

J. B. KIRBY.
 HANDHOLD VACUUM CLEANER.
 APPLICATION FILED JUNE 11, 1910.

1,156,235.

Patented Oct. 12, 1915.

2 SHEETS—SHEET 1.

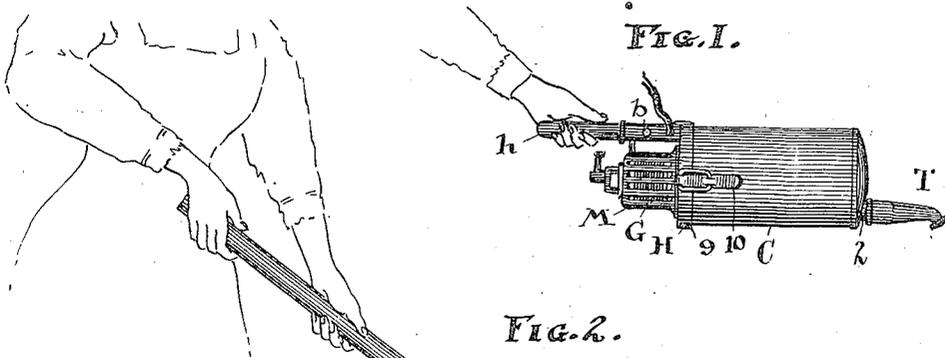


FIG. 1.

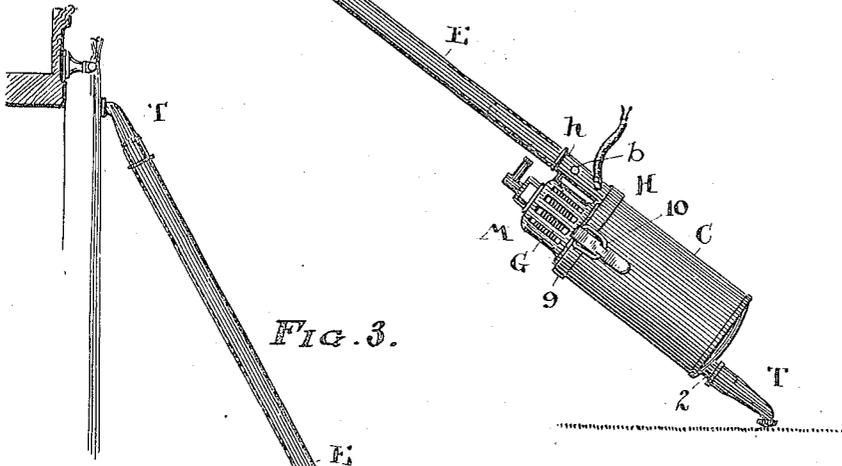


FIG. 2.

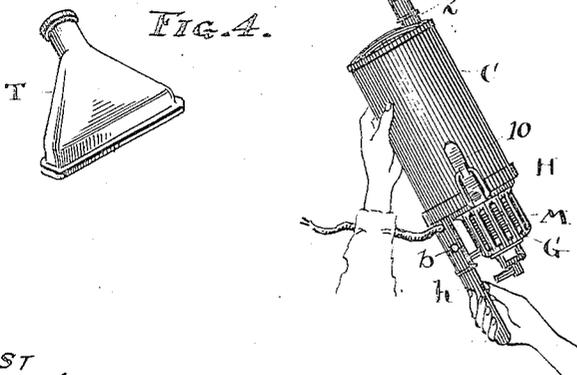


FIG. 3.

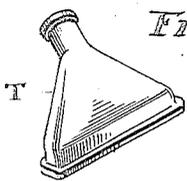


FIG. 4.

ATTEST
 E. M. Fisher
 J. C. Mussum.

INVENTOR
 JAMES B. KIRBY.
 BY Fisher & Moore ATTYS.

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FIG. 5.

