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1,573,771

S. McCLATCHIE

VACUUM CLEANER

Filed June 5, 1920

2 Sheets-Sheet 1

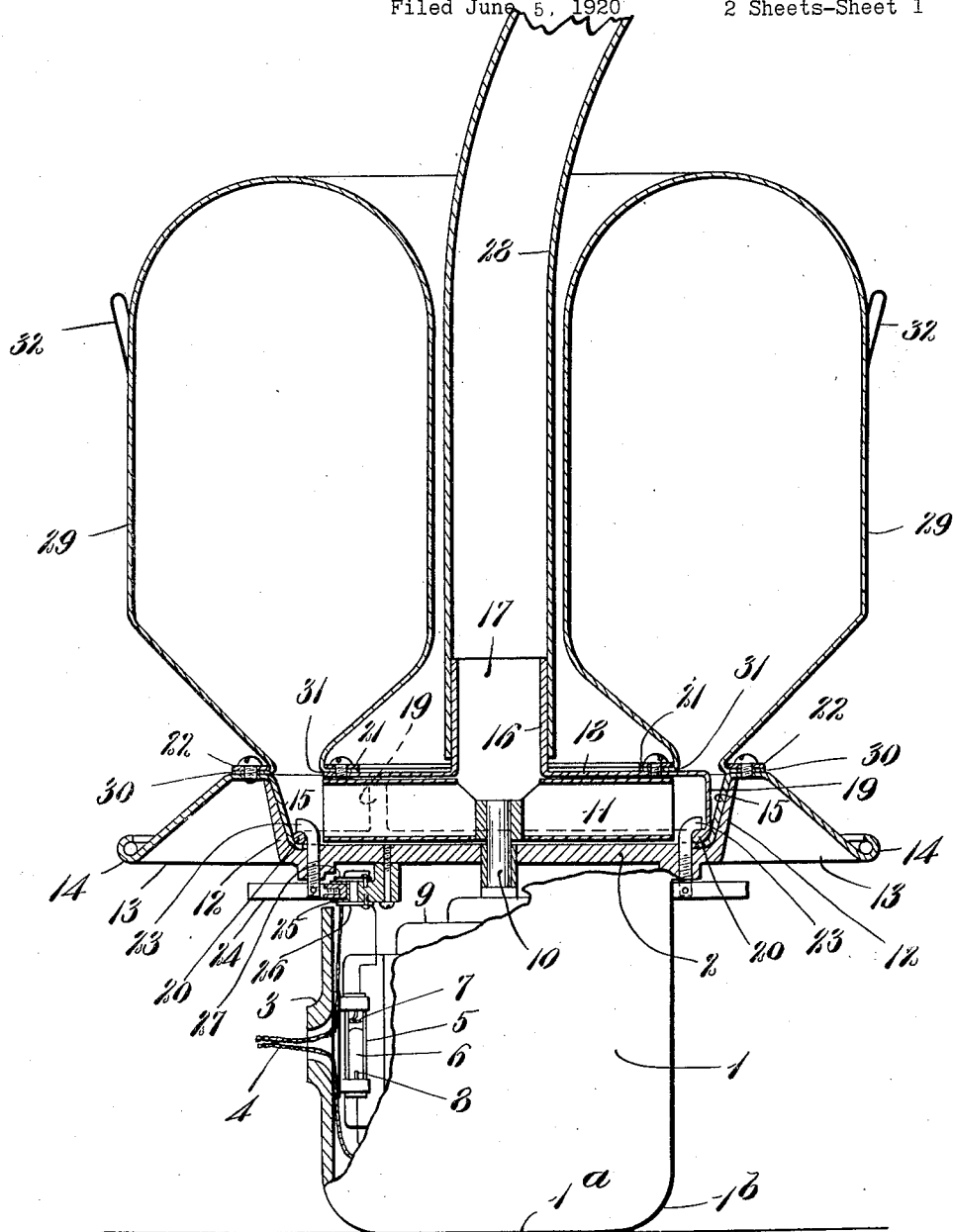


Fig. 1.

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Fig. 2.

