April 30, 1940. R. H. RUSSELL 2,199,142

SPRINKLER

Filed Aug. 6, 1937

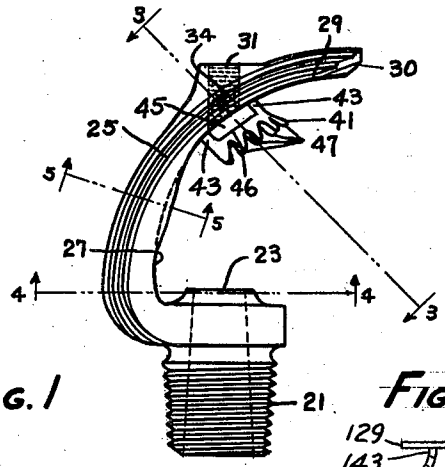


FIG. 1

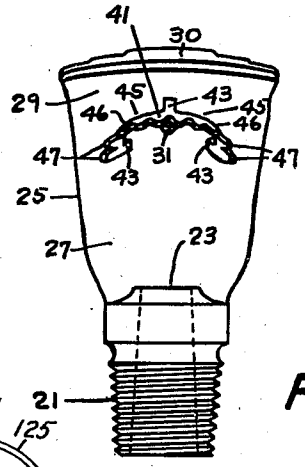


FIG. 2

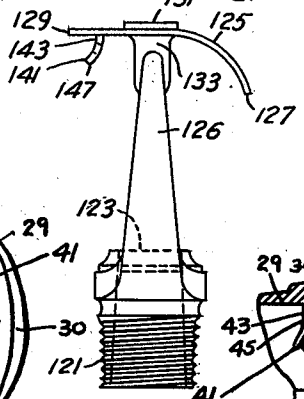


FIG. 7

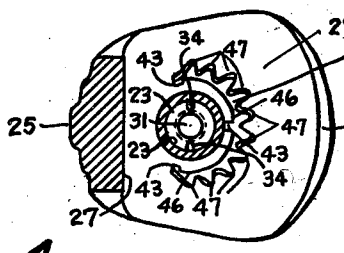


FIG. 4

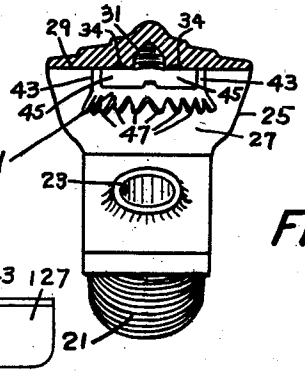


FIG. 3

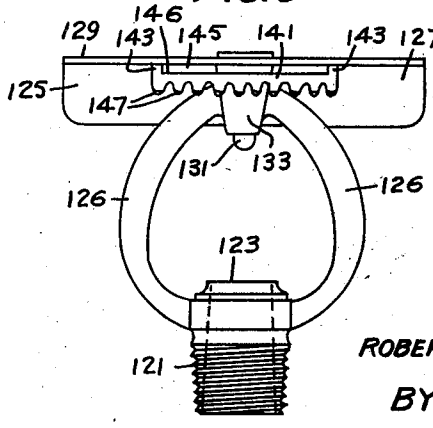


FIG. 6

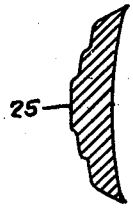


FIG. 5

INVENTOR

ROBERT HARRISON RUSSELL

BY C. E. Beach

ATTORNEY

Patented Apr. 30, 1940 2,199,142

UNITED STATES PATENT OFFICE

2,199,142

SPRINKLER

Robert Harrison Russell, Worcester, Mass., assignor to Rockwood Sprinkler Company of Massachusetts, Worcester, Mass., a corporation of Massachusetts

Application August 6, 1937, Serial No. 157,637

3 Claims. (Cl. 299—121)

This invention relates to sprinklers, and more particularly to sprinklers for fire extinguishment, both of the so-called "automatic" or thermostatically controlled type and of the so-called "open" type.

For service in certain situations, it is desirable that a sprinkler shall simultaneously effect distribution of a liquid fire extinguishing agent in diverse manners such as will cause various portions of the agent to reach various predetermined areas and produce desired effects in such areas.

Thus it may be deemed expedient that sprinklers installed in a given room shall be situated near side walls of such room, and yet be capable of effecting adequate distribution of the extinguishing agent throughout the entire area of the room.

To this end, a suitable portion of the extinguishing agent should leave the sprinklers in a more or less finely divided spray for distribution over nearby surfaces, while other portions should leave in substantially continuous sheet form, in order to be more effectively projected to more distant surfaces, whereat distribution may occur in either spray or more compact form, as may be predetermined by the characteristics of the sprinkler structure.