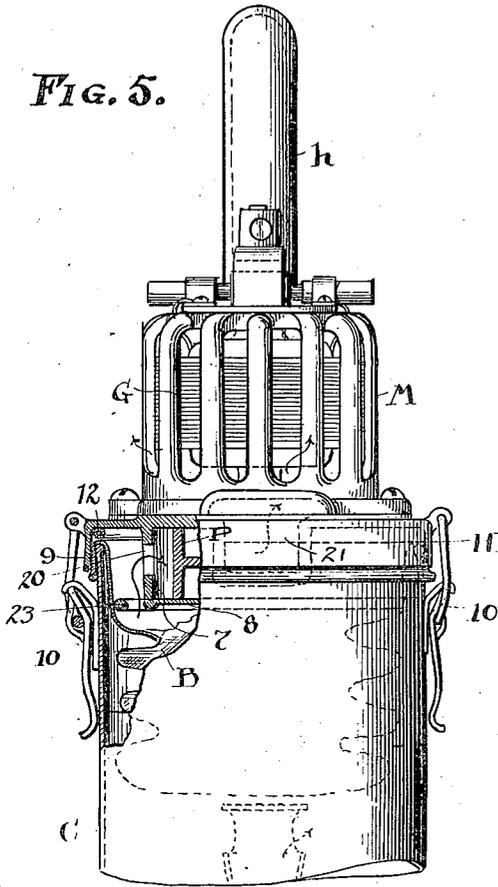


FIG. 6.

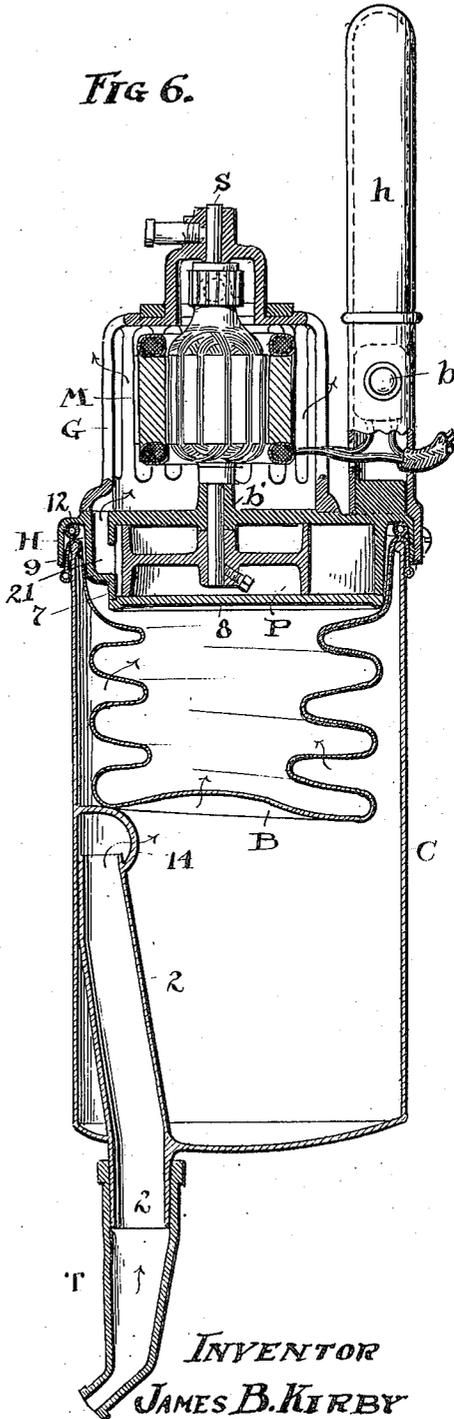
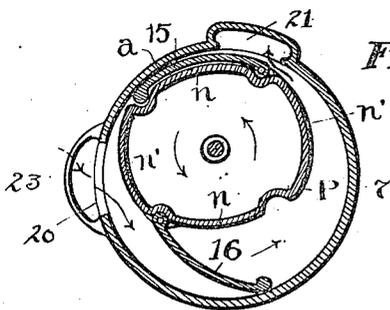


FIG. 7.



