

Oct. 9, 1956

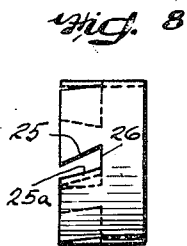
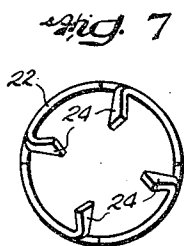
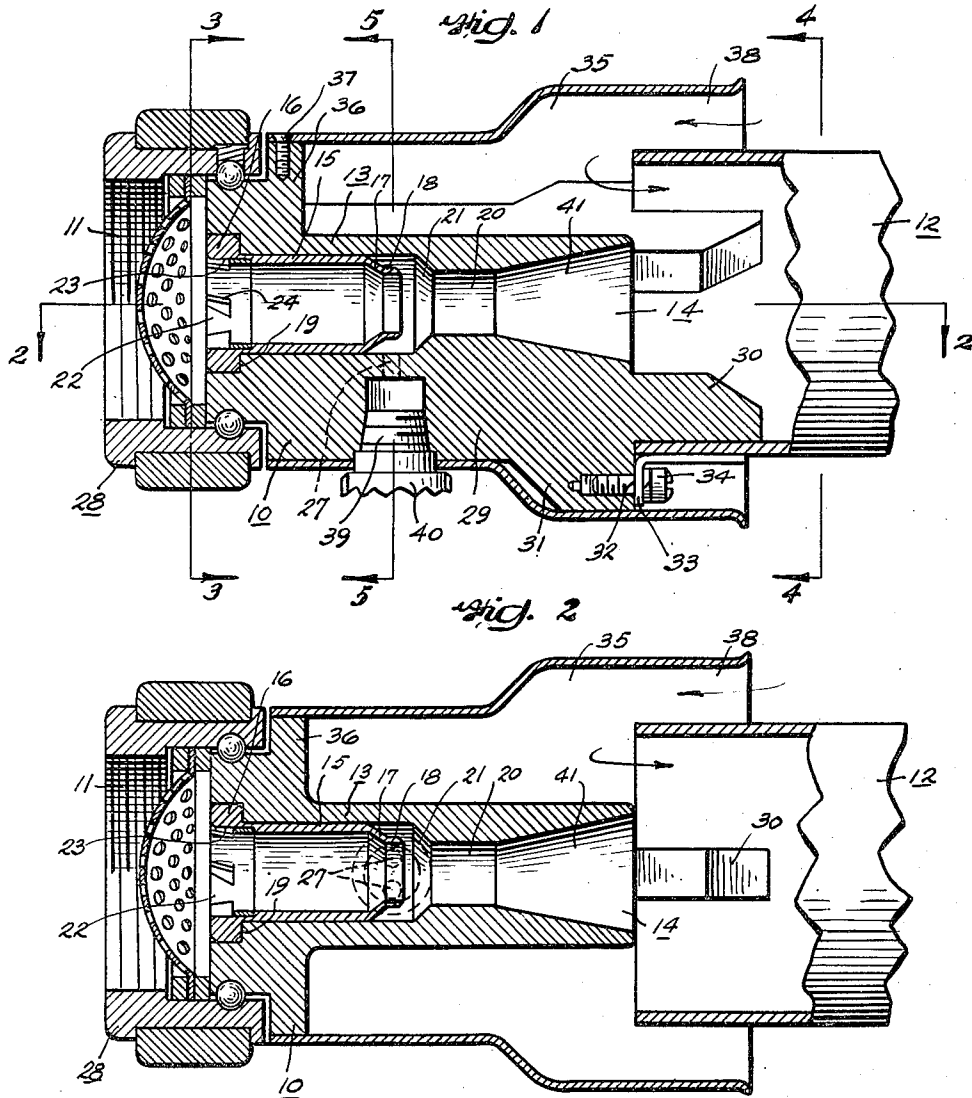
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2,765,856

FIRE EXTINGUISHING FOAM PRODUCING UNIT

Filed Nov. 1, 1952

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 3

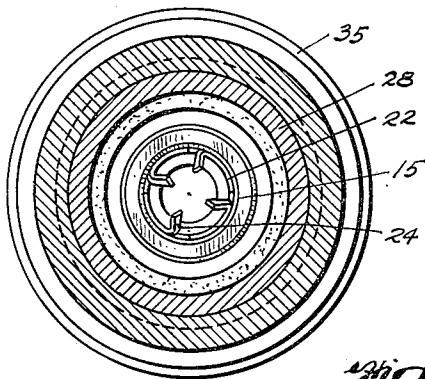


Fig. 4

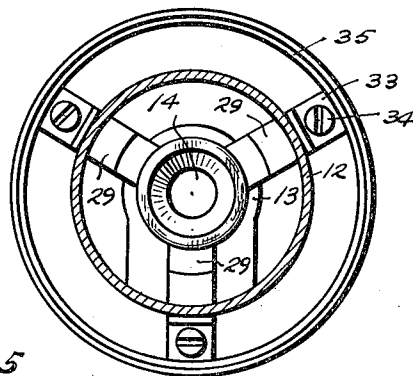


Fig. 5

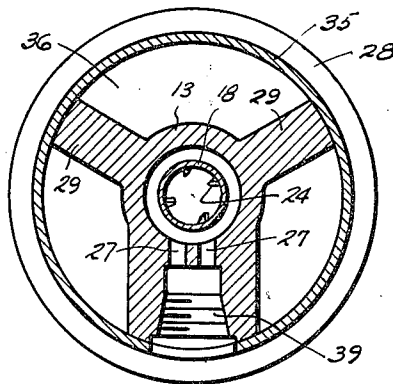
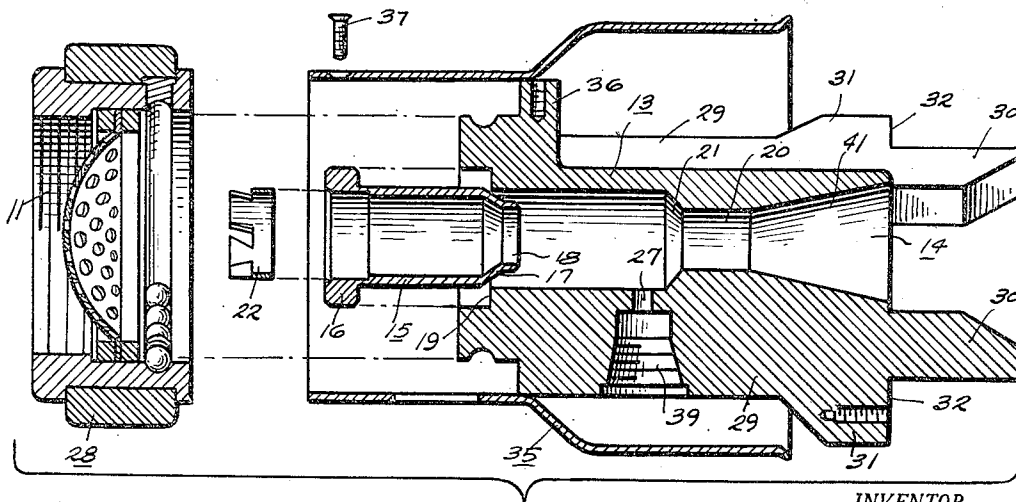


Fig. 6



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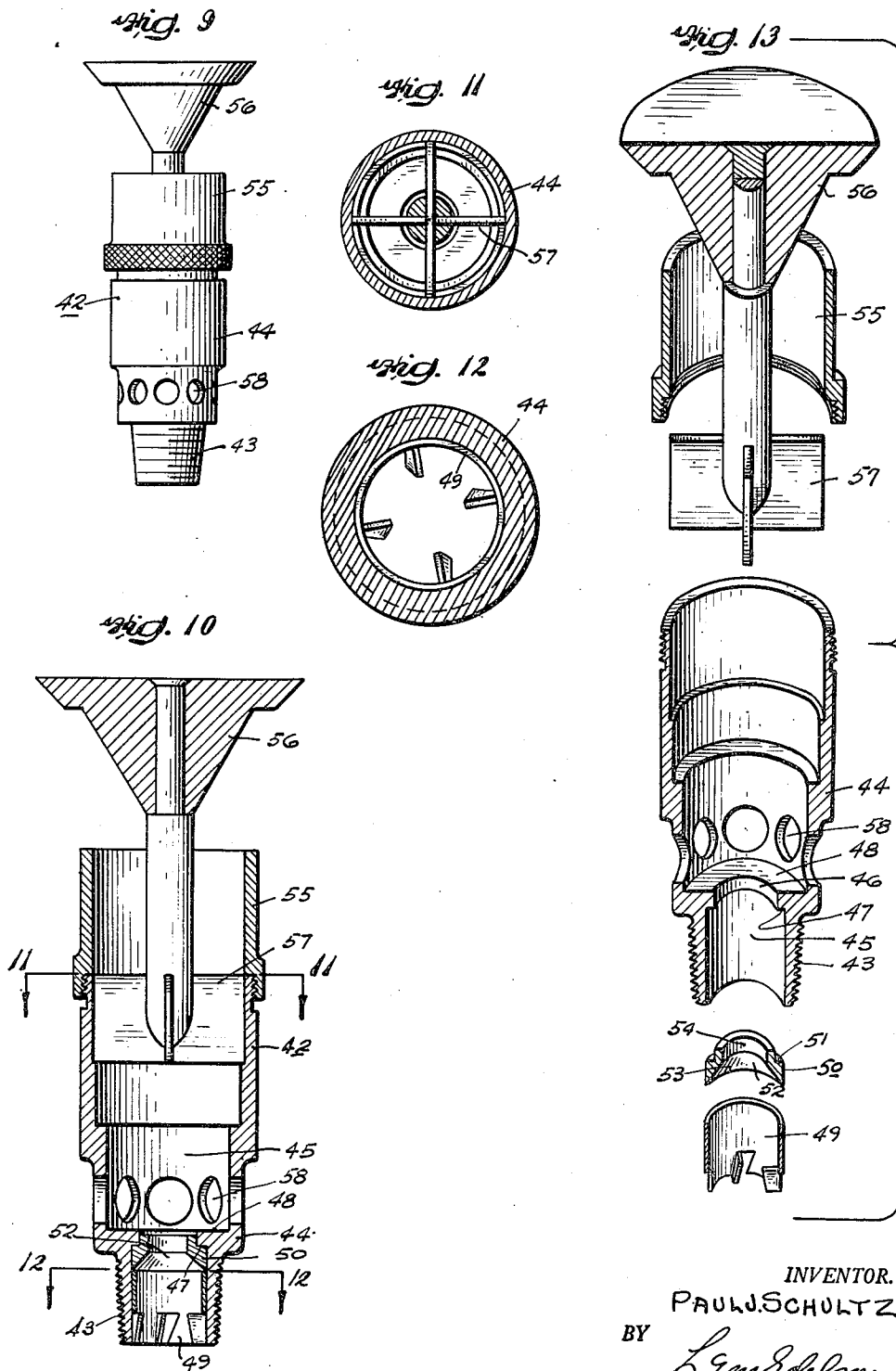
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FIRE EXTINGUISHING FOAM PRODUCING UNIT

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3 Sheets-Sheet 3



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2,765,856

FIRE EXTINGUISHING FOAM PRODUCING UNIT 5

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Application November 1, 1952, Serial No. 318,184 10

2 Claims. (Cl. 169—15)

This invention relates generally to fire extinguishing apparatus and is more particularly concerned with an improved construction of the discharger for a fire extinguishing solution.

Among the principal objects of the present invention is to provide the posterior portion of the main body of the discharger with means adapted to impart a whirling motion to a stream of fluid passed therethrough.

Still another object of the present invention is to provide such a discharger with improved means for entraining in a fluid passed therethrough and forming the principal portion of the fire extinguishing solution an agent which forms a complementary portion of the fire extinguishing solution.

Another object of this invention is to provide a discharger which is exceedingly simple in design and construction and which is comparatively simple and inexpensive to manufacture.

Other objects and advantages of the invention will be apparent more fully hereinafter, it being understood that the present invention consists substantially in the combination, construction, location and relative arrangement of parts, all as will appear more fully hereinafter, as shown in the accompanying drawings, and as finally pointed out in the appended claims.

In the accompanying drawings, which are illustrative of preferred embodiments of the present invention:

Figure 1 is a longitudinal sectional view through the nozzle of a discharger for a fire extinguishing solution, the discharger being of the type used to produce mechanical or air foam.

Figure 2 is a longitudinal sectional view taken on line 2—2 of Figure 1.

Figures 3, 4 and 5 are, respectively, transverse sectional views taken on the lines 3—3, 4—4 and 5—5 of Figure 1.

Figure 6 is an exploded view showing in section the several component parts of the discharger nozzle shown in Figure 1.

Figure 7 is an enlarged end view of the whirler element.

Figure 8 is a side view of the whirler element shown in Figure 7.

Figure 9 is an elevational view of discharger or sprinkler head embodying the present invention.

Figure 10 is a longitudinal sectional view of the sprinkler head shown in Figure 9.

Figure 11 is a transverse section on line 11—11 of Figure 10.

Figure 12 is an enlarged transverse section on line 12—12 of Figure 10; and

Figure 13 is an exploded view showing in section the several component parts of the sprinkler head shown in Figure 9.

Referring to the drawings and more particularly to Figures 1 and 2, it will be observed that in one embodiment of the present invention a nozzle designated generally by the reference numeral 10 is adapted to be connected

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by means of its interiorly threaded end 11 to a conduit (not shown) through which water under suitable pressure is supplied for mixture with a suitable foam-forming agent and air to form foam in accordance with principles well known and understood in the art, the foam so produced being discharged by way of a foam discharge tube 12 for application to the fire to be extinguished.

Referring particularly to Figures 1, 2, 5 and 6, the nozzle 10 essentially consists of a main body member 13 provided with a bore 14 which extends longitudinally therethrough. The upstream end of the bore 14 receives a hollow cylindrical member 15 which has at one end thereof an integral annular flange 16, the end of the member 15 remote from the flange 16 being inwardly flared, as at 17, to afford a cylindrical discharge end 18 of reduced diameter. For seating the flange 16, the bore 14 is suitably counter-bored to form an annular shoulder 19, and when the flange 16 is seated against the shoulder 19, the flared portion 17 and the discharge end 18 of the cylindrical member 15 extend into what may be referred to as the anterior portion of the bore 14, being disposed in spaced relation to the wall thereof, while the remainder of the cylindrical member 15 is positioned in what may be referred to as the posterior portion of the bore 14, the cylindrical member 15 being thereby frictionally secured against relative movement. To provide for the direct passage of water through the nozzle 10, the discharge end 18 of the member 15 is disposed on the upstream side of a reduced diameter intermediate section 20 of the bore 14, the diameter of the bore section 20 being slightly larger than that of the discharge end 18 of the member 15. Preferably, the intermediate bore section 20 merges with the portion of the bore 14 to the rear thereof through the medium of a tapered section 21 disposed axially forward of the discharge end 18 of the member 15.

Fixedly received in the rear end of the member 15 is an element 22 operative to impart a whirling motion to the liquid stream as it passes through the nozzle 10, this element being in the form of a cylindrical member press-fitted into a counterbored seat 23 formed in the upstream or rear end of the member 15. Formed in the upstream end of the element 22 are a plurality of identical fins 24 uniformly spaced circumferentially about the interior of said element, each fin being formed as an integral part of the element 22 by cutting into the end wall of the latter along an oblique line 25 and thence circumferentially along a line 26 to form a part which is then inwardly turned along the oblique line 25^a to provide the internal fin 24. The bend line 25^a, when extended, converges on the upstream side of the part 22 with the extended line of cut 25. It will be observed that the fin-like elements 24 are respectively disposed in planes that are angularly related to the longitudinal axis of the part 22, thus being adapted to deflect the water that impinges thereon from a direct course through the part 22.

It will be understood that a passage through the nozzle 10 for the water supplied thereto is provided by way of the interiors of the part 22 and the member 15 and the anterior portion of the bore 14, the discharge end 18 of the cylindrical member 15 being disposed opposite a pair of auxiliary passages 27—27 which open into the anterior portion of the bore 14, the passages 27—27 being for a foam-forming agent.

For readily connecting the nozzle 10 to the conduit (not shown) leading to the source of water which is delivered thereby under suitable pressure to the nozzle 10 for discharge therefrom by way of the passage therethrough, the upstream end of the nozzle 10 is externally fitted with a freely revoluble coupling member 28.

As most clearly appears in Figures 1, 2, 4 and 6, for supporting the foam discharge tube 12, the main body member 13 is externally provided with a plurality of circum-

ferentially spaced radially extending elements 29, each having a forwardly extending portion 30 providing a seat for the inner end of the foam discharge tube 12, said end of the tube being fitted snugly over and about the seat portions 30 so that it is in axial alinement with the passage through the nozzle 10. These tube-supporting elements 29 are respectively provided with radially extending portions 31, the forward edges 32 of which are disposed substantially in the transverse plane of the terminal end of the main body member 13, these edges 32 serving as abutments for the rear end of the tube 12. The latter is preferably provided with radially extending elements 33 through which screws 34 are projected into the edges 32 of the tube-supporting elements 29 to fixedly secure the tube 12 in position. It will be noted that the inner end of the tube 12 is of larger diameter than that of the proximate end of the main body member 13, the said ends of the tube and the main body member being thus maintained in spaced relation to permit the free passage of air from atmosphere in to the region of the stream discharged from the nozzle 10.

The radially extending portions 31 of the tube-supporting elements 29 additionally serve to center about the main body member 13 an external shield 35, the rear end of which is snugly fitted about an annular flange 36 integrally formed upon the rear end of the main body member 13. One or more screws 37 secure the rear end of the shield 35 to the flange 36, it being observed that the forward portion 38 of the shield is of such enlarged diameter and so extends forwardly of the discharge end of the main body member 13 that it is disposed in spaced relation about the inner end of the foam discharge tube 12. Thus, air from atmosphere is free to pass in the direction of the arrows shown in Figures 1 and 2 for entrainment with the foam-forming solution discharged from the nozzle 10 into the entrance end of the discharge tube.

It will be apparent that when the nozzle 10 is connected to the water supply (not shown), water under suitable pressure enters the element 22, and in passing therethrough portions of the stream nearest the inner wall surface of the part 22 impinge upon the fin-like elements 24, being diverted thereby from a direct line of movement and being forced to advance with a whirling motion which is imparted to the stream of water as a whole. The latter wipes the inner wall surface of the cylindrical member 15 and issues from the discharge end 18 at a high velocity, thus inducing in the vicinity of the element 18 a suction action which is utilized to draw into the water stream a suitable foam-forming agent by way of the pair of auxiliary passages 27—27. The outer ends of these passages 27—27 commonly communicates with an internally threaded opening 39 formed in the sidewall of the main body member 13 for receiving one end of a tube 40 leading to the source of foam-forming material, the sidewall of the main body member 13 being suitably thickened in the region of the opening 39 to accommodate the latter.

In order to most efficiently introduce the foam-forming agent into the water stream the auxiliary passages 27—27 are disposed in close transversely spaced parallel relation to one another, respectively extending laterally of the bore 14 and opening into the anterior portion thereof opposite the discharge end 18 of the cylindrical member 15. It will be apparent that the foam-forming agent drawn out of the passages 27—27 by injector action impinges upon the discharge end 18 of the cylindrical member 15, wiping the outer surface thereof on opposite sides and occupying the annular space or chamber thereabout. Thus, the cylindrical member 15, through its integral discharge end 18, affords baffle means for directing the foam-forming agent into embracing relation to the water stream, from whence it is drawn into the water stream to form the fire extinguishing solution, of which the water stream forms the principal portion and the foam-forming

agent forms a complementary portion. In this manner the foam-forming agent is brought into contact with the entire surface of the water stream as the latter issues from the discharge end 18, thereby insuring dispersion of the foam-forming agent into and throughout the water stream, this dispersion being accelerated and made more thorough by reason of the whirling motion of the stream of water.

The stream of fire extinguishing solution is projected through the reduced bore section 29 of the bore 14 and, due to its whirling motion, diverges outwardly as it emerges therefrom and passes through a flared bore section 41 for subsequent entrainment of air to produce foam of a volume and consistency suitable for fire-extinguishing purposes. The resulting centrifugal force of the whirling stream causes the latter, as it emerges from the discharger, to assume the form of an outwardly tapering, high velocity stream which wipes along the internal surface of the foam delivery tube 12 to thereby insure maximum entrainment of air from atmosphere into the foam-forming solution.

The nozzle 10 is adapted for use in connection with premixed foam-forming solutions, in which case the tube 40 is dispensed with, the pre-mixed solution being delivered directly to and through the nozzle 10 for discharge therefrom in the form of a high velocity stream into which air is entrained to produce foam.

