

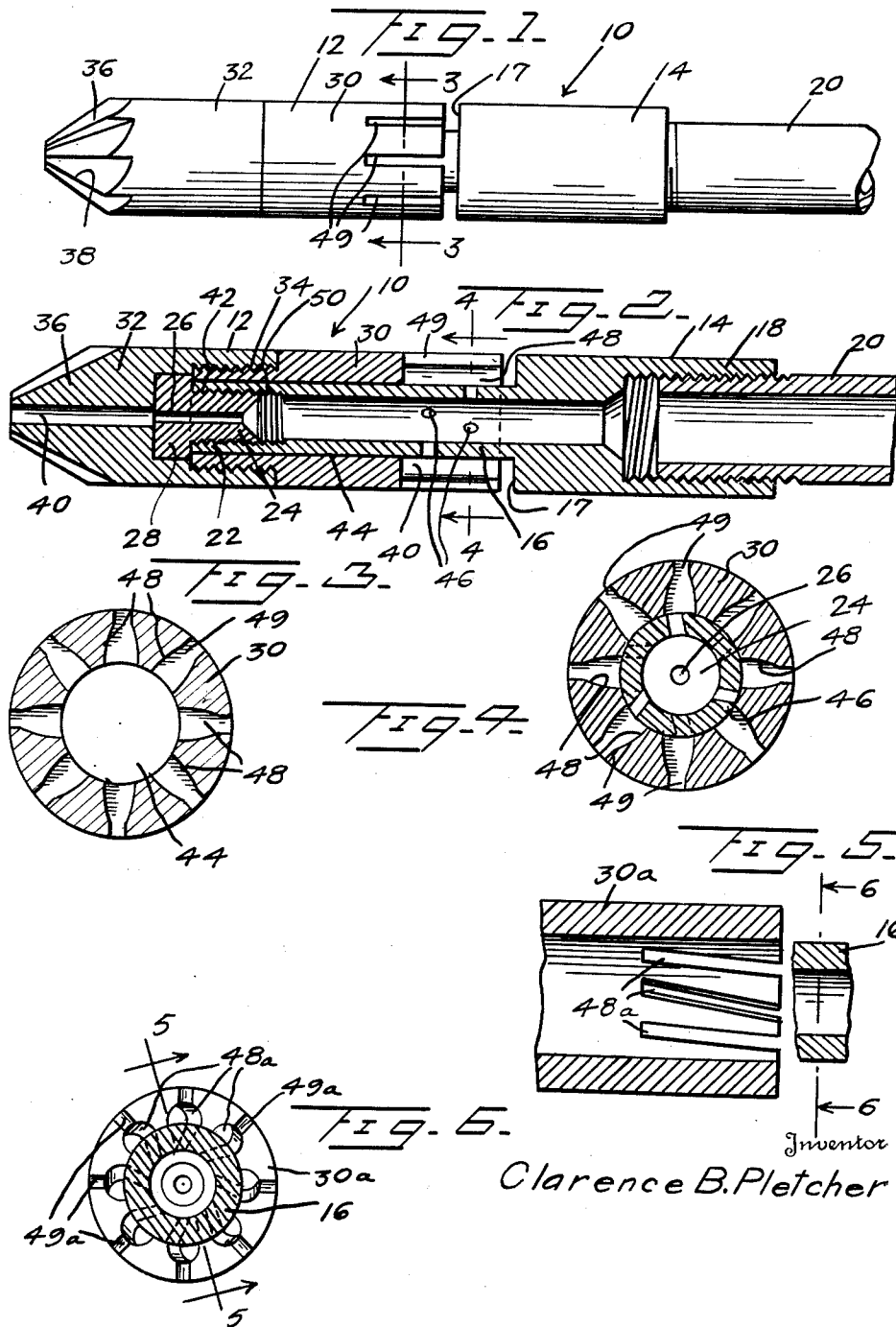
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C. B. PLETCHER

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WATER JET PROPELLED NOZZLE HEAD

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WATER JET PROPELLED NOZZLE HEAD

Clarence B. Pletcher, Buchanan, Mich.