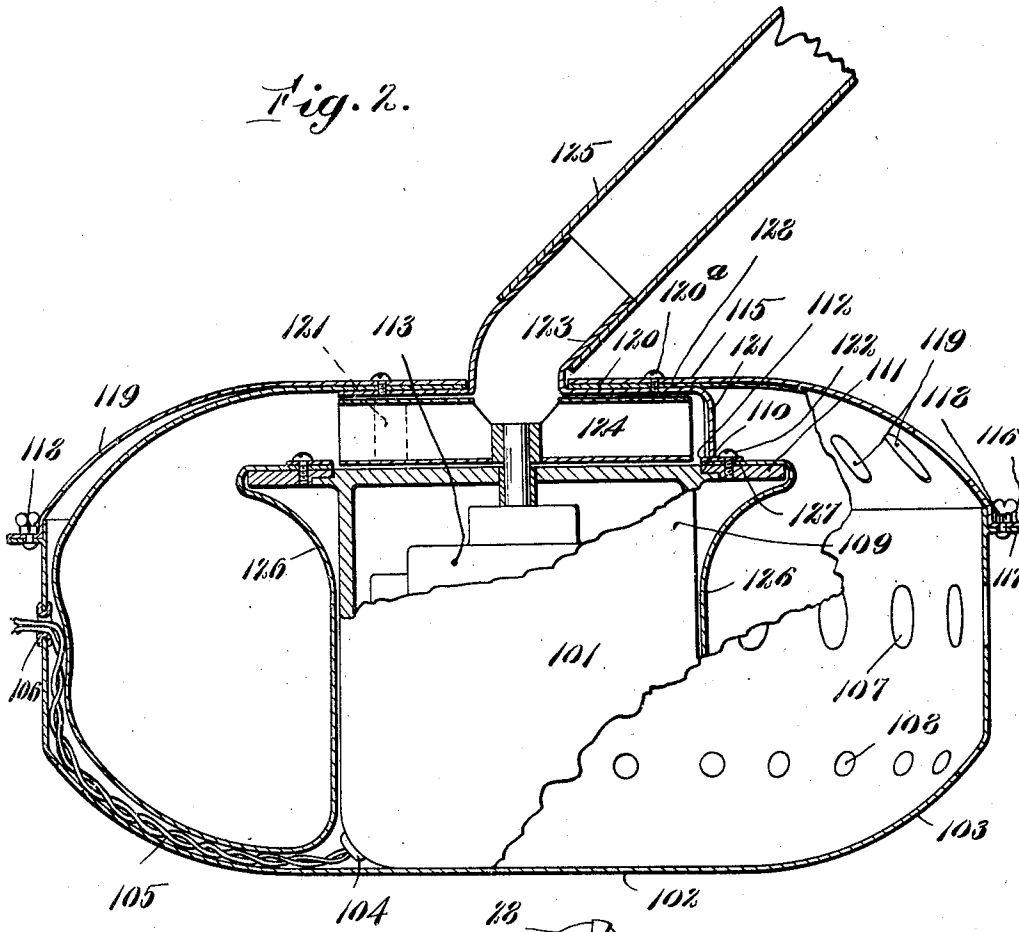
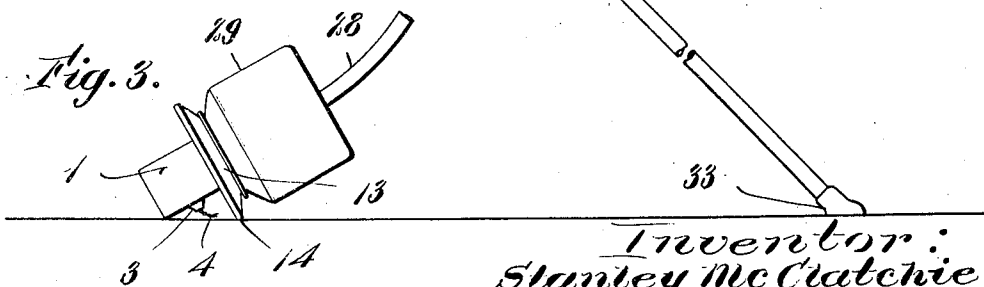


Fig. 3.



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UNITED STATES PATENT OFFICE.

STANLEY McCLATCHIE, OF CAMBRIDGE, MASSACHUSETTS.

VACUUM CLEANER.

Application filed June 5, 1920. Serial No. 386,905.