ATTEST
 E. M. Fisher
 J. C. Musson

INVENTOR
 JAMES B. KIRBY

By Fisher & Moser ATTYS.

UNITED STATES PATENT OFFICE.

JAMES B. KIRBY, OF CLEVELAND, OHIO.

HANDHOLD VACUUM-CLEANER.

1,156,235.

Specification of Letters Patent.

Patented Oct. 12, 1915.

Application filed June 11, 1910. Serial No. 566,307.

To all whom it may concern:

Be it known that I, JAMES B. KIRBY, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Handhold Vacuum-Cleaners, of which the following is a specification.

My invention relates to vacuum cleaners, and the invention consists in a style and construction of cleaner which is purposely made light and convenient in handling so that women can use it not only for running over carpets and rugs as they do the ordinary sweeper but also for dusting furniture, drapery and the like, all substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the device in the form most convenient for cleaning furniture, while Fig. 2 is an elevation thereof with a long handle as used on floors or carpets. Fig. 3 is a reversal of the parts with the long tubular handle shown in Fig. 2 engaged between the vacuum tool, shown in Fig. 4, and the vacuum cylinder and as adapted to cleanse drapery in its usual suspended position. Fig. 5 is an enlarged partially sectioned elevation of the device, and Fig. 6 is a vertical sectional elevation thereof on the line of its exhaust from the pump. Fig. 7 is a horizontal cross section through the pump.

The cleaning device as thus shown is essentially a domestic machine and planned throughout to be handled and used by women who have no more than ordinary strength, so that a person who can operate an ordinary carpet sweeper will need exert no more strength to operate this machine for like work. Of course in case the machine has to be lifted bodily as in cleansing drapery or furniture, a greater strength may be required or possibly only a different use thereof. At any rate the entire machine need not weigh exceeding six pounds, and it is so reduced in size and proportions that it is easily grasped by the hands and held to its work, as seen in Figs. 1 and 3.

Now, referring specifically to the parts, C represents the cylinder provided with an inlet tube or pipe 2 in its bottom and projecting both within and without said bottom and constructed to affix the vacuum tool T thereon as shown in Fig. 6, or to attach

the handle extension tube E as in Fig. 3. The projection *h* on the head H of cylinder C therefore is to be regarded as the handle proper and which may or may not be supplemented by said tube E according to the work to be done. The said handle *h* is at one side of the said head, and rigidly affixed thereto and the electrical connections to or with the electric motor M are preferably through the base of said handle and upon which I provide a switch button *b* for convenience of operation. In any case, therefore, the said handle is a fixed portion of head H, and the motor M is supported in an open work crib G rigidly fixed upon said head and having a shaft S extending down into head H and carrying the vacuum pump P mounted thereon in the interior chamber of said head. Said chamber is drum shaped with annular rim 7 on said head forming its outside and closed on its bottom by a plate or disk 8. A flange 9 is formed about the outside of head H and overlaps the upper edge of can or cylinder C on which said head is temporarily locked by suitable fastening means 10, Fig. 5. As to this fastening mechanism it is to be understood that the particular devices shown or their equivalent can be used, and a close packing ring 12 is interposed between said head and cylinder to prevent leakage at that point. The dust collecting or rather detaining bag B is engaged about its edge beneath head H and over the edge of the cylinder and otherwise is suspended in the cylinder and relatively in the upper portion thereof so that the lower portion remains as essentially the dust chamber and in which the dust deposits beneath the level of the mouth of the delivery tube or spout 2. A hood 14 is placed over this mouth to prevent any possible direct return of the dust and free openings remain at the sides of the hood for admission of the dust to the said chamber.

By the foregoing arrangement of the dust separating bag or fabric B with respect to the pump and parts above the dust is completely excluded therefrom and only thoroughly cleansed air passes through the machine.

