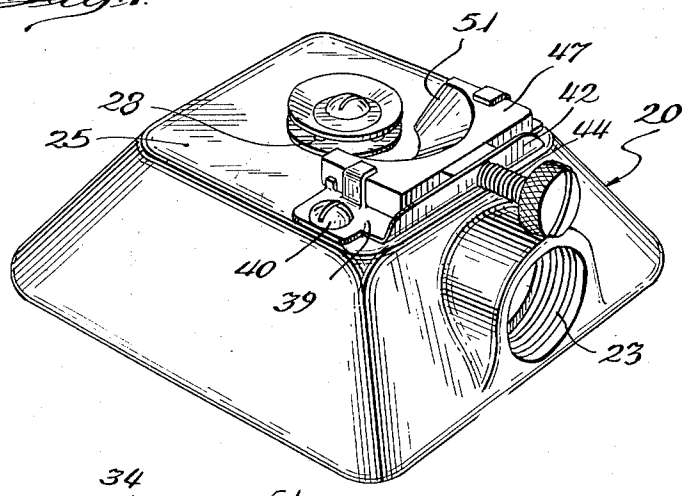
Sept. 4, 1951 B. A. TETZLAFF 2,566,781

SPRAY DEVICE

Filed Oct. 22, 1947 2 Sheets-Sheet 1

Fig. 1.



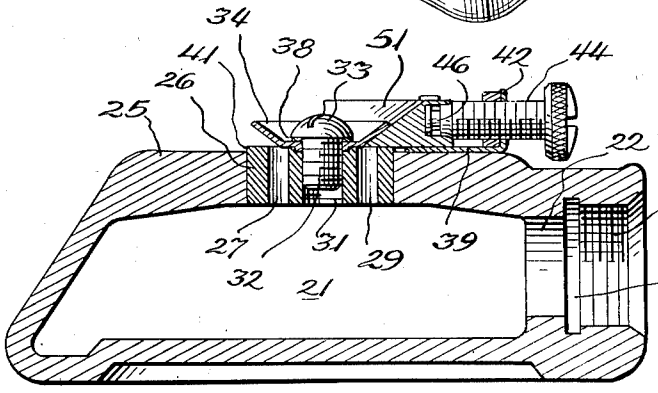


Fig. 2.

Fig. 3.

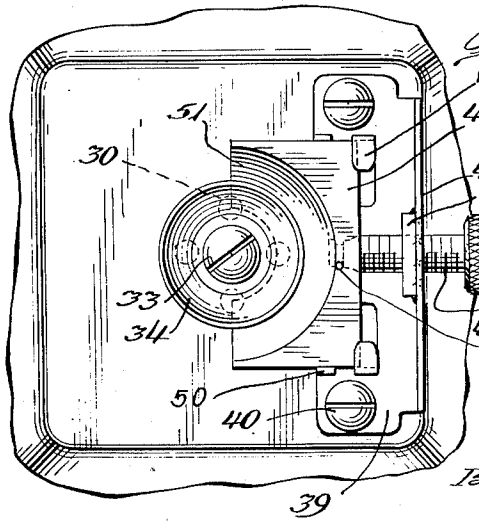
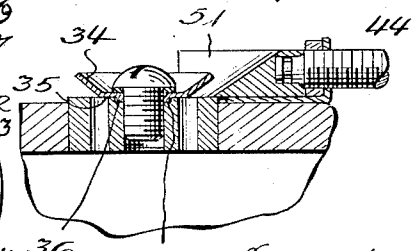


Fig. 4.



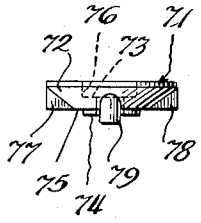
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SPRAY DEVICE

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Fig. 12.



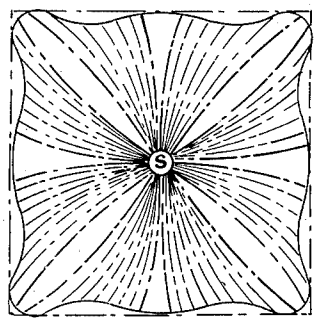


Fig. 5.

Fig. 6.

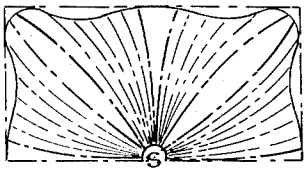


Fig. 7.