To all whom it may concern:

Be it known that I, STANLEY McCLATCHIE, a citizen of the United States of America, and resident of Cambridge, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Vacuum Cleaners, of which the following is a specification.

My invention relates to electric-motor-driven portable vacuum cleaning apparatus and has among its objects the provision of readily transferred and easily manipulated apparatus of this general character. My improvements thus relate particularly to the class of portable vacuum cleaning apparatus which is moved from room to room and electrically attached to a lamp or wall socket by means of electric wire or cord of suitable length. Such apparatus comprises an electric motor, a suction fan driven thereby, a collecting nozzle and a dust separator and three specific types have heretofore been employed, namely the stationary type wherein the motor and fan are permanently located as in the basement of a building and connected by pipes to the different rooms to which are attached a flexible hose which leads from the nozzle; second the can type wherein the motor and fan are mounted in a manner to enable them to be moved from room to room, and there connected to the hose, the hose being ordinarily in such cases made of sufficient length to cover a comparatively large area of floor without moving the suction apparatus; the third or portable type is that wherein the motor fan and nozzle are housed in a nozzle casing mounted on wheels so as to be moved bodily about the floor during the entire cleaning operation.

My invention concerns a type of machine intermediate between the can type and the portable type, and differing from the portable type in requiring the movement of only a light and simple nozzle member about the floor or walls to effect the cleaning, and improving upon the can and stationary types in requiring only a short length of hose which in turn so reduces the internal friction as to enable a substantial reduction in the size, weight and cost of the motor and fan. The objects of the invention are therefore the provision of an improved suction cleaning apparatus in which a comparatively short length of hose constitutes both the connection between the fan and nozzle and the handle for carrying or dragging the fan

and motor from place to place; the provision of a vacuum cleaning apparatus in which the fan and motor are housed in a casing which is so shaped as to roll and slide bodily on the floor as the hose is moved following the movements of the operator; while further objects of the invention will become apparent as the description proceeds.

Other objects of these improvements will appear in the course of description of the apparatus.

In the drawings hereto annexed, which illustrate alternative embodiments of my improvements—

Fig. 1 represents the form which on the whole is believed to be preferable, partly in elevation and partly broken away to show a vertical section.

Fig. 2 represents an alternative form of the vacuum cleaning apparatus partly in elevation and partly broken away to show a vertical section; and

Fig. 3 shows on a small scale the normal operating posture of the apparatus illustrated in Fig. 1.

Referring to Figs. 1 and 3:

My improved cleaner comprises a flexible tube or hose which constitutes both a handle for the casing and a connection to the cleaning tool. The casing has the form of a surface of revolution about an axis to permit it to roll freely and uniformly on the floor, and in the form shown in Fig. 1 comprises a motor housing 1 having an externally smooth bottom 1^a, smoothly rounded lower edge 1^b and cover 2, the latter having a laterally extending portion 12, 13, 14, hereafter described which constitutes in effect part of the casing and assists in supporting the remaining parts upon the floor. The housing 1 is perforated as at 3 for the introduction of the electric cords or lead wires 4, this point of entry being preferably on the side of the housing 1, about midway from the bottom to the top. The motor 9 is securely mounted in the interior of the housing 1 and carries the fan shaft 10. In the apparatus represented in Fig. 1, when the motor housing 1 rests on its flat bottom 1^a, the motor is automatically kept out of circuit by means of the circuit-breaker shown at 5, this being adapted to close the electric circuit automatically when the apparatus is tipped to one side so as to assume an inclined position as indicated in Fig. 3. The automatic circuit controller here shown comprises

metallic terminals 7 and 8 and an intermediate body of conductive liquid such as mercury indicated at 6. This controller is placed in circuit so that when the apparatus stands in the upright position shown in Fig. 1, the motor circuit is open but that when the apparatus is tipped to one side, the fluid member 6 establishes circuit between the terminals 7 and 8.

The draft generating fan 11 is mounted on the motor shaft 10 and when in use is enclosed between the housing cover 2 and the top plate 18, these two members, when the apparatus is assembled and in operation, are component portions of the motor and fan housing. The plate 18 is provided with a preferably integral tubular extension 16, connected axially to the casing at one end the interior of which provides the axial induct port 17 to the fan 11.

