July 30, 1957 I. M. RIDLEY 2,801,133

ANGLE NOZZLE

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Fig. 1.

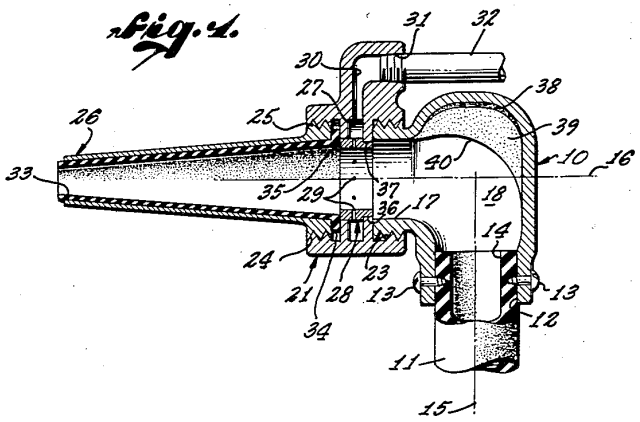
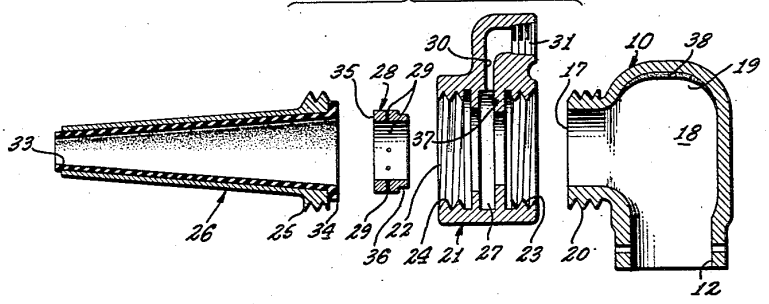


Fig. 2.



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ANGLE NOZZLE

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1 Claim. (Cl. 299—107)

This invention relates to spray nozzles and has particular reference to nozzles wherein a change in direction is provided for. The nozzle is one especially well adapted to the spraying of cementitious or refractory materials which may be of an inherently abrasive character having a strong tendency to wear out nozzles of conventional construction.

The spraying of refractory materials, cementitious materials, and other aggregates such as Portland cement aggregate, has long been practiced. Ordinarily straight nozzles have been employed—that is to say, nozzles having a continuous bore straight through the fitting from the pipeline introducing the material to be sprayed to the ejector end.

There are, however, numerous occasions where, because of close quarters straight nozzles cannot be used, especially where, as in the handling of the material in question, the supply hose must be made of walls having such thickness that the hose cannot be bent in a sharp radius. Since there must be a reasonable distance between the nozzle tip and the surface upon which the material is to be sprayed—that is to say, a thickness exceeding twelve or fourteen inches—unless the nozzle can be removed further than this distance, the spray technique cannot be employed.

It is therefore among the objects of the invention to provide a new and improved spray nozzle for cementitious and refractory materials which is capable of sharply changing the direction of the material, thereby to make possible use of the nozzle in close quarters.

Another object of the invention is to provide a new and improved angular spray nozzle for semi-fluid materials with somewhat inherently abrasive characteristics so designed as to provide a pad of wear-resistant material at the location where the direction of flow is changed so that the material from which the nozzle is made will not wear out.

Still another object of the invention is to provide a new and improved nozzle for the spraying of semi-fluid cementitious materials having an abrasive character wherein the direction of flow is abruptly changed, the nozzle being so constructed that the abrasive material may be accumulated in a pocket which assumes, on its surface, the direction of flow where the direction of flow is changed so that a portion of the material normally passed through the nozzle may serve as a wear-resistant pad as long as the nozzle continues in use.

With these and other objects in view the invention consists in the construction, arrangement, and combination of the various parts of the device whereby the objects contemplated are attained as hereinafter set forth, pointed out in the appended claim, and illustrated in the accompanying drawings.

Figure 1 is a longitudinal sectional view of the nozzle in assembled condition showing the location of the abrasive resistant pad.

Figure 2 is a longitudinal sectional exploded view of the parts illustrated in Figure 1.

