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Livingston

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[54] **DISCHARGE HEAD FOR DISCHARGING FLUID IN TWO DISCHARGE PATTERNS AND FIRE PROTECTION SYSTEM INCORPORATING SAID HEAD**

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[52] **U.S. Cl.** ..... **169/1 B,** 169/16, 169/37, 169/42, 239/504, 239/515

[51] **Int. Cl.** **A62c 31/26,** B05b 1/26

[58] **Field of Search** ..... 169/1 B, 16, 37, 169/42; 239/498, 504, 514, 515, 507, 521, 523, 524

[56] **References Cited**

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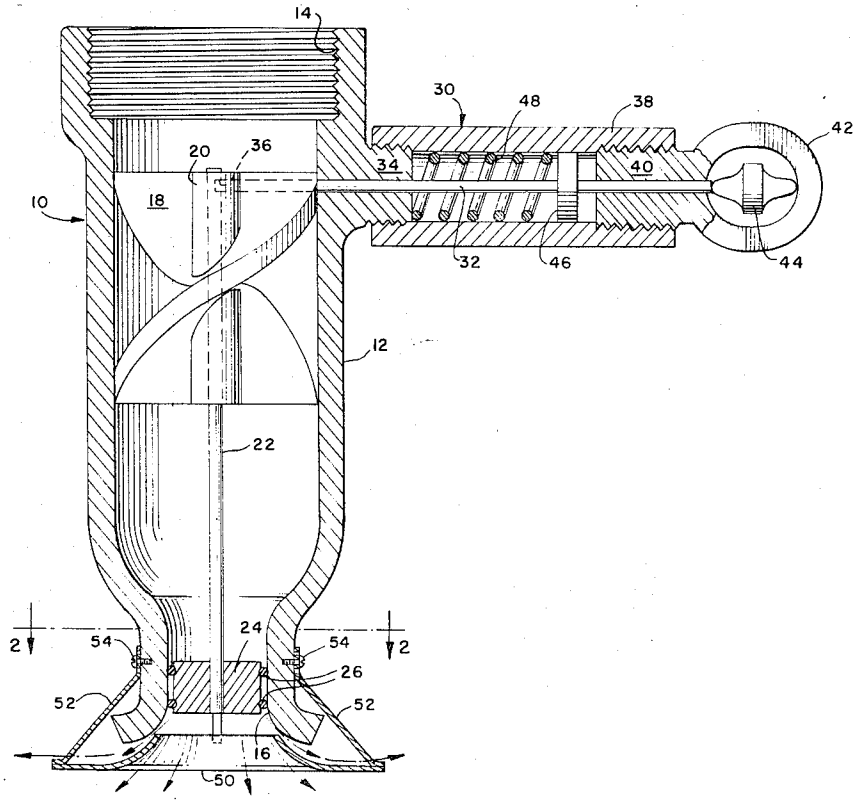
Assistant Examiner—Andres Kashnikow
Attorney—Joseph M. Lane et al.

[57] **ABSTRACT**

A discharge head and a fire protection system incorporating the head in which the head is in the form of a body member having an inlet adapted for connection to a source of fluid and an outlet for directly discharging the fluid in a solid conical spray pattern. A curved deflector plate cooperates with the outlet of the head for intercepting a portion of the spray and forming an additional discharge pattern.

