Sept. 27, 1938. J. E. BARRNER 2,131,548

SUCTION NOZZLE

Filed Aug. 1, 1936

Fig. 1.

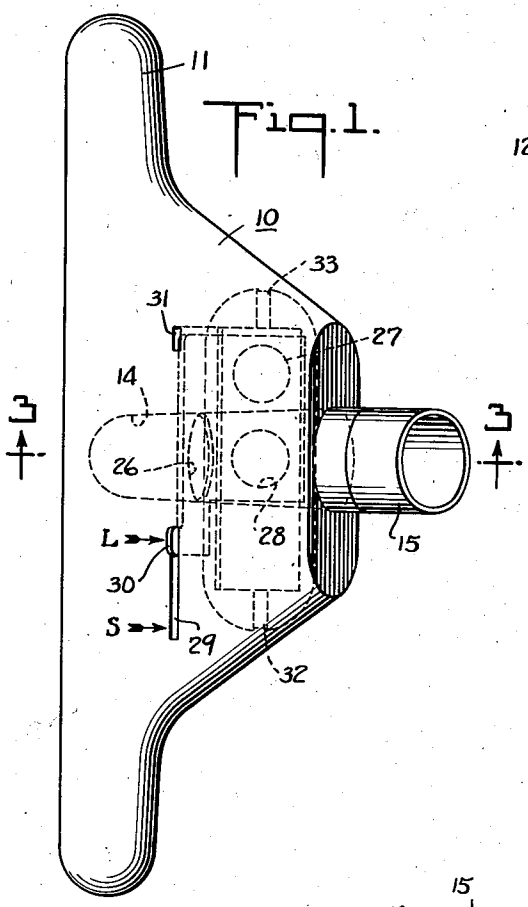


Fig. 2.

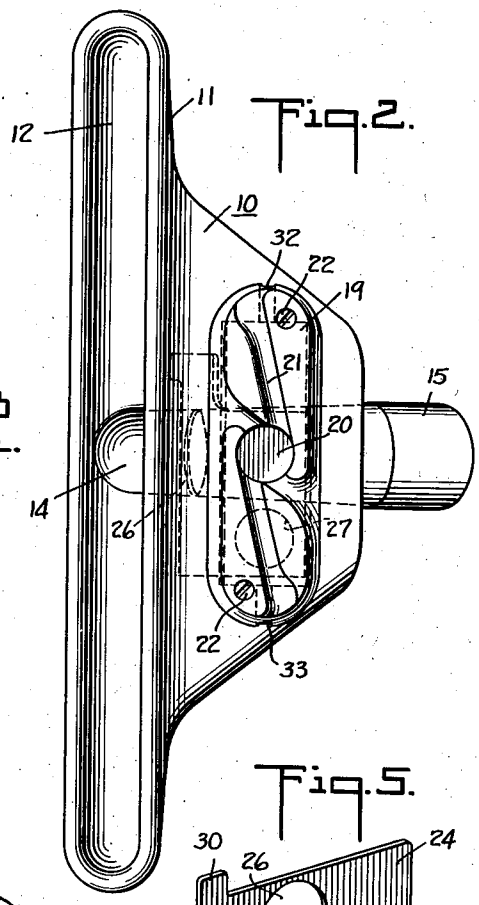


Fig. 5.

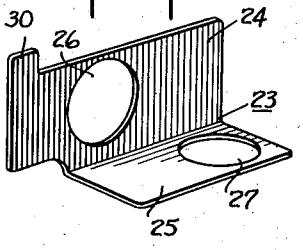


Fig. 3.