The educt port of the fan is peripheral and extends entirely around the fan, the space between the housing cover 2 and the top plate 18 constituting the peripheral educt port. The motor and fan housing, for purposes presently to be described, is provided with a peripheral extension composed in the instance shown of several pieces or parts, but which as a whole constitutes a means of support for the apparatus when it is tipped to its operating position. The housing cover 2 is provided at its rim with a flaring flange 12. The rim 13 fits within the flaring flange 12, its inner portion 15 being provided with an inwardly extending ledge or flange on which the ring 20 rests as will presently be described. The outer periphery of the rim 13 is rolled as at 14 so as to present a smoothly rounded surface of ample radius adapted to roll or slide easily over any surface with which it may be in contact.

The plate 18 which serves as an enclosure at one side of the fan 11 is provided with three or more outwardly and downwardly extending arms 19 which at their lower ends are attached to the ring 20 which, as above indicated, rests on and fits closely within the flange or ledge formed on the inner part 15 of the rim 13. In order to secure the above mentioned members firmly together there are provided in the overhanging ledge portion of the housing cover 2, the catches 23. These catches are manipulated by means of the short arms 24 which, as shown in the drawing, are accessible to the person using the apparatus. One of these catches is associated with means for opening and closing the motor circuit so that when this catch is moved to disengage the ring 20 and rim 13, the motor circuit will be open and remain so. This is to guard against accidental starting of the motor and fan when the latter is not enclosed by the members which normally constitute this housing. One of the catch manipulating arms 24 is prolonged so

as to extend into the motor housing, through an aperture provided for the purpose. This inward extension 25 carries a suitable insulated conducting strip which, when the arm 20 is turned so as to lie close to the outer periphery of the housing 1, is removed from between the contact members 26 and 27 and thus keeps the motor circuit open even though the other circuit controlling devices may be in closed circuit position. When the apparatus is assembled and the ring 20 and rim 13 locked in position shown in Fig. 1 by means of catches 23, the inward extension 25 of one of these catches makes contact with the members 26 and 27 and establishes a closed circuit.

The flexible tube 28 is joined and firmly secured to the tubular projection 16 on the plate 18 and carries at its free end (see Fig. 3) a dust inhaling nozzle 33.

The dust collecting receptacle 29 herein shown is of peculiar form, being substantially tubular and capable of being telescopically folded within itself. For this purpose the tube is preferably tapered so that the larger end or lip 30 is secured to the rim extension 13 by means of the clamping plate 22 and the smaller lip 31 is similarly secured to the plate 18 by a clamping ring 21. When secured in this way the two lips of the dust receptacle are concentric and provide between them an annular opening which is in effect a continuation of the peripheral educt port of the fan 11. Tabs 32 may be provided on the dust receptacle 29 for convenience in manipulating the receptacle. It will be observed that the entire apparatus above described is symmetrically disposed about the axis coincident with the axis of the fan shaft 10 and induct port 17.

The rounded lower edge 1^b of the housing 1 and the smoothly rounded edge at 14 of the rim extension 13 are adapted to afford support for the apparatus in whatever direction it may be tipped and are adapted also to slide, turn or roll easily upon a floor in response to a pull on the flexible tube 28 which for this purpose constitutes and forms the function of a flexible tractor for the apparatus. The dust receptacle 29 being concentrically arranged around the flexible tube 28 is supported by the flexible tube so that when the apparatus is operating in the tipped or inclined position, the dust receptacle will be held clear of the floor. When it is desired to remove the dust receptacle for emptying, the catches 23 are turned by means of their manipulating arms 24 so that the plate 18 and rim 13 are at once released from securement to the other parts of the housing. The rim 13 can then be lifted, together with the plate 18, flexible tube 28, and dust receptacle 29 and when these removed parts are taken to the place

where the receptacle is to be emptied, the plate 18 is simply drawn away from the extension 13 thus unfolding the receptacle 29 to its substantially tubular form affording an ample aperture within the inner flange 15 of the rim 13 for the escape of dust. The rim 13 is adapted to be set on a piece of paper and held down by the toes while the bag is shaken for the purpose of emptying the dust. Spreading of the dirt round about in the emptying process is thus eliminated. The parts are easily replaced upon the motor housing and re-clamped in position for further operation.

The above described arrangement of the dust receptacle and parts associated with it are made the subject of an application for United States Letters Patent filed concurrently herewith by me, Serial No. 386,906.