Correspondingly, for extinguishing fire in and around containers of oil or other inflammable substances, it is often very desirable that water or other extinguishing fluid shall be applied in a finely divided spray to the surfaces of the substances within such containers, to the end that agitation and aeration of such substances shall be minimized; while being equally desirable that comparatively heavy sheets of such fluid shall be applied to combustible surfaces which are subject to ignition from the heat of fire within the containers.

Furthermore, while it is well recognized that, under many circumstances, a more or less finely divided spray of a fire extinguishing agent adjacent to a point of combustion is more effective than a sheet or stream of greater compactness, both in the rapidity of heat absorption and in the cutting off of oxygen; it is also well known that a more compact sheet or stream of an agent such as water will be better projected to and distributed over areas situated at a greater distance, and that, therefore, such sheet or stream distribution should be employed where there are comparatively large open bays or other situations for which it is inexpedient to provide supply piping other than where supporting structure is available, as along the edges of bays.

There are many other situations for which it is desirable to utilize sprinklers, individual ones of which will produce a spray for reaching nearby areas and will effect projection of a more compact stream or sheet toward more distant areas. It is further desirable that such sprinklers may be simply and readily preset or adjusted so that the compact portion will either retain most of its compact form or will become subdivided into spray when reaching surfaces situated at intended distances toward which it is directed, as may be made expedient by conditions at such surfaces. Examples of such other situations are found in upper and lower berths of boats, above and below store counters and work benches, and the like.

It is, therefore, an important object of this invention to provide a sprinkler which will efficiently effect uniform distribution of a fluid over adjacent, distant and intervening areas simultaneously.

It is another object to provide a sprinkler which will more or less finely divide a portion of the medium which may issue therefrom and effect projection of such portion to certain surfaces to be sprinkled, and which will cause another portion or the remainder of such issuing medium to be projected in a sheet or stream to other such surfaces.

It is a further object to provide such a sprinkler which will effect projection of such more finely divided portion to nearby surfaces and of such more compact portions to more distant surfaces.

It is a still further object to provide, in such a sprinkler, structure whereby the relative proportions of such more finely divided and compact portions may be simply and expeditiously preset or adjusted, and whereby the characteristics of such compact portions may be so varied that, when reaching intended objectives, either there will have been little dispersion or else such portions will have become more or less finely divided while en route to such objectives.

Other objects are to provide a sprinkler which may be simply and inexpensively manufactured and assembled, and which will be more efficient in certain oft encountered situations than prior sprinklers.

Still other objects will be in part obvious and in part pointed out in greater detail in the course of the following description.

In constructing this invention in accordance with a broad aspect thereof, a deflector is associated with a discharge nozzle in such relationship thereto that when a stream of fluid of intended character and velocity issues from the nozzle it will impinge against a surface of the deflector.

Such surface is preferably smooth enough to facilitate the flow of a sheet of water thereover and is so shaped that a substantial portion of such a stream will, when leaving the deflector, be moving in a direction and at a velocity which

will cause a suitable part of such stream portion to reach the most distant areas which should be sprinkled thereby.

In suitable proximity to such surface of the deflector, there is a diverting member, which, for most situations, should also serve to break into a spray a portion of the discharged stream. For want of a better name, such a diverting member will be hereinafter, at times, referred to as a "diverter."

Pursuant to a more specific aspect of this invention, such diverter involves a strip or bar which, for many uses, has one edge thereof substantially straight and the opposite edge serrated so as to break into a spray such portion of the sheet of liquid as may encounter it; although, for certain other uses, both edges should be serrated, and, for still other uses, both edges should be substantially straight.

Such diverter strip is so positioned with relation to the stream directing surface of the deflector that one of the edges of said diverter will be adjacent to said surface, and be so spaced therefrom as to permit a sheet of liquid of suitable thickness to pass between said diverter edge and the deflector.

Other and more specific aspects of this invention will be best understood from a consideration of the ensuing description, in connection with the annexed drawing, in which

Figure 1 is a side elevation of a so-called "side-wall" sprinkler head embodying the general and certain of the specific features of this invention;

Fig. 2 is a front elevation of the sprinkler head of Fig. 1;

Fig. 3 is a fragmentary view, partly in a section taken along the line **3—3** of Fig. 1, showing the adjacent portions of the deflector and the diverter;

Fig. 4 is a fragmentary view, partly in section, of the sprinkler head of Fig. 1, taken along the line **4—4** and indicating a certain relationship between the diverter, the deflector and the nozzle;

Fig. 5 is a section of the deflector of Fig. 1 taken along the line **5—5**, and illustrates a certain stream-directing-characteristic of the formation of said deflector;

Fig. 6 is a front elevation of a well known type of sprinkler head, together with modifications in accordance with certain features of this invention; and

Fig. 7 is a side elevation of the sprinkler head of Fig. 6.

