used in the construction.

FIG. 7 is a similar view with said reversing means in another position.

FIG. 8 is a vertical sectional view as taken on the line 8-8 of FIG. 7.

FIG. 9 is a cross-sectional view as taken on the line 9-9 of FIG. 2 and drawn to the scale of FIGS. 5 to 8.

Except where hereinafter indicated, the elements of the present sprinkler are made of a high-impact, tough, and wear-resistant thermoplastic resin that is approximately one-fifth as heavy as steel or brass, yet having destruction-resistant properties approaching that of such and similar metals and alloys. The resin preferred is Delrin Acetal Resin, a product of E. I. du Pont de Nemours and Co. of Wilmington, Delaware. This resin is well suited to in-

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jection molding techniques and provides elements that not only have the above-mentioned characteristics but are also characterized by stiffness combined with resilience over a wide temperature range, good dimensional stability in the presence of moisture, excellent resistance to organic solvents and, generally, good attributes for the present purposes. A thermoplastic polycarbonate resin, a material called "Lexan," produced by General Electric Co., Schenectady, New York, and possessing an unusual combination of toughness, impact strength, heat resistance, and dimensional stability may be advantageously used instead of Delrin. Cyclocac, a product of Marbon Chemical Division, Borg-Warner Corp., Gary, Indiana, is a high-impact, styrene-type, rigid, thermoplastic resin, also suitable to the present purpose. Nylon plastic is a thermoplastic that also has desired properties as above set forth. The four materials mentioned are, of course, exemplary and, generally, define a high-impact thermoplastic resin suitable for mold injection.

The impulse-driven water sprinkler that is illustrated comprises, generally, a body 10, a metal (preferably brass) journal tube 11 extending downward from said body, a bearing 12 rotationally engaged with the tube 11, an oscillating impulse arm 13 mounted on the body 10 on a vertical metal pivot pin 14, a metal coil spring 15 interconnecting the body and the arm 13 to bias the latter in a rotational direction counter to the direction that the arm is moved by the force of a stream of water discharging from a nozzle 16 provided in the body, a stream deflector 17 carried by the body, deflector-adjusting means 18 to regulate the degree of interception of the deflector relative to the water stream, and means 19 for reversing the operation of the sprinkler.

The body 10 has a main part 20 in which is formed a threaded bore 21 that is then directed at an upward angle to terminate in the mentioned nozzle 16, thereby enabling directing of an upwardly-angled stream of water that enters by way of the bore 21. Said body 10 has a frame part 22 that is formed to have a flat wall 23 that resides in a plane parallel to the axis of bore 21. Said wall has a face in which is formed a trough-like channel 24 directed at the angle of the nozzle 16 and extending therefrom. A water stream exiting from the nozzle 16 will be partly accommodated in the channel 24 as the same follows a path at the angle of the channel.

Said body 10 is provided with vertically-aligned bearings 25 and 26 for the mentioned pivot pin 14, an opening 27 separating said bearings. A transverse, angularly-disposed wall 28 defines the upper portion of the wall 23 and mounts the deflector-adjusting means 18. A housing part 29 is integrally provided as a lateral extension of the body part 20, the same being enclosed at the outside, by a cover plate 30, and having an inner wall 31 (FIG. 8) in which an opening 32 is provided. The interior 33 of the housing part 29 is in communication, through opening 32, with a vertical housing part 34 in the body portion 20. A vertical bore 35 extends from the part 34 upwardly and opens onto opening 27. A horizontal bearing face 36 is provided on the body portion 20 where the bore 35 ends.

The journal tube 11 is threadedly engaged with the threads of bore 21 and has a head 37 at the end opposite said threads. The head is provided with a taper adapted to engage in a seat in a pipe outlet on which the present device is mounted so that water from said pipe may enter the bore 21 through the journal tube.

The bearing 12 comprises a body 38 with a polygonal portion 39 by means of which the same may be held against rotation during connection, by a suitable union fitting, of the bearing and the mentioned water pipe. Such a union fitting may engage threads 40 provided on said bearing. In any case, the bearing is adapted to be

affixed to the discharge end of a water outlet pipe in such manner that the journal tube is adapted to be rotated against the frictional bias imposed by a washer 41 interposed between said head 37 and the adjacent end face of the bearing 12.

The oscillating impulse arm 13 is provided with a bearing part 42 through which the pin 14 extends, the same, therefore, comprising the bearing around which the arm is adapted to freely rotate in a horizontal plane. Said arm essentially comprises a tail-extension 43 from one side of the bearing part 42, and a reaction or impulse extension 44 from the opposite side. The latter extension is disposed at an upward angle on the side of wall 23 that has the channel 24 and is normally biased by coil spring 15 into contact with said face. The tail extension 43 is on the side of the frame part 22 that faces oppositely to the mentioned side of the wall 23. Thus, it will be clear that arm 13 can move rotationally only in a counter-clockwise direction from the position of FIG. 1 and, as suggested in FIG. 4, back in a clockwise direction under bias of spring 15.

