

United States Patent

[11] 3,561,536

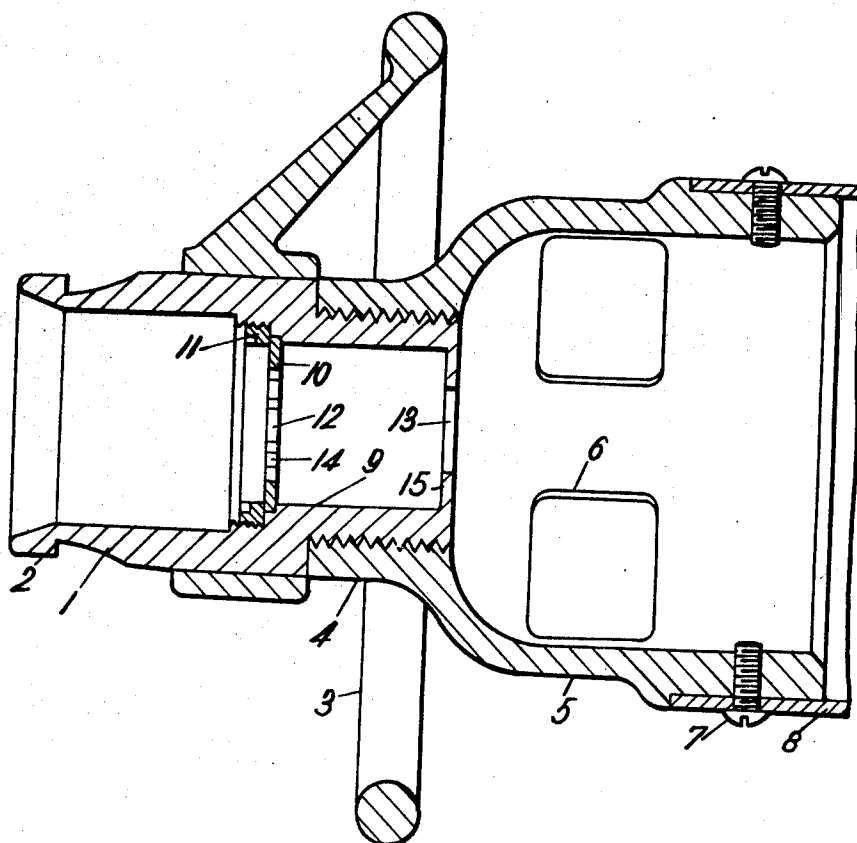
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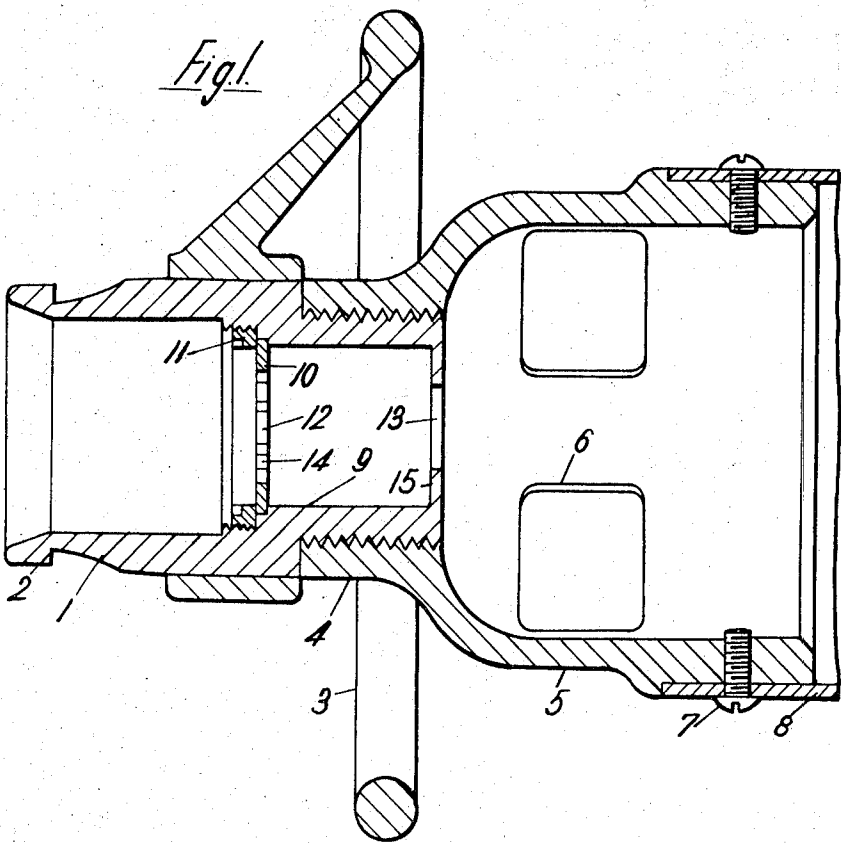
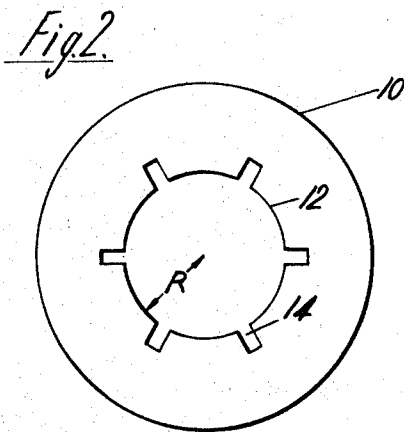
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[54] **JET HEAD FOR FOAM GENERATORS**
5 Claims, 2 Drawing Figs.