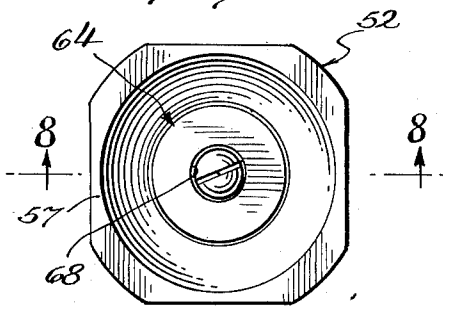
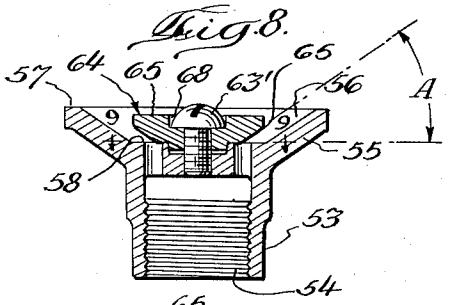


Fig. 8.



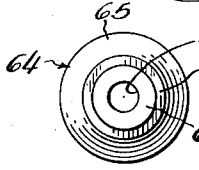


Fig. 10.

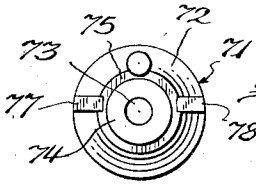


Fig. 11.

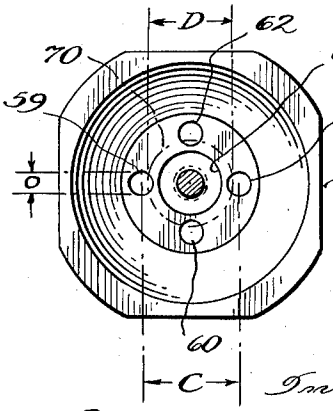


Fig. 9.

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Patented Sept. 4, 1951 2,566,781

UNITED STATES PATENT OFFICE

2,566,781

SPRAY DEVICE

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Application October 22, 1947, Serial No. 781,459

1 Claim. (Cl. 299—18)

1

This invention relates to spray devices and more particularly to the type of lawn sprinkler in which a square area is adapted to be wetted so that a given plot may be accurately sprinkled without affecting the adjacent terrain.

The invention contemplates improvements over the teachings of U. S. Patent No. 2,190,639, issued February 13, 1940 to Joseph Wittek. The objects of this invention are primarily to provide spray devices which are simpler in construction and operation, more economical to manufacture, simpler to adjust, and more efficient and accurate in performance than prior spray devices in general, and those described in the said Wittek patent in particular.

Another object of the invention is to provide a spray device of the character described where the area sprinkled is sharply and precisely defined.

A further object of the invention is to provide a spray device of the character described in which a perfect square or a half of that square may be wetted by the same device by means of an adjustment easily made.

Certain important objects of the invention lie in the novel construction of the adjustable means for converting the sprinkler from producing a square spray pattern to produce a rectangular pattern comprising one half of the square area.

Another object of the invention is to provide a spray device which will produce a sharply defined rectangular spray pattern.

A further object of the invention is to provide a sprinkler head in which the water is emitted in a finely divided and uniformly distributed spray and in which the area wetted will be uniformly saturated.

An important object of this invention is to provide an improved formula for the designing of spray heads to produce a uniformly distributed spray of square or rectangular design.

Other objects of the invention lie in the provision of novel fixed spray heads for producing either square or rectangular spray patterns.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

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For the purpose of facilitating an understanding of this invention, there is illustrated in the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, this invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Fig. 1 is a perspective view of a spray device embodying the new invention, same being shown adjusted to produce a perfectly square spray pattern.

Fig. 2 is a sectional view taken through the center of same.

Fig. 3 is a fragmentary top plan view of the same showing the device adjusted to produce a perfectly rectangular spray pattern exactly half the size of that capable of being produced when the condition of the device is as shown in Fig. 1.

Fig. 4 is a fragmentary sectional view similar to that of Fig. 2 but showing the device adjusted as in Fig. 1.

Fig. 5 is a diagrammatical illustration of the pattern of the sprayed area when the sprinkler is adjusted to produce a square pattern.

Fig. 6 is a diagrammatical illustration of the pattern of the sprayed area when the sprinkler has been adjusted to produce half of the sprayed pattern of Fig. 5, namely, a rectangle.

Fig. 7 is a top elevational view of a fixed sprinkler head adapted to be attached to a permanent sprinkler system for example, embodying the teachings of the invention.

