

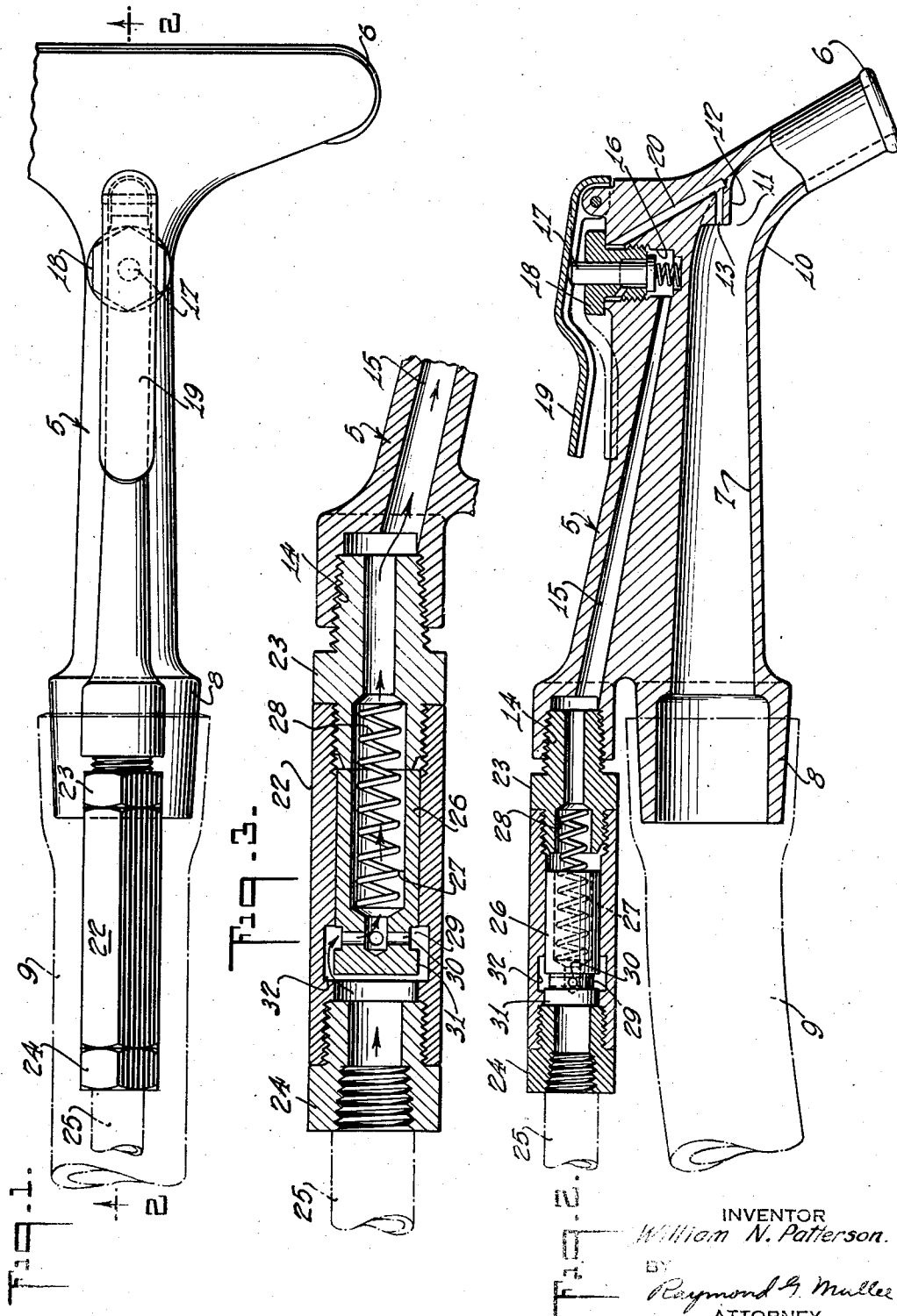
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SUCTION CLEANER

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SUCTION CLEANER

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This invention relates to vacuum cleaners and more particularly to portable suction cleaning apparatus of the type employing a jet pump. The invention is especially suited for the removal of dirt and other foreign substances from the upholstery of automobiles and railroad cars but is susceptible of other applications.

Among the objects of the invention are to increase the cleaning efficiency and reduce the air consumption of a vacuum cleaner operated by compressed air.

