June 15, 1943. D. J. BRUNNER, JR 2,321,648

SUCTION CLEANER

Filed Oct. 11, 1940

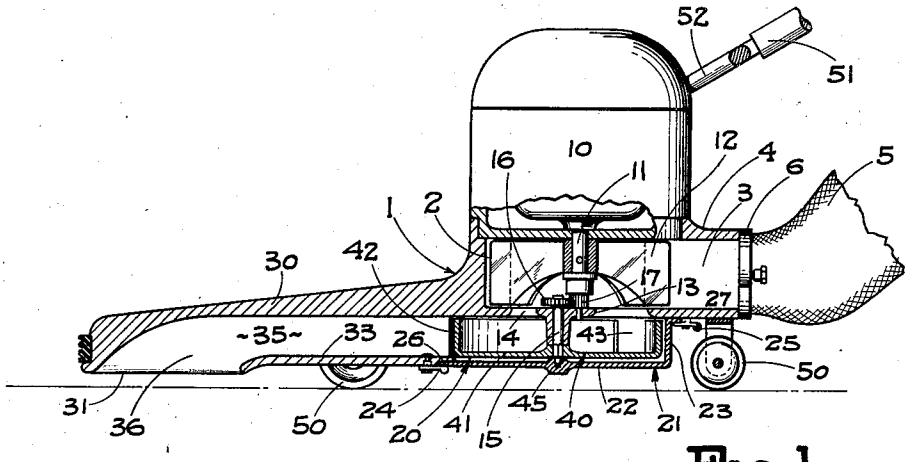

FIG. 1.

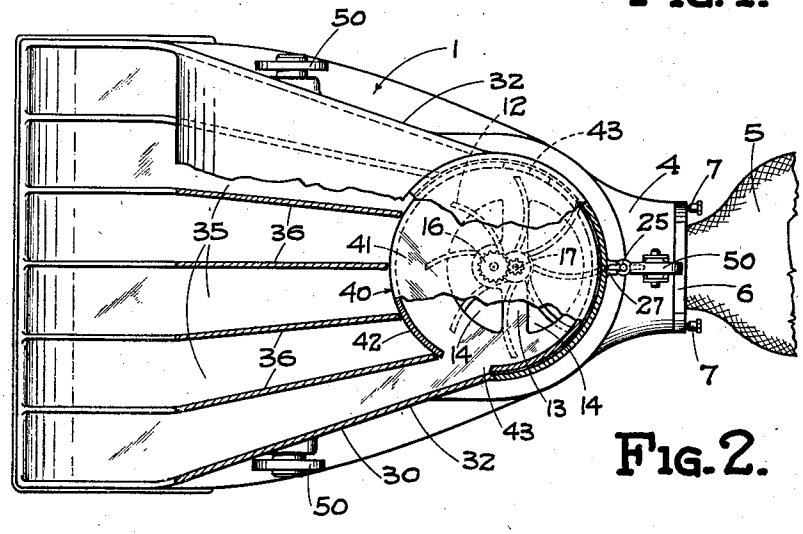

FIG. 2.

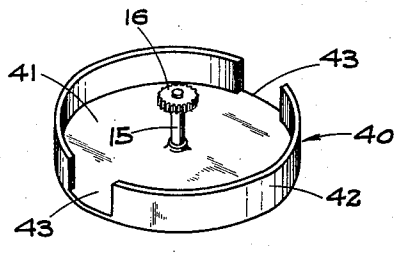

FIG. 3.

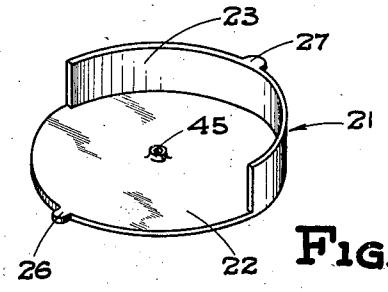

FIG. 4.

INVENTOR.
DAVID J. BRUNNER JR.
BY Hull, West & Shilton,
ATTORNEYS.

Patented June 15, 1943 2,321,648

UNITED STATES PATENT OFFICE

2,321,648

SUCTION CLEANER

David J. Brunner, Jr., Shaker Heights, Ohio

Application October 11, 1940, Serial No. 360,794

3 Claims. (Cl. 15—16)

This invention relates to suction cleaning apparatus or so-called vacuum cleaners or sweepers, and its more important objects are to increase the power and efficiency of the apparatus and to otherwise render more effective its action on carpets and the like.

