July 14, 1959

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2,894,694

MODIFIED FOAM NOZZLE

Filed Dec. 6, 1954

3 Sheets-Sheet 1

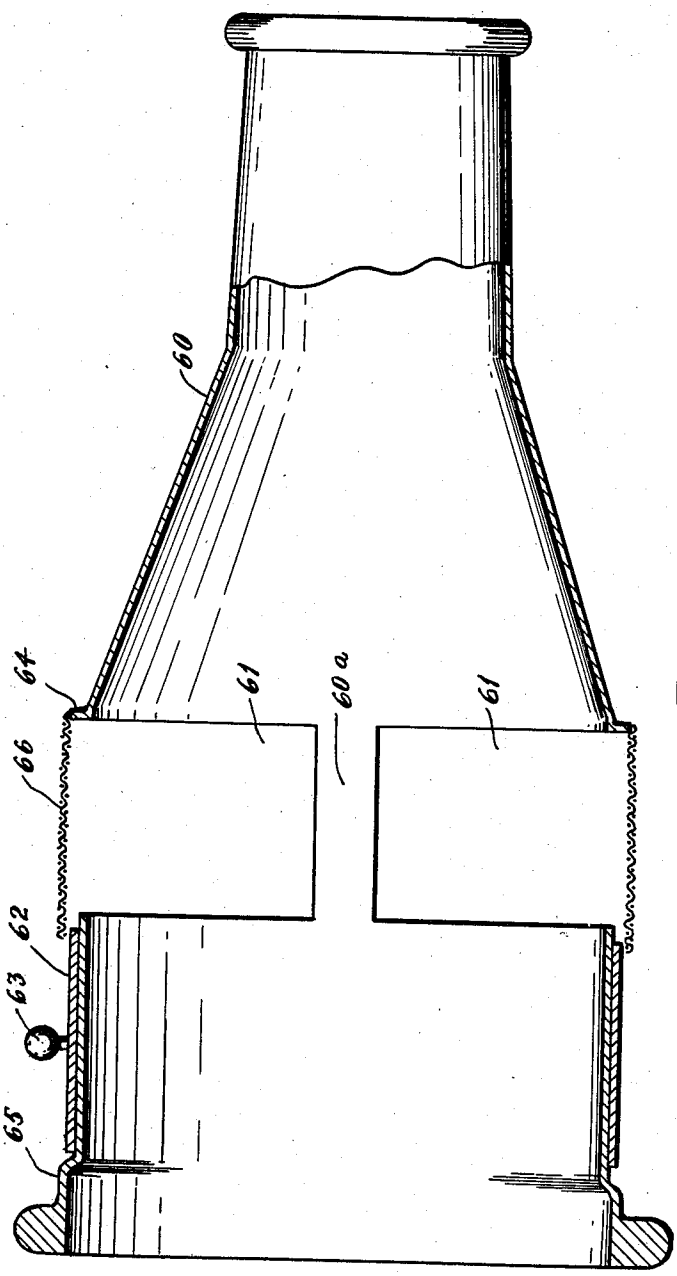


FIG. 1

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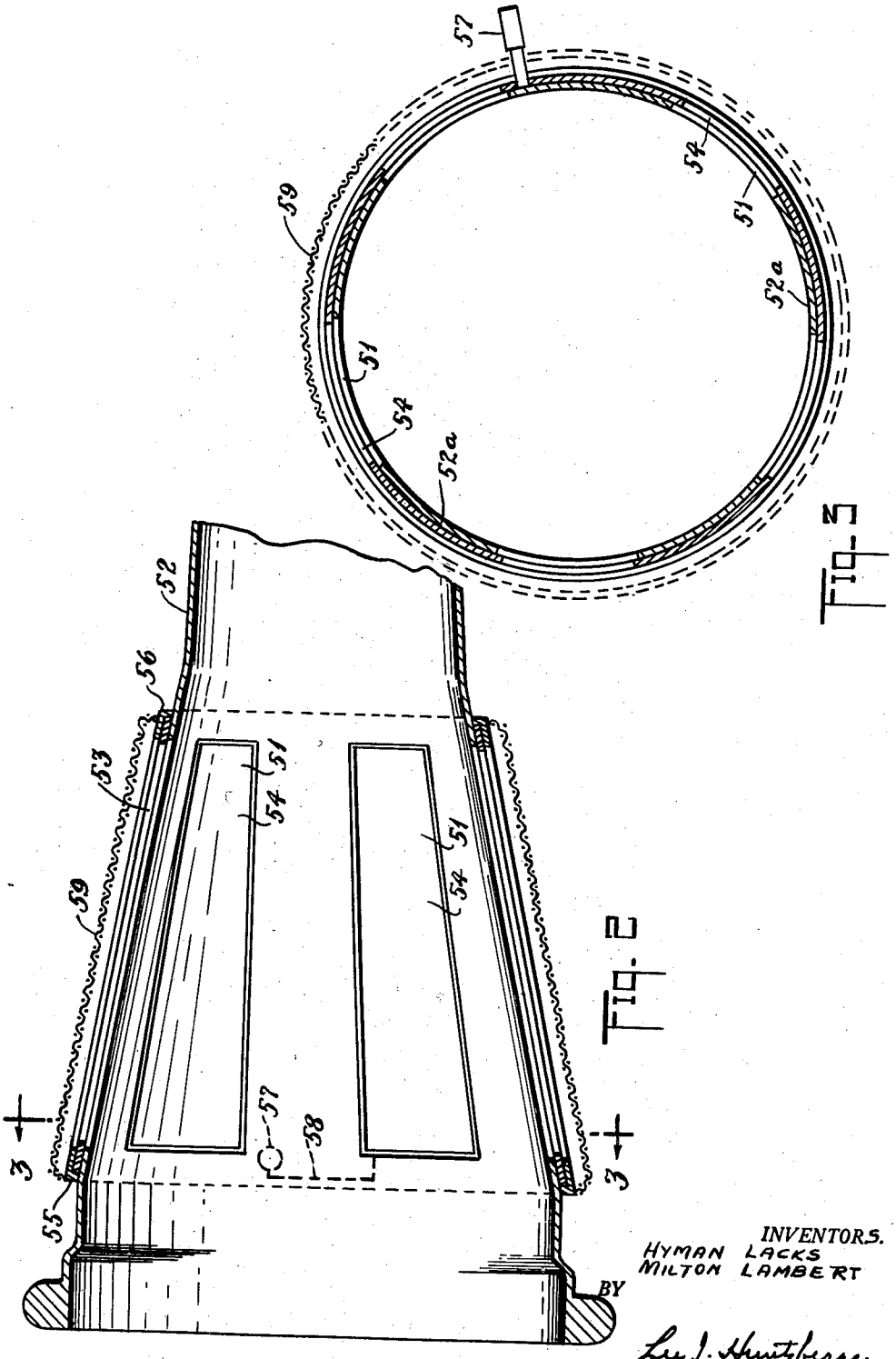