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3 Claims. (Cl. 15—104.12)

This invention generally relates to new and novel improvements in nozzle heads for apparatus for cleaning pipes, conduits and similar elongated hollow bodies and is particularly directed to improvements over my prior Patent No. 2,710,980, granted June 21, 1955.

In the above designated patent, a nozzle head unit is disclosed wherein the nozzle head includes relatively rotating inner and outer sections, the outer section being forward of the inner section and having cutters on its front portion and rotatably receiving the inner section in an axial bore in its rear portion. The wall of the bore is formed with axially extending vanes and the inner section is formed with an annular series of jet ports that extend substantially tangentially from a bore in the inner section, the bore receiving an end of a flexible fluid conveying hose. Because of the relationship of the ports and the vanes, water or similar fluid conveyed by the hose is caused to impinge on the vanes and rotate the outer section around the inner section which is held against rotation by the hose. The reaction of the water issuing in jets from the ports and impinging on the vanes produces a rotation of the outer section and the jets being backwardly and spirally directed cause the nozzle head to be moved forwardly in the bore of a pipe.

The inner section has a reduced extension on its forward end on which a bearing sleeve is fitted to provide the contact between the inner and outer sections.

While such patented construction has been found to be extremely effective and practical in cutting through debris and forcing it out of a pipe and in cleaning the pipe, I have discovered that the nozzle head can operate more efficiently with less power and can be made at less cost to last longer because of the improvements of the present invention.

In accordance with the present invention the inner section, rearwardly of a reduced extension which projects into the outer section, is of substantially the same diameter as the outer section, whereby a shoulder is formed closely adjacent the inner end of the rotating outer section and the rear exit of the vanes, thus providing a restricted fluid exit, the vanes being provided with slots which extend radially through the outside wall of the outer section, the shoulder thus serving to force the major quantity of fluid outwardly radially through these slots, thus increasing the radial force extended on and through the vanes from a given quantity of fluid.

Additionally the instant invention permits the omission of the nylon bearing of my patented device, the present construction being designed to provide a fluid cushion between the outer section and the reduced extension of the inner section, there being thus substantially no metal to metal contact during operation of the device.

In the preferred embodiment of the invention the vanes and their associated slots are aligned with the axis of rotation of the outer section, but in a modified form of the invention the vanes may be angled relative to such axis.

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Thus the primary objects of the present invention are to provide an improved jet and vane assembly whereby an increased drive with less power may be realized and to provide a fluid washer or bearing means whereby there will be no wear on the metal parts and the need of a bearing and consequent production costs of the nozzle head can be obviated and reduced.

The foregoing and ancillary objects are attained by this invention, the preferred form of which is described in the following description and illustrated in the attached drawing, wherein:

Fig. 1 is a side elevational view of one form of nozzle embodying features of the instant invention.

Fig. 2 is an enlarged longitudinal sectional view taken substantially along the center line of the structure of Fig. 1.

Fig. 3 is an enlarged sectional view taken substantially along the line 3—3 of Fig. 1 as viewed in the direction indicated by the arrows.

Fig. 4 is an enlarged sectional view taken substantially along the line 4—4 of Fig. 2 as viewed in the direction indicated by the arrows.

Fig. 5 is a fragmentary enlarged sectional view of a slightly modified form of construction taken substantially along the line 5—5 of Fig. 6 as viewed in the direction of the arrows, and

Fig. 6 is a sectional view taken substantially along the line 5—5 of Fig. 6 as viewed in the direction of the arrows.

Referring now more particularly to the drawing, the nozzle head 10 includes a forward or outer section 12 and a rearward or inner section 14.

The rearward section 14, includes an elongated cylindrical and axially bored body portion 16 which has a counterbored rear end portion 18 that is internally threaded to receive one end of a flexible hose 20 or similar supplying means for a fluid, such as water under pressure.

The forward end of the bore 22 in the body portion is internally threaded to receive a plug 24 which has a reduced axial jet passage 26 that is aligned with the center of the bore. The plug has a flange 28 formed on its outer end and the flange serves, as will be described, to retain the sections in rotatable assembled relation.

The outer or forward section 12 is cylindrical and is composed of two threaded cylindrical portions 30 and 32. The portion 32 is internally threaded, as at 34, and terminates, at its forward end, in a conical nose portion 36. The nose portion 36 is formed with spirally arranged cutters 38 and has a centrally disposed, axial jet passage 40 which is aligned with the jet passage 26 in the plug 24.