14 Claims, 6 Drawing Figures



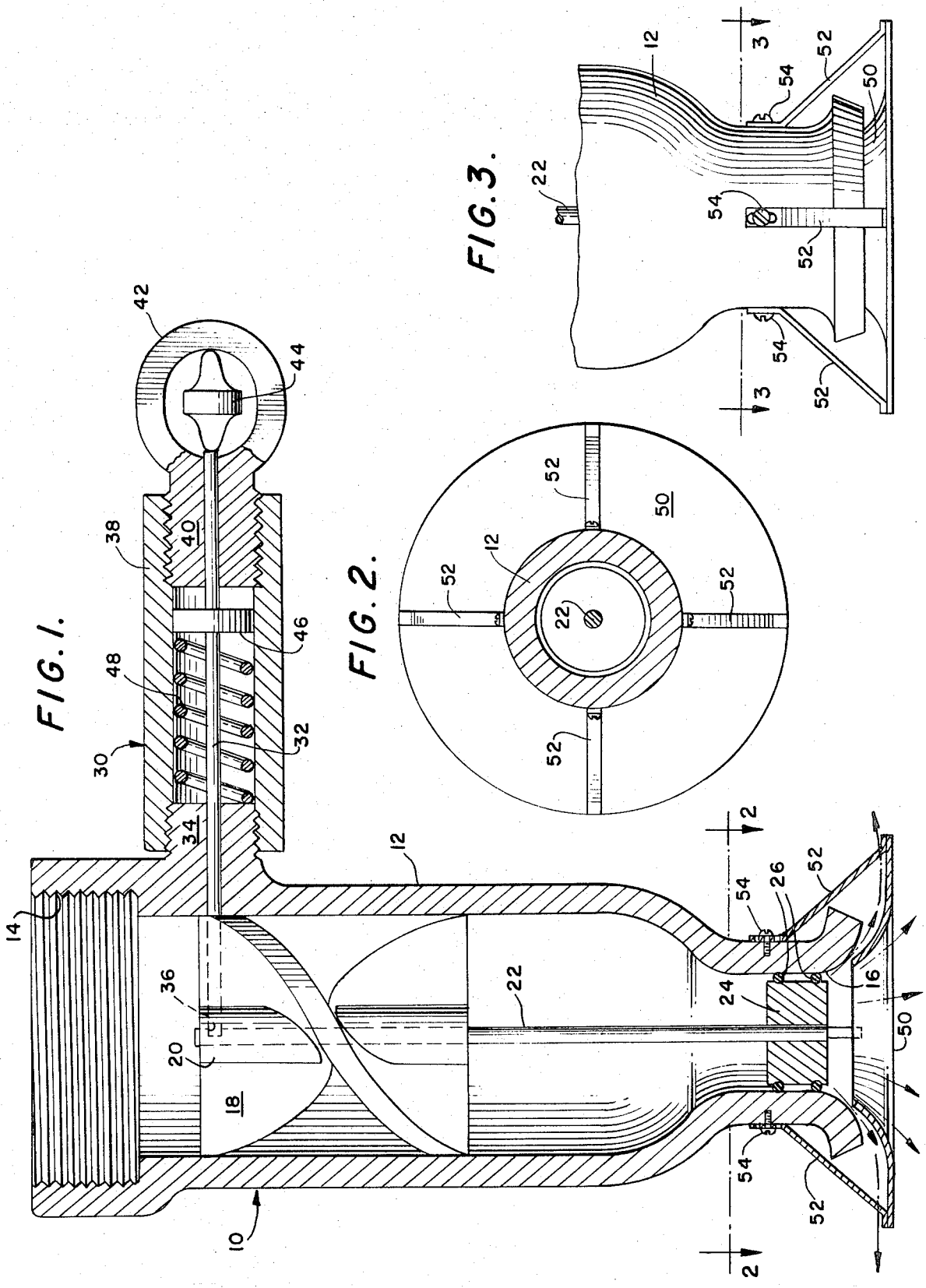


FIG. 1.
FIG. 2.
FIG. 3.
10
12
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FIG. 4.