FIG. 3

FIG. 2

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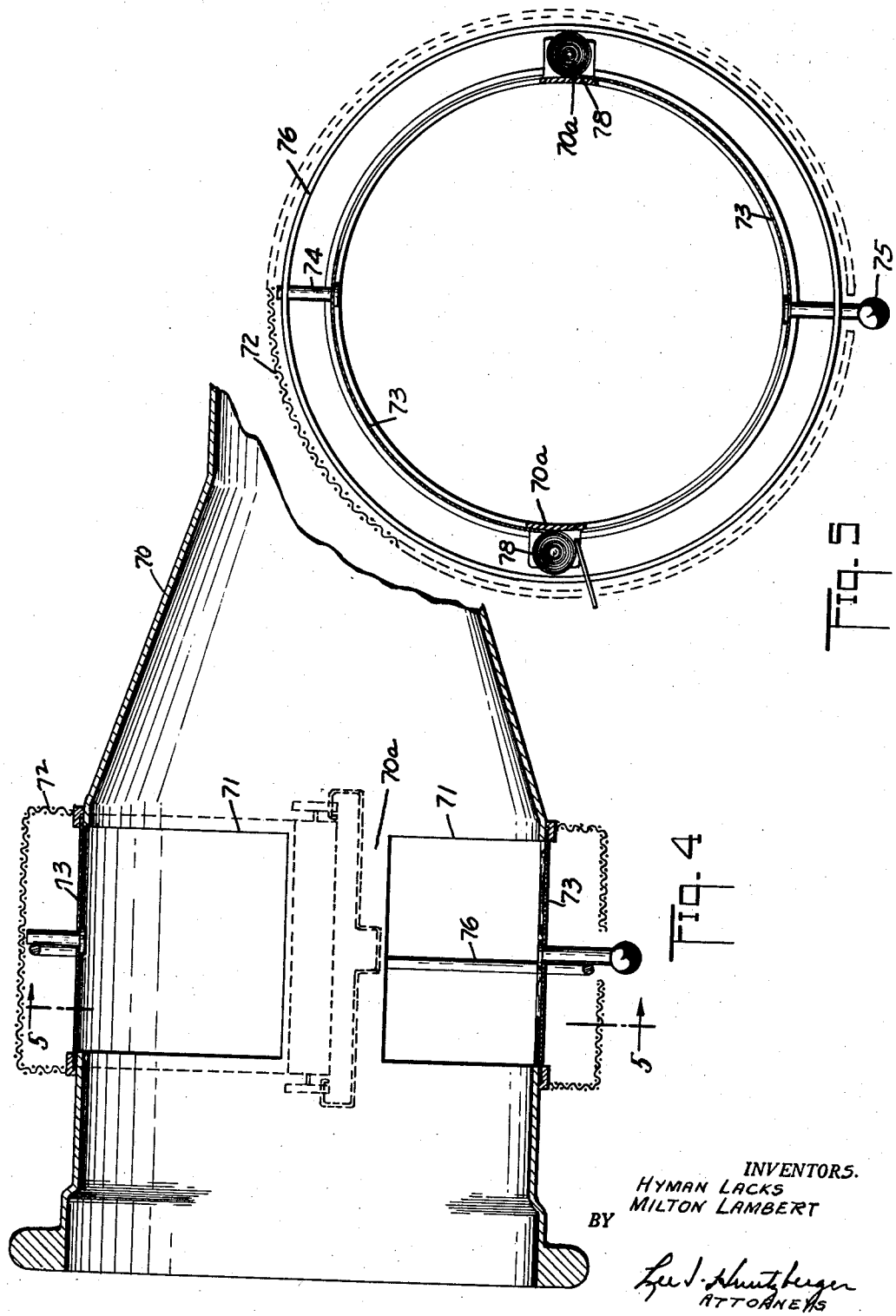


FIG. 5

FIG. 4

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MODIFIED FOAM NOZZLE

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12 Claims. (Cl. 239—443)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to apparatus for producing foam for extinguishing fire and more particularly an apparatus in which the foam produced is collected and discharged into the atmosphere.

An important object of the present invention is to provide a method and means for projecting either a wide cone-shaped pattern of foam that can be applied directly to flammable liquid fires from close by or a long range solid foam stream that can be applied from a longer distance.

Another object of this invention is to provide a device to interchange readily from long to short range throw of stream or from short to long range throw of stream without the necessity of adding or discarding any element of the device and without the necessity of stopping the flow of fluid to the apparatus.

Another object of this invention is to provide an apparatus that will discharge high quality fire extinguishment foams at short range throw as well as at long range solid foam stream.

A further object is to provide a foam nozzle that is light of weight, portable, easily operable manually, easily maneuverable, structurally reliable, and self-contained and compact.

A feature of the invention is the provision of a tube or casing having a plurality of openings or apertures on its side wall which are provided with closures having movable means for readily opening or closing these apertures simultaneously. Locking means are provided for keeping the closure in any desired position. This arrangement provides a very simple form of apparatus in which a wide cone-shaped pattern of foam can be produced when the apertures are open and a long range solid foam stream when the apertures are closed.

This invention finally solves a very vexing problem that is met within fire fighting operations where foams are employed, namely, the production of satisfactory foam, by means of one device, for both short range and long range throw of foam stream.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

In carrying out a preferred form of the present invention it was found advantageous to provide a tube, the conically contracting wall of which is provided with cut-outs or openings covered over with a screening through which foam may be projected for a wide cone-shaped pattern of foam for short range throw of stream. It was further found advantageous to provide hinged leaves or covers for the cut-outs or openings which are adapted to serve as cleasures for the openings when it is desired to produce a long range solid foam stream.

It was further found advantageous to provide covers for the cut-outs or openings which are adapted to act as closures for the openings when it is desired to produce a long range solid foam stream.

In the drawings:

Fig. 1 is a side elevation of one embodiment of the invention.