The portions 30 and 32 are of similar external diameter and the portion 30 has a reduced, externally threaded forward end 42 which is threaded into the portion 32. The portion 30 has an axial bore 44 within which the cylindrical body portion 16 is freely fitted, the wall of the portion 16 being out of contact with the wall of the bore 44 when the sections 12 and 14 are relatively rotating due to the arrangement of jet ports 46 in the body portion 16 and vanes 48 which extend longitudinally of the portion 30.

The jet ports 46 are formed in, at least, two longitudinally spaced, annular series in the body portion 16 and extend tangentially from the bore 22, as shown in Fig. 4. The ports 46 extend radially of portion 16 and are directed into the vanes 48. Vanes 48 are provided with radial slots 49 extending through the outside of portion 30, the slots being reduced in width relative to the vanes.

The enlarged portion 18 forms with reduced portion 16 a shoulder 17 closely adjacent the rear end of sec-

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tion 30, which serves as a partial closure to the ends of vanes 48, whereby the major portion of fluid flow is directed radially outwardly through the slots 49.

The plug 24 is formed in its rearward end with a conical counterbore 50 that faces the bore 22. The flange 28 abuts the outer end 42 of the portion 30 to axially locate the inner section in the outer section.

In assembling the nozzle head, the forward end of the body portion 16 is passed through the bore 44 in the portion 30 of the section 12 and the plug 24 is threaded in place. The nose portion is then threaded onto the portion 30.

The modification of Figs. 5 and 6 is in all respects similar to that of the previously described modification, with the exception of the fact that the vanes 48a are arranged spirally about the rear periphery of a section 30a otherwise identical to section 30. Slots 49a corresponding to slots 49 are obviously similarly spirally arranged.

In use, the outer section 12 rotates about the body portion 16, but is held out of friction creating contact therewith by a fluid bearing formed by the jets of water, issuing from the jet ports 46, and impinging against the vanes 48. The placement of the vanes 48, slots 49 and the specific structural placement of the jet ports 46 and the shoulder 17 ensures an impingement of the water against the vanes on a square basis. Because the jet streams strike the vanes on a square basis, as shown clearly in Fig. 4, that is, because the jet ports lie perpendicular to the vanes, considerably more power is developed from the jet streams.

While the best known form of my invention has been disclosed and shown herein, other forms may be realized as come within the scope and spirit of the appended claims.

What is claimed is:

1. For use with an apparatus in cleaning pipes, a nozzle head of a diameter substantially equal to the diameter of a pipe to be cleaned; said nozzle head comprising a forward, outer cylindrical section having an axial bore and having an open end portion and an opposing conical nose end, said nose end having spirally arranged cutters formed thereon and having a centrally disposed, axial jet passage formed therethrough in align-

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ment with the center of the bore, said cylindrical section having formed vanes provided on the wall of its bore at the open end portion, reduced slots extending from said vanes through the outer wall of said outer section, and said nozzle head further comprising an inner rearward cylindrical section having an axial bore, and an extended portion forming a shoulder adjacent the rear end of said forward section, said extended portion having a bore aligned with said axial bore in said inner rearward section, means fitting said extended portion in the bore of the forward section and axially locating it relative to the forward section which is rotatable around the rearward section, said extended portion having an annular series of jet ports formed therein and extending substantially tangentially from the bore in fluid impinging relationship with the vanes, fluid from said jet ports penetrating between said extended portion and said outer cylindrical portion to form a water lubricated bearing for said outer cylindrical portion and hence said nose end.

2. A nozzle head as claimed in claim 1 wherein said means fitting the extended portion of the rearward section in the bore of the forward section includes a threaded fitting threaded in the forward end of the bore of the rearward section and having an annular flange abutting an internal abutment on the forward section, said fitting having an axial, centrally disposed jet passage.

3. A nozzle head as claimed in claim 2, wherein said forward section is composed of two end to end threaded parts, one of said parts having an end shoulder defining the abutment, and said forward section is spaced from the extended portion of said inner rearward cylindrical section to provide a space into which fluid may enter to provide a fluid bearing.

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