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FLUID DISCHARGE NOZZLE

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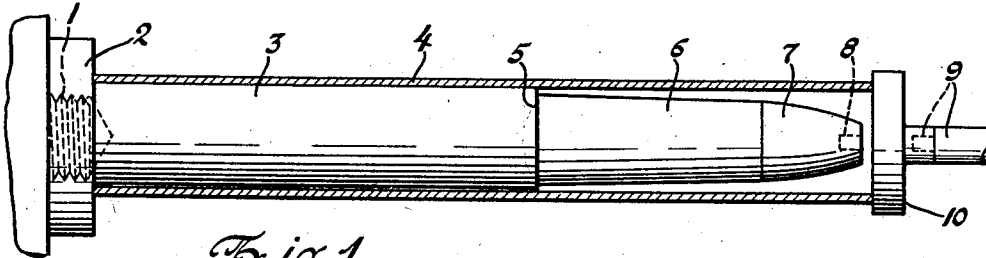


Fig. 1

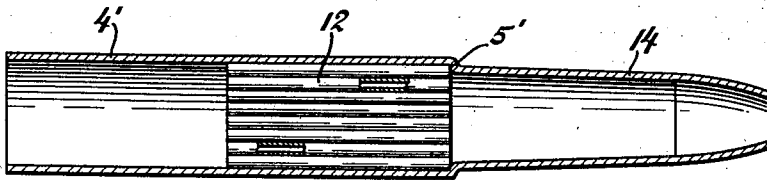


Fig. 2

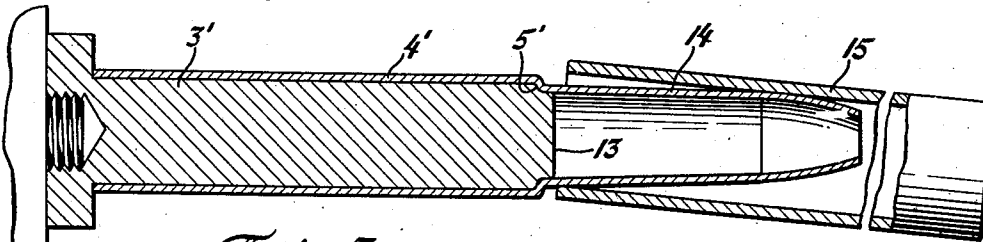


Fig. 3

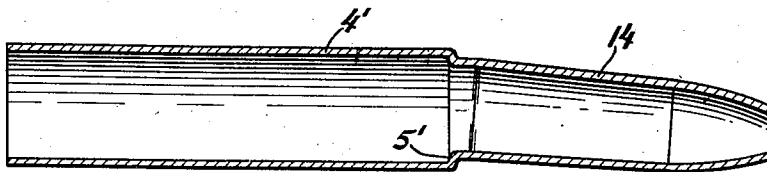


Fig. 4

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FLUID DISCHARGE NOZZLE

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Original application August 25, 1941, Serial No. 408,187. Divided and this application July 15, 1944, Serial No. 545,135

2 Claims. (Cl. 299-107)

This invention relates to a one-piece fluid discharge nozzle, preferably assembled to a flange to render the unit suitable for demountable attachment.

For overhead irrigation of land areas it is necessary to direct the water stream, preferably through a nozzle, upward and outward from the distribution point or points and, furthermore, to cause the directing nozzle to rotate continuously or intermittently about a provided pivot in order to irrigate a generated area. To realize maximum throwing distance with a given pressure at the nozzle, it is necessary to remove any turbulence present in the water stream as it is delivered to the nozzle and for this purpose it is the practice to provide straighteners in the form of a pack of small tubes positioned inside and parallel to the nozzle.

For the irrigation of large land areas water pressures of the order of 100 to 180 lbs./sq. in. are involved and a desirable size of the distributing nozzle is of the order of forty inches in length, three inches in diameter at its up-stream end and one and one-half inches diameter at the orifice end. It has been the practice, because of the length of such nozzles, to build them up of flanged sections bolted together with sealing gaskets. In one such arrangement the nozzle has been composed of three sections, the up-stream section being a straight 3-inch pipe flanged at one end for connection to the water source and at the other end for connection to a middle flanged casting containing a tapered hole. The third or orifice section is an internally machined casting flanged at one end for attachment to the middle section and having a discharge orifice at the other end. Such a nozzle weighs approximately 20½ pounds and is therefore unwieldy besides being subject to leakage at the joints.

The aligned middle and orifice sections may be so joined to the up-stream section that their common axis is inclined horizontally in respect to the horizontal axis of the latter. A stream, discharging through the nozzle thus assembled, is deflected from its straight path at the point of the nozzle's horizontal inclination and the force of deflection causes the pivoted nozzle to revolve in the case of continuous discharge, or to index in the case of intermittent discharge.

I recognize as old in the art, a nozzle whose inner bore consists respectively of a straight section, a truncated conical section and an orifice section and embodying a pack of straighteners to remove turbulence from a fluid stream passing through it, and also recognize that it is not new

to incline horizontally the tip end of a nozzle to effect rotation; and I do not claim such to be a part of my invention.