The mode of operation of the above described apparatus is as follows:

The several parts being assembled as shown in Fig. 1, the apparatus is carried to the room where it is to be used. The securement of the flexible tube 28 to the educt port extension 16 is sufficiently firm to enable the flexible tube 28 to be used as a support and carrying handle. The apparatus is placed in upright position on its bottom 1^a and the electric cord 4 inserted in a lamp or wall socket. A nozzle 33 (see Fig. 2) is attached to the free end of the flexible tube. The motor circuit is still open because the automatic circuit breaker 15 maintains an open circuit position so long as the apparatus stands vertically on its bottom. Other manual circuit controllers being closed, the operator gives a pull to the flexible tube 28 and the apparatus promptly tips sidewise and rests on the rounded edge 1^b of the motor housing 1 and the rounded edge 14 of the upper peripheral extension 13, as indicated in Fig. 3. Tipping the apparatus on to its side in any direction causes the circuit controller 15 to close the motor circuit automatically and the apparatus is then in operation. It will be observed that the aperture 3 through which the electric cord is introduced into the motor housing, being located well up on the side of that housing, is always held clear of the floor so that the electric cords 4 are always free. As the operator moves the cleaning nozzle from place to place no attention whatever need be paid to the motor and fan part of the apparatus; this will easily turn or roll and when the extreme radius of the flexible tube 28 is reached, the tube serves as a flexible tractor to drag the motor and fan housing over the floor to a new position.

The ease with which smooth and round edged metallic surfaces slide over either a carpet or other floor surface is well-known.

If the apparatus above described is to be moved to another field of operation, the

operator simply picks up the tube 28 at a point near the dust collecting receptacle and lifts the whole apparatus clear of the floor. The apparatus automatically assumes a vertical position, the automatic circuit controller 5 opens the motor circuit and the motor stops; nor will it resume operation until the apparatus is again put to work by tipping the motor and fan-housing again into the inclined position illustrated in Fig. 3.

An alternative form of apparatus in which certain of my improvements may be embodied is shown in Fig. 2. The housing for the operative parts comprises the motor casing 101 and an outer dish bottom plate 102 which embraces the operative parts, so as to provide a smooth bottom for the apparatus. The bottom plate 102 is smoothly rounded upward around its periphery 103 and thence extends upward in cylindrical form to the flange at 117. The housing 101 is provided with an aperture at 104 for the insertion of the electric cord 105 which is also led through a suitable aperture 106 in the cylindrical side of the outer housing plate. The motor casing 101 has a suitable cover 109, this being provided with a ledge 110 which serves as a seat for the ring plate 111. The motor 113 is mounted inside the casing 101 and carries the fan shaft, the fan 124 operating in the usual manner. The upper surface of the cover 109 serves to house one side of the fan 124, the other side of which is covered and protected by the plate 120. This plate 120 has three or more peripheral arms 121 which extend outward and then downward so as to rest upon the ring 112 which is secured as by screws 122 to the ring plate 111. The top plate 120 is provided with a preferably integral tubular extension 123 which serves as an induct port or channel to the fan 124. The educt from the fan extends entirely around its periphery between the plate 120 and the ring plate 111. The plate 120 is secured as by screws 120^a to the cover plate 115. This cover plate has a flange 116 which is seated upon the flange 117 and is secured thereto as by wing nuts 118. Securement of the motor flange 115 by means of these wing nuts 118 brings the ends of the arms 121 to bear firmly on the ring 112 and thereby holds the ring plate 111 securely seated on the ledge 110. The outer members of the above described motor and fan housing are provided with perforations at 107, 108 and 119 to allow the escape of air from the dust collecting receptacle 126. This receptacle is generally speaking tubular in form and resembles somewhat the dust receptacle shown in Fig. 1 and described above. One end 127 of this receptacle is securely clamped between the