Referring to Figs. 1, 2, 3 and 4, the threaded base or nipple **21** has an opening **23** therethrough (as indicated by dotted lines in Figs. 1 and 2) and is suited for upright attachment to a distribution piping system to serve as a nozzle for projecting a jet of a fire extinguishing agent supplied through such piping.

A curved deflector **25** (see also Fig. 5) is formed integral with the base **21**, said deflector having a slightly concave portion **27** extending from said base at one side of the intended discharge path from said opening **23**, and a further portion **29** inclining toward and extending across such path.

The portion **27** of said deflector nearest said base **21** has a width several times the diameter of the opening **23**, which width increases as said deflector extends away from said nozzle. Such concave portion, in association with the increasing width just referred to, serves with a desired degree of effectiveness for guiding substantially all of such stream as may issue from said nozzle, as will now be more fully explained.

The surface **29**, of said deflector, faces the path of such afore-said nozzle stream. Said surface is comparatively smooth and inclines in a curve of gradually decreasing radius, whereby to convert a comparatively round stream into a stream of sheet form and to deflect such stream through a desired angle with a minimum loss of velocity. For some situations, it has been found that the free end **30** of the deflector **25** may best form an angle of approximately seventy degrees (70°) with the axis of the opening **23**, as viewed in Fig. 1.

A threaded hole **31** in the deflector **25** is shown in alignment with the opening **23**, for receiving a supporting screw for automatic sprinkler thermostatic flow-controlling means. Detailed representation of such a screw and controlling means is herein omitted in the interest of clearness, in-as-much as such means forms no part of this invention. For open sprinkler service, such hole **31** may be omitted.

Holes **34, 34** may be provided in the deflector **25**, in the path of a stream from nozzle **23**, for conducting extinguishing fluid to surfaces situated at the opposite side of the deflector; such holes, by their size, number and direction, determining the nature and extent of fluid distribution along ceiling or other surfaces otherwise shielded from such distribution by the deflector **25**.

A diverter **41**, of semi-circular form, is secured to the deflector **25** by the lugs **43** and is situated just outside the path of a stream or jet directly from the nozzle **21**, while being in the path of such a stream along the surface of said deflector after impinging thereupon. (See Fig. 4).

Said diverter **41** flares outwardly, so that the portion thereof farthest from said deflector is of greatest radius.

The edge **46** of said diverter **41** which is nearest to said deflector is spaced therefrom sufficiently to provide the openings **45, 45** therebetween (see Fig. 3); which openings are of such width as to permit a sheet of liquid of desired thickness to pass therethrough. The opposite edge of said diverter has the serrations **47** formed therein for breaking up or finely dividing that portion of the nozzle stream which is diverted by said diverter from following along the surface of said deflector.

From the foregoing it will be understood that, in operation, substantially all of a stream of fluid issuing from nozzle **23**, at intended velocity, will strike the deflector **25** in the vicinity of the diverter **41**, where it will be converted into a flat sheet or stream which will flow along the surface **29**. A portion of such stream will pass through the openings **45, 45** substantially unimpeded and, by its acquired momentum, will be projected to distant surfaces, in accordance with its velocity, mass and the contour of the surface **29**. Another portion of such stream will encounter the diverter edge **46** and pass among the serrations **47** and be thereby divided into a spray which will be projected to comparatively nearby surfaces; the extent, density and character of such spray being determined by its velocity, mass and the contour of the diverter **41**.

Relative proportioning of the nozzle stream as between nearby and distant surfaces, and the character of the distantly projected sheet may be diversely preestablished to meet varying con-

ditions by embodying suitable characteristics in the form and size of the openings 45 and in the surface 29, in accordance with the foregoing explanations; and the character of the spray to be directed toward comparatively nearby surfaces may be variously preestablished by utilization of serrations 47 suitable in size, number and formation; all as will be readily understood by those skilled in this art.

Referring now to the sprinkler of Figs. 6 and 7; the threaded base 121 has an opening 123 therethrough, and has the yoke arms 126, 126 associated therewith. For automatic sprinkler service, these arms may carry a screw 131 at their junction 133, for supporting desired thermostatic flow-releasing mechanism.

A deflector 125 of oblong form is secured to the yoke arms 126, 126 at their junction 133. The major axis of this deflector corresponds substantially with the plane occupied by the arms 126, 126. The portion 129 of said deflector, which is situated at one side of said axis, extends perpendicularly to the axis of the opening 123.

The portion 127 of said deflector, which is situated at the other side of its said major axis, curves toward said base 121 for a reason which will be hereinafter more fully set forth.

A diverter 141 is supported on the portion 129 of said deflector by the lugs 143; the adjacent edge 146 of said diverter being spaced from said deflector so as to provide an opening 145 therebetween, and the opposite edge of said diverter having the serrations 147 formed therein.

Said diverter 141 is inclined with reference to the adjacent surface of the deflector so that the serrated edge 147 is farther from the path of a jet from the nozzle 121 than the plain or straight edge 146, to the end that, such portion of such jet as is diverted by said diverter will be directed in a path at an angle to the path of such portion as passes in sheet form between said diverter and the adjacent portion of said deflector.

The curvature of the portion 127 of the deflector 125 tends to direct fluid issuing from the nozzle 123 in the general direction of the edge 129 and towards the diverter 141, where portions of such fluid will be projected to distant surfaces, while other portions are formed into spray and projected to comparatively nearby surfaces, all in a manner corresponding with that hereinbefore described in connection with Figs. 1–5.

For situations where similar extents of fluid delivery should be effective at respective sides of the nozzle, a deflector may be provided which, in place of the curved portion 127 of the deflector 125. has a portion substantially perpendicular to the axis of the opening 123, similar to the portion 129, and having associated therewith a second diverter, such as the diverter 141.

Where fluid delivery at one side of the nozzle should differ in extent from that at the other side, the deflector may be somewhat curved at the side where there should be least extent of delivery, and the diverter at such side may be higher and/or may be so placed or formed as to leave a smaller opening thereunder, than the diverter at the other side; or a combination of such expedients may be employed.

Under other circumstances, diverters more or less similar to the diverter 141 may be advantageously employed across the shorter sides of such a deflector, or the area of the deflector surface upon which the nozzle stream impinges may be more or less completely surrounded by diverter structure.

For installation in a pendent position, sprinklers constructed in accordance with this invention will give best results for many situations if a serrated diverter edge is provided adjacent the deflector surface and a straight edge is on the opposite side.

In order to meet diverse conditions, diverters of various forms may be alternatively associated with given sprinkler heads. In selecting diverters for providing given results, it should be kept in mind that serrations along a certain edge of the diverter tend to break into spray a stream of otherwise sheet formation passing over such edge, the proportion of such stream which will be broken into spray tends to increase with the length of serrations, and the fineness of such spray tends to increase with that of the interstices between serrations.

In any event, the nature and extent of diverter structure suited for attaining needed results may, in the light of the foregoing explanations, be readily determined by those skilled in this art; and it will be apparent that this invention is not limited to the particular sprinklers illustrated in the accompanying drawings and hereinbefore described in detail, as various modifications may be made without departing from its spirit and scope as set forth in the appended claims.

What I claim and desire to secure by Letters Patent of the United States of America is:

1. A sprinkler comprising a discharge nozzle and a plate-like portion secured to said nozzle and from thence extending at one side of and then at an angle with and across the intended discharge path, whereby a stream issuing from said nozzle will impinge against a surface of said plate-like portion and move thereover in a substantially solid sheet, in combination with a diverter strip secured to said plate-like portion and inclined at an angle to the adjacent part of said surface for diverting a portion of such sheet, and the outer edge of said strip being serrated for breaking into spray the diverted portion of said sheet.

2. A sprinkler head having a discharge outlet, a plate-like deflector surface extending to one side of the discharge outlet and intercepting the path of fluid discharged from the outlet in a manner to deliver a sheet of fluid therefrom to one side of the outlet, and a spray-forming member mounted on the surface and positioned in the fluid sheet in advance of the delivery point and serving to intercept and divert a portion only of fluid from the sheet before delivery from the surface to provide a distribution of spray over areas adjacent to the head while permitting projection of the relatively continuous sheet of fluid to areas therebeyond.

3. A sprinkler head comprising an upright outlet discharging a substantially vertical stream, a plate-like deflector surface having a delivery edge positioned at one side of the outlet and intercepting the stream delivered therefrom at an angle designed to divert the stream to one side of the head, and a diverting comb mounted upon the deflector surface in advance of the delivery edge and spaced from the deflector surface to intercept and transform a portion of the stream flowing over the deflector surface into spray before delivery of the remainder of the sheet from the delivery edge.

ROBERT HARRISON RUSSELL.