In accordance with a feature of this invention, the casing or body of the cleaner is connected to a vibrator arranged to cause the suction nozzle to agitate the surface over which it is held and thereby produce a more effective cleaning action than would be accomplished by the use of suction alone. Preferably the vibrator comprises a reciprocating piston operable to interrupt periodically the supply of compressed air to the jet pump.

Other objects and features of the invention will appear more clearly from the following description taken in connection with the accompanying drawing and appended claims.

In the drawing, which illustrates a suction cleaner embodying the invention:

Fig. 1 is a plan view, a portion of the suction nozzle being broken away;

Fig. 2 is a longitudinal section as indicated by the arrows 2 in Fig. 1, a portion of the suction nozzle being shown in section, the parts being illustrated in their inoperative positions; and

Fig. 3 is a fragmentary longitudinal section on an enlarged scale, showing the vibrating or agitating unit, the piston being illustrated in a different position from that shown in Fig. 2.

In the illustrative embodiment of the invention, the suction cleaner comprises a body member or casing 5 preferably, though not necessarily, made of cast aluminum in order to minimize weight. A suction nozzle 6 of oblong shape, adapted to be moved over the material to be cleaned, is formed on the front end of the casing 5. A passageway 7 extends from the suction nozzle 6 to the rear end of the casing and terminates at an exhaust outlet 8, to which a flexible tube or hose 9 may be connected. The casing 5 is provided near its elbow portion 10 with a jet pump 11. The jet pump comprises a boss 12 on the inside of the casing 5, and a drilled port 13 projecting toward the exhaust outlet 8 and providing a jet orifice for injecting a stream of live pressure fluid into the passageway 7. The pas-

sageway tapers from the outlet 8 toward the jet pump 11.

Live air is admitted to the jet pump 11 from a threaded recess 14 near the rear end of the casing 5 and above the exhaust outlet 8. The air flows from said recess through a passage 15 to a throttle valve recess 16. A throttle valve 17, of ordinary construction, is adapted to seat against the inner end of a plug 18 which is threadably secured in recess 16. A manipulative throttle valve lever 19, resting against the outer end of valve 17, is adapted to force the valve off its seat in opposition to spring pressure and thereby establish communication between inlet passage 15 and a drilled port 20 extending to the jet orifice 13.

The vibrator unit, shown best in Fig. 3, comprises a cylinder 22, a front head or front anvil block 23 and a back-head or rear anvil block 24. The front head is screw threaded to both the cylinder 22 and the casing 5 whereby vibrations are transmitted from the vibrator unit to the casing. If desired, however, the cylinder, front head and casing may be constructed in one piece. The back-head 24 is screw threaded to the rear end of the cylinder and is adapted to be connected to a live air hose 25. The back-head 24 and front head 23 are bored to permit pressure fluid to enter and leave the cylinder respectively under control of a reciprocating piston 26. The piston has a recess 27 opening at its front end. A spring 28, housed in said recess and in a recess in front head 23, tends to hold the piston in engagement with the back-head 24. The piston 26 has an annular groove 29 in constant communication with recess 27 by means of radial ports 30, and has a head 31 lying between the annular groove and the rear end of the piston. An internal annular groove 32 in the cylinder is adapted to provide a pressure fluid passageway extending from the rear end of the piston and around the head 31 into the groove 29, when the piston is moved away from the back-head 24.

Assuming that the parts are arranged as shown in Fig. 2, with the throttle valve 17 closed and the inlet hose 25 supplied with live air, the piston 26 is held against the back-head 24 due to the pressure of spring 28. The operator holds the casing 5 in his hand, places the suction nozzle 6 against the fabric or other material to be cleaned and depresses the throttle valve lever 19 to the position shown in broken lines in Fig. 2. The opening of the throttle valve 17 exhausts the air in front of the piston 26 and permits the compressed air at the rear end of the piston to

overpower the pressure of spring 28 and move the piston forward to the Fig. 3 position. When the piston head 31 uncovers the portion of the cylinder in back of groove 32 it opens communication between the ends of the cylinder through cylinder groove 32, piston groove 29, radial ports 30 and piston recess 27. Live air thus flows momentarily from the supply hose 25 through cylinder 22, passage 15, throttle valve recess 16, around the head of throttle valve 17 and through ports 20 and 13. The jet of air issuing from port 13 creates a partial vacuum inside the suction nozzle 6 and projects the dust-laden air, received by nozzle 6, through the passageway 7 and flexible tube 9 from whence the air may be discharged to atmosphere or into a suitable receptacle such as a dust bag (not shown).

