

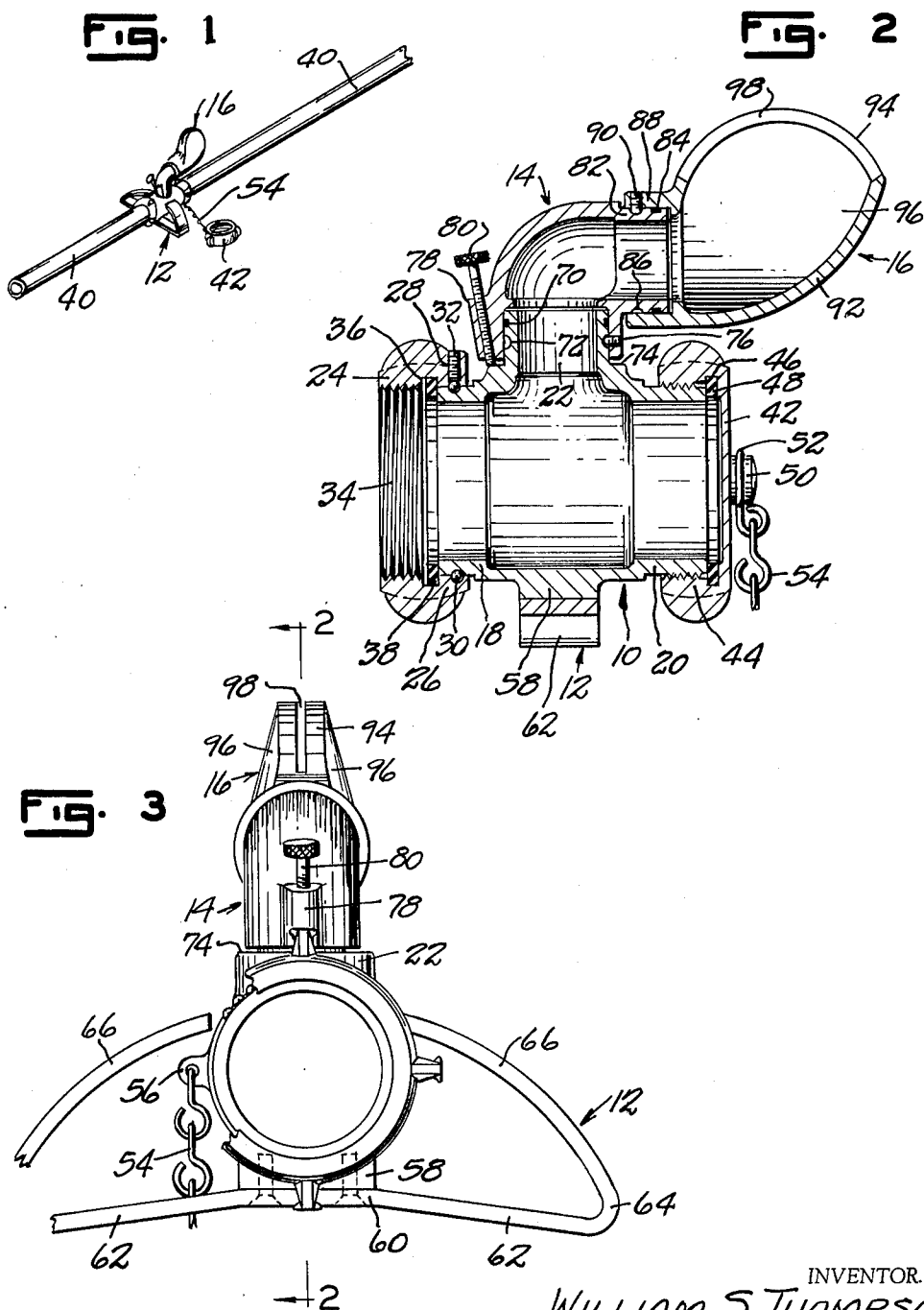
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WATER CURTAIN NOZZLE

