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P. L. GEER

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MIXING NOZZLE

Filed Aug. 17, 1927

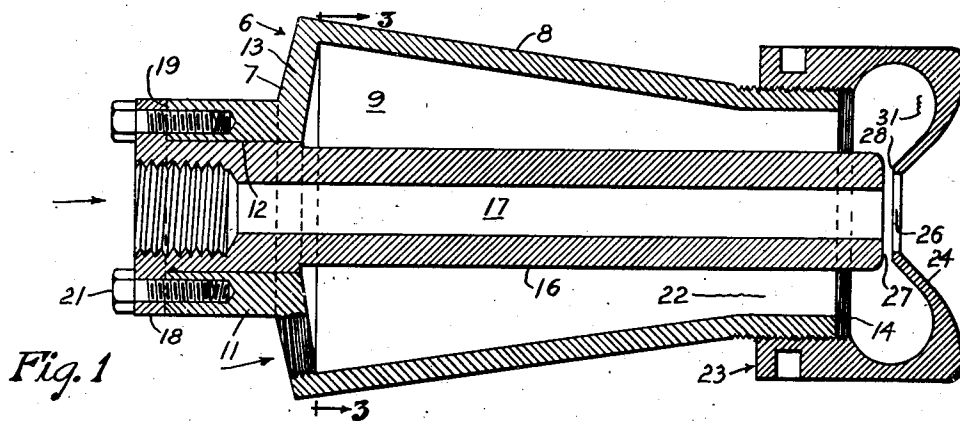


Fig. 1

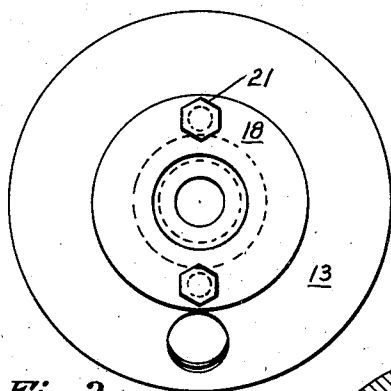


Fig. 2

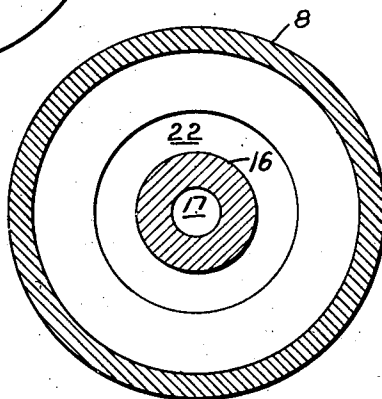


Fig. 3

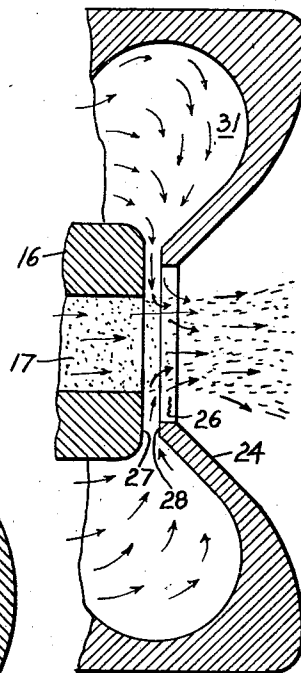


Fig. 4

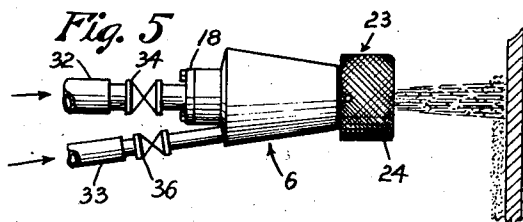


Fig. 5

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UNITED STATES PATENT OFFICE

PAUL L. GEER, OF OAKLAND, CALIFORNIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF THREE-TENTHS TO WESLEY M. WOOTEN, OF SAN FRANCISCO, CALIFORNIA, AND THREE-TENTHS TO LAURA FENTON FRANK, OF OAKLAND, CALIFORNIA

MIXING NOZZLE

Application filed August 17, 1927. Serial No. 213,483.

My invention relates to a nozzle for uniting streams of different materials, in mixed relation, for delivery in a single stream.