Referring particularly to Figures 9 to 13, it will be observed that in another embodiment of the present invention a combination water-air foam sprinkler head designated generally by the numeral 42 is adapted to be connected by means of an exteriorly threaded end 43 into a piping system through which a suitable fluid under pressure is supplied to the head 42 for discharge therefrom for application to the fire to be extinguished.

The threads 43 are formed on a terminal portion of a body part 44 which is provided with a bore 45 extending longitudinally therethrough. A reduced diameter intermediate section 46 of the bore 45 affords a pair of sharp shoulders 47 and 48 respectively at the upstream and downstream ends thereof.

In the section of the bore 45 on the upstream side of the intermediate bore section 46, there is fixedly received a stream whirling element 49 and an annulus 50. The latter has opposite end portions which suitably change in external diameter to afford a sharp annular shoulder 51 which, when the annulus 50 is fully inserted into the bore 45, abuts the sharp annular shoulder 47 of the part 44, the reduced end portion of the annulus 50 being thereby projected into the intermediate bore section 46 of the bore 45.

The sleeve part 49, which in all respects is similar to the element 22, is disposed on the upstream side of the annulus 50 and in abutting relation thereto with its fin-like elements proximate the terminal portion of the part 44, being frictionally secured against relative movement. The interior of the element 49 communicates with the section of the bore 45 on the downstream side of the intermediate bore section 45 by means of a bore 52 which extends through the annulus 50, the bore 52 being provided with a flared bore section 53 proximate the element 49 and a communicating reduced bore section 54 remote from the element 49.

In addition to the body 44, sleeve 49 and annulus 50, the sprinkler head 42 comprises a tubular member 55 disposed in longitudinal continuation of the body part 44, a spreader 56 and a spider 57 suitably arranged for supporting the spreader 56. A more detailed description of the combination water-air foam sprinkler head 42 is deemed to be unnecessary for a full understanding of the present invention because, except for the details given hereinabove, the construction and operation thereof are generally the same as that of the combination water and foam sprinkler of the patent to L. W. Boerner, 2,601,899, issued July 1, 1952, to which reference may be made for

the details of structure and operation not covered herein. It should be noted, however, that in passing through the element 49, external portions of the fire-extinguishing liquid stream are deflected from a direct line of movement and, as hereinabove described, are caused to advance with a whirling motion imparted to the stream as a whole. It will be apparent that as the whirling stream of foam-forming solution issues at a high velocity from the reduced bore section 54 of the annulus 50, the resulting centrifugal force of the whirling stream causes it to spread annularly and intimately wipe against the inner surface of the conduit 42 just ahead of the air inlet openings 58, thereby inducing a suction action which is utilized to draw air into the solution stream through the openings 58 to form foam as well understood in the art. The radially extending elements of the spider 57 serve effectively to straighten out the stream of foam formed in the foam discharge conduit which includes the section 55, to thereby insure a better distribution of the discharged foam.

It will be understood, of course, that the present invention is susceptible of various changes and modifications which may be made from time to time without departing from the general principles or real spirit thereof, and it is accordingly intended to claim the same broadly, as well as specifically, as indicated in the appended claims.

What is claimed and new and useful is:

1. A nozzle for fire extinguishing foam forming solution including a main body having an axially extending through bore and at least one transversely extending passage communicating with said bore, a positionally fixed cylindrical member fitted into the upstream end of said

bore, one end portion of said cylindrical member of substantial axial extent being of reduced uniform diameter whereby to provide an annular space internally of said bore extending about said reduced diameter end portion and communicating with said transversely extending passage, said through bore being provided with a constricted section disposed in axially aligned spaced relation to said reduced diameter end portion, on the downstream side thereof, and a positionally fixed tubular sleeve fitted into the upstream end of said nozzle and having struck from the wall thereof a multiplicity of inwardly extending circumferentially spaced fin like elements angularly related to the central axis of said sleeve, whereby to impart to the stream of foam forming solution a whirling motion.

2. A nozzle for fire extinguishing foam forming solution as defined in claim 1 wherein the main body, cylindrical member and tubular sleeve form an interested assembly of parts wherein said tubular sleeve is fitted into and positionally fixed relative to said cylindrical part.

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