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HAND HELD AIR OPERATED VACUUM CLEANER

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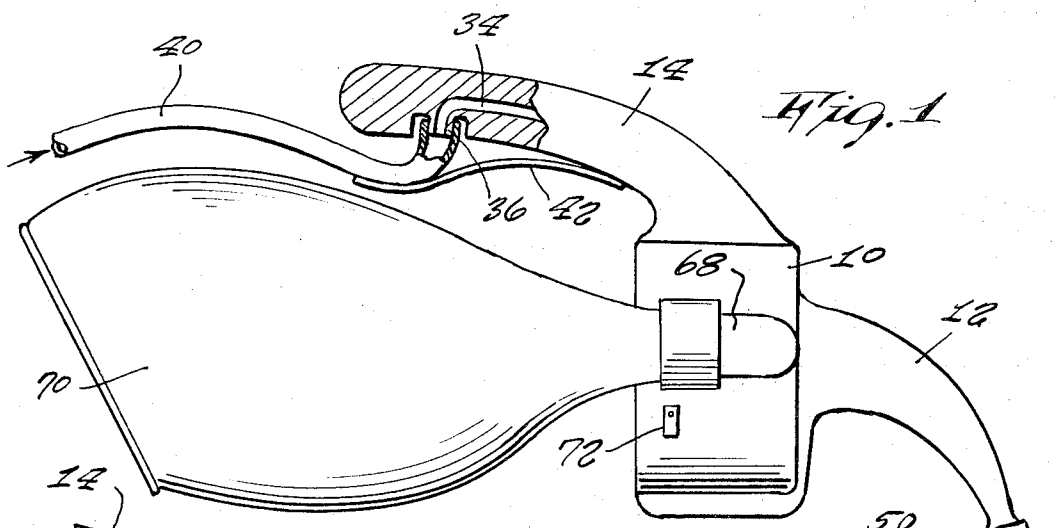


Fig. 1

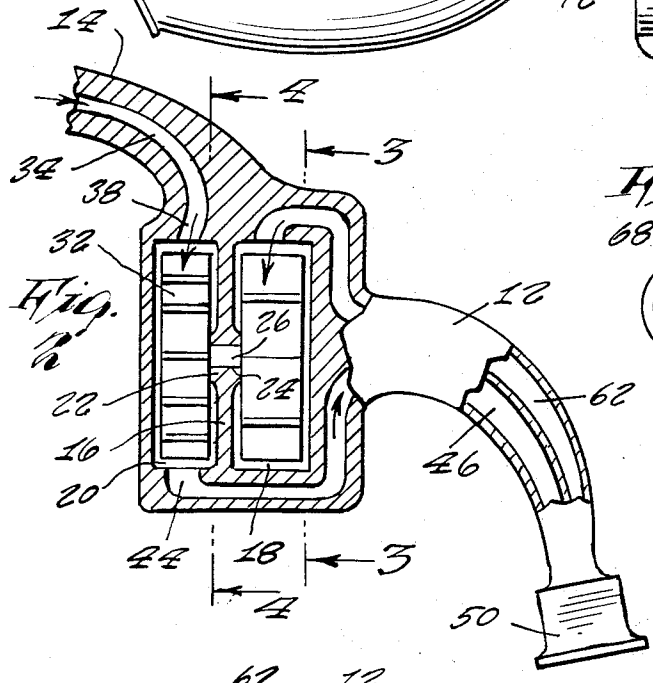


Fig. 2

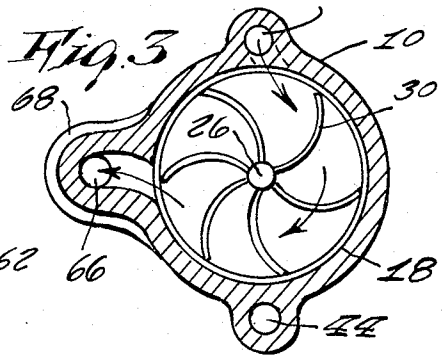


Fig. 3

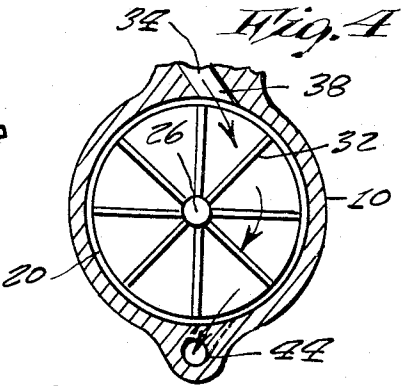


Fig. 4

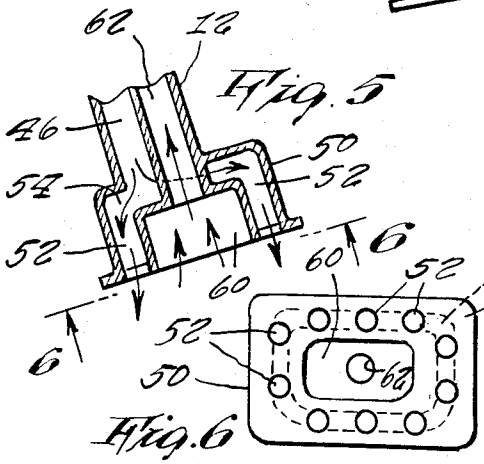


Fig. 5

Fig. 6

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HAND HELD AIR OPERATED VACUUM CLEANER