[52] U.S. Cl..... **169/15,**
239/419.5, 239/590, 239/596, 239/601
[51] Int. Cl..... **A62c 31/12**
[50] Field of Search..... 169/15;
239/419.5, 428.5, 498, 590, 596, 601

ABSTRACT: A jet head for a fire-fighting foam generator by which the jet is caused to form a uniform conical spray of droplets without substantial loss of kinetic energy. The liquid stream to form the jet passes through a chamber having an inlet orifice with slots around its periphery, and the part of the stream that passes through these slots impinges on the end wall of the chamber around the periphery of the outlet orifice.





JET HEAD FOR FOAM GENERATORS

In the production of foam for fire-extinguishing purposes, the kind of foam-generating apparatus most commonly used is that in which air is entrained through the end of, or through side openings in, a form tube by a jet of a flowing solution of a foam-stabilizing compound in water and the mixture forms foam in flowing through the form tube to a nozzle at, or constituted by, the open end of the tube. This apparatus includes a jet head by which the jet is formed.

The design of the jet head is a matter of importance. It is desirable that as little as possible of the kinetic energy of the liquid stream should be lost, and to retain the maximum energy the jet should be unbroken. On the other hand, the expansion of the foam depends on the entrainment of air, and an unbroken jet entrains little air. If the core of the jet is "solid," it will travel at a higher velocity than the periphery and mix as free liquid with the foam produced. This free liquid is not aerated and drains away rapidly from the foam. This, of course, is undesirable, since the foam should remain as such, even when subjected to heat from the fire.

The basic problem, therefore, is to break up the stream into droplets, and at the same time to maintain the velocity.

British Pat. No. 842,461 describes a jet head which has proved successful in practice. It comprises a chamber having at its inlet end a circular orifice, of smaller cross-sectional area than the chamber, adapted to form the stream of fluid flowing through a supply tube into a solid jet and at its outlet end a circular orifice, also of smaller cross-sectional area than the chamber, axially aligned with the inlet orifice and of such size at such a distance from the inlet orifice that an undisturbed solid jet formed on passage through the inlet orifice will all pass through the outlet orifice. The chamber is reentrant in the tube and openings are made in its sidewalls for the passage of part of the oncoming stream to form lateral jets which impinge directly on the solid jet within the chamber and increase its volume to such an extent that it makes contact with the wall pounding the outlet orifice.

Although this jet head has not only been successful but also has allowed the whole generator to be much shorter than was previously necessary, the construction is somewhat complicated in manufacture, and the lateral jets either insufficiently disturb the periphery of the solid jet or cause more loss of energy of the whole jet than is desirable. In addition, the openings for the lateral jets are liable to become choked, and it has been found highly desirable to protect them by filters such as wire gauze.

An important object of this invention is to provide an improved device for producing a conical spray of liquid in which the distribution of the droplets is substantially uniform over the cross section without any substantial loss of kinetic energy.

This object is achieved according to the invention by making the jet head as a chamber with inlet and outlet orifices in opposite end walls. Slots extending outwards are made in the periphery of the inlet orifice so that this orifice ceases to be truly circular in cross section. The liquid flows through these slots as well as through the circular center of the orifice, and it is found that there is excellent formation of droplets without substantial loss of kinetic energy of the jet as a whole if the slots are of appropriate dimensions and spacing. The breaking of the jet, particularly towards the core, is improved. In fact the jet is broken into a substantially uniform conical spray of droplets. Moreover, this jet head is simpler to make, and no filters are necessary.