Fig. 8 is a sectional view taken through the head shown in Fig. 7 along the line 8—8 as indicated by the arrows. The appearance of the heads which are designed to produce either square or rectangular spray patterns are identical in plan. Fig. 8 illustrates a head intended to produce a perfectly square spray pattern.

Fig. 9 is a top plan view similar to that of Fig. 7 but with a section taken through the bottom of the spreader cap or deflector along the line 9—9 of Fig. 8.

Fig. 10 is a bottom plan view of the spreader cap or deflector used in the head shown in Fig. 8 and adapted to produce a perfectly square spray pattern.

Fig. 11 is a bottom plan view of the spreader cap or deflector used to produce a rectangular spray pattern.

Fig. 12 is a side elevational view of the same.

In the Wittek patent above referred to, a spray device was described which could produce a substantially square spray pattern. The sprinkler or

spray head was provided with four passages ending in orifices 90° apart and vertically arranged. The water coming through these orifices was directed to impinge on the bottom of a spreader cap or deflector. The cap was shaped somewhat like a squat, inverted, truncated cone and the water impinged on the slanted sides of the cone. As a result of this impingement, the water from each orifice theoretically spread over the frusto-conical member and fanned out in a somewhat triangular segment approximately 120° in extent, or roughly ⅓ of the square area. Since there were four orifices, the water pattern overlapped at each corner by 15°. This overlap of pattern caused the water to fly further at each corner since the juncture of the spray increased the volume in relative ratio of the overlap. Thus a square pattern was formed.

This same general principle is used in the instant invention with certain improvements which will be pointed out hereinafter.

By reason of the practical application of the above theory set forth in the Wittek pattern a perfectly rectangular pattern was not produced by the described construction. Such a result is possible, however, by means of the construction of the instant invention.

The reference character **20** designates a base preferably cast from some heavy metal such as iron and having a water chamber **21** formed therein. Access to the chamber is had at the side of the base by means of a passageway **22** which is screw threaded at its outer end **23** to receive the threaded ferrule of an ordinary garden hose (not shown). A rubber ring **24** is provided to serve as a gasket when the ferrule is attached.

The base **20** is generally of truncated pyramidal formation in the embodiment shown, although this is not essential to the invention. The top wall **25** is provided with a plug member **26** comprising a discharge head which is set into the top wall and extends through same to the chamber **21**. The plug member **26** is cylindrical in formation and is provided with four circular passageways **27**, **28**, **29**, and **30**, equally spaced thereabout and extending therethrough, parallel to the axis of the member **26**. Centrally of the plug member **26** there is provided a screw threaded passageway **31** for the accommodation of a machine screw **32** the head **33** of which holds the deflector cap **34** in place over the upper open ends of the passageways **27** to **30**. These open ends comprise fluid discharge orifices.

The spreader or deflector cap **34** comprises a dished member of frusto-conical formation having a flat bottom surface **35** which overlies the upper end of the plug member **26** and overlaps the upper openings or orifices of the passageways **27** to **30**. Centrally of the bottom surface **35** there is provided a downwardly extending protuberance **36** which is adapted to engage in and be received by a seating recess **37** formed about the upper end of the passageway **31**. The cap **34** is firmly engaged on the end of the member **26** by the head **33** of the screw **32**, a lock washer being provided for security as shown at **38**.

As thus far described, the sprinkler will produce a perfectly square spray pattern. It is essential that certain proportions be used in choosing the dimensions of the orifices, spreader-cap, etc., but this will be more fully discussed hereinafter. Suffice it to say that the square pattern which will be produced by the new and improved sprinkler is a more precise and accurate one than has heretofore been achieved.

It is often desirous, in portable sprinkler systems to be able to spray and saturate a section of the lawn immediately adjacent a walk or driveway which is being used. It is required that the lawn properly be wetted while the driveway remains dry. Naturally the area to be sprayed should be controlled and in the case of the instant invention it can be precisely defined so that the systematic spraying of the terrain can be efficiently accomplished.

On the top of the base **20** there is attached a plate member **39** by means of the screws **40**. The thickness of the plate member **39** is preferably substantially equal to the amount which the member **26** extends above the surface of the wall **25** as indicated at **41**. The plate member **39** is rectangular in formation and is arranged on one side of the member **26**, preferably along the same edge of the base **20** having the inlet **22**. The outer edge of the plate member **39** is provided with a turned up portion forming a flange **42**. A nut **43** is welded to the flange **42** on the inside thereof aligned with an appropriately positioned opening in the flange. A screw **44** having a knurled head **45** is engaged in said nut **43**. The inner end of the thumb screw **44** is grooved at **46** and is pinned within the slide block **47** by the pin **48**. The plate member **39** has a pair of ears **49** formed thereon, preferably by striking same from the same member as shown, said ears coming up the end walls of the block **47** and overlapping the top surface thereof whereby they retain and guide same in its sliding movement. An additional pair of lugs **50** will be found advantageous in properly guiding the sliding movement or the block.