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2 Sheets-Sheet 1



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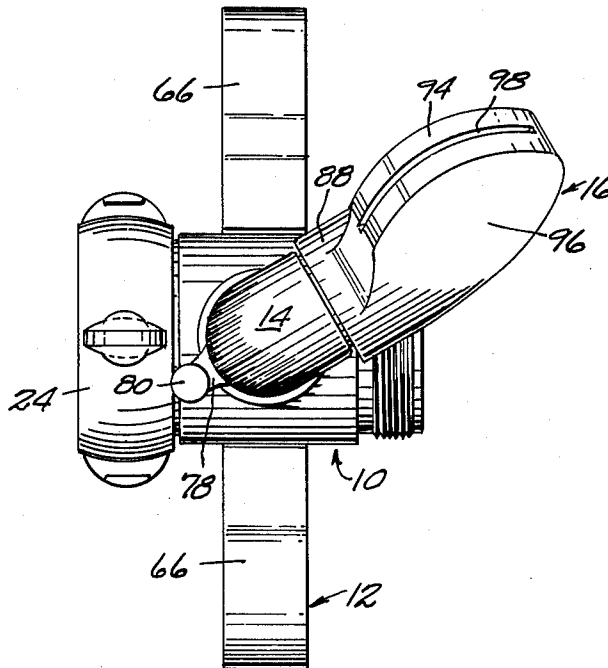
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Fig. 4



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WATER CURTAIN NOZZLE

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This invention relates to a water curtain nozzle and more particularly to a nozzle usable by the fire services.

One of the problems which the fire services frequently encounter in fighting a fire is to protect buildings located near a flaming or burning building against ignition by a burning brand projected by wind, explosion or other means in the direction of adjacent structures. Thus in a city it is necessary to protect against spread of a conflagration to adjoining buildings and to nearby but separated buildings, such as those separated by narrow walkways or alleys. The effective prevention of spread of a fire to adjoining and adjacent buildings has heretofore required the attention of substantial numbers of firemen in addition to those firemen who are directly concerned with the efforts to bring under control the fire which is the primary hazard. The equipment which is available for use by those men assigned to the task of guarding against undesired spread of the fire to adjacent or adjoining structures is generally the same equipment which is used for the purpose of extinguishing a fire. The purpose of design of such equipment, such as nozzles, being primarily for fire extinguishment rather than for protection against spreading of a fire, has limited the effectiveness of such preventive measures against spread of a fire and contributed to the requirement for the assignment of a substantial number of men to fire spread-preventing duties in areas where buildings are congested.

It is the primary object of this invention to provide a nozzle which will be particularly well suited for use to produce a water curtain of such character as to protect against spread of a fire in an effective manner which minimizes the requirements for constant supervision or handling by fire service personnel.

A further object is to provide a nozzle which will project a water curtain in any selected direction relative to a water supply line or hose which feeds the same, and which discharges water or other fire-fighting fluid therefrom in a pattern affording a large area of discharge effective for prevention of spread of fire as a positive barrier between a burning building and an adjoining or adjacent building, and also serving effectively as a means to protect a building near a fire from the heat of the fire by maintaining the same below igniting temperature.

A further object is to provide a device of this character which is self-positioning and adjustable to discharge water in a flat sheet in selected direction and which device may also be held manually during use when required.

A further object is to provide a nozzle of this character having a thin flaring pattern of discharge which is well suited for use to flush flammable liquids to a place of safety following leakage of such liquids as a result of accidents of trucks.

Other objects will be apparent from the following specification.

In the drawings:

FIG. 1 is a perspective view illustrating the connection of a nozzle intermediate the length of a fire hose line;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 3;

FIG. 3 is an end view of the nozzle as viewed from the lefthand end of FIG. 2;

FIG. 4 is a top plan view illustrating an adjustment of the nozzle different from that shown in FIG. 3.

Referring to the drawings which illustrate the preferred embodiment of the invention, the numeral 10 designates

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a body portion to which is secured a support or mounting member 12. The body portion carries a swivel elbow 14 which in turn carries a stream shaper or discharge member 16.

The body portion 10 is generally of the character of a tubular T-shaped member which has aligned tubular portions 18 and 20 and a third intermediate perpendicular tube part 22. One of the aligned tubular ends of the body 10 is shown as tubular end 18, mounts a swivel coupling 24. The coupling 24 has an end part 26 which encircles and has rotative clearance with the tubular end 18 of the body and has an internal circumferential groove which is adapted to register with an external circumferential groove in the tubular body part 18. A screw-threaded radial bore 28 in the coupling end part 26 communicates with the circumferential groove and accommodates the reception of spherical bearing members 30. The spherical ball bearing members 30 serve the dual function of interlocking the coupling end part 26 on the tubular body end part 18 to prevent separation of the parts and also of facilitating free rotation of the swivel coupling 24 upon the body. A set screw 32 is threaded in the bore 28 and serves as a means to retain the members 30 in interlocking position. Also, in cases where a number of bearings or balls 30 is used which extend completely around the device, the set screw may be used as a means to separate adjacent members 30 and thereby apply a wedging force tending to reduce the free relative rotation of the coupling on the body to a selected or adjusted extent. The coupling 24 has an internally screw-threaded bore 34 at its outer or free end terminating at an internal circumferential groove 36 defining a circumferential socket of greater diameter than the bore of the coupling end part 26 and receiving a gasket ring 38 adapted to span the annular clearance between the bore of the coupling end part 26 and the outer surface of the tubular end part 18. It will be understood that the coupling 24 is adapted to receive the threaded male coupling (not shown) on a conventional fire hose 40 or other conduit through which liquid may be supplied to the nozzle.