To these ends I provide a multiple duct nozzle that communicates at its discharge end with a suction chamber and across the mouth of which nozzle are disposed, in series, the receiving ends of the ducts. Means are provided for uninterruptedly exhausting the suction chamber, and valve or shutter means are utilized for restricting communication between the nozzle and suction chamber at any one time to less than all the ducts, preferably to approximately the capacity of one duct, and which valve or shutter means desirably acts to throw the ducts into communication with the chamber successively from one end of the series to the other.

As a consequence of this combination of a multiple duct nozzle and valve or shutter means, approximately the full power of the suction apparatus is concentrated on restricted portions of the carpet or other object being cleaned corresponding substantially to the cross sectional area of the receiving end of the duct, but the action on the object is practically as though it were continuous throughout the area of the mouth of the nozzle because of the rapidity with which the ducts are successively thrown into communication with the suction chamber.

In the case of a carpet cleaner, for example, this rapidity of action insures against any part of the carpet over which the sweeper is moved to and fro being missed. The intermittent action of the individual ducts, following one another in rapid succession, has the further advantage of vibrating the portion of the carpet or other object being cleaned and, if they be of the kinds having nap, of separating the nap so as to loosen any dirt or dust lodged therein and liberate it to the stream of inflowing air.

Other objects will appear as I proceed to describe the embodiment of the invention illustrated in the accompanying drawing, among which objects are simplicity of construction, and convenience of removal of the parts necessary for inspection and cleaning.

In the drawing, Fig. 1 is a central vertical section from front to rear through a suction cleaner incorporating the invention, with certain parts shown in elevation; Fig. 2 is a bottom plan view of the apparatus with parts broken away; Fig. 3 is a perspective view of the valve or shutter and includes the shaft and gear by which it is driven, and Fig. 4 is a similar view of the removable casing of the suction chamber.

The body 1 of the apparatus, which may consist of a casting of suitable material, such as plastic, aluminum or other metal, encloses a fan chamber 2 that is shown as opening through the top of the body and as having an outlet passage 3 that is enclosed by a rearwardly extending boss 4. A dust bag 5, equipped with a metal fitting 6 at its receiving end, is removably attached to the boss 4, through the medium of said fitting, by holding means 7.

Surmounting the body 1 over the fan chamber 2 is an electric motor that is designated generally by the reference numeral 10 and the shaft 11 of which extends downwardly into the chamber 2 where it has secured to it a fan 12. The lower end of the shaft is shown as journaled in a part 13 of the housing which extends across the inlet opening 14 in the bottom wall of the fan chamber, said part being extended forwardly in the vicinity of the shaft 11 and provided with a hollow depending boss within which is journaled a shaft 15 to the upper end of which is secured a gear 16. This gear meshes with a pinion 17 on the lower end of the motor shaft 11.

Below the fan chamber, and communicating therewith through the opening 14, is a suction chamber 20 that is enclosed by parts of the body 1 in cooperation with a removable casing 21 that is composed of a circular bottom wall 22 and a semi-cylindrical side wall 23. The casing 21 is removably attached to the body 1 by latch members or buttons 24 and 25 that are pivoted to the body and are arranged to engage the respective lugs 26 and 27 of the casing.

The body 1 includes a nozzle 30 that flares forwardly and has a relatively wide mouth 31 at the bottom of its forward end. At its rear end the nozzle opens into the suction chamber 20. The rearwardly converging side walls 32 of the nozzle terminate at diametrically opposite sides of the suction chamber and are engaged by the vertical edges of the semi-cylindrical wall 23 of the casing 21. The rear edge of the bottom wall 33 of the nozzle is shaped to fit the edge portion of the front half of the circular bottom wall 22 of the casing. The interior of the nozzle is separated into a plurality of ducts 35 by partitions 36 that extend from the mouth of the nozzle to its discharge end where said ducts communicate with the suction chamber 20 through what may be regarded the front wall thereof.

Operating within the suction chamber is a valve or shutter **40**, shown in perspective in Fig. 3, the same consisting of a circular bottom wall **41** and a cylindrical edge wall **42** that is interrupted at diametrically opposite points by openings **43**. The shutter has a central aperture through which the shaft **15** extends, the shaft and shutter being connected together in such manner as to be held against relative rotation. The lower end of the shaft is reduced and journaled in a central bearing recess **45** of the bottom wall **22** of the casing **21**.

Wheels **50**, attached to the body **1** in the usual way, support the apparatus at a proper elevation above the floor with the mouth **31** of the nozzle spaced the desired distance therefrom. The apparatus is adapted to be moved to and fro across the floor by means of a handle **51** that is attached in the customary manner through a yoke **52** to the body of the apparatus.