The block **47** is rectangular in formation, but is provided along the edge facing the spreader or deflector cap **34** with a semicircular cut-away portion **51** which spreads outwardly and upwardly at the identical angle of the lower surface of the cap **34**, and being of the identical circular dimensions. In other words, the conical surfaces defined by the cut-away portion **51** and the bottom surface of the spreader cap **34** are identical. The angle at which the water is sprayed as a result of the impingement thereof against the bottom surface of the spreader cap **34** is thus parallel to the angle of the cut-away surface of the block **47** and hence the block need not be spaced a great distance from the spreader cap in order for the spray to clear same in the production of a perfectly square spray pattern.

When the thumb screw **44** is turned to its furthest clockwise extent, the block **47** slides along the plate **39**, onto the upper surface of the plug **26**, and into engagement with the spreader cap **34**. The orifices which comprise the upper ends of the passageways **28**, **29**, and **30** will be covered by the block **47**, the passage **29** being completely covered, and the passages **28** and **30** being only half covered. Thus, the passageway **27** will be completely uncovered and the left halves of the orifices comprising the ends of the passageways **28** and **30** will be uncovered, viewed in Fig. 3. It should be appreciated that by reason of the overlapping portion of the spreader cap **34**, as will be hereinafter described, the normal area of a completely uncovered orifice is less than the cross sectional area of any of the passageways.

It should be noted that the leading edges of the block member **47** are perpendicular to the half

covered orifices and as such define one edge of the rectangular spray pattern.

With the block 47 moved completely to the left as shown in Fig. 2, it has been found that the pattern produced by the spray is precisely one-half of that produced when the block is moved to its fullest "open" extent. The pattern is shown in Fig. 6. The position of the sprinkler is indicated at S. The half of the area served by the sprinkler which is dry is that half to the side where the hose is attached. It is therefore possible to move the device while same is operating and without danger of getting wet. The advantages of being able to spray a precise rectangular pattern to one side of the sprinkler are believed obvious without further mention.

Where a permanent sprinkling system is installed to spray a large area, the invention is highly advantageous since it enables a minimum of spray heads to be used, while a completely uniform saturation is obtained. In such systems the feature of adjustability is not required and hence this invention contemplates the application of the principles to permanent spray heads.

The heads which are utilized to produce a square or rectangular pattern are substantially identical with the exception of the deflector cap. Thus in Fig. 7 there is shown the top plan view of a spray head which could be of either type. The reference character 52 designates generally the spray head which includes a shank 53 having an internally threaded passage 54 whereby the head 52 may be secured to a pipe or the like (not shown). A flared end portion 55 is carried on the shank 53, same being recessed at 56 so that the deflector cap may be below the upper surface 57 of the head. This enables the lawn to be mowed without danger of injuring the blades of the mower and causing interference with the sprinkler heads. The base of the recessed portion is flat as shown at 58 and is provided with four circumferentially arranged orifices 59, 60, 61, and 62 each of which communicates with the passageway 54. Centrally of the base 58 there is provided a circular seating recess 63 arranged to cooperate with the downwardly depending protuberances formed on the spreader caps as will be described. A machine screw 63' is adapted to engage in a centrally positioned tapped opening provided in said head 52 for holding the spreader caps in position.

Two different types of spreader caps are utilized in connection with the described permanent spray head 52. One is for the production of a perfectly square spray pattern and the other is for the production of a half of said square pattern. In Fig. 10 there is shown a bottom plan view of the spreader cap which is intended for the former purpose. Same is shown installed on the head in Fig. 8. The spreader cap 64 of Figs. 10 and 8 comprises a member of substantially squat truncated conical formation heretofore described as frusto-conical having the conical spreading surface 65 inverted upon the base 58 so that water ejected through the orifices 59, 60, 61, and 62 will be broken into fine mist-like spray. There is provided a central opening 66 to allow passage of the screw 63', a downwardly depending protuberance 67 to cooperate with the recess 63 in locating and seating said cap 65 on the base 58, and an upper seating recess 68 to accommodate the head of the screw 63'. There is an annular flat portion 69 which is intended to overlap the orifices a given amount as will be described below. The edge defined by the juncture of the surface 65 and the surface 69 is designated 70, and is represented in broken lines in Fig. 9 in order to show the relation thereof with respect to the orifices for purposes of describing the improved formula of relative values of the important dimensions of the device.