The tubular end part 20 is preferably externally screw-threaded and is of a diameter and thread character adapted to receive a conventional female hose coupling (not shown) commonly used upon a length of fire hose 40, as well understood in the art. A closure cap 42 having an internally screw-threaded skirt portion 44 adapted to mate with the threads on body part 20 may be mounted thereon, as illustrated in FIG. 2. The cap 42 is preferably provided with a circumferential socket 46 of greater diameter than the threaded bore of the skirt 44 and receives a gasket ring 48 adapted to bear against the end surface of the tubular end part 20 of the body 10 for sealing said end part 20 in use when positioned as illustrated in FIG. 2. The cap 42 preferably mounts a central pin or stud 50 having a groove or reduced circumferential portion within which is mounted a ring member 52 so as to be freely rotatable upon the stud 50. Ring member 52 is carried by one end of a chain 54. The opposite end of the chain 54 is anchored to a lug or ear 56 carried by the nozzle body part 10. It will be apparent that the arrangement permits the cap 42 to seal tubular end 20 of the body when the nozzle is mounted at the end of line or hose supplying water thereto, and that the cap is removable, as illustrated in FIG. 1, when it is desired to connect the nozzle between two sections of hose 40, as illustrated in FIG. 1. In the latter case the chain serves to retain the cap 42 so as to avoid loss thereof without interfering with the desired functioning of the nozzle or its positioning in any selected operating location. The body portion 10 of the nozzle is preferably provided with a projection 58 intermediate its length and substantially diametrically opposed to the intermediate

tube part 22 of the body. The projection 58 preferably has a flat outer surface against which bears a portion 60 of the support or mounting member. The support or mounting member preferably has diverging parts 62 projecting from the part 60 and of similar dimensions and configuration, from whose outer ends are bent at 64 terminal support parts 66 preferably curved and cooperating with the part 62 to define a generally V-shaped part of the support. The support is such that it may rest upon a pavement or other supporting surface, as illustrated in FIG. 3, bearing upon the ends of part 62 thereof laterally spaced from the body and cooperating with the support afforded by the connected hose 40 to position the nozzle body at desired location and attitude. At the same time the support may be grasped to serve as means for firmly carrying the nozzle and holding it in desired position when manual manipulation and support of the nozzle is desired.

The intermediate tube part 22 of the body 10 preferably has a substantially cylindrical exterior surface which is interrupted spaced from but adjacent to its outer end by a groove within which may be mounted a gasket or resilient sealing member, such as an "O-ring" 70. The exterior surface of intermediate tube part 22 is also interrupted by a second or inner circumferential groove 72 located at a greater distance from the free or outer end of tube part 22 than the groove which mounts the O-ring 70. The body 10 also preferably includes a circumferential shoulder or abutment 74 encircling the intermediate tube part 22. One end portion of the swivel elbow 14 has a snug rotative fit around the intermediate tube part 22 and a plurality of radial screw-threaded bores, preferably three or more in number, are formed in that end portion of the swivel elbow 14 and each receives a set screw 76 whose inner end extends into the grooves 72 so as to interlock swivel elbow 14 with the intermediate tube part 22 of the body 10. It will be understood that the set screws will normally have such a fit in the grooves 72 as to permit relative rotation of the swivel elbow 14 upon the tube part 22 of the body. A lug 78 projects from the end of the swivel elbow 14 which encircles the body tube part 22 and has a screw-threaded bore there-through preferably extending at an angle to the axis of the end of the elbow by which it is carried. A threaded stud 80 passes through the bore of the lug 78 with its inner end adapted to bear against the shoulder 74. The stud 80 preferably has an enlarged knurled head facilitating rapid manual rotation thereof without the use of tools. The stud 80, when rotated to advance it into frictional engagement with the shoulder 74, provides means for holding the swivel elbow in any selected angular position of rotation within the 360° range of rotation of the elbow on the body permitted by the construction described above. It will be understood, of course, that the O-ring 70 provides a seal between tube part 22 and the swivel elbow 14 at all times without interfering with rotative adjustment of the elbow upon the body.