Fig. 2 is a fragmentary side elevation of another embodiment of the invention.

Figure 3 is a sectional view along line 3—3 of Fig. 2.

Fig. 3 is a sectional view along line 3—3 of Fig. 2.

Fig. 4 is a fragmentary side elevation of another embodiment of the invention.

Fig. 5 is a sectional view along line 5—5 of Fig. 4.

In Fig. 1 is shown a modified form of casing, opening and closure means. In this form of the invention, the casing **60** is provided with a pair of equally sized openings **61** connected by a pair of casing ribs **60***a* disposed on opposite sides. It will be observed from Fig. 1 that the total face area of the apertures **61** is at least about as large as the face area of the restricted discharge end of the casing **60**. A sliding cylindrical section **62** is provided which is concentric with and close fitting to the portion of the casing **60** that carries opening **61**. A handle **63** is rigidly fastened to sliding cylindrical member **62** so as to permit member **62** to be moved from a forward position to a rear position so as to permit opening and closing the opening **61**. A rim **64** is fastened to the casing **60** and end portion **65** of the casing **60** permits positive positioning in either the open or closed position of the opening **61**. A cylindrical shaped screen **66** is positioned over the opening **61** and rigidly fastened to the rim **64**. It will be noted in Fig. 1 that the part of the tube between the apertures **61** and the restricted discharge end is convergingly tapered so that when the apertures **61** are uncovered, the back pressure created by this tapered portion on a fluid stream passing through the tube will expedite the discharge of a very substantial part of a foaming fire fighting fluid from the tube through the apertures **61** and the screen **66** in addition to the fluid then released from the tube at the discharge end at a much lower velocity. This prevents scattering of a fire against which the liquid is discharged.

In Figs. 2 and 3, there is shown a modified form of casing opening, and closure means. In this form of the invention, a plurality of equally sized openings **51** are provided circumferentially in the casing **52**. The casing portion **52***a* adjacent to each opening is slightly wider than the width of the openings **51**. A conical section member **53** provided with the same number of openings **54** as openings **51**, openings **54** being slightly smaller sized than openings **51**, is positioned over the casing so as to be rotatively positioned within the circumferential guides **55** and **56**. The openings **54** are disposed to fall within the openings **51**. A handle **57** is rigidly fastened to rotating member **53** so as to cover or uncover casing openings **51**. A slot **58** of suitable length is provided in the circumferential guide **55** so as to engage the handle **57** so as to permit positive positioning in either the open or closed position of the mating openings **51** and **54**. A conical shaped screen **59** is positioned over the conical member **53** and is attached to the circumferential guides **55** and **56**.

In Figs. 4 and 5, there is shown a modified form of casing, opening and closure means. In this form of the invention the casing **70** is provided with a pair of equally sized openings **71** connected by a pair of casing ribs **70***a*. A screen **72** extends around the outside of casing **70** and covers openings **71**. There is provided a pair of window-shade type covers **73**, one for each opening **71**. One cover **73** carries an actuating rod **74** adjacent its leading edge and the other cover **73** carries an actuating rod **75**

adjacent its leading edge. Actuating rods 74 and 75 are fastened together by an annular ring 76 extending about the outside of casing 60 and fastened to rods 74 and 75. Each of covers 73 is mounted upon a window-shade type roller 78 provided with conventional springs tending to return covers 73 to retracted position whereby openings 71 are uncovered.

It will be observed that in the modifications of Figs. 2 to 5 as well as in Fig. 1, the total face area of the apertures in the side wall of each nozzle or tube is about the same area or more as the face area of the discharge end of the tube, so that when the apertures of a tube are uncovered to release some of the fire fighting foam stream through the apertures, the stream part so released through the apertures will be substantial enough to greatly curtail the velocity of the rest of the stream that is being released at the same time through the discharge end of the nozzle tube. The low velocity streams from the discharge end of the nozzle and from the apertures may be applied directly at close range to a fire to provide a foam blanket over it without serious danger of scattering the fire. This is important when fighting fires in burning liquids when scattering of the burning liquid would be dangerous and objectionable. Also as in Fig. 1 the tapered part of the wall expedites the diversion of some of the foam stream through the apertures when the apertures are uncovered. The stream delivered to the nozzle is a mixture of water and a foamable material atomized into an air stream and is not a solid stream of liquid.