The impulse extension 44 is shown as integrally comprising a draw in blade 46 that is parallel to and aligned with one side of the nozzle and has an angled edge 47 adjacent to the nozzle 16, and a water-conducting channel 48 that is comprised of a web 49 that is offset from the blade 46 and flanges 50 that terminate along edges 51 that are coplanar with the face of blade 46 that is adjacent to channel 24. At the end of web 49 is provided a reaction wall 51 that is directed at an angle opposite that of the draw in angle of edge 47. The outer edge 52 of blade 46 and the inner edge 53 of web 49 are longitudinally spaced, as shown.

It has been found that by providing the edge 47 with a pre-determined angle, the magnitude of the driving impact of the water is effectively controlled. This edge angle controls this force by controlling or determining the precise instant that the water starts to enter the channel 48 and the instant of reactive impact of the water on the reaction wall 51.

When the water that enters channel 48 reaches a magnitude of force greater than that on the draw in edge 47, the impulse arm extension 44 is driven away from wall 23 against the bias of the spring 45, leaving a clear path for the stream of water. This movement increases the tension or bias of said spring and the same acts to sharply return the extension 44 to initial position against wall 23. The impact of return movement by arm extensions 43 and 44 on the mentioned opposite faces of the frame part 22 and wall 23 produces a reaction force on the sprinkler body 10 that causes it to move slightly on the axis of tube 11, thereby changing the direction of the stream of water by the resultant change of angle of the body. Repeated percussions, as above, cause intermittent rotational advance of the body 10 and of the water stream.

The impact moment can be set, as desired, by the degree of slope of edge 47. Side-spit, an undesirable action in impulse sprinklers, can be considerably reduced by designing the channel 48 with deep flanges 50 and proportioning the reaction wall and angle 51 relative to the angle and thickness of the edge 47.

The water stream deflector 17 comprises a plate that is mounted on the wall 28 of the body 10 and is directed to extend across the path of a stream of water being discharged through nozzle 16. Said plate is slidably mounted so that its interception or intrusion into said stream may be varied to, accordingly, vary the range of area to be watered.

The means 18 for slidably adjusting the deflector 17 comprises a knob 54 that is rotationally carried by a metal screw 55 that is affixed to wall 28 and has a pin 56 which extends into a suitably formed cam slot 57 in deflector 17. Since the deflector is held from rotational movement by engagement of flanges 58 thereof with the

edges of wall 28, rotation of the knob results in the mentioned sliding movement of the deflector. By providing an index mark 59 on the top face of the deflector and radial graduations 60 on a peripheral flange 61 of the knob, said mark and graduations provide a visual means by which the adjusted position of the deflector may be had. Thus, adjustment may be made without the need for trial and error and the range of the stream set with easy facility, and it is a simple matter to re-set an adjustment after the same had been changed.

The reversing means 19 is partly enclosed in the housing parts 29 and 34 and partly in the bore 35, range-adjustable means 62 being provided on the bearing 12 to operate said means 19.

As best seen in FIGS. 6, 7 and 8, the means 19 comprises a metal shaft 63 that has bearing in wall 31 and closure plate 30 and is disposed in the interior 33 of housing part 29, an operating lever 64 fulcrumed on said shaft and extending downward through an opening 65 in said housing part, an arm 66 formed integrally with lever 64, a second arm 67 also fulcrumed on shaft 62, and an overcenter spring 68. From a comparison of FIGS. 6 and 7, it will be clear that said arms and lever provide for a toggle or overcenter action when the lever is moved away from either of the stop shoulders 69 and 70 of the lower wall 71 of housing part 29. As a consequence of this action, the arm 67 is raised and lowered, accordingly, raising and lowering a cross pin 72 that extends from said arm 67, through the wall opening 32 and into connection with a vertical interlock pin 73 that is slidably movable in bore 35.

The pin 73, therefore, has a retracted position with its upper end below or at least flush with the top face of body bearing face 36, as in FIG. 6, and a projected position, as in FIG. 7. A rotation-limiting slot 74 is formed in the under face of the arm 13 where the same bears on bearing face 36. Said pin 73, when projected enters said slot 74.

When pin 73 is retracted, the arm 13 is free to respond to reaction impulses as above described so that the body is intermittently rotated in one direction and the path of the stream changed accordingly. When pin 73 is projected, the reaction movement of the arm extension 44 is limited by said pin and slot connection causing an intermittent movement of the body 10 in the opposite direction. In other words, each time the trailing end wall of slot 74 strikes the projecting pin, as in FIG. 4, the body is moved and the direction of movement is opposite to movement caused by the percussive force between arm 13 and the faces of body frame 22 and wall 23.