It is the purpose of my invention, among other things, to provide a fluid discharge nozzle having a bore so shaped that quantities of such nozzles may be produced with substantial savings over methods hitherto employed. A further purpose of my invention is to provide in said bore a shoulder or seat against which a straightener pack may abut to prevent said pack in service from wedging into the conical bore next down-stream, consequently constricting or closing openings of individual straightener tubes. Other advantages of my invention will become apparent from the description which follows.

In producing nozzles embodying my invention, a mandrel preferably of steel is shaped by machining in a lathe or by other suitable means, to conform to the desired internal contour of the nozzle. The mandrel is fixed to a drive suitable to rotate it about its longitudinal axis. A suitable length of pipe, steel or copper being preferred but of any other suitable metal or alloy, is placed over the mandrel, the internal diameter of the pipe corresponding to the maximum external diameter of the mandrel. The mandrel and pipe are then rotated simultaneously and preferably heat is applied by oxy-acetylene torch or by other convenient means to soften the metal to a more workable state; and the pipe is spun against the mandrel using hand tools well known in the metal-spinning art. Although I have found the use of hand tools effective, mechanically mounted rollers could also be used. The spun nozzle is removed from the mandrel and next mounted on a stub mandrel, as later described in detail, for bending to its final form.

In the drawing:

Figure 1 is a side elevation of apparatus for spinning a tubular blank to form a nozzle embodying my invention, the blank being shown in section.

Figure 2 is a longitudinal section through the nozzle after spinning but before bending of the end of the nozzle. In this figure the straightener tubes are shown in assembled position.

Figure 3 is a partial longitudinal section showing the equipment used in bending the end of the nozzle.

Figure 4 is a longitudinal section through the finished nozzle but with the straightener tubes omitted.

Referring to Figure 1, the mandrel consists of a flange 2, internally threaded at 1 for attach-

ment to the live center (not shown) of a lathe or to other suitable driving means. The cylindrical section 3 of the mandrel is of a diameter to conform to the internal diameter of the pipe 4. Other sections of the mandrel are, a shoulder 5, a truncated conical section 6, and tip 7. The tip section 7 is provided with a bore 8 to receive the dead center 9 the latter mounted preferably on the tail stock (not shown) of the lathe or on other suitable support. The idling center 10 is interposed between the right end of pipe 4 and the dead center 9, to afford means of pressing said pipe against driving flange 2 thus assuring frictional drive of said pipe until such time as shoulder 5 and at least a portion of section 6 have established frictional driving contact with the partially spun pipe; center 10 may then be removed and center 9 advanced to engage the hole 8 to permit completion of the spinning operation.

In Figure 3 is shown in section, a stub arbor 3' and spun nozzle 4', the latter being in position to be slowly revolved through frictional contact with the former which is preferably attached to a lathe center as described in connection with Fig. 1. The spun nozzle 4' is preferably heated, (while slowly rotating), for a short distance along its length toward the orifice from, but adjacent to, end 13 of the stub arbor, before applying pressure while stationary by some suitable means to bend the end 14 so its longitudinal axis will be inclined from its original straight alignment with the remainder of the nozzle length. Extension of the stub arbor beyond shoulder 5' of the nozzle, to position 13, affords support to said shoulder and prevents deformation thereof during the bending operation. Bending pressure may conveniently be applied by slipping a pipe 15, as shown, over the nozzle tip. The shoulder 5' in the finished article serves to position the straightener 12.

Nozzles made by the above described methods are, because of their continuous one-piece structure, free from troublesome blow-out of gaskets with attendant service cost and service interrup-

tions. Such failures are not uncommon where high pressures are involved as is the case in economically irrigating large areas. They may be manufactured in quantity from ordinary commercial metal pipe, spun over a once-machined mandrel, in contrast to the several individually machined or assembled sections formerly necessary for fabrication of each single nozzle. A rigid shoulder of predetermined and controlled dimensions for retention of the straightener pack, and an accurately shaped orifice are realized at extremely low production cost. The actual weight of a nozzle as fabricated and assembled by prior art methods is approximately 20½ pounds while a nozzle of the same inner bore shape and length, as fabricated and assembled by means here disclosed, is approximately eleven pounds. Besides representing a marked cost saving in labor and material, the new lighter-weight nozzle has the advantage of practically halving the objectionable eccentric load imposed upon the nozzle's pivoted bearing.

This application is a division of my application Serial No. 408,187, filed August 25, 1941.

Having thus described my invention, I claim:

1. A one-piece fluid discharge nozzle comprising a body of mechanically compressed metal having a substantially uniform wall thickness throughout and comprising a cylindrical portion, and a portion of reduced diameter connected to the first-named portion by an annular shoulder, said portion of reduced diameter having a tapered extremity.

2. A one-piece fluid discharge nozzle comprising a body of mechanically compressed metal having a substantially uniform wall thickness throughout and comprising a cylindrical portion, and a portion of reduced diameter connected to the first-named portion by an annular shoulder, said portion of reduced diameter having a tapered extremity, the major portion of said reduced portion being bent so that its axis is inclined with respect to the axis of the remainder of the nozzle.

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