In the cementing of the interior of blast furnaces, fire boxes, pouring ladles, and the like, conventional nozzle equipment capable of spraying a cementitious lining on the walls thereof can be used where there is sufficient room. On many occasions, however, the fire box or other cavity may be of relatively small size, or more particularly, located so close to some adjacent obstruction that a straight nozzle connected to a hose resistant to sharp bends cannot be worked into a proper position with respect to the walls upon which the material is to be sprayed. Since locations wherein such close quarters are found comprise a very large percentage of the locations where the spray technique could otherwise be employed, it becomes highly desirable to provide an angle discharge nozzle which can avoid bending the supply hose. By providing a nozzle having the maximum change in direction of 90 degrees, almost all installations, however close the quarters may be, can be treated by the spraying technique.

In the form of the device chosen to illustrate the invention, there is provided an ejector or angle nozzle consisting of an angle fitting **10** to which is connected a supply hose or inlet line **11**. The fitting is provided with an inlet opening **12** within which the supply line is mounted and there secured, for example, by means of screws **13** having a length such that no portion of the metal of the screw is exposed to an inside bore **14** of the supply hose.

The longitudinal axis of the supply hose is herein indicated by the reference character **15**. This is at right angles to a longitudinal axis **16** of an outlet opening **17** with which the fitting **10** is supplied.

A chamber **18** forms the interior of the fitting. More particularly, the chamber **18** is so formed that an extension of the chamber forms a pocket **19** in axial alignment with the supply hose and at the side of the chamber immediately opposite the inlet end of the supply hose.

On the fitting extending around the outlet opening **17** is a threaded connection **20**, to which is attached an outlet flow fitting **21**. The outlet flow fitting has a straight passage **22** therethrough in axial alignment with the outlet opening **17**. Internal threads **23** on one side engage the threaded connection **20**. Internal threads **24** on the other side engage external threads **25** on a nozzle **26**.

An annular space **27** within the outflow fitting is adapted to contain and have centered therein a water ring **28**. The water ring contains a series of circumferentially disposed water apertures **29** whereby water or other fluid may be supplied to the material prior to ejection from the nozzle. The water enters the space **27** through a passage **30** connected to a threaded water port **31**, which in turn connects to a water line **32**.

The nozzle **26** has a frusto-conical shape and is fitted with a frusto-conical lining **33**. The lining is of preferably some soft material such as natural or synthetic rubber which is resistant to the wear experienced from passage therethrough of the abrasive, cementitious material. For securing the lining there is provided a bead **34** at the large end of the lining, which is pressed between the large threaded end of the nozzle and an adjacent face **35** of the water ring. A recess **36** is provided on the opposite side of the water ring which fits against a similarly shaped shoulder **37** at the interior of the outflow fitting so that the water ring may be anchored in proper position.

If desired, the pocket **19** may be initially lined with a somewhat sticky, mastic material **38** should the character of the semi-fluid abrasive material normally passed

through the nozzle be one resistant to normal accumulation in the pocket. It is found, however, that most of the materials with which the nozzle is used are such that after a few moments of operation during which the cementitious material is blown through the nozzle, a quantity of the same material will accumulate in the form of a pad **39**, as illustrated in Figure 1. The continuous motion of the cementitious material passing through the nozzle gives the pad a spherically curved surface **40**, which becomes the natural line of flow of material through the nozzle after any eddying effect is eliminated by the accumulation of material forming the pad.

It will be appreciated further that should occasion require, a complete pad of material may be initially built into the fitting so that the abrasive material passing through the nozzle need not be depended upon to build up a wear-resistant pad for itself. Various materials may be employed for this purpose, including in addition to natural or synthetic rubber, various plastic materials or even materials of somewhat harder character which, however, are sufficiently resistant to the abrasive effect of the material used with the nozzle to maintain their curved shape conforming to the direction of flow.

There has accordingly been described herein an angle nozzle of such inherent characteristics that it is highly

resistant to wear, even when the direction of flow changes as much as 90 degrees with respect to the inflow, the fitting herein disclosed being one which greatly extends the field of usefulness of nozzles adapted for this purpose.

I claim:

In an angular ejector for semi-fluid aggregate mixture, the improvement comprising an empty chamber in the form of an abrupt angle intermediate the inlet and outlet openings of the ejector, a pocket opposite the inlet opening to the chamber adapted to accumulate a pad of the aggregate of the mixture for protection of the wall of the chamber against wear, and a lining of mastic material on the inside surface of the pocket for accumulating the pad thereon.

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