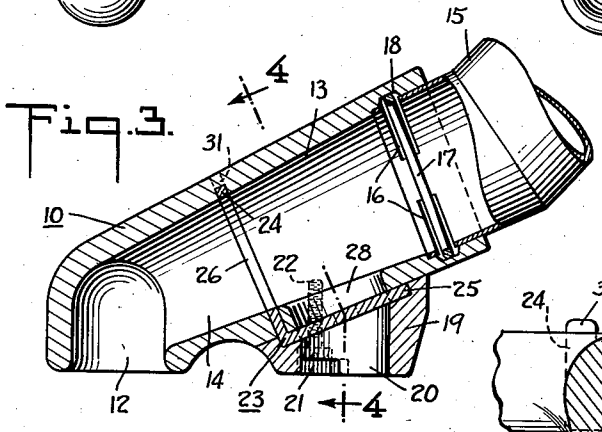
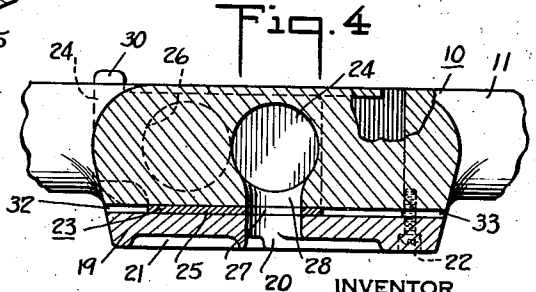


Fig. 4



INVENTOR

Jacob Eliel Barrner

BY

Thomas C. Betts

his ATTORNEY

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SUCTION NOZZLE

Jacob Eliel Barrner, Camden, N. J., assignor to Electrolux, Inc., New York, N. Y., a corporation of New York

Application August 1, 1936, Serial No. 93,754

11 Claims. (Cl. 15—155)

My invention relates to suction nozzles and more particularly to suction nozzles of the so-called duplex type, in which dissimilar nozzle openings are provided.

In nozzles of this type it is preferable to provide an elongated suction opening in order that as large a surface as possible may be covered by the nozzle in a minimum length of operating time. The force of the suction is thus distributed over a considerable space, but is nevertheless sufficient to pick up ordinary dirt on and in a surface undergoing cleaning, such as a rug. However, the force of this suction may not be sufficient to remove articles such as threads or the like which adhere strongly to the surface. Consequently, it is necessary to provide a smaller opening whereby a more concentrated suction is obtainable in order to remove threads and the like from the surface.

One of the objects of my invention is to provide a nozzle of this type having a valve for controlling flow of air through the nozzle openings, which valve may be shifted from one position to another by merely suddenly changing the speed of movement of the nozzle. The valve member has sufficient weight so that its inertia causes it to change position under these conditions. Another object of my invention is to so arrange the valve that the difference in air pressures acting on one part of the valve tends to retain it in any given position, wherefore it will not be accidently shifted during normal manipulation of the nozzle. Still another object of my invention is to provide means for preventing the accumulation of the dirt around the valve, which would be apt to cause the valve to bind.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawing which forms part of this specification, and of which:—

Fig. 1 is a top view of a preferred embodiment of my invention;

Fig. 2 is a bottom view of the nozzle shown in Fig. 1;

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 3, and

Fig. 5 is a prospective view of a valve member.

Referring to the figures, reference character 10 designates generally a hollow nozzle body formed with an elongated portion 11 which defines an elongated nozzle opening 12. The central part of body 10 is formed with an inclined passageway 13 with which nozzle opening 12 communicates through passage 14. A tubular elbow member 15 is rotatably secured to body 10 within passageway 13 in any suitable manner. As shown, member 15 is provided with slots 16 adjacent its inner end and a spring member 17 expands through these slots to engage a continuous circular groove 18 formed in the wall of passageway 13. The upper end of member 15 is adapted to be connected to a hollow rigid handle member (not shown) which serves to move the nozzle over a surface undergoing cleaning. The other end of the handle member may be connected by means of a flexible hose with a vacuum cleaner unit including a dust separating member and a motor-fan unit for producing flow of air.