The opposite or outer tubular end portion 82 of the elbow 14, which is positioned outermost relative to the body, preferably extends perpendicularly to the intermediate body tube part 22. The elbow end part 82 has a substantially cylindrical outer surface which is interrupted by a circumferential groove which receives an annular resilient sealing member, such as an O-ring 84. The elbow part 82 also has its outer surface interrupted by an inner circumferential groove 86 spaced from the end of part 82 a distance greater than the O-ring 84 and spaced from said O-ring. The stream shaper or discharge member 16 has a tubular end part 88 having a bore with a snug rotative fit around the elbow end part 82 and engaged continuously circumferentially by the O-ring 84 to provide an effective fluid-tight seal in all rotative adjustments of the stream shaper 16 upon the elbow 14. A plurality of radial screw-threaded bores, preferably three in number, are formed in the

tubular end 88 of the shaper and each mounts a set screw 90 having an inner end portion projecting into the circumferential groove 86 of the part 82 of the elbow 14. The inner ends of the set screws 90 are preferably rounded or otherwise configured substantially to correspond to transverse configuration of the groove 86 and provide frictional resistance to rotation of the stream shaper upon the elbow 14. The extent of frictional engagement may vary according to the wishes of the user but preferably the set screws 90 will constantly exert sufficient frictional resistance to rotation of the shaper 16 so as to hold the shaper 16 in any rotative attitude or adjustment on the elbow 14 which the user may select, said maintenance of position continuing during the discharge of water or other liquid under pressure from the stream shaper despite tendency of the discharging water to vary the position of the stream shaper which had been selected. At the same time it is desirable that the frictional resistance to rotation of the stream shaper exerted by the set screws 90 shall not be so great as to require the use of tools to intentionally manually alter the rotative position of the stream shaper on the elbow.

The stream shaper has a head portion projecting from the tubular end 88 thereof which is of irregular shape and configuration and which consists of an arcuate wall 92 of progressively diminishing width. A second narrow arcuate wall 94 is curved oppositely to the wall 92 and projects laterally relative to the tubular end 88 of the shaper. Opposed side walls 96 project from the margins of the arcuate wall 92 and converge longitudinally toward the free end of the wall 92 and laterally toward the arcuate wall 94. An elongated discharge slot 98 or a series of outlet openings preferably extends full length of the wall 94. In one embodiment the slot 98 is of a length in the order of four to four and one-quarter inches and is of a width in the order of three thirty-seconds of an inch. One end of the slot is located adjacent the tubular end 88 of the shaper, and the other end of the slot extends to the outermost end of the arcuate wall 94 and may even extend into the opposed arcuate wall 92 adjacent its outermost end.

In use, water flowing into the shaper at its tubular end 88 engages and is deflected laterally by the curved wall 92 of the shaper to direct it toward the curved wall 94 and the discharge slot 98. The width of the slot is such that discharge of water occurs substantially uniformly through the length of the slot. The discharge from the slot is substantially fan-shaped in a flat wall of water which diverges from the slot through an angle of at least 90 degrees. The narrow width of the slot coupled with the pressure at which water is supplied to the nozzle, such as a pressure in the range from 40 p.s.i. or less to 100 p.s.i. or more, assures that the water wall emitted from the nozzle will have a substantial throw. Thus the throw or spread of the water wall in a direction parallel to the length of the discharge slot 98 at the pressures mentioned, will preferably exceed fifty feet, and the throw of the water in a direction transverse of the wall 94 will preferably be of the same order, that is, at least fifty feet.

It will be apparent from the foregoing description that, when it is desired to form a water curtain through an alleyway or walkway between adjacent buildings so as to protect against ignition of one building by an adjacent burning building, a hose line may be laid through the alleyway or walkway, and my improved water curtain nozzles will be in that hose line. Fire hose is commonly provided in fifty-foot lengths, and one of the new nozzles may be connected between each pair of hose lengths to the extent required to provide the required protection, and a nozzle may be mounted upon the endmost hose length and provided with a sealing cap 42. The nozzles will be supported firmly by the hose 40 and the support member 12. The swivel elbow 14 and the stream shaper 16 may then be adjusted to desired angular relation for

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the purpose of positioning or directing the water wall or curtain emitted from each nozzle in the manner which provides the desired protection. Thus, assuming that the hose is laid in an alleyway or walkway and that a continuous wall of water is desired to extend lengthwise of the hose, the elbow 14 may be adjusted so that the axis of its tubular end part 32 is substantially parallel to the axis of the body parts 18 and 20 and the stream shaper 16 may be adjusted to the position illustrated in FIGS. 2 and 3 with its discharge slot 98 extending upwardly and substantially parallel to the hose 40. The various water curtains will flare from the respective nozzles and will merge adjacent their lateral extremities when the width of the wall is equal to or greater than the spacing between nozzles, that is, equal to or greater than the length of a hose section. This wall of water extending vertically to a distance of forty or fifty feet will provide effective protection against burning brands flying through the air from a burning building toward adjacent structures and will also serve as a means to prevent overheating of adjacent structures, such as might otherwise occur in windy weather and render adjacent structures susceptible to ignition.