The means 62 determines when the lever 64 will be shifted one way or the other to change the direction of rotation. Said means 62 is shown as two limit stop members 75 and 76 that are rotationally adjustable around the bearing 12 to provide a range of adjustment up to 350°, if such a large or wide range is desired. To this end, grooves 77 in an enlargement 78 of said bearing 12 rotationally hold circular portions 79 of the stops 75 and 76. The included angle of adjustment of said stops is varied by rotational adjustment afforded by the mentioned grooves 77 and portions 79 and the frictional engagement thereof holds the adjustment until a change in the range of operation of the stream is desired. By directing the stops along the desired watering limits, the stream will reach these limits alternately and then move in a reverse direction to the opposite limit.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the construction is, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifica-

tions that may fall within the scope of the appended claims.

Having thus described this invention, what is claimed and desired to be secured by Letters Patent is:

1. In an impulse-driven water sprinkler having a rotationally mounted body from which a stream of water is ejected and having a spring-biased impulse arm that is deflected against the bias of said stream and is mounted on a vertical pivot on said body, and means to reverse the operative rotational movement of the body as instituted by the impulse arm, the improvement that comprises reversing means provided with two adjustable fixedly positioned limit stops, a pivot on the body transverse to the axis of rotation of the body, a reversing lever on said pivot and alternately engageable by said limit stops, an arm fixed with said lever, a second arm on the mentioned pivot, an over-center spring connecting said arms to cause the second arm to move between two positions as instituted by movement of the lever by the respective limit stops, and an interlock pin connected to the second arm and movable thereby parallel to the axis of rotation of the body to engage the impulse arm in one position thereof and to release said impulse arm in the other position, said body being provided with a housing to enclose said pivot, two arms, interlock pin and over-center spring, and to partly enclose the reversing lever.

2. In an impulse-driven water sprinkler having a rotationally mounted body from which a stream of water is ejected and having a spring-biased impulse arm that is deflected against the bias of said stream and is mounted on a vertical pivot on said body, and means to reverse the operative rotational movement of the body as instituted by the impulse arm, the improvement that comprises reversing means provided with two adjustable fixedly positioned limit stops, a pivot on the body transverse to the axis of rotation of the body, a reversing lever on said pivot and alternately engageable by said limit stops, an arm fixed with said lever, a second arm on the mentioned pivot, an over-center spring connecting said arms to cause the second arm to move between two positions as instituted by movement of the lever by the respective limit stops, a pin extending laterally from the second arm, and an interlock pin connected to the lateral pin and movable thereby parallel to the axis of rotation of the body to engage the impulse arm in one position thereof and to release said impulse arm in the other position, said body being provided with a housing to enclose said pivot, two arms, pin and interlock pin, and over-center spring, and to partly enclose the reversing lever.

3. In an impulse-driven water sprinkler having a rotationally mounted body from which a stream of water is ejected and having a spring-biased impulse arm that is deflected against the bias of said stream and is mounted

on a vertical pivot on said body, and means to reverse the operative rotational movement of the body as instituted by the impulse arm, the improvement that comprises reversing means provided with two adjustable fixedly positioned limit stops, a pivot on the body, a reversing lever on said pivot and alternately engageable by said limit stops, an arm fixed with said lever, a second arm on the mentioned pivot, an over-center spring connecting said arms to cause the second arm to move between two positions as instituted by movement of the lever by the respective limit stops, a pin extending laterally from the second arm, and an interlock pin connected to the lateral pin and movable thereby to engage the impulse arm in one position thereof and to release said impulse arm in the other position, the impulse arm having a slot into which the interlock pin extends in one position thereof and which effects a lost-motion connection between said body and the impulse arm.

4. In an impulse-driven water sprinkler having a rotationally mounted body from which a stream of water is ejected and having a spring-biased impulse arm that is deflected against the bias of said stream and is mounted on a vertical pivot on said body, and means to reverse the operative rotational movement of the body as instituted by the impulse arm, the improvement that comprises reversing means provided with two adjustable fixedly positioned limit stops, a pivot on the body, a reversing lever on said pivot and alternately engageable by said limit stops, an arm fixed with said lever, a second arm on the mentioned pivot, an over-center spring connecting said arms to cause the second arm to move between two positions as instituted by movement of the lever by the respective limit stops, and an interlock pin connected to the second arm and movable thereby to engage the impulse arm in one position thereof and to release said impulse arm in the other position, the impulse arm having a slot into which the interlock pin extends in one position thereof and which effects a lost-motion connection between said body and the impulse arm.

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