When current is supplied to the electric motor **10** through suitable conductors (not shown) the fan **12** is driven at a high rate of speed to exhaust the fan casing and the suction chamber **20** therebelow, the fan casing discharging through the passage **3** into the bag **5**.

The rotation of the motor shaft is transmitted, at reduced speed, through the pinion **17** and gear **16**, to the shaft **15** and shutter **40**. As the shutter rotates, the openings **43** in the edge wall **42** thereof alternately sweep across the discharge ends of the ducts **35**, throwing said ducts successively into communication with the suction chamber **20**. By this means the partial vacuum prevailing in the suction chamber **20** is concentrated within one or two of the ducts **35**, at no time exceeding in capacity that of one of the ducts in view of the fact that the openings **43** correspond in area to that of the receiving ends of the individual ducts. As a consequence of this, that portion of the carpet beneath the active duct or ducts **35** has imposed upon it the full power of the apparatus, and this concentrated suction shifts very rapidly across the mouth of the nozzle, causing the breadth of carpet beneath said mouth to vibrate rapidly. In other words, laterally shifting waves or wrinkles of the carpet play across the mouth of the nozzle from one end to the other in very rapid succession, thereby to manipulate the fiber or separate the nap of the carpet and loosen the dirt and dust lodged therein and liberate it to the action of the apparatus.

While I have in the foregoing discussion made reference especially to carpet, it will be understood that the apparatus may be used for cleaning various kinds of fabrics or materials; and further, that the construction of the apparatus may be varied without departing from the spirit of the invention so long as the construction falls within the terms of the claims appended hereto.

Brushing or beating means may be arranged within the mouth of the nozzle in much the same way as in prevailing sweepers, but in my case the same would be divided into sections according to the number of ducts. This being such an obvious addition, illustration is deemed unnecessary.

Having thus described my invention, what I claim is:

1. In apparatus of the class described, the combination of a suction chamber having a cylindrical peripheral wall, a nozzle including a plurality of ducts that open into the suction chamber through said wall, the outlet ends of the ducts being arranged in series about the wall, a shutter including a cylindrical wall of slightly less diameter than the peripheral wall of the chamber, the cylindrical wall of the shutter having openings spaced apart considerably further than the outlet ends of the ducts, the shutter being rotatably supported within the chamber with its axis coincident with that of the chamber, a fan chamber whose inlet communicates with the suction chamber through an end wall of the latter, a fan in said chamber, means for rotating the fan, and operative connection between the same and said shutter.

2. In apparatus of the class described, the combination of a suction chamber having a cylindrical peripheral wall, a nozzle including a plurality of ducts that open into the suction chamber through said wall, the outlet ends of the ducts being arranged in series about the wall, a shutter including a cylindrical wall of slightly less diameter than the peripheral wall of the chamber, the cylindrical wall of the shutter having openings spaced apart considerably further than the outlet ends of the ducts, the shutter being rotatably supported within the chamber with its axis coincident with that of the chamber, a fan chamber whose inlet communicates with the suction chamber through an end wall of the latter, a fan in said chamber, a motor for driving the fan, and driving connections between the motor and shutter of such character as to rotate the shutter at a speed considerably less than that of the fan.

3. In apparatus of the class described, the combination of a body enclosing a fan chamber having an inlet opening in its bottom wall, a fan within said chamber for rotation on a vertical axis, a motor supported by the body with its shaft vertically disposed and extending downwardly through the fan chamber, the fan being mounted upon and secured to said shaft, there being a cylindrical suction chamber below the fan chamber and communicating with the latter through the aforesaid inlet opening, a casing removably attached to the under side of the body and cooperating with the adjacent portion of the body to enclose the suction chamber, the body including a nozzle having a plurality of ducts that open into the suction chamber through a semi-cylindrical wall of the chamber composed of a part of the body, the aforesaid casing including a semi-cylindrical wall that is arranged in opposed relation to the former semi-cylindrical wall and including also an end wall in opposed relation to the previously mentioned end wall of the fan chamber, a shutter fitting within the suction chamber and comprising a circular end wall arranged adjacent the end wall of the casing and a cylindrical peripheral wall of slightly less diameter than the suction chamber, said peripheral wall having diametrically opposed openings, a shaft supported axially of the suction chamber in parallel relation to but offset to one side of the motor shaft, and driving connections between the motor shaft and the second mentioned shaft in the region of the end wall of the fan chamber.

DAVID J. BRUNNER, JR.