In other instances it may be desirable to discharge a wall curtain of water at a selected angle to the hose line which supplies the nozzle and at a selected angle to the vertical. Inasmuch as the rotative connection of the elbow 14 to the body permits 360 deg. revolution thereof, and similarly inasmuch as 360 deg. rotation of the stream shaper 16 may be provided upon the elbow 14, it will be apparent that any desired direction of discharge and any desired location or attitude of the water curtain may be secured.

In instances where tall buildings are involved, presenting combustion hazards at a height above that to which water can be thrown from the nozzle in an upward vertical direction, the device can be used by passing a hose to the top of a building and there holding the nozzle so that it discharges a wall of water downwardly alongside the wall of the building to be protected. In such instances support means 12 provides a convenient hand grip by which a fireman may hold the nozzle in desired position.

The device also has other uses, one of which is the provision of a flat wide discharge of water which can be used to propel flammable liquids along a roadway to a drain or to a collecting location remote from combustible structures or the like. Accidents to tank trucks containing combustible liquids which are discharged from or which leak from a tank onto the ground present a common hazard, particularly when they occur in congested areas. Flushing of the spilled combustible liquids is the most effective means of combatting a serious fire hazard in such cases, and the present nozzle provides a very efficient means for effecting protection in this manner. Here again, the fireman may grasp the support of the nozzle as a means to train it and direct the stream emitted from it in such a manner as to achieve the rapid and efficient and desired directional flushing of the flammable liquid toward a safe location.

While the preferred embodiment of the invention has been illustrated and described, it will be understood that changes in construction may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. A water curtain fire nozzle comprising
 - a tubular body having a passage extending therethrough between an inlet and an outlet whose respective axes are angularly displaced,
 - a support secured to and projecting from said body and adapted to position said body on a supporting surface with the axis of said inlet substantially parallel to said surface,

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- an elbow rotatably mounted on said body at said outlet with a sealed connection,
- said elbow having a passage therethrough between angularly displaced inlet and outlet end portions,
- a hollow stream shaper having an inlet portion rotatably mounted on the outlet portion of said elbow with a sealed connection,
- said shaper having a laterally projecting wall with an elongated narrow discharge slot for directing water laterally of said shaper inlet in a fan-shaped curtain from said nozzle,
- the rotative connection of said elbow and said body including a tubular elbow inlet portion encircling a tubular outlet of said body,
- said tubular body outlet having a pair of spaced circumferential grooves,
- an annular resilient sealing member seated in the groove adjacent the end of said tubular body outlet and engaging said elbow inlet portion continuously circumferentially thereof,
- a plurality of spaced members carried by and projecting into said elbow inlet portion and seating in the other circumferential groove of said tubular body outlet,
- said body having an annular abutment adjacent said tubular outlet portion,
- said elbow having a lateral projection with a threaded bore therethrough extending substantially parallel to the axis of said elbow inlet portion, and
- a stud threaded in said elbow projection and bearing against said annular body abutment.
2. A water curtain nozzle comprising
 - a tubular body having a passage between a tubular inlet portion and a tubular outlet portion,
 - supporting means carried by and projecting from said body,
 - a tubular elbow having a tubular inlet part rotatably mounted on said body outlet portion with a sealed connection and a tubular outlet part extending angularly to said tubular inlet part,
 - means for restraining said elbow against free rotation on said body,
 - a hollow stream shaper having a tubular inlet part rotatably mounted on said tubular elbow part with a sealed connection, and
 - means for restraining said stream shaper against free rotation on said elbow,
 - said stream shaper having an elongated curved wall intercepting water flowing therein from said tubular inlet part, a laterally offset elongated wall opposite said first wall, and side walls connecting said curved and offset walls, said elongated offset wall having a narrow elongated discharge slot therein.
3. A nozzle as defined in claim 2, wherein the side walls of said stream shaper converge from said tubular inlet and from said curved wall toward said slotted wall.

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