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3,563,674

ASPIRATING DEVICE

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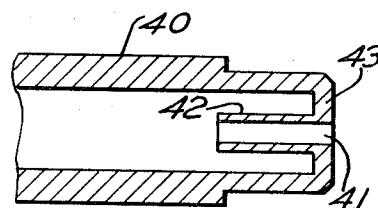
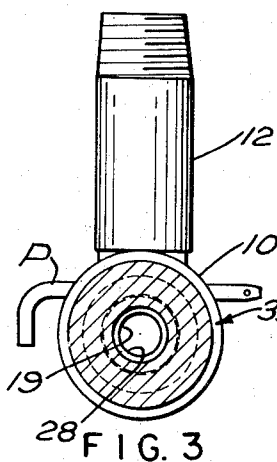
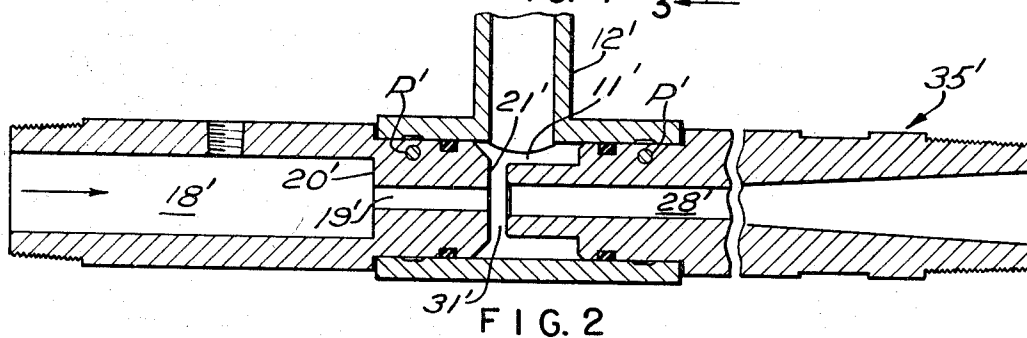
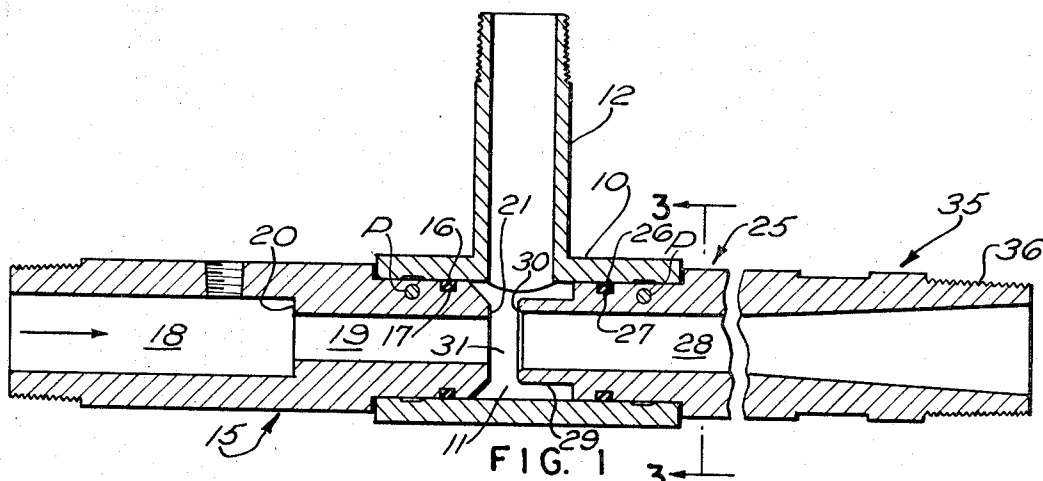


FIG. 4

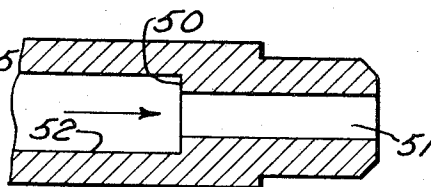


FIG. 5

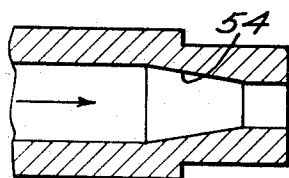


FIG. 6

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ASPIRATING DEVICE

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1 Claim

ABSTRACT OF THE DISCLOSURE

An aspirating device comprising a nozzle and a throat portion with a suction chamber between, the throat portion being coaxial with the nozzle and of a greater diameter, the suction chamber being of a diameter greater than the throat portion wherein the relative diameters and lengths of the parts are significant.

BACKGROUND OF THE INVENTION

Aspirating nozzles have been provided with a restricted portion followed by increasingly larger chambers in the direction of the forward flow of fluid in which the relative diameters and lengths of the chambers have been important.

SUMMARY OF THE INVENTION

The aspirating device of this application is found to have a greater efficiency than the prior art construction pointed out above by providing an enlarged suction chamber followed by a throat smaller than the suction chamber but larger than the nozzle, thereby increasing the suction for the pickup of material to be projected in the flow stream.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a central sectional view showing the aspirating device;

FIG. 2 is a similar view slightly modified as to proportions of the parts;

FIG. 3 is a sectional view on line 3—3 of FIG. 1;

FIG. 4 is a fragmental sectional view of the nozzle in a modified form;

FIG. 5 is a sectional view of the nozzle of this invention; and

FIG. 6 is a similar view of a different form of nozzle.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The aspirating device comprises a generally cylindrical body section 10 which contains a suction chamber 11 with a leg 12 extending therefrom through which a fluid may be drawn to be mixed with a liquid passing through the suction chamber. The body section 10 is cylindrical with open ends and receives the reduced end of a nozzle 15 which is held therein by pin P and is sealed by O-ring 16 located in recess 17. This nozzle has a passage 18 to convey a liquid from some suitable source to and through the suction chamber. This conduit is abruptly reduced to provide a restricted portion 19 which is coaxial with the portion 18, and the abrupt reduction provides a shoulder 20 extending radially at generally right angles to the axis of the nozzle. The length of this restricted portion from the shoulder 20 to the end 21 of the nozzle is at least two and a half times the diameter of the restricted portion 19 so that the liquid moving through the nozzle fills the nozzle as it exits therefrom, thus giving a solid stream of liquid from the end 21. FIGS. 1 and 2 show different diameters of restricted portions 19, 19' with corresponding varying lengths in accordance with this ratio.

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The throat designated generally 25 comprises a member having a conduit the wall of which is reduced to extend into the other end of the body section 10 and is sealed by an O-ring 26 in a recess 27 in the reduced portion of the throat and held therein by a pin. A passage 28 coaxial with the nozzle is provided through this throat which will be of a diameter greater than the diameter of the restricted portion 19 of the nozzle and will be between 1.2 and 1.8 times as large as the diameter of the nozzle restriction 19 and will be of a length at least four times its diameter.

The throat 25 has a reduced end 29 extending into the body section 10 with its end 30 spaced from end 21 of the nozzle providing a gap 31 which forms a suction chamber 11. The diameter of this suction chamber is greater than the passage 19 through the nozzle or passage of the throat at 28, which diameter is not critical. The end 30 of the throat is spaced from the end 21 of the nozzle so that the gap between them will be at least one seventh of the diameter of the nozzle. It has been found to work equally well if the gap 31 is between 14% to 300% of the diameter of the nozzle. Downstream of the throat portion there is the recovery or discharge section designated generally 35 which has an outwardly flaring passage therethrough from which the aspirator device discharges into some conduit which may be connected to it by threads 36. It is found that by providing a larger suction chamber than either the restricted diameter of the nozzle or the opening through the throat that a much more efficient aspiration is provided than if the chambers are successively greater in diameter. Further, it will be observed that the openings through the nozzle and throat and discharge are unobstructed by any insertions, baffles or the like.

In FIG. 2 where the proportions are somewhat different than shown in FIG. 1, the restricted opening is designated as 19' and the gap 31' being also different but within proportions above stated. Likewise, the throat passage 28' is of a smaller diameter. The numerals are applied similarly to FIG. 1 but with a prime added to those shown in FIG. 1. Basically with the proportions shown, the flow volume is reduced with a corresponding reduction of material sucked into the suction chamber 11'.

In some cases it has been found that a nozzle embodying the well-known re-entrant tube configuration shown in FIG. 4 may be utilized in which its body 40 has a restricted opening 41 which is formed by a tubular portion 42 extending inwardly from an end wall 43 a substantial distance. In this form a sharp edge entrance into the tubular portion is provided so that a vena contracta is produced in like fashion to the embodiments of FIGS. 1, 2 and 5.

It is found that by making an abrupt reduction in the nozzle such as shown by the shoulder 50 in FIG. 5 with a restricted portion 51 substantially smaller than the conduit 52 that a jet is provided issuing from the nozzle. A form of nozzle which produces a vena contracta jet is a more efficient converter of static to kinetic energy than the conventional nozzle with the tapered approach such as shown in FIG. 6.

We claim:

1. An aspirating device, comprising in combination, a cylindrical body portion, a unitary cylindrical nozzle member fitted into said body portion, said nozzle member having a cylindrical inlet passage with a unitary shoulder member therein extending normal to the axis of said inlet passage, said passage continuing as a restricted diameter portion and presenting a sharp edge immediately at its entry formed by the intersection of said shoulder and said restricted diameter portion to provide a vena contracta in the fluid stream which has a diameter less

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than said restricted diameter, said restricted diameter portion having a length of at least two and one-half times said restricted diameter, a suction chamber formed in said body portion into which said nozzle member discharges, a unitary throat member containing a throat section and a recovery section and fitted into said body portion, said throat section being axially aligned with said nozzle member and having a cylindrical throat passage of a diameter 1.2 to 1.8 times said restricted diameter, said throat section discharging into said recovery section, said suction chamber being of a diameter greater than said throat passage and wherein the gap between the end of said nozzle member and the entrance to said throat section in said suction chamber is from 14% to 300% of said restricted diameter and wherein the length of said cylindrical throat passage is at least four times greater than its diameter.

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