An object of the invention is to provide a nozzle structure which is particularly efficient for effecting a thorough mixing of a fluid, such as emulsified asphalt, with solid particles of a material, such as sand, whereby such particles may become uniformly mixed and coated with the fluid and otherwise function therewith.

Another object of the invention is to provide a nozzle of the class described which is non-clogging.

A further object of the invention is to provide a nozzle of the class described which itself serves both as a shut-off and control valve for one of the streams to be united.

A still further object of the invention is to provide a nozzle of particularly simple structure which may be readily taken apart, and in which, the parts thereof subjected to wear are readily replaceable.

Other and ancillary objects of my invention will be suggested in the following description and in the use of the device of my invention. Certain of the objects, or certain portions or combinations of the objects of my invention may be attained with the use of less than all its advantageous features, or with modifications within its purview. It is petitioned therefore, that my invention be limited only by the claims constituting its final determination.

In the accompanying drawing forming part of this specification:

Figure 1 is a longitudinal sectional view of the nozzle taken on the axial line thereof.

Fig. 2 is a rear end view of the nozzle.

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged sectional fragmentary view of the discharge end of the nozzle as shown in Fig. 1, the various directions of flow of the materials being indicated therein.

Fig. 5 is a side view of the invention showing the connecting supply pipes and the device operatively disposed with respect to a surface receiving the discharge therefrom.

As herewith illustrated, the nozzle of my

invention, denoted in general by the numeral 6, includes a body member 7 having a shell portion 8 providing a generally frusto-conical cavity or chamber 9, and a portion 11 providing a cylindrical bore 12 communicating with the cavity 9 at the larger end thereof and coaxially related thereto. The portion 11 is of somewhat smaller diameter than the adjacent part of the portion 8, and a body portion 13 is accordingly utilized for connecting said first portions; the portion 13 being generally in the form of an annular disc and being preferably formed integral with the portions 8 and 11, whereby the body 7 constitutes a unitary member.

Mounted in the bore 12 to extend forwardly therefrom through the chamber 9 to a point beyond the smaller and forward end 14 of the shell 8, is a tubular nozzle member 16, such member being preferably of uniform cross-section and having an axial passage 17 extending therethrough. The member 16 is desirably arranged to be detachably fixed to the nozzle body and is here shown provided at its inner end with a radially extending annular flange 18, disposable against the inner end face 19 of the body portion 11 to which it is secured by means of cap screws 21. The diameter of the member 16, it will be noted, is somewhat less than that of the cavity 9 at its forward and smallest end whereby a passage 22 of annular cross-section is defined about the member 16, such passage being of decreasing cross-sectional area toward the forward end 14 of the nozzle body.

It will now be noted that streams of different materials are arranged to move generally forwardly through the passages 17 and 22 and that in order to effect a mixing of the materials of the streams, means must be provided for directing one stream into the other. As here shown, the outer stream through the annular passage 22 is arranged to be deflected transversely into the central stream of the passage 17, and the means provided comprises a mixing cap 23 mounted on the forward end of the nozzle portion 8 in threaded engagement with the exterior thereof. The cap end 24 is disposed forwardly of the end of the member 16 and provided with

a central axial opening 26 which is somewhat larger than the passage 17. The forward end of the member 16 provides an annular seat 27 disposed in a plane at right angles to that of the nozzle axis, and an inner annular surface 28 is provided on the cap end, such surface extending radially outwardly from the inner end of the bore 26 and being arranged for relative engagement with the seat 27 when the cap is screwed on the portion 8. In this manner, the cap 23 and the end of the nozzle member 16 cooperate to provide a valve; the discharge from which is directed radially inwardly between the seat 27 and surface 28 in a flat sheet-like plane into the stream issuing from the nozzle member 16 whereby a thorough mixing of the materials of the streams from the passages 17 and 22 is assured, it being particularly noted that because the discharge into the stream from the passage 22 is coplanar and at right angles to the axis of such passage, none of the material from passage 22 is allowed to escape by passing through such stream as might occur were the discharge thereinto oblique.