Secured to the under-side of body 10 behind elongated portion 11 is a mouth-piece member 19 formed with a relative small suction opening 20. The lower face of member 19 may be formed with grooves 21 which extend from the outer edges of the member to the central opening 20. Preferably, these grooves are generally tangential to the central opening as shown particularly in Fig. 2. Member 19 may be secured to body 10 by means of screws 22 and when in place forms part of the body.

Body 10 and member 19 together define a narrow elongated recess having branches substantially at right angles to each other. Slidably disposed in this recess is a plate valve 23 having angularly disposed parts 24 and 25, formed with ports 26 and 27, respectively. It will be noted that these ports lie wholly on opposite sides of an imaginary plane extending at right angles to parts 24 and 25. Part 24 of the valve member is disposed in that portion of the aforementioned recess which intersects passage 14, while part 25 is in that portion of the recess which intersects passage 28 connecting opening 20 with passageway 13. The lengthwise extent of the recess is greater than that of valve plate 23, whereby the valve plate is slidable therein in a direction parallel to the lengthwise extent of elongated portion 11.

Body 10 is formed with an elongated port or slot 29 in the upper part thereof which communicates with one end of the recess containing part 24 of the valve member. The valve member is provided with a projection 30 which extends through slot 29 and is consequently accessible from outside the nozzle. Designating marks, such as "L" and "S" may be placed adjacent opposite ends of slot 29 and serve to indicate the position of the valve member. Thus, when projection 30 is opposite "L" it indicates to the operator that the large suction opening 12 is in communication with passageway 13, while projection 30 being opposite "S" indicates that the small nozzle opening 20 is in operation. Projection 30 may also be used to shift the valve member, if desired, although as will later appear, other provision is made for moving the valve.

Body 10 is also provided with a port 31 located adjacent to the other end of the recess from port

29. In addition, ports 32 and 33 are provided for establishing communication between the atmosphere and the opposite ends of the part of the recess in which part 25 of the valve is positioned.

The operation of the above described device is as follows:—

With the valve member 23 in the position shown in Figs. 1 and 3, port 26 in part 24 of the valve is in alignment with passage 14 and hence communication is established through this passage from large nozzle opening 12 to passageway 13, which passageway is permanently in communication through member 15, the hollow handle and the hose with the source of action. Passage 28, on the other hand, is closed by the imperforate portion of part 25 of the valve member. Consequently, air will be drawn into the nozzle through the entire extent of elongated opening 12 and when the nozzle is passed over a dusty surface, dust will be entrained with the air from that portion of the surface covered by the opening. In the normal operation of the nozzle, it is moved back and forth by means of the hollow handle in a direction substantially at right angles to the lengthwise extent of the elongated portion 11. Thus, the nozzle will clean a strip of the surface having a width equal to the elongated extent of opening 12 and a length equal to the stroke of the nozzle.

If, during cleaning, an object such as a thread or the like adheres to the surface to such an extent that it is not picked up by the air flowing through the elongated opening 12, it is desirable to provide a more concentrated suction. This may be done by suddenly moving the nozzle body sideways in a direction substantially parallel to the lengthwise extent of elongated portion 11. Valve member 23 is made to have sufficient weight so that its inertia causes it to lag behind the sideway movement of the rest of the nozzle. Thus, to shift to the valve from the position shown in Fig. 1 to a position where the projection 30 is in alignment with "S", the body is suddenly moved to the right, as seen from the rear in this figure. The valve 23 lags behind and consequently moves to the left with respect to the rest of the nozzle. If desired, the movement of the valve from position "L" to "S" may be effected by moving the nozzle body comparatively slowly to the left, as seen from the rear in Fig. 1, and suddenly arresting this movement. In this case, the inertia of the valve member causes it to continue to travel after the body has been suddenly stopped.

With the valve member in the position with projection 30 in alignment with "S", port 27 in part 25 is in alignment with passage 28 connecting nozzle opening 20 with passageway 13. The solid portion of part 24 prevents communication between passage 14 and passageway 13, thus cutting off flow of air through the large nozzle opening. Consequently, all of the flow takes place through the small opening 20 which results in a concentrated flow of air which is able to remove threads and the like from the surface undergoing cleaning. The valve member 23 is moved back in the same manner as that above described, except that the direction of movement of the nozzle body is reversed.

It will be noted that the sudden movement of the nozzle body which results in shifting the valve member is in a direction at right angles to the normal movement of the nozzle over a surface during cleaning operation. Consequently, no matter how suddenly the change in speed of movement of the nozzle over the surface being cleaned may take place, it will have no tendency to shift the valve member.

Accidently shifting of the valve member is further prevented due to the force exerted on the member by the atmosphere. With the valve in the position shown in Fig. 3, the imperforate portion of part 25 closes passage 28. Consequently, atmospheric pressure acts on the lower face of part 25 while a reduced pressure acts on the upper face. The result is that the valve member is held against the wall of the recess in which it is disposed with such frictional force as to prevent unintended shifting of the valve. On the other hand, this force is not sufficient to prevent shifting of the valve by a sudden movement of the nozzle body in the proper direction as above described. When the valve is in the position shown in Fig. 4, atmospheric pressure acts against the imperforate portion of part 24 to provide the force for giving the frictional engagement between the valve member and the wall of the recess in which it is mounted.

In order to prevent the accumulation of dirt between the valve member and the walls of the recess, leakage ports 29, 31, 32 and 33 are provided. Clean atmospheric air flows through these ports into the recess where it travels past the valve member to passageway 13. This flow of air, while very slight and not sufficient to noticeably affect the suction produced at either opening 12 or 20, nevertheless, is sufficient to immediately remove any particles of dirt which tend to collect in the recess. It is particularly important in a valve which is shiftable due to its inertia that the resistance to the movement of the valve shall remain substantially constant and not be increased by accumulation of dirt around the valve.

The swivel connection between the nozzle body 10 and elbow member 15 makes it possible to manipulate the nozzle under furniture, inasmuch as turning of member 15 through 180 degrees from the position shown in Fig. 3 causes its upper end to which the hollow rigid handle is connected to extend substantially horizontally. Rotation of member 15 has no effect whatsoever on the flow of air through the nozzle openings 12 and 20.

Member 19 has been shown as a separate piece from body 10. The reason for this is that the removability of member 19 makes it possible to insert valve member 23 during assembly of the nozzle. Otherwise, members 10 and 19 might be integral.

While I have shown and described one more or less specific embodiment of my invention it is to be understood that this has been done for purposes of illustration only and does not constitute a limitation of my invention, the scope of which is to be determined by the appended claims viewed in the light of the prior art.

What I claim is:—

1. In a suction nozzle for cleaning a surface, a hollow body formed with a large nozzle opening and a small nozzle opening, said body being adapted to be moved back and forth in a substantially straight line over a surface to be cleaned during normal cleaning operation, and valve structure including a member movable with respect to said body in a direction substantially at right angles to said line for closing either of said openings selectively, said member being constructed and arranged and having sufficient weight so that due to its inertia the valve structure is movable relative to said body by suddenly

changing the speed of movement of said body while the body is in contact with the surface.

2. In a suction nozzle for cleaning a surface, a hollow body formed with a large nozzle opening and a small nozzle opening, said body being adapted to be moved back and forth in a substantially straight line over a surface to be cleaned during normal cleaning operation, and a valve member movable in a substantially straight line with respect to said body in a direction at an angle to the first mentioned line for closing either of said openings selectively, said valve member having sufficient weight so that due to its inertia the valve member is movable relative to said body by a sudden alteration in the speed of movement of said body in the direction of movement of said valve member while the body is in contact with the surface.

3. In a suction nozzle for cleaning a surface, a hollow body formed with an elongated nozzle opening and a small nozzle opening, a handle member extending substantially at right angles to the lengthwise extent of said elongated nozzle opening for moving said body back and forth over a surface to be cleaned in a direction substantially at right angles to said lengthwise extent, and a valve member movable in a straight line with respect to said body in a direction substantially parallel to said lengthwise extent for selectively closing either of said openings, said valve member having sufficient inertia so that it is movable relative to said body by suddenly altering the speed of movement of said body in the direction of said lengthwise extent while the body is in contact with the surface.