Movement of the piston 26 to the Fig. 3 position exposes the recess 27 and the front end of the piston to pressure of live motive fluid which supplements the force of spring 28 to return the piston to the position illustrated in Fig. 2. As soon as the supply of live air to the recess 27 is cut off by the piston head 31, the pressure in recess 27 drops, due to the open throttle valve 17, and the piston is again moved forward owing to the preponderance of pressure at its rear end.

To discontinue operation of the suction cleaner, the operator merely releases the pressure on throttle valve handle 19 and the parts come to rest in the position shown in full lines in Fig. 2, the piston 26 being held in engagement with the back-head 24 by the combined pressure of spring 28 and the motive fluid trapped in the front end of the cylinder.

The piston 26 has the function of an automatic valve inasmuch as it cuts off periodically the supply of compressed air to the jet pump 11. The valve action results in a rapid succession of jets of air issuing from the jet orifice 13. Due to the inertia of the stream of dust laden air in moving through the passageway 7, the invention provides a substantially continuous suction without recourse to a continuous consumption of live pressure fluid.

The piston 26 has the additional function of vibrating the casing 5. In its reciprocation, the piston delivers impacts to the front and rear anvils 23 and 24 respectively, thereby vibrating the cylinder 22 and casing 5. The suction nozzle 6, which is rigid with, and preferably integral with, the casing 5, vibrates in unison with the casing and has an agitating or beating effect on the fabric or other material being cleaned, whereby the particles of dust, dirt, sand, or other foreign substances are dislodged from the fabric and released for removal by the partial vacuum in the suction nozzle.

In the illustrative embodiment, the vibrations are delivered along a line disposed at an acute angle relative to the plane of the suction nozzle 6, but this angle may be varied if desired.

What is claimed is:

1. A suction cleaner comprising a casing having a suction nozzle, an exhaust outlet and a passageway connecting the interior of the nozzle with said outlet; means associated with said passageway for drawing dust laden air from said nozzle and discharging said air through said passageway and exhaust outlet; and means for agitating the nozzle, said agitating means comprising a cylinder in fixed relation to the nozzle, a reciprocating piston therein, means for delivering compressed air to one end of the cylinder and for exhausting the other end, a spring urging the piston toward the inlet end of the cylinder, said spring being adapted to be overpowered by compressed air at the inlet end, said piston and cylinder having cooperating passages establishing communication between the ends of the cylinder only when the piston is away from the inlet end of the cylinder to permit air at the exhaust end to assist the spring in returning the piston.

2. A suction cleaner comprising a casing having a suction nozzle, an exhaust outlet, a passageway connecting the interior of the nozzle with said outlet, a jet pump associated with said passageway for drawing air from the nozzle and discharging said air through the passageway and exhaust outlet, a vibrator carried by said casing, said vibrator comprising a cylinder and a piston reciprocating therein, means for supplying compressed air to said vibrator to operate the latter, and means for exhausting air from said vibrator and delivering the exhaust air to the jet pump for operating said pump.

3. A portable suction cleaner adapted to be held in the hand of the operator, comprising a casing having a suction nozzle, an exhaust outlet, a passageway connecting the interior of the nozzle with said outlet, a jet pump associated with said passageway for drawing air from the nozzle and discharging said air through the passageway and exhaust outlet, said suction cleaner having an inlet opening opening for the admission of compressed motive fluid thereto, connections between said inlet opening and the jet pump, said connections comprising a pneumatic vibrator adapted to agitate the casing and nozzle.

4. A suction cleaner comprising a casing having a suction nozzle, an exhaust outlet, a passageway connecting the interior of the nozzle with said outlet, a jet pump associated with said passageway for drawing air from the nozzle and discharging said air through the passageway and exhaust outlet, a reciprocating piston arranged to deliver a rapid succession of hammer blows to said casing for agitating said nozzle, a source of compressed air for actuating the piston, a passage leading from said source to said jet pump, said piston being positioned to periodically connect and disconnect said passage with respect to said source whereby to cause the air to issue from the jet pump in short sharp blasts.

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