It will be noticed that the pump P is set eccentrically in its chamber, Fig. 7, and that it has two wings 15 and 16 hinged oppositely thereon with free edges adapted to run against the wall 7 thereof. Again, the said pump chamber has an inlet opening 20

at one side and an outlet or exhaust 21 farther around in the same wall, and the pump is so arranged as not only to run nearest to the inclosing wall 7 between these openings but so that it does its work in the wider and more open space between said inlet and said outlet on their longer radius.

The opposite sides of the pump rotor P are somewhat flattened where they are overlapped by the said wings 15 and 16 which are adapted to close more or less completely as they pass through the otherwise idle space between the inlet and exhaust ports 20 and 21 or rather from 21 down to 20. Of course centrifugal force alone is sufficient to always keep the wings or blades 15 and 16 out in open position to confine and carry the entrapped air, and obviously, also, the said blades gradually close as they reach the exhaust port and exclude the air. With say twenty-five hundred revolutions per minute the effect is to carry off a great volume of air and to induce more or less vacuum effects in and through the tool T, and in the vacuum cylinder. This of course is a necessary effect in the operation with certain limits, but under some conditions of work, as on rugs and carpets with a heavy nap, the tool may allow an insufficient air supply, and in such cases the back pull upon the electric motor is liable to become excessive and the operations of the machine correspondingly embarrassed. I have therefore anticipated these conditions and made provision for automatically relieving the same, or in fact preventing their occurrence, and this is accomplished in the construction of the pump and as best shown in Fig. 7. In this view the rotor body P is shown as having slightly curved opposite sides *n* adapted to be overlapped and closed upon successively by the wings or blades 15 and 16. That is under certain conditions of operation. Otherwise said wings remain more or less open according to their position in the rotation, and it will be understood that their free outer edges are kept against the wall 7 by centrifugal force when at work. Their nearest closure is in the idle space between ports 20 and 21 on the shorter arc *a* shown at the top, Fig. 7. But even here the said wings do not normally close entirely on said sides *n*, and if they did there would be an air space between the two ports outside said wing and a consequent short circuit of air from port 21 to port 20. Now this is exactly what does occur under the overloaded conditions above described, as when excessive vacuum is induced in the tool and cylinder by reason of the flow of air through the tool being unduly impeded. In such cases when a certain state of vacuum occurs, and which is manifested at inlet port 20 to the pump, the wing 15 or 16 which for the time is in the position of wing

15, Fig. 7, will yield to the vacuum pull when it becomes greater than the centrifugal force which keeps it out and close accordingly on the surface of the rotor. The instant this occurs the air will rush in behind said wing from port 21 to 20 and the burden on the pump and motor will be relieved. This will continue as to each wing successively until normal conditions are restored, and the entire action is automatic and self regulating.

It will be observed that handle *h* is a fixed part on the cylinder head H and adapted to be used alone as a handle for the entire device when cleaning furniture and the like. Otherwise the supplemental handle stem or tube E can be attached as in 2, or in case draperies are to be cleansed or possibly the side walls of the room the said tube is transferred into the suction channel and tool T is fixed on its free end and the tube is engaged with outer end of the intake duct 2. This interchangeability of the handle tube E in conjunction with fixed short handle *h* adapts the machine to several uses not otherwise possible and is deemed a very convenient and valuable improvement.

By having the inclosure G of the motor ribbed and open as shown it is kept much cooler than it would be if inclosed all around, and the air exhaust 21 from the pump issues directly upon the motor, as seen in Fig. 6, and contributes materially to the cooling effect.

As to the matter of size and weight for handling it may be stated that the original Patent Office drawings, Figs. 5, 6 and 7 show the parts about half their full size, and the weight is about six pounds all told. The construction is such that the head H and all that is mounted thereon can be easily removed from the cylinder by releasing the fastening links 10 when the dust separator B is also taken out and cleansed and the dust deposits removed. The said head in effect or practically constitutes a cap or cover for the cylinder C and is hermetically fixed and sealed thereon except as to the exhaust 21 from the pump. This brings said pump practically within the cylinder on the under side of head H while the motor is on the top of outside thereof, and the two are operatively united by shaft S which has an extended bearing *b'* centrally in said head.