ring 112 and the plate 111 by means of the screws 122. The other end of the dust receptacle 128 is clamped between the outer cover plate 115 and the fan covering plate 120 as by screws 120^a. The annular space between the motor housing 101 and the outer member 103 and 115 of the above described housing provides the necessary room for the inflation of the dust receptacle 126 through the meshes of which air escapes and passes out through the holes 107, 108 and 119 leaving the dust inside the receptacle. A flexible tube marked 125 in Fig. 2 is secured to the induct port extension 123 and will carry at its free end a dust inhaling nozzle. The housing of the apparatus shown in Fig. 2 is adapted to turn and slip easily on the floor by reason of its smooth bottom and smoothly rounded lower edge. In general its mode of use will be the same as that of the apparatus described in connection with Figs. 1 and 2, (with this exception, that the normal operating posture is that shown in Fig. 2). The apparatus seats squarely upon the floor and is intended to tip only slightly in response to a pull on the flexible tractor 125. The low, flat shape reduces the tendency towards upsetting. The removal of the dust receptacle for the purpose of emptying is substantially the same as that above described in connection with Fig. 1. The cover plate 115 being detached from the lower housing member 102, 103, the dust receptacle 126 with the plate 120 and ring plate 111 attached thereto can be readily lifted and conveyed away from emptying purposes and the receptacle 126 will be extended into its substantially tubular form for the purpose of shaking out the dust through the opening in the ring plate 111.

Considered in its general aspect, my invention may be defined as that improvement in vacuum cleaners which consists in housing the fan and motor in a casing adapted to be carried solely by the hose and to roll and slide bodily on the floor as the hose is used, following the movements of the operator. Casters and rollers being omitted there is no necessity for the operator to pay attention to the position or behavior of the casing and the entire attention may be concentrated upon the cleaning. It will be understood that the numerous details of construction, such as the shape and mode of attachment of the bag, the design and detail structure of the casing, and other subsidiary features can be very greatly modified, and additions made without departing from my invention, wherefore I do not limit myself to any details except as the same are specifically recited in my several claims which I desire may be construed, each without reference to limitations contained in other claims.

What I claim and desire to secure by Letters Patent is:

1. A vacuum cleaner comprising, in combination, a portable casing having a fan and motor therein and adapted to lie directly on the floor, and a suction hose attached to said casing and having the double function of constituting a connection for a cleaner tool and a handle for said casing, the portion of said casing which rests on the floor while said cleaner is being used having a rounded shape to permit it to roll and tip bodily to accommodate itself to the movements of the hose.

2. A vacuum cleaner comprising, in combination, a portable casing formed as a surface of revolution about an axis, said casing having a fan and motor therein and adapted to roll on the floor and a length of hose connected axially to said casing and adapted to have a working tool secured thereto, said hose constituting the sole handle for said casing, the portion of said casing which normally lies on the floor having a rounded shape to permit the casing to roll and tip freely in accordance with the movements of the hose.

3. A vacuum cleaner comprising a hose, a suction tool at one end thereof, a casing secured to the other end thereof so as to be carried thereby, a dust bag carried by that end of said casing to which said hose is attached, an electric motor within said casing, and a suction device between said bag and motor and communicating with said hose and bag, said casing being exteriorly rounded so as to turn, tip, and roll bodily to accommodate itself to the movements of the hose.

4. A vacuum cleaner comprising, in combination, a hose, a hollow casing secured to one end of said hose and having an enlargement at the end from which the hose projects, a fan and motor in said casing, and a working tool at the other end of said hose, said casing shaped to roll bodily on the floor while the cleaner is in use and said hose constituting the handle for said casing.

5. A vacuum cleaner comprising a hose and a casing formed as a surface of revolution about an axis, the hose being attached to and communicating with said axis concentrically, a motor and a fan in said casing and a dust separator carried by said casing, said casing arranged to roll bodily on the floor while the cleaner is in use and a portion of the casing nearest said hose having a peripheral enlargement whereby said casing may assume a position with its axis oblique to the floor on which it lies.

6. Vacuum cleaning apparatus comprising a flexible tube, a dust inhaling nozzle on one end of the tube, a suction motor, and casing therefor on the other end of the tube, the casing adapted to rest on a floor and to

be easily drawn about by the flexible tube when said casing is tipped sidewise, and a circuit controller carried by the casing, adapted to close the motor circuit when the casing is tipped sidewise and open it when the casing stands upright.

7. Vacuum cleaning apparatus comprising a flexible tube, a dust inhaling nozzle on one end of the tube, a motor, suction producer, and housing on the other end of the tube, the housing having a peripheral extension near the end having junction with the flexible tube and adapted to rest on a floor partially supported by said extension.

8. Vacuum cleