June 12, 1951 G. L. BROUSSARD 2,556,517

NOZZLE FOR PRODUCING AN INTERMITTENT JET OF GAS OR LIQUID

Filed Feb. 9, 1948 2 Sheets-Sheet 1

Fig. 1

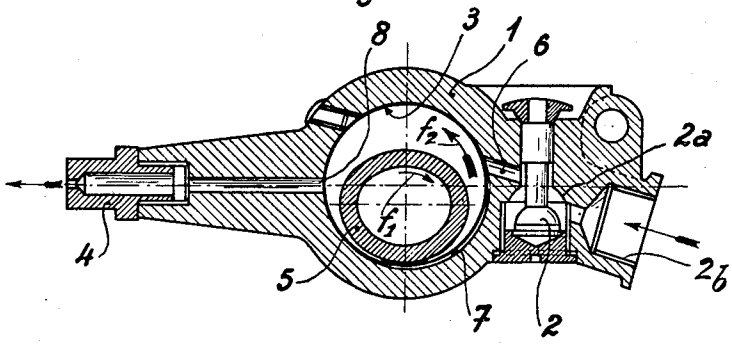
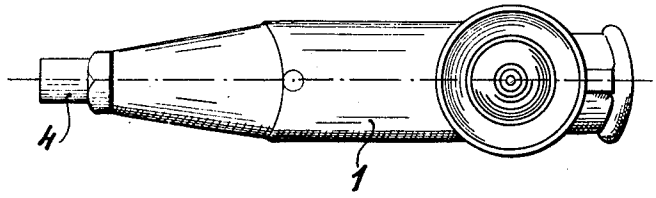


Fig. 2



Inventor
Gaston L. Broussard
by Stevens Davis & Miller
his attorneys

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Fig. 3

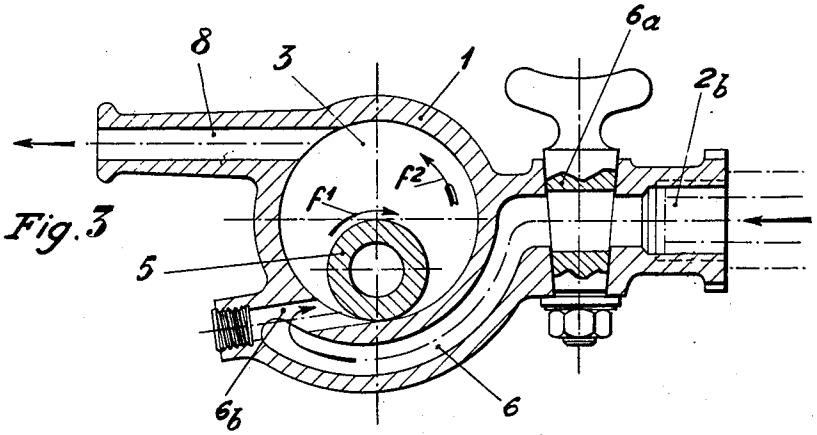


Fig. 4

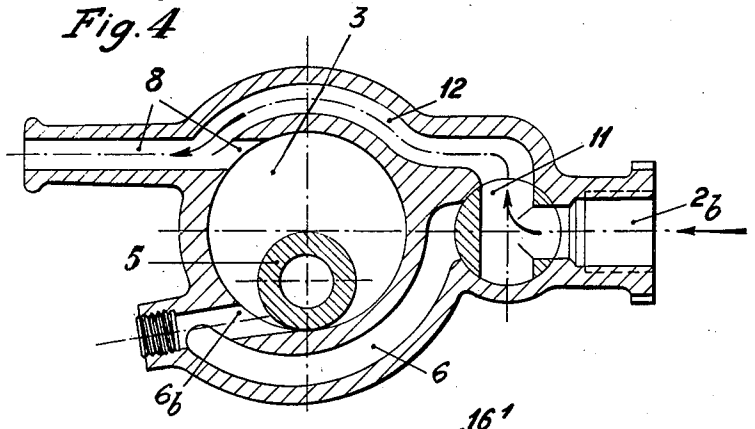
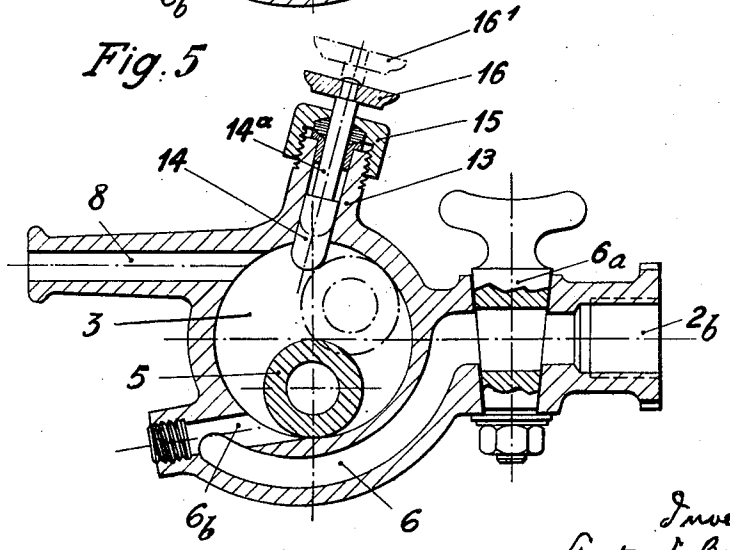


Fig. 5



Inventor
Gaston L. Broussard
by Stevens Davis & Miller
his attorneys

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UNITED STATES PATENT OFFICE

2,556,517

NOZZLE FOR PRODUCING AN INTERMITTENT JET OF GAS OR LIQUID

Gaston L. Broussard, Le Perreux, France

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In France December 3, 1945

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Patent expires December 3, 1965

12 Claims. (Cl. 299—25)

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Apparatus called "blowers" used for the cleaning of various articles by means of compressed air are already known.

These apparatus generally comprise a cylinder or air-chamber, a feed pipe supplying this chamber with compressed air through a valve which is normally closed by the compressed air and on which pressure is exerted with the finger in order to open it, and a nozzle or ejector in communication with this cylinder, from which flows a continuous jet of air when the valve is open.

My invention has for its object an improved apparatus delivering a high speed jet of fluid, said apparatus being so arranged as to rapidly and periodically intercept the outflow of the fluid. The jerky jet of fluid flowing from the apparatus gives rise to successive knocks onto the surface to be cleaned, and this knocking action favours removing of dust, mud, liquids or the like adhering thereto, so that said surface is more rapidly and fully cleaned with a lower consumption of compressed fluid.

According to my invention, the improved apparatus comprises a cylinder fed with fluid under pressure through an inlet passage located in a plane perpendicular to the axis of said cylinder and in a plane which is oblique to and at an angle approaching a tangent with respect to the peripheral wall of said cylinder, an outlet tube in communication with said cylinder, and a free rotor formed of a cylindrical body with generatrices parallel to those of the cylinder and of a smaller section than that of the cylinder, the arrangement being such that the fluid flowing into the cylinder forces the rotor to roll along the cylinder wall in consequence of the whirling motion imparted to said fluid in said chamber, and to close the outlet tube on each revolution.

Advantageously, a shallow groove is provided in the wall of the cylinder, said groove extending circumferentially from at least the generatrix of contact of the cylinder with the rotor at rest (or dead position), to the aperture of the inlet passage in the cylinder, said groove facilitating the revolution of the rotor and the crossing of this dead position.

In accordance with one form of execution particularly adapted to air nozzles, the rotor has an oval section so that its movement gives rise to vibrations which pass on to the hand of the user, from which it follows that the direction of the jet itself is continually moving and that the hit surface is increased though the user doesn't move the apparatus.

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In the case of air nozzles, the air is introduced in an upward slanted direction into the upper part of the stator or cylindrical body according to a direction which is broadly the same as the air outlet, whereas in the case of liquid jets, the liquid is introduced obliquely into the lower part of the stator and in the reverse a direction to that of the liquid outlet.

The apparatus described above can, advantageously, be provided with means permitting one to obtain at will either an intermittent jet or a continuous jet.

In a first embodiment of this two-purpose apparatus, a branch pipe extends from the inlet passage to the outlet tube, and a three way cock, provided at the junction of said branch pipe with the inlet passage, is so arranged as to feed either the cylinder or the branch pipe so that a jerky jet or a continuous jet can be obtained respectively by operating this cock which is also capable to cut off the liquid supply and replaces the usual stop-cock.

In another embodiment, the cylindrical chamber is provided with a lateral neck which serves as a guide for a sliding rod which can be completely drawn into this neck during normal working but can be projected out on the cylinder wall in order to stop the rotor when it is desired to change from the intermittent jet to the continuous one.

In the accompanying drawings which show, by way of example, one form of execution of the improved air nozzle and one form of execution of the improved liquid nozzle,

Fig. 1 is a longitudinal section of the air nozzle showing the rotor in its dead position.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a longitudinal section of a liquid nozzle for intermittent jet only.

Fig. 4 is a longitudinal section of a nozzle delivering an intermittent liquid jet or a continuous liquid jet.

Fig. 5 is a longitudinal section of another embodiment of the liquid nozzle.

On the drawings (Figs. 1 and 2), 1 denotes the body of the apparatus, 2 is the inlet valve which is normally pressed onto its seat 2*a* by the pressure of the air arriving at 2*b*, 3 is the cylinder and 4 the nozzle. A free rotor 5 is provided in the cylinder 3, said rotor being formed by a cylindrical body having a determined weight and which is either ring-shaped or solid, according to the specific weight of the material selected. Preferably this rotor is of stainless steel as also is the body 1.

The rotor 5 has a smaller cross section than that of the cylinder 3 and is arranged with its generatrices parallel to those of the cylinder. Said rotor has an axial length which is about the same as that of the cylinder, a small gap just sufficient to permit its free revolution without axial movement being provided at both ends. Moreover the passage 6 leading the air into the cylinder is set obliquely in relation to the wall of the latter, i. e. that its axis does not meet the axis of the cylinder. Of course the obliquity of this passage 6 with respect to the wall of the cylinder can be varied according to the speed of revolution which is desired to impart to the rotor, and, therefore, according to the desired frequency of interruptions of the jet.

Referring to Fig. 1, it is therefore easy to ascertain that, when valve 2 is lowered, the air entering the crescent-shaped part of the cylinder exerts a thrust on the rotor and compels it to roll in an anti-clockwise direction (arrow f_2) on the wall of the cylinder, and to revolve on itself in a clockwise direction (arrow f_1). Starting of the rotor and, generally speaking, crossing of the dead point (position of rest as shown in Fig. 1) is facilitated by a groove 7 extending circumferentially from at least said dead point to the orifice of passage 6 in the cylinder which allows a small current of air to pass under the rotor. Further, in the axial direction of cylinder 3, the length of the orifice of the outlet tube 8 in the cylinder wall is materially shorter than—the length of the generatrices of rotor 5, so that when rolling on said wall, rotor 5 closes a short time said outlet on each revolution, thus producing an intermittent or jerky jet of air at the outlet of the apparatus.

Advantageously instead of giving to the rotor a circular section, said rotor can have an oval section, as shown, so that the movement of the rotor gives rise to vibrations, as has already been explained.

In the case of a nozzle mounted in a fixed position, the mounting will be made with interposition of suitable means for allowing these vibrations to be maintained.

In the embodiment shown on Fig. 3, the nozzle is adapted for delivering an intermittent jet of liquid. The apparatus comprises a body 1, provided with a liquid feed pipe 2*b* having means for connecting the apparatus to a liquid supply system.

The feed pipe 2*b* communicates through a stop-cock 6*a* with an inner passage 6 leading to an inlet port 6*b* opening into the cylindrical chamber 3 of body 1, and an outlet tube 8 protrudes from said body, through which flows the liquid jet.

The inlet port 6*b* is set obliquely with respect to the cylindrical wall of chamber 3 and in such a direction that the fed liquid flows in chamber 3 in the reverse direction of the spouting liquid from the outlet tube 8.

The chamber 3 encloses a cylindrical rotor 5 of smaller section than that of this chamber and the generatrices of which are parallel to and slightly shorter than those of the said chamber.

The rotor 5 can be ring shaped as shown in the drawing or of full section according to the specific weight of the material selected.

Of course, the angle of incidence of the inlet port 6*b* can vary according to the revolving speed of rotor 5 which is desired to obtain and also according to the pressure of the liquid.

It will be understood that when the cock 6*a* is open rotor 5 begins to revolve with respect to its own axis in the direction of the arrow f_1, and to roll on the inner wall of the cylindrical chamber 3 in the direction of the arrow f_2 so that on each revolution it closes the outlet tube 8, the inner orifice of which extends only on a part of the length of chamber 3, thus making the jet intermittent.

With the arrangement above described the rotor operates whatever is the angle made by the jet with a horizontal plane when the apparatus is held in a vertical plane, and further the apparatus can be turned of 90° from the vertical plane into a horizontal plane without the operation of the rotor ceases.

In the embodiment shown on Fig. 4, the nozzle can deliver at will an intermittent jet or a continuous jet; in said figure the same reference numbers denote the same parts as previously. The stop-cock 6*a* of Fig. 3 is replaced here by a three-way cock 11 which can either close the feed of liquid, or direct it either towards passage 6—in which case the nozzle delivers an intermittent or jerky jet as in the previous case—or towards a branch pipe 12 which opens directly in the outlet tube 8.

In the embodiment shown in Fig. 5 the nozzle is generally formed in the same way as in the case of Fig. 3 but it comprises further a neck 13 opening into chamber 3 and in which is mounted a sliding finger 14, the stem 14*a* of which passes through a stuffing box 15 outwardly closing the said neck. An operating knob 16 is fitted on the end of stem 14*a* and normally occupies the position 16^1 for which the finger is completely drawn into the neck 13. By pushing the knob 16, as far as the position shown in continuous lines, finger 14 is caused to project in chamber 3 which thus causes the rotor to stop and, consequently, changes the intermittent jet to the continuous jet.

The movement of the rotor also produces a further beneficial effect, namely, a vibration of the jet which permits the exploration of a larger surface without having to move the hand.

It will be appreciated that many changes and modifications may be made to the apparatus above described and the invention embodied in widely different forms without departing from the spirit and scope of the appended claims.

What I claim is:

1. Apparatus for delivering a jerky jet of fluid which comprises a body provided with a cylindrical chamber: an inlet passage opening into said chamber for feeding it with compressed fluid, said passage having its axis in a plane substantially perpendicular to the axis of said cylindrical chamber and in a plane which is oblique to and at an angle approaching a tangent with respect to the cylindrical wall of said cylindrical chamber; an outlet tube in communication with said chamber, opening into said chamber through at least one orifice located in its cylindrical wall and having in the axial direction of said chamber a length materially shorter than the length of the generatrix of said cylindrical wall; and a cylindrical rotor within said chamber having its generatrix parallel to the cylindrical wall, whereby the fluid flowing into said chamber through said passage takes a whirling motion in said chamber and forces the rotor to roll along the chamber wall and to close said outlet tube on each revolution.

2. Apparatus as claimed in claim 1 in which

said rotor has a smaller cross section than said cylindrical chamber and an axial length which is substantially the same as that of said chamber.

3. Apparatus as claimed in claim 1 in which said rotor is of oval section.

4. Apparatus as claimed in claim 1 in which the cylindrical wall of said chamber is provided with a groove of small depth extending from at least the dead point of the rotor to the fluid inlet.

5. Apparatus as claimed in claim 1 especially intended for liquid, in which the port of said inlet passage is located in a part of said chamber spaced from the outlet tube, and the portion of said passage contiguous to said chamber is broadly directed in the reverse direction of said outlet tube.

6. Apparatus as claimed in claim 5, further comprising a branch pipe leading from said inlet passage to said outlet tube and a three-way cock at the junction of the branch pipe with the inlet passage, said cock being arranged and adapted so that the liquid supply may be shut off or a continuous or jerky jet of liquid may be obtained at will.

7. Apparatus as claimed in claim 5 further comprising a neck provided on the outer wall of said chamber and a sliding finger in said neck adapted and arranged to be moved in the path of said rotor to stop its movement and thereby allow a continuous jet of liquid.

8. Apparatus as claimed in claim 1 specially intended for gas in which said inlet passage opens

in the upper part of said chamber and is broadly directed in the same direction as said outlet tube.

9. A nozzle comprising a cylindrical chamber, a fluid inlet and a separate fluid outlet communicating with said cylindrical chamber at spaced points in the circumference thereof, and a rotor adapted to be rolled along the wall of said chamber by the force of fluid introduced into said chamber by said fluid inlet and to periodically intercept the flow of fluid from said outlet.

10. A nozzle as set out in claim 9 in which the inlet is arranged at an oblique angle approaching a tangent to the cylindrical wall of said chamber.

11. A nozzle as set out in claim 9 in which said inlet and said outlet are alternately at least partially closed by said rotor.

12. A nozzle as set out in claim 9 in which both the inlet and outlet are arranged substantially tangent to the cylindrical wall of said chamber and directed so that fluid flows in reverse directions through said inlet and outlet, respectively.

GASTON L. BROUSSARD.

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The following references are of record in the file of this patent:

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