July 23, 1935. O. F. MARVIN 2,008,871

NOZZLE

Filed Feb. 3, 1930

Fig. 1

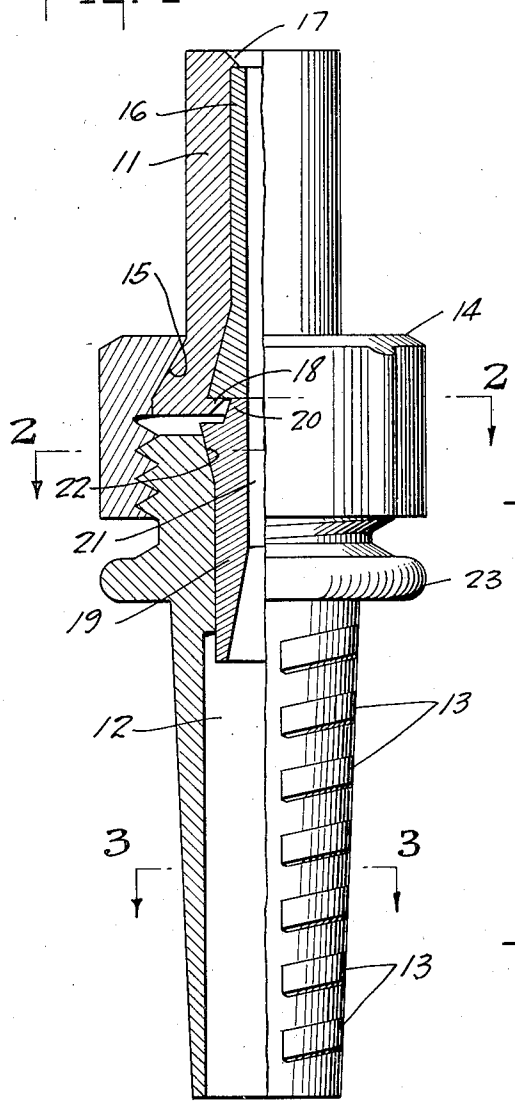


Fig. 4

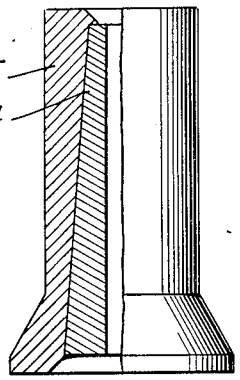


Fig. 2

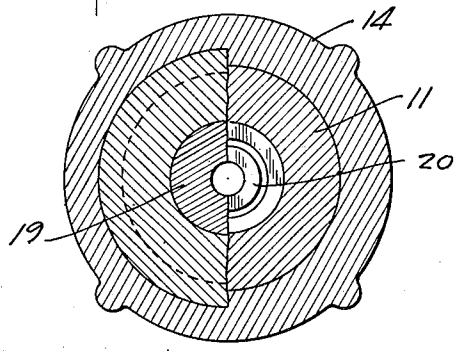
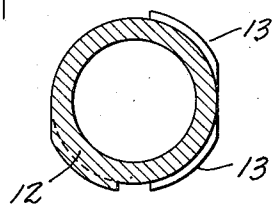


Fig. 3



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NOZZLE

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Application February 3, 1939, Serial No. 425,582

1 Claim. (Cl. 51—11)

This invention relates to a nozzle, such as may be used for directing a stream of fluid. In general, my invention can be utilized wherever there is a discharge orifice for a material that tends to wear the walls of the orifice.

More particularly, my invention relates to a structure whereby the useful life of such orifices (as fluid directing means) may be very materially lengthened, and especially by the use of a material forming the orifice that is so hard as to resist wear. Such a structure is useful for example for sand blast nozzles, which direct an abradent stream of air and sand against objects to be abraded. The sand, reaching a velocity in the orifice of such value, due to the impelling action of the compressed air, of course rubs against the walls of the orifice. If no special precautions be taken, the orifice soon enlarges to an extent making it unfit for use; and in fact, the walls of the nozzle may wear entirely through.

Such action is also noted in nozzles that are utilized for other moving material, such as oil from a well, in which enough coarse sand exists to form quite an abrasive fluid, tending to wear out the nozzle.

It is one of the objects of my invention to provide a nozzle structure in which this wear is minimized, so that nozzles may be used, under the right conditions, for as much as several thousand hours.

It is of course possible to choose that material for making the nozzle which resists wear best; but often such material has other qualities that interfere with its use as a nozzle. For example, tungsten carbide might be suggested from which a nozzle can be fashioned. This material is extremely hard and resists wear; but it is likewise very brittle, making it entirely unsuitable, by itself, as nozzle material.

It is therefore another object of my invention to make it possible to utilize such material as tungsten carbide for forming the orifices of nozzles. I attain this object by providing a support for the orifice forming material in such a manner that the combined structure resists breaking.

My invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of several embodiments of my invention. For this purpose I have shown a few forms in the drawing accompanying and forming part of the present specification. I shall now proceed to describe these forms in detail, which illustrate the general principles of my invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of my invention is best defined by the appended claim.

Referring to the drawing:

Figure 1 is a part section, part elevation, of a nozzle structure embodying my invention;

Fig. 2 is a sectional view, taken along plane 2—2 of Fig. 1;

Fig. 3 is a sectional view, taken along plane 3—3 of Fig. 1; and

Fig. 4 is a part section, part elevation, of a nozzle member of slightly different form.

In Figs. 1, 2, and 3, I show a nozzle member 11, of general cylindrical form. This nozzle member is joined to an inlet pipe 12, to which a hose can be connected, and which has shallow vanes or ribs 13 for facilitating the tightening of the hose onto the pipe 12. This pipe is arranged to be tightly connected to the lower end of member 11 in any suitable way; for example, by a structure similar to a pipe coupling.

Thus a nut member 14 is shown as in threaded engagement with the upper threaded end of pipe 12 and it has a tapered aperture 15 therein coacting with a sloping shoulder on member 11. By tightening coupling nut 14 it is apparent that the member 11 and pipe 12 will be drawn together.

A lining tube 16 is shown in member 11 to define the nozzle orifice; this tube can either be made as a solid member or in sections axially spaced. This tube is preferably made from such hard material as tungsten carbide, to lend long life to the nozzle. This lining or leeve is first made, and the outer member 11 is placed around it to serve as a heavy support or cushion to hold the sleeve 16 against breakage. For example, member 11 can be made from some comparatively softer metal melting at a much lower temperature than the material from which tube 16 is made. Thus such metal can be cast around the tube 16 and upon cooling, the member 11 will of course hold tube 16 tight. To ensure against any possibility of relative axial displacement, the outer member 11 can overlap the ends of sleeve or lining 16, as shown at 17 and 18.

Other material could be used for member 11, such as vulcanized rubber, so long as it is massive enough and can serve effectively to prevent the sleeve 16 from being flexed to the breaking point.

As the nut 14 is tightened, the lower end of the lining 16 contacts with another wear resisting inset 19, which is placed into the top of pipe member 12. The upper end carries a reduced portion 20 which interfits in the overhanging shoulder 13. The inset 19 also has an aperture

21 that is of the same size as the orifice of sleeve 16 and in fact forms a part of the orifice. This inset can be loose in pipe 12, it being wedged downwardly onto a sloping seat 22 in the pipe. Furthermore, the aperture 21 widens at the bottom for the inlet of a stream of fluid.

This inset 19 can also be made from such material as tungsten carbide to protect the nozzle holding pipe 12 against wear. Other suitable material, not quite so hard as tungsten carbide, could be used, such as any of the common chromium, tungsten and manganese alloys. If such softer material is used, the inset 19 would have to be replaced quite often, such replacements being simple and inexpensive. The inset increases the effective length of the orifice, which can thus be chosen to be the optimum for the fluid pressure used, by proper choice of length of the inset. Thus the effectiveness of the abrasive stream (if the nozzle is used for sand blasting) is increased, due to the increased velocity obtained for the stream.

The members 16 and 19, which are preferably made from tungsten carbide, of course should be made from material that is free from pores or blow holes. In this way, the members do not crumble under use. To make it possible to produce tungsten carbide having no pores of appreciable or material size, it is preferred to pour molten tungsten carbide into massive copper molds to form the linings or insets. The copper conducts the heat away rapidly from the molten alloy. Copper is inactive in connection with tungsten carbide even at the high temperatures attained, and thus no gases are formed during cooling. A dense, tough grain structure free from pores is the result.

This manner of manufacturing tungsten carbide is the subject matter of another application filed concurrently herewith in my name, and entitled: "Process of manufacturing tungsten carbide".

The nozzle holding parts, such as 12, 14, can be made from any desired kind of material, such as cast iron, machined to fit the parts accurately. A flange 23 can be provided at the base of the threaded part of member 12, to serve as an abutment for the hose connected to the pipe 12. The exterior surface of member 11 can also be machined, to form a valve fit with the nut 14.

In Fig. 4 I show an alternative form of nozzle structure. In this case, the inset or sleeve 24 is wedge shaped, the larger end being at the bottom. Thus the pressure of the fluid entering the base will tend to wedge the inset or lining 24 into the casing member 25. For this reason, no overhanging shoulder such as 18 in Fig. 1, is needed to prevent axial displacement.

I claim:

In a nozzle structure, tungsten carbide means for forming a discharge orifice, a nozzle support engaging said means, a shoulder on said support, a nozzle holder having threads thereon, an interchangeable inset adapted to be wedged in said holder and also adapted to be a continuation of said discharge means, said inset being wedged in said holder at an end of the holder nearest said discharge means and said inset extending through said holder in a direction receding from said discharge means, and a nut cooperating with said shoulder and said threads to urge said holder and said support together, thus wedging the inset tightly in said holder and holding it tightly against said means.

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