To be possibly more definite respecting the automatic action hereinbefore described it is to be noted that the two ports 20 and 21 are within a radius of each other approximately one-third of the complete circumference of the pump chamber measured horizontally, and that the axis of the pump is set relatively about the same distance from both ports and eccentrically to said chamber. This brings the sides *n* of the

pump which are overlapped by the wings nearest to this area or what is known as the idle area between the said ports and indicated by the reference α . As to this area it may also be observed that the distance from port to port is substantially the same as the length of the said wings, so that when the wings come into this area both ports will still be open and automatic relief for excessive vacuum afforded as herein described. In this connection it is to be seen that the said wings trap the air from the inlet port and carry it forward with a constantly decreasing space until the exhaust is reached. The segmental surfaces or portions n' of the pump body are adapted to run in close relation to the wall of the pump chamber in the idle area α and thereby contribute to the effective working of the pump.

A lateral projection 23 of semi-ring form on bottom 8 is located adjacent to intake opening 20 of pump P to prevent the bag from closing said opening by suction during operations.

What I claim is:

1. A vacuum machine having a dust receptacle provided with an inlet tube projecting into the same through the bottom thereof and next to the wall at one side and a dust guard closed over the top of said inlet tube and open at its side for the escape of dust into the said receptacle, and a dust intercepting bag of woven fabric suspended from about the top of said receptacle and a suction fan communicating with the interior of said bag.

2. A vacuum cleaning device comprising a receptacle having a dust inlet tube extending through its bottom to a point about the middle of the receptacle and a dust bag suspended within the top thereof and extending when in its expanded condition below the mouth of the inlet tube, means on the top of said receptacle and bag adapted to create suction through said bag, and a dust guard closed over the top of said inlet tube and open at its side to admit dust laden air to the receptacle, said dust guard being of substantial width whereby it acts to prevent closure of the inlet tube by the bag and as a baffle for the dust laden air tending to throw down the larger particles before the air passes to the bag.

3. In a suction cleaner, a casing having a pump chamber, a rotary pumping device therein, and an elongated dust detaining bag arranged with its longitudinal axis substantially coincident with the axis of said

pumping device and with its mouth surrounding said pump chamber, the interior of said bag being in communication with the interior of said chamber.

4. In a suction cleaner, a casing having a pump chamber therein, a motor supported concentric with said pump chamber, a rotatable pumping device in said chamber and operatively connected to the motor, an elongated dust detaining bag arranged with its longitudinal axis substantially coincident with the longitudinal axis of the pumping device and motor and having its mouth surrounding said pump chamber, the interior of said bag being in communication with the interior of said pump chamber and the parts being so arranged that the air discharged from said pump chamber will pass around said motor.

5. In a suction cleaner, a supporting element comprising an annular bag-support and a motor support substantially concentric therewith, a motor carried by said motor support having its shaft substantially parallel to the axis of said bag support, a rotary suction-producing device operatively connected to said motor and located inside said bag support, and an elongated dust detaining bag having one end closed and having its mouth secured to said annular bag-support, there being a passageway inside said bag-support establishing communication between said suction producing device and the bag interior.

6. In a suction cleaner, a supporting element comprising an annular bag-support and a motor support substantially concentric therewith, a motor carried by said motor support, a rotary suction-producing device operatively connected to said motor and located inside said bag support, and an elongated dust detaining bag having one end closed and having its mouth secured to said annular bag-support, there being a passageway inside said bag-support establishing communication between said suction producing device and the bag interior, and the motor support being located in the path of the discharge from said suction producing member whereby said motor may be kept cool.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES B. KIRBY.

Witnesses:

R. B. MOSER,
F. C. MUSSUN.