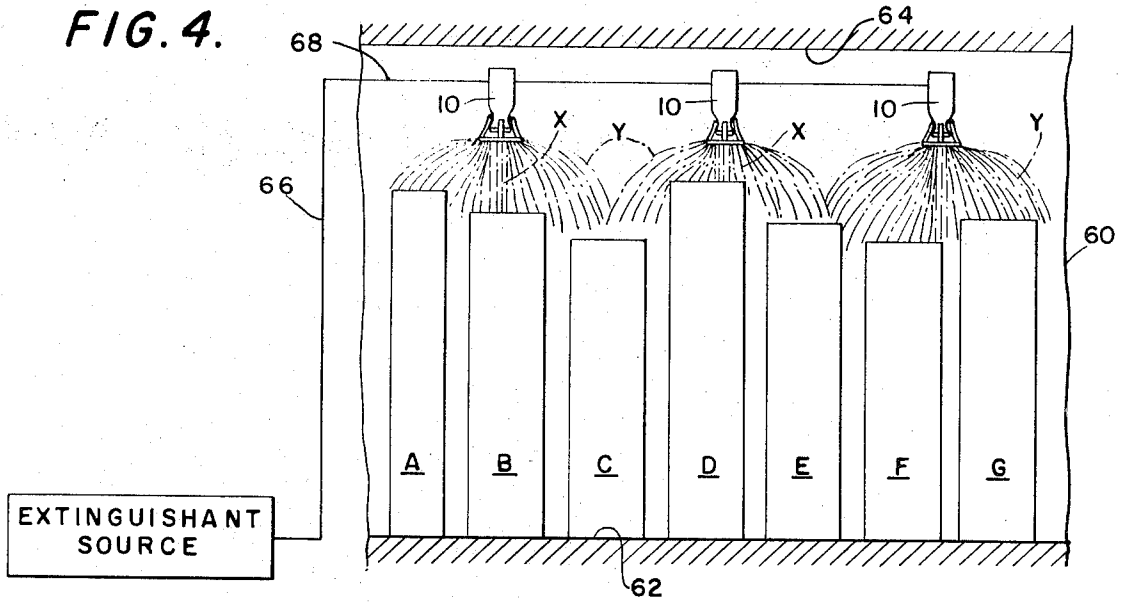


FIG. 5.

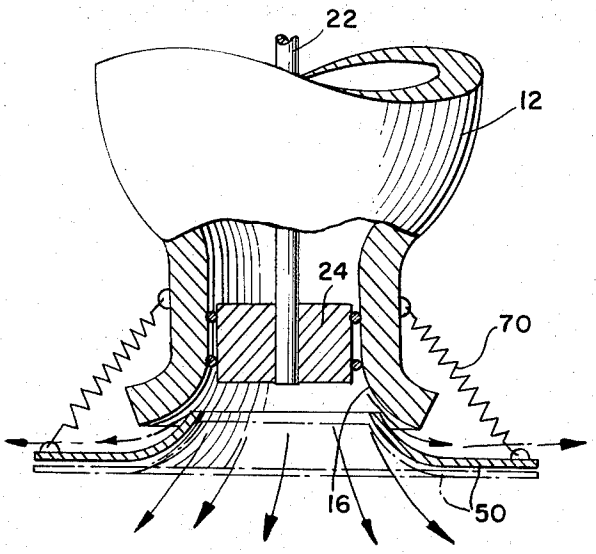
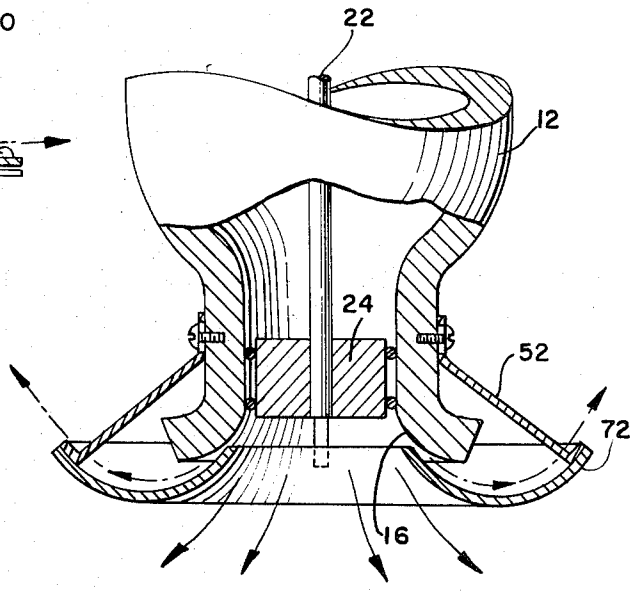


FIG. 6.



DISCHARGE HEAD FOR DISCHARGING FLUID IN TWO DISCHARGE PATTERNS AND FIRE PROTECTION SYSTEM INCORPORATING SAID HEAD

BACKGROUND OF THE INVENTION

This invention relates to a discharge head and to a fire protection system incorporating the head, and, more particularly, to such a head and system in which extinguishant is discharged towards the fire in the space to be protected in two separate discharge patterns.