It is necessary for the diameters of the orifices and their distances apart to be such that in the absence of the slots liquid supplied under appropriate pressure for forming foam would pass as a solid jet through the outlet orifice.

The total cross-sectional area of the inlet orifice (including the cross-sectional area of the slots) preferably equals that of the outlet orifice.

The inlet and outlet orifices may be spaced apart from one another by a distance that is between 0.25 and 3, and preferably between 1 and 2, times the diameter of the outlet orifice.

The slots are preferably rectangular and normally there are from 4 to 12 equally spaced around the periphery. If the inlet orifice is of radius R , the width of the slot normally is from $0.1 R$ to $0.5 R$. The distance through which the slot extends from the periphery of the orifice may be from one-eighth to one-half R .

The preferred construction is shown by way of example in the accompanying drawings, in which:

FIG. 1 is a longitudinal section through part of a foam-generating apparatus; and

FIG. 2 is a plan view of a plate that forms part of the jet head.

The apparatus shown in FIG. 1 comprises a supply tube 1 for foam-generating liquid, having an inlet end 2 shaped for connection to a hose pipe and formed with a handle 3. The outlet end of the tube 1 is externally threaded and engages an internally threaded neck 4 of a fitting 5 which is formed with openings 6 for the admission of air. This fitting is united by screws 7 to a foam tube 8 which terminates in a discharge nozzle not shown.

To produce foam a mixture of water and foam-stabilizing solution is introduced under pressure through the tube 1 and must be converted into a jet which will entrain air through the openings 6 and pass through the foam tube 8. The jet is produced in a jet head according to the invention which is in part formed by the tube 1. The end of this tube is shaped as a chamber 9, and a plate 10 is let into the inlet end of this chamber and held by a threaded ring 11. A central circular opening 12 in this plate constitutes an inlet orifice, and at the outlet end 15 of the chamber 9 there is a central circular outlet orifice 13 axially aligned with the inlet orifice 12.

FIG. 2 shows the plate 10. The orifice 12 is of radius R , and six rectangular slots 14 are made in the periphery of the orifice 12 at 60° spacing, each extending from the periphery of the orifice to a distance of $0.25 R$. The width of each slot is $0.2 R$, i.e., rather less than its depth.

The radius of the outlet orifice 13 is slightly more than R , but the total cross-sectional area of the inlet orifice 12 including the slots is the same as that of the outlet orifice 13.

In one successful device according to the invention the chamber 9 is 1.313 inch long and 1.25 inch diameter. The radius R of the inlet orifice 12 is 0.33 inch. There are six slots each extending outwardly for 0.082 inch, that is to say to a distance of $0.25 R$, and each of width 0.062 inch, that is to say $0.2 R$. The outlet orifice 13 is 0.338 inch in diameter. The plate 10 and the end 15 of the chamber are each 0.093 inch thick.

I claim:

1. For the production of a conical spray of liquid to be formed into foam by the incorporation of air, a device comprising a tube for the supply of liquid and a jet head at the end of the tube, the jet head comprising a chamber with opposed end walls, one end wall being formed with an inlet orifice from the periphery of which slots extend outwards, and the other end wall being formed with an outlet orifice, both the inlet and outlet orifices being smaller in cross-sectional area than the chamber, and the diameters of the orifices and their distance apart being such that in the absence of the slots liquid supplied under appropriate pressure for forming foam would pass as a solid jet from the inlet orifice through the outlet orifice, and the slots being of such spacing and dimensions that liquid supplied under appropriate pressure for forming foam and passing through the slots impinges on the second end wall around the outlet orifice, whereby the jet is broken up into a uniform conical spray of droplets without substantial loss of kinetic energy of the jet as a whole.

2. A jet head according to claim 1 in which the inlet orifice has from four to 12 rectangular slots equally spaced around its periphery.

3. A jet head as claimed in claim 1 in which the distance between the inlet and outlet orifices is between 0.25 and three times the diameter of the outlet orifice, the slots extend from the periphery of the inlet orifice to a distance of between $0.125 R$ and $0.5 R$ and the width of each slot is between $0.1 R$ and $0.5 R$, where R is the radius of the inlet orifice.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,561,536 Dated February 9, 1971

Inventor(s) Thomas Anthony Henshaw

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

In the heading of the Patent the following statement
is added:

--Application filed under Rule 47--.

Signed and sealed this 29th day of June 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patent