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6 Claims. (Cl. 15—344)

This invention relates to vacuum cleaners, and more particularly to a small, lightweight, hand held vacuum cleaner suitable for use in filling stations, car wash establishments and automobile dealers for cleaning of floor mats around accelerator and brake pedals, ledges, upholstery, etc., also in barber shops for the removal of clipped and waste hair or other debris.

It is the primary object of this invention to provide a small compact hand held air operated vacuum cleaner having an air turbine for driving the suction fan and receiving pressurized air by a readily attachable and detachable connection to the conventional air pressure hose available at all automobile service centers and barber shops, that is, of simple construction, efficient, of great power and durability, with no parts to get out of order, and as the vacuum cleaner requires no electric switches, wigging, insulators, etc., the unit can be economically produced from light weight materials at low production costs.

Another object of this invention is to provide the mounting of the air turbine and suction fan of the vacuum cleaner on a single shaft having a single bearing support between the air turbine and suction fan.

A further object of this invention is to provide in the face of the suction nozzle of the vacuum cleaner, a plurality of suitably angled air discharge outlets through which the exhaust air is discharged to agitate the dirt and debris.

Still another object of this invention relates to the provision of a spring clip on the handle of the vacuum cleaner which supports the air chuck at the end of the air hose and holds the same in operative connection with the air inlet of the vacuum cleaner.

A still further object of this invention is the provision of an exhaust control for regulating the pressure of the exhaust air leading to head of the suction nozzle to vary the degree of agitation set up by the air expelled from the air discharge outlets.

Other objects and advantages appear hereinafter as set out in the following description and claims.

The accompanying drawings show, for the purpose of exemplification without limiting the invention or claims thereto, certain practical embodiments of the invention wherein:

FIGURE 1 is an elevational view partly in section of the vacuum cleaner;

FIGURE 2 is a fragmentary cross-section thereof on a vertical plane showing details of the air turbine and suction fan arrangement with air supply, air discharge and air suction passages;

FIGURE 3 is a sectional view of the suction fan housing taken on line 3—3, FIGURE 2;

FIGURE 4 is a sectional view of the air turbine housing taken on line 4—4, FIGURE 2;

FIGURE 5 is a detail sectional view of the suction nozzle;

FIGURE 6 is an end view of the suction nozzle as viewed on line 6—6 of FIGURE 5.

Referring to the drawings, the vacuum cleaner is made up of a casing **10** having a suction nozzle **12** at one side thereof, and a handle **14** disposed at the top of the casing. It will be seen in FIGURE 1, that the nozzle **12** projects forwardly and downwardly with reference

to the casing **10**, while the handle **14** extends upwardly and rearwardly from the casing **10**. Both the nozzle **12** and handle **14** may be formed integral with the casing **10**, or may be detachably connected thereto in any desired manner.

A partition wall **16** divides the casing **10** into a suction fan chamber **18** and a rotor chamber **20**. Formed axially in the partition wall **16** is a hub **22** providing a bearing **24** for a shaft **26**. The shaft **26** carries on one end a fan **30** rotating within the suction chamber **18** and at its other end a rotor **32** operative within the rotor chamber **20**. It is to be noted that the fan **30** and rotor **32** are axially spaced apart and the intermediate portion of the shaft **26** has bearing support within the bearing **24**. The casing **10** is suitably divided into at least two separate and connected sections (not shown) to permit assembly of the shaft **26** with attached rotor and fan therewithin.

Provided in the handle **14** is an air supply passage **34** having its inlet end formed with a nipple **36** disposed on the underside of the handle adjacent its free end. The passage **34** is so related to the rotor chamber **20** as to have its discharge end **38** substantially tangential to the periphery thereof, as shown in FIG. 4, so that pressurized air discharged therefrom, will impinge directly on the vanes of the rotor **32**. An air hose **40** connected to a source of compressed air (not shown) is attached to the nipple **36** and is held in place by a spring clip **42**. The air hose **40** may have at its free end a valve fitting (not shown) of the type conventionally employed on air hoses of filling stations supplying pressurized air to tires. In such a case the nipple **36** is so dimensional as to coact with such a valve fitting, the spring clip **42** acting to hold the same in connected relation to the nipple. The air exhausted from the rotor chamber **20** flows outwardly therefrom through an air discharge passage **44** in the casing **10** which communicates with an air discharge passage **46** in the nozzle **12** for a purpose to be hereinafter described. It is to be understood that the rotor **32** may have any desired number of vanes of any suitable configuration and size.