Recent improvements in fire protection systems have included the use of direct discharge nozzles which directly discharge an extinguishant towards the fire in response to predetermined fire conditions, rather than the use of the traditional sprinkler heads which employ a deflector plate, or the like, to break the extinguishant up into a fine mist-like spray.

A vane is normally disposed in these direct discharge nozzles for imparting a swirling action to the extinguishant as it passes therethrough to impart a conical-like divergent pattern to the spray of extinguishant.

These direct discharge nozzles are especially effective in discharging the extinguishant due to the increased size of the nozzles which enables them to discharge the extinguishant in relatively high quantities and rates, which is particularly attractive when the building to be protected is a warehouse, or other storage facility, having a relatively large volume of combustible materials. However, since the nozzles usually must be spaced no less than fifteen feet apart largely due to economical considerations, and since the combustible materials may be stored as high as three feet from the nozzles under most fire insurance regulations, these spaced divergent patterns of spray may not extend across the entire area defined by the upper surfaces of the combustible materials. Therefore, gaps, or dry spots, often occur between the spray patterns of adjacent nozzles at or near the upper surfaces of the combustible materials.

Since a fire occurring in a particular location will tend to spread towards the areas of least resistance, it will thus move towards these dry areas or gaps and very probably develop to the point that it is uncontrollable.

SUMMARY OF THE PRESENT INVENTION

It is, therefore, an object of the present invention to provide a system and head of the above type in which each discharge head is adapted to discharge the extinguishant in two separate discharge patterns.

It is a further object of the present invention to provide a discharge head and a fire protection system incorporating a plurality of the heads, in which a continuous supply of extinguishant is discharged across the entire area to be protected without the necessity of increasing the number of branch lines and heads.

Towards the fulfillment of these and other objects, the fire protection system of the present invention comprises a plurality of extinguishant discharge heads located in a structure to be protected, means for connecting said heads to a source of extinguishant, each of said heads having an outlet for directly discharging a spray of extinguishant downwardly towards the floor of said structure in a solid conical spray pattern, and means supported by said heads for intercepting a portion of the respective sprays from said heads and directing said portions at an angle with respect to their respective conical discharge patterns.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference is now made to the accompanying drawings for a better understanding of the nature and objects of the present invention. The drawings illustrate the best mode presently contemplated for carrying out the objects of the invention and are not to be construed as restrictions or limitations on its scope. In the drawings:

FIG. 1 is a cross-sectional view of a discharge head utilized in the system of the present invention;

FIG. 2 is an enlarged sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a partial elevational view of a portion of the head of FIG. 1;

FIG. 4 is a schematic view of the fire protection system of the present invention shown mounted in a space to be protected; and

FIGS. 5 and 6 are partial sectional views depicting two alternative embodiments of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1–3, the discharge head of the present invention is shown in general by the refernece numeral 10 and comprises a cylindrical body 12 having an upper end portion which is internally threaded as shown at 14 for connection to a source of extinguishant, such as water, and a lower end portion which defines a flared outlet orifice 16.

A spiral vane 18 is fixed within the body 12 for imparting a swirling motion to water flowing downwardly therethrough to form a solid conical discharge pattern in a conventional manner. A hollow central hub 20 is defined in the vane 18 and supports a rod 22 having a head 24 fixed on its lower end. A pair of ring seals 26 are supported on the head 24 and engage the inner wall of the body 12 to normally prevent water from discharging from the orifice 16.

The rod 22 is latched in the position shown in FIG. 1 by a latching assembly shown in general by the reference numeral 30 in FIG. 1. This assembly includes a rod 32 which slidably extends through an externally threaded boss 34 projecting from the side of the body 12. One end of the rod 32 extends through the vane 18 and the wall of the central hub 20 into a slot 36 in the rod 22 to latch it in the position shown in FIG. 1.