The spreader cap or deflector 71, which is intended to be used with the spray head 52 for the production of a half of the square pattern, namely a precise rectangle, is shown in Figs. 11 and 12. Same comprises a member of substantially squat truncated conical formation having the conical spreading surface 72, the central opening 73 accommodate the screw 63', the downwardly extending protuberance 74 for engaging with and being seated within the recess 63, and the flat portion 75, corresponding to the portion 67 of the spreader cap 64. A recess 76 is provided for the head of the screw 63'. As thus far described the cap 71 is identical with the cap 64. In addition, however, there are provided diametrically opposed orifice blocking members 77 and 78 of generally parallelepipedal formation set into the sides of the cap 71 and having their bottom surfaces flush with the surface 75 so as to engage the base 58. These members 77 and 78 are arranged on the center line of the cap 71 as will be noted from Fig. 11, so that when in position upon the head 52, the halves of a pair of diametrically opposed orifices will be effectively covered, exactly as in the case of the portable device in the condition shown in Fig. 2. In order properly to center the cap 71 so that the blocking members 77 and 78 are perfectly positioned, a pin 79 is attached to the cap 71 and adapted to enter and block the orifice on the covered side of the members 77 and 78. Thus the pin 79 serves a dual purpose.

If for example, the cap 71 is arranged so that the upper halves of the orifices 59 and 61 of Fig. 9 are covered, the pin 79 will be engaged within and blocking the orifice 62.

It should be obvious that the reason for the comparatively complicated construction of the cap 71 is to permit the same head 52 to be used with both that cap and cap 64. This is a matter of economy in manufacture. Naturally special heads may be designed in which the construction of the cap to produce the rectangular pattern need not be as complicated. For example, an orifice could be eliminated, in which case means could be provided for centering the cap in other than the manner described.

In order to achieve the fine spray referred to above and to further achieve the formation of the square and half square patterns, certain requirements must be met. The initial volume of water must be of a certain amount, the area of the orifices covered must be a certain amount in relation thereto, and the angle of the cap must be of a certain amount to give the flying water the correct pitch so that it will fly the proper distance. If any of these factors are off, the sprinkler will not produce a square (or rectangular) spray pattern. The formulae described in the Wittek patent did not produce as precise and uniform a square as possible in view of the fact that certain factors were not properly adjusted one relative to the other. This resulted in certain limitations which to a considerable extent restricted the size of the sprinkler.

It has been found that the results described herein can readily be obtained by utilizing certain formulae (reference being had for the letters to Fig. 9 and Fig. 8), wherein, O equals

the diameter of the orifice; C equals the diameter of a circle intersecting the centers of the orifices spaced 90° apart; D equals the diameter of the bottom of the deflector cap at the point of intersection of the conical and flat surfaces, designated 70 in Fig. 9; and A equals the angle of the face of the deflector cap relative to the base of the sprinkler head.

These formulae are expressed as follows:

O is any given value.
C equals four times O.
D equals C, minus one fiftieth of O.
A equals 34°.

The above proportions have been found to give the results described herein. Variations of two percent in the dimensions have been determined to be permissible, without substantial departure from desirable results.

The invention is applicable to any spray device regardless of whether for the purpose of sprinkling lawns or not, and it is not intended to limit the disclosure by describing a lawn sprinkler.

It is believed that this invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while a preferred embodiment of the invention has been shown and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of this invention as defined in the appended claim.

What it is claimed and desired to secure by Letters Patent of the United States is:

In a spraying device, a base having a top and a fluid intake, a discharge head carried upon the top of the base and including circumferentially arranged openings, a spreader for spreading the fluid discharged from the openings and means for blocking off half of the openings, said means comprising a sliding block member adapted to cover the openings arranged upon the top of the base and movable into complete engagement against said spreader, a vertically arranged flange upon the top, a thumbscrew threaded in said flange and arranged parallel with the top, the end of the thumbscrew being rotatively mounted in the block member, said block member being slidable reciprocally with rotation of said screw, and ears on opposite edges of the top slidably engaging the edges of the block member to guide the reciprocal sliding movement thereof.

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