The suction nozzle **12** is provided at its lower free end with a suction head **50**, shown in FIGURES 5 and 6 to be somewhat rectangular in shape. Arranged in the suction head **50** is a perimetrical row of air discharge ports **52**, each in communication with a plenum chamber **54** formed in the upper portion of the suction head **50**, which passage is in communication with the air discharge passage **46**. Thus, the pressurized air which operates the rotor **32** is exhausted from the rotor chamber **20** through air discharge passages **44**, **46** for final discharge through the air discharge ports **52** in the suction head **50**, the air thus discharged serving to agitate and loosen the dirt and debris beneath the suction head **50** as the same is moved across a surface to be cleaned.

Formed centrally in the suction head **50** which has a flat surface engaging side **56**, and inwardly of the air ports **52** a suction orifice **60** shown rectangular in shape which communicates with a suction passage **62** in the suction nozzle **12**. The suction passage **62** in turn communicates with a suction inlet passage **64** in the casing **10** which discharges into the suction fan chamber **18**. A suction outlet passage **66** extends from the fan chamber **18** and has its outlet in the casing extension **68**. Attached in any suitable manner to the casing extension **68** is a dirt collecting bag or receptacle into which the dirt from suction outlet passage **66** is discharged. As with the rotor **32**, the fan **30** may have any number of vanes which may be of any desired shape and size.

Thus, in the operation of the vacuum cleaner, it is seen that the rotor **32** is powered by pressurized air which

is exhausted through ports **52** to agitate the dirt in the vicinity of the head **50**, the dirt in turn being drawn into the suction orifice **60** by the suction set up by fan **30** for ultimate discharge into the bag **70**.

The pressure of the air discharged from the ports **52** in the suction head **50** is regulated by a manually operated slide valve **72** which controls a vent opening (not shown), the degree to which the vent is opened controlling the amount and/or pressure of air exhausted through passage **44**.

The novel features and the operation of this device will be apparent from the foregoing description. While the device has been shown and the structure described in detail, it is obvious that this is not to be considered limited to the exact form disclosed, and that changes may be made therein within the scope and the spirit of the invention.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. A hand held air pressure operated vacuum cleaner comprising:

(a) a casing,

(b) a partition wall within said casing forming therewithin a rotor chamber and a suction fan chamber,

(c) a shaft rotatably supported intermediate its ends by said partition wall,

(d) a rotor on one end portion of said shaft operative within said rotor chamber,

(e) a suction fan on the other end portion of said shaft operative within said suction fan chamber,

(f) a handle fixed to said casing,

(g) an air supply passage on said handle,

(h) means at the inlet end of said passage for connection to a source of pressurized air,

(i) said air supply passage at its discharge end delivering pressurized air substantially tangential to the periphery of said rotor to drive the same,

(j) a suction nozzle on said casing in communication with said suction fan chamber, and

(k) a dirt collecting bag connected to said casing in communication with said suction fan chamber,

whereby said rotor when actuated by a supply of pressurized air, will operate to drive said suction fan for drawing dirt into said suction nozzle to be delivered into said bag.

2. The vacuum cleaner of claim **1**, including:

(a) a suction head on the free end of said suction nozzle,

(b) a suction orifice in said suction head,

(c) a suction passage in said suction nozzle,

(d) said suction fan chamber having an inlet and a discharge opening,

(e) said suction passage connecting said suction orifice with the inlet opening of said fan chamber,

(f) an extension on said casing to which said dirt collecting bag is connected,

(g) there being passage means in said casing and extension connecting the discharge opening of said fan chamber with said dirt collecting bag.

3. The vacuum cleaner of claim **2**, wherein:

(a) said rotor chamber includes an air exhaust outlet,

(b) there being an air discharge passage in said casing and suction nozzle in communication at one end with said air exhaust nozzle,

(c) a plurality of air discharge ports in said suction head surrounding said suction orifice,

(d) a plenum chamber in said suction head,

(e) said air discharge passage communicating at its other end with said plenum chamber, and

(f) each of said discharge ports being in communication with said plenum chamber,

whereby the exhaust air from said rotor chamber discharged from said discharge ports in said suction head will agitate the dirt in the vicinity of said suction orifice when the suction head is moved over a surface to be cleaned.

4. The vacuum cleaner of claim **3**, including:

(a) a spring clip secured to said handle, and

(b) said connecting means at the inlet end of the air supply passage in said handle comprising a nipple formed to coact with an end of an air hose connected to said source of pressurized air,

whereby on application of said air hose end to said nipple, said spring clip will engage said air hose end to hold the same in operative relation to said nipple and handle.

5. The vacuum cleaner of claim **4**, wherein:

(a) said suction head has a flat face for movement on a surface to be cleaned, and

(b) said ports being arranged in a perimetrical row with relation to the sides of said suction head and wholly surrounding said suction orifice.

6. The vacuum cleaner of claim **5**, including:

(a) vent means in the casing wall at the exhaust side of said rotor chamber, and

(b) valve means for controlling said vent means whereby to regulate the supply of exhaust air to said discharge ports to regulate the degree of agitation effected by said exhaust air expelled from said discharge ports.

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