A sleeve 38 is threaded on the end of the boss 34. The outer end of the sleeve 38 is closed off by an externally threaded stub shaft 40 having a ring or yoke 42 thereon. The rod 32 slidably extends through the stub shaft 40, and the other end of the rod engages a conventional thermal fuse element 44 positioned within the ring 42. The fuse element 44 prevents movement of the rod 32 to the right as viewed in FIG. 1, until the heat of a fire fuses the element so that it collapses. Since the fuse element 44 is the standard type commonly used in conventional sprinkler heads now on the market, it will not be described in greater detail.

The rod 32 has a piston head 46 mounted thereon which slidably engages the internal wall of the sleeve 38. A spring 48 is positioned between the boss 34 and the piston head 46 to bias the piston head and the rod 32 to the right with a predetermined biasing force.

With this arrangement, the piston head **46** and the rod **32** will be driven to the right under the action of the spring **48** upon the fuse element **44** collapsing in response to the heat of the fire. This unlatches the rod **22** and allows it, along with the head **24,** to be expelled from the outlet orifice **16** of the body **12,** and permit the water to spray out through the orifice.

With the vane **18** imparting a swirling action to the water as it passes through the body **12,** the extinguishant discharge pattern from the outlet orifice **16** is in the form of a solid cone which diverges outwardly from the orifice.

According to a main feature of the present invention, a curved deflector plate **50** is mounted relative to the outlet orifice **16** in a manner to intercept a portion of the spray discharging from the outlet orifice and direct same outwardly away from the normal solid conical spray pattern.

Four struts **52** support the deflector plate **50** relative to the body **12** in a manner so that the upper surface of the plate is spaced slightly from the inner surface of the body **12** defining the outlet orifice **16.** The struts **52** may be attached to the deflector plate **50** in any conventional manner such as by welding or the like and are attached to the body **12** by means of bolts **54** extending through openings in the respective struts and into corresponding tapped holes provided in the body. As better shown in FIG. **3,** there are three openings provided through each strut **52** for receiving its corresponding bolt so that the position of the struts, and therefore the deflector plate **50,** can be varied in order to vary the space between the upper surface of the plate and the inner surface of the body **12.** This, of course, enables the amount of the discharge spray that is intercepted by the plate **50** to be adjusted.

The design is such that the deflector plate intercepts a relatively small portion of the conical discharge pattern from the outlet orifice **16,** such as 8–12 percent depending on the position that the struts **50** are mounted on the body **12** by the bolts **54.**

A fire protection system incorporating the discharge head **10** of the present invention is shown schematically in connection with FIG. **4** of the drawings mounted in an elevated position in a building **60** having a floor **62** and a ceiling **64.** The heads **10** are spaced apart a predetermined distance, such as **15** feet, and are mounted relatively close to the ceiling **64** in any conventional manner, with three adjacent heads being shown in FIG. **4** as an example.

Each head is supplied with extinguishant, such as water, from a source via a riser **66** and a plurality of branch lines, one of which is shown by the reference numeral **68.** The combustible materials which are to be protected in the building **60** are represented by the reference letters A–G. Upon a fire occurring in the building **60** of the magnitude to actuate the thermal links **44** of each of the heads **10,** the extinguishant will discharge from each head in the primary solid conical shaped discharge patterns shown by the reference letters X in FIG. **4.** The deflector plates **50** associated with each head will intercept the outer peripheral portion of its respective spray and deflect same in the arcuate patterns shown by the reference letters Y, which patterns fall between the primary conical discharge patterns X. As a result extinguishant will be continuously discharged across the uppermost surfaces of the combustible materials A–G.

Two alternate embodiments of the discharge head of the present invention are depicted in FIGS. **5** and **6.** Since the basic structure in each of the latter embodiments is identical to that of the previous embodiment, the identical structure will be given the same reference numerals. In the embodiment of FIG. **5,** a plurality of compression springs **70** connect the deflector plate **50** to the body member **12** in a manner similar to the struts **52,** of the previous embodiment. As a result, upon release of the plug **24** from the body member, the springs **70** will enable the deflector plate **50** to move between the positions shown by the solid lines and the dashed lines in response to variations in pressure of the extinguishant discharging from the outlet orifice **16** and vary the distance between the upper surface of the plate, and the inner surface of the body member **12** defining the outlet orifice **16.** As a result, the amount of the primary discharge spray from the outlet orifice **16** that is intercepted by the deflector plate **50** will vary in accordance with these variations in extinguishant pressure.