It will now be noted that if the inner surface of the cap end which lies radially outwardly of the bearing surface 28 be in generally coplanar relation with the latter surface, a right-angled turn would be impressed upon material issuing from the passage 22, whereby such material would impinge against the cap end at right angles thereto, so that materials having relatively high adhesive and cohesive properties would tend to accumulate on such end and clog the passage between the seat 27 and surface 28. Accordingly, the cap end is formed to provide within it an annular groove or recess 31 extending forwardly of the plane of the surface 28 and radially outwardly from the nozzle member 16 beyond the mouth of the passage 22 whereby a chamber is defined which lies both in the plane of the surface 28 and in the path of discharge from the passage 22. Preferably, the walls of the groove 31 are smooth and present no sharp angles; as here shown, the groove is so shaped that a section thereof taken in a plane including the nozzle axis comprises an intermediate semi-circular portion having the diameter thereof intersecting said axis forwardly of the nozzle at an angle of about forty-five degrees and with its center in the plane of the surface 28, and connecting portions extending tangentially from the intermediate portion in mutually parallel relation to terminate at the surface 28 and the cap threads. With the groove 31 formed generally as described, no direct impact of material from the passage 22 against the cap is permitted, and the material contacting with the surface moves only along it to keep it scoured clean. The groove 31, forming the chamber that may entrap air, also serves as a cushion to

smooth out any slight variations in the discharge pressure of material from the outer passage 22.

The member 16 is threaded at its inner end for connecting the passage 17 thereof to a supply pipe or hose 32, and the nozzle portion 13 is provided with a threaded perforation for connecting the passage 22 to a second hose 33, suitable valves being provided in the respective hose lines as at 34 and 36 respectively.

The nozzle structure now described is particularly designed for use in effecting a coating of sand particles with a cementing material and immediately and forcibly depositing the coated sand in place, particular reference being had to the use of an emulsified asphaltum as a cementing agent for the sand particles. When used for such particular purpose, the sand is supplied to the passage 17 through the hose 32 and is carried by an air stream in the manner of a sand blast. The cementing material is supplied through the hose 33 to the passage 22 under pressure and in a liquid or atomized form, whence it is delivered into the sand stream at right angles thereto in the manner hereinbefore set forth. In the case of emulsified oil, the impact of the sand with the oil-water droplets break up the latter, and the superior adhesion of the oil causes a coating of the sand grains therewith rather than with the water, whereby the water is freed to evaporate. In this manner, the sand grains become coated with the cementing material and are held together by the cohesion of such material as they forcibly strike the surface to be coated, attention being particularly called to the variation in the amount of cementing material made possible through adjustment of the mixing cap whereby a most advantageous use of material may be effected entirely by adjustment at the nozzle. It will, of course, be obvious that other granular materials may be applied by the use of the nozzle and that a wide variety of cementing materials may be applied thereby.

In practice, the cap opening 26 is made large enough so that the stream of mixed materials may not contact with its sides or surface 28 as the stream leaves the nozzle. Furthermore, the layer of material intersecting the stream through the passage 17 acts to retard such stream, whereby a given pressure impressed behind the stream will be reduced at delivery, thus reducing the usual amount of rebound waste in applying the materials to vertical or overhead surfaces.

Since the member 16 is arranged to have solid material delivered therethrough, it may wear out by abrasion, and its formation and mounting as an independent part of the structure to permit its ready replacement is therefore an important feature of the structure disclosed.

From the foregoing description taken in

connection with the accompanying drawing, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative and that such changes may be made, when desired, as fall within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States the following:

1. In a mixing nozzle, a member arranged to axially discharge a substantially cylindrical stream of material, and means directing other material entirely perpendicularly into said stream at a point adjacent its point of exit from said member, and from all sides of the stream.

2. In a mixing nozzle, a member providing a passage for the axial discharge of a cylindrical stream of material, and means directing material from another stream of material entirely perpendicularly into said first stream from all sides thereof and toward a common point beyond said member.

3. In a mixing nozzle, a tubular member providing a passage for axially discharging a stream of material, a second member fixedly related to said first member and providing a passage for a second stream of material, and means carried by said second member operative to direct the material from its stream entirely perpendicularly into the first stream adjacent its point of emergence from its passage and from all sides of said first stream in a plane at right-angles to the axis thereof.

In testimony whereof, I affix my signature.
PAUL L. GEER.