4. In a suction nozzle, a hollow body formed with a large nozzle opening and a small nozzle opening, said body being formed with a passageway adapted to be connected to a source of suction and passages connecting said openings with said passageway, and a ported valve member slidable with respect to said body for selectively closing either of said passages and opening the other passage, said valve member having sufficient weight so that due to its inertia the valve member is movable relative to said body by a sudden change in speed of movement of said body, the atmospheric pressure acting against the part of said valve member which is aligned with the closed passage forcing said valve member against said body to thereby increase the frictional resistance to movement of said valve member.

5. In a suction nozzle, a hollow body formed with a large nozzle opening and a small nozzle opening, said body being formed with a passageway adapted to be connected to a source of suction and passages connecting said openings with said passageway, the center lines of said passages being disposed at an angle to each other and substantially in a vertical center plane of said body, and a valve plate slidably mounted in said body and having two angularly disposed parts formed with ports, the port in one part being wholly to one side of the port in the other part, whereby said valve plate is slidable to align the port in one of said parts with one of said passages and to close the other passage with said other part and selectively to align the port in said other part with said other passage and to close said one of said passages with said one of said parts.

6. In a suction nozzle, a hollow body formed with a large nozzle opening and a small nozzle opening, and a valve member slidable in a recess formed in said body for closing either of said openings selectively, said body being formed with ports so arranged as to provide for leakage flow of air past substantially the entire surface of said valve member and between the valve member and the wall of said recess to prevent the accumulation therein of dirt.

7. In a suction nozzle, a hollow body formed with dissimilar nozzle openings, a valve member movable in a recess formed in said body for regulating flow through said openings, said body being formed with ports connecting said recess with the atmosphere and so arranged as to provide for leakage flow of air past substantially the entire surface of said valve member and through said recess to remove dirt therefrom, one of said ports having an extent at least as great as the total movement of the valve member, and a projection from said valve member extending through said port to the outside of said body.

8. In a suction nozzle, a hollow body formed with two dissimilar nozzle openings, and a valve member slidable in a recess in said body for selectively closing either of said openings, said valve member having sufficient weight so that due to its inertia the valve member is movable relative to said body by suddenly changing the speed of movement of said body, said body being formed with ports so arranged as to provide for leakage flow of air past substantially the entire surface of said valve member and through said recess to prevent the accumulation therein of dirt.

9. In a suction nozzle, a hollow body formed with a large suction opening and a small suction opening, and a plate valve movable in an elongated recess in said body to selectively close either of said openings, said openings communicating with the central part of said recess and said body being formed with ports communicating with each end of said recess to provide for flow of clean atmospheric air past substantially the entire surface of said valve member and through said recess to prevent the accumulation therein of dirt.

10. In a suction nozzle, a hollow body formed with a large nozzle opening and a small nozzle opening located side by side in substantially the same plane, an inclined passageway formed in said body and extending over said small nozzle opening, said small nozzle opening communicating with one side of said passageway and said large nozzle opening communicating with the lower end of said passageway, the upper end of said passageway being connectable to a source of suction, and a plate valve slidable in a recess formed in said body, said plate valve being formed with angularly disposed parts each formed with a port and so arranged in said body that in one position the port in one of said parts establishes communication between one of said nozzle openings and said passageway and the other nozzle opening is closed by the other part while in another position the port in said other part establishes communication between said other nozzle opening and said passageway and said one of said nozzle openings is closed by said one of said parts.

11. A device as described in claim 10 in which said valve plate has sufficient weight so that due to its inertia the valve plate is movable from one of said positions to the other by suddenly changing the speed of movement of said body.

JACOB ELIEL BARRNER.