According to the embodiment of FIG. **6,** the deflector plate **50** is replaced by a deflector plate **72** which is curved at its outer edges to direct the intercepted extinguishant upwardly against the ceiling of the building in which the head is mounted. This effects a cooling of the ceiling without a substantial sacrifice in extinguishant.

Of course, the springs **70** of the embodiment of FIG. **5** may be utilized in place of the struts **52** of the embodiment of FIG. **6,** if desired.

It is thus seen that the discharge head, and the fire protection system incorporating the head, of the present invention enjoys several advantages. For example, it enables a continuous discharge of extinguishant to exist across a predetermined reference plane in the building to be protected yet does not require an increase in head size or decrease in head spacing.

The head of the present invention also responds in a favorable manner to variations in flow rates through its outlet. In particular, as the flow rate through the system decreases as a result of several heads opening to fight the fire, the primary solid conical spray pattern angle from the open heads will narrow causing a corresponding decrease in the amount of spray intercepted by the deflector plates, resulting in an efficient use of the extinguishant.

Of course, other variations of the specific construction and arrangement of the system and head disclosed above can be made by those skilled in the art without departing from the invention as defined in the appended claims.

I claim:

1. A fire protection system for buildings and the like comprising a plurality of extinguishant discharge heads located in the space to be protected, means for connecting said heads to a source of extinguishant, each of said heads having an outlet for discharging a spray of said extinguishant in a pattern of a generally solid circuit cross-section, means supported by said heads for intercepting the outer peripheral portion of the respective sprays from said heads and directing said portions outwardly from their respective sprays, the remaining portions of each of said sprays being allowed to discharge directly towards a predetermined assigned area in said space.

2. The system of claim 1 wherein said sprays from said outlets are discharged in solid conical spray patterns.

3. The system of claim 1 wherein said outlets are normally closed and further comprising control means automatically responsive to a fire in said space for controlling the opening of said outlets.

4. The system of claim 1 wherein said intercepting means are adjustably mounted relative to their respective heads to enable said portions of said sprays to be varied.

5. The system of claim 1 further comprising means responsive to variations in a predetermined condition of said system for varying the amounts of said intercepted sprays.

6. The system of claim 5 wherein said predetermined condition of said system is the extinguishant pressure at each of said heads.

7. The system of claim 1 wherein said intercepting means directs said intercepted sprays in a substantially radial direction relative to said remaining portions of said sprays.

8. The system of claim 1 wherein said intercepting means directs said intercepted sprays in a direction substantially opposite that of said remaining portion of said sprays.

9. A discharge head comprising a body member having an inlet adapted for connection to a source of fluid and an outlet for discharging a spray of said fluid in a pattern of a generally solid circular cross-section, and means supported by said body member for intercepting the outer peripheral portion of said spray and directing said portion outwardly from the remaining portion of said spray and towards an assigned area a predetermined distance from said body member, said remaining portion of said spray being allowed to discharge directly and unimpeded towards said area to provide a continuous spray pattern across said area.

10. The head of claim 9 wherein said spray is discharged from said outlet in a solid conical spray pattern.

11. The head of claim 9 wherein said outlet is normally closed and further comprising control means automatically responsive to a predetermined temperature in the vicinity of said body member for controlling the opening of said outlet.

12. The head of claim 9 wherein said intercepting means is adjustably mounted relative to said body member to enable the amount of the intercepted spray to be varied.

13. The head of claim 9 further comprising means responsive to variations in the fluid pressure in said head for varying the amount of said intercepted spray.

14. The head of claim 9 wherein said intercepting means directs said intercepted spray in a substantially radial direction relative to said remaining portion of said spray.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,779,318 Dated December 18, 1973

Inventor(s) William L. Livingston

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, bridging lines 60 and 61, "circuit" should read --circular--.

Signed and sealed this 21st day of May 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.