It is thus to be seen that the present invention provides distinct advantages which are not to be found in similar devices now in existence and use. First, it permits the provision either of substantially solid conical short solid foam stream, a sole long range stream or selected patterns of dispersed foam streams. Secondly, it provides a device wherein the firefighter need not stop to detach any parts or add parts to the device to change from a short range to a long range stream. Thirdly, to form a long range solid foam stream, a smooth inner contour is provided so that no turbulence occurs to impede the flow of the foam since the closure means in the closed position is intermediate the screen and the openings. Fourthly, to form a rich foam suitable for fire fighting purposes, the foramination of a section of the tubular member, effectively provided by screens with numerous perforations over the openings presents a multiplicity of orifices needed for foam generation. Fifthly, the combination of a rich foam long range stream together with a good short range stream provides a total stream of solid conical contour.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

We claim:

1. A nozzle for selectively producing solid foam streams having selected patterns comprising a tubular member having a bore with a substantially continuous contour and a plurality of openings around said tube intermediate the ends of said member, screening means over said openings, and tubular closure means engirdling said tubular member and having openings similar to the openings in the tubular member, said closure means being mounted to be turned about said member whereby in a first open position, the openings in said member and said closure means are in registration and in a second closed position the openings in said member and said closure means are out of registration, said closure means excluding said screening means when in a closed position.

2. A nozzle for selectively producing solid foam streams having selected patterns comprising a tubular member having a substantially continuous contour, said member having first wider and second narrower end portions and a tapered portion intermediate said end portions, a plurality of openings transversely disposed about said tapered portion, screening means covering said openings, and tubular closure means engirdling said tapered portion and having openings similar to the openings in the tubular member, said closure means being adapted to be turned about said tapered portion whereby in a first open position, the openings in said tapered portion and in said closure means are in registration and in a second closed position, the openings in said member and said tapered portion are out of registration, said closure means excluding said screening means when in said second position.

3. A nozzle for selectively producing substantially solid foam streams having selected patterns comprising a tubular member having a bore with a substantially continuous contour and having a plurality of openings around said member intermediate the ends thereof, screening means on said openings and closure means for said openings selectively movable into a first closed position to close the openings and to exclude the screening means and into a second open position to open the openings, the closure means comprising a window-shade type roller mounted adjacent one edge of each opening, a window-shade type cover associated with said roller and adapted to be drawn into an extended position to close the opening and returned into retracted position to uncover the opening and means operatively associated with said covers for effecting simultaneous movement thereof.

4. A nozzle for selectively producing substantially solid foam streams having selected patterns comprising a tubular member having a bore with a substantially continuous contour, said member comprising first wider and second narrower end portions and a tapered portion intermediate the end portions, said second wider end portion having a plurality of substantially transversely disposed openings, screening means on said openings, and closure means for said openings selectively movable into a first position to close the openings and to exclude said screening means and into a second open position to open the openings, the closure means comprising a window-shade type roller mounted adjacent one edge of each opening, a window-shade type cover associated with said roller and adapted to be drawn into an extended position to close the opening and returned into retracted position to uncover the opening and means operatively associated with said covers for effecting simultaneous movement thereof.

5. A high pressure, high velocity nozzle for fighting a scatterable fire with a foam blanket, selectively at long and at close ranges, comprising a single tube having a single bore from end to end therethrough and having a restricted discharge orifice, through which a foam stream under pressure can be delivered, the side wall of said tube away from said discharge orifice being apertured to form an unobstructed branch path from the tube bore directly to the atmosphere with a total face area equal to not less than about the face area of said discharge end, screening over said apertured wall, closure means mounted on the exterior of said tube between the tube and screening and movable selectively to completely close the apertured part of said tube wall and thereby confine the discharged stream to the restricted discharge orifice for discharge at a relatively high velocity for long range fire fighting, and to uncover the apertured part of said tube wall and distribute part of the discharged foam stream through said apertured wall and part through said discharge orifice, both at a relatively low velocity, said screening being operable to cause a turbulence inducing extensive foaming of the stream discharged therethrough.

6. A high pressure, high velocity nozzle for handling a gaseous stream of foamable material comprising a single tube having a single bore, said tube being open throughout its length and at its ends to define a single,

straight bore path for fluid through the nozzle from one end of the nozzle to the other, the discharge end of said bore being restricted, said tube intermediate of its ends being apertured to form a branch path from the tube bore directly to the atmosphere, screening over the apertured part of said tube, a closure mounted at said tube opening and consisting of a single obstruction movable in a direction parallel to the axis of said bore into closed position to completely close the apertured wall of said tube and thereby confine the fluid path exclusively within, and end to end through the tube and coextensive with the tube bore for discharge through said restricted end at high velocity for long range fire fighting, said closure being movable in the opposite direction into opened position on said apertured wall to form an unobstructed branch path for some of said fluid through said apertured wall and screen, at low velocity, with the balance discharged from said restricted end at a relatively low velocity.

7. Apparatus for both long and close range fighting of flammable liquid fires with a blanket of foam, which comprises a nozzle tube having a passage therethrough from an entrance end to a restricted discharge end that is of substantially smaller cross sectional area than of the entrance end, the wall of said tube along an intermediate section of said passage that is of substantially greater cross-sectional area than said discharge end having apertures therethrough and of a total face area which is at least as great as the face area of said discharge end, closure means mounted on said tube for movement into and out of a position closing said apertures or uncovering them, and open mesh screening mounted on the exterior of said tube, covering said apertures, and disposed outwardly of said closure means to enable free movement of said closure means in directions to cover and uncover said apertures, whereby when said apertures are closed by said closure means, a foam stream that is delivered under pressure to the entrance end of said tube, may be delivered entirely from the discharge end of the tube at high velocity for long range fire fighting, and when the apertures are entirely uncovered and the delivered pressure of the foam liquid is about the same, said foam stream will be released from said tube at a relatively low velocity through both said apertures and said discharge end for close range fire fighting, where scattering of the fire is not desired, said screening being operable on the foam stream discharged therethrough to create therein a turbulence which will induce extensive foaming of such liquid.

8. The apparatus as set forth in claim 7, wherein the apertured part of said tube is cylindrical, said screening is spaced from the exterior wall of said tube, and said closure means is a sleeve surrounding and confined to the tube beneath said screening means for sliding movement in a direction parallel to the axis of said passage to cover and uncover the apertured part of said tube.

9. The apparatus as set forth in claim 7, wherein that part of said tube between the apertures and the restricted discharge end is convergingly tapered toward the discharge end to create a back pressure at the apertured part of the tube which, when the closure means uncovers the apertured part of the wall, will expedite the discharge of some of the foaming stream through the apertured wall in addition to the discharge through the restricted discharge end.

10. A nozzle for use in firefighting apparatus and operable to convert a gaseous stream containing, in finely divided particles in suspension therein a foamable fire extinguishing fluid into a highly foaming stream and selectively delivering it as a single high velocity stream for long range fire-fighting or as a plurality of low velocity streams for close range fire fighting, which comprises a tube open therethrough from end to end and having a restricted discharge end and a larger stream receiving end, the wall of said tube in a section intermediate of the ends of the tube being apertured with a total face area of the apertures at least about equal to the face area of the restricted discharge end, means on said tube and selectively operable thereon to cover and uncover the apertured part of said tube, and thus discharge as a low velocity stream a substantial part of the stream through said apertured wall and the balance through said discharge end when the apertured part of the wall is uncovered for close range fire fighting, and discharge all of the stream through said discharge end of said tube as a high velocity stream for long range fire fighting when the apertured part of the wall is covered by said covering means, and screening disposed on and exteriorly of said tube, and covering the apertured part of said wall for increasing the foaming of the part of the stream passing through the apertured part of said tube wall.

11. A delivery nozzle for handling a stream of foamable fire extinguishing fluid for fighting fires at both close and distant ranges, which comprises a nozzle tube having a bore passage therethrough from an entrance end to a restricted discharge end, and also screened branch passage escape means between the entrance and discharge ends having a total face area at least about as large as the face area of the restricted discharge end and closure means carried by said tube and adjustable thereon between two positions, in one of which it prevents discharge of any of the stream through said branch passage means and directs said stream substantially all to said restricted discharge end for delivery therefrom as a high velocity stream to fight a fire at a distant range, and another position in which it opens said branch passage escape means to permit escape of some of the stream therethrough, with a lower velocity of the stream through both the restricted discharge end and the branch passage escape means for close range fire fighting.

12. The nozzle as set forth in claim 11, wherein said closure means is convergent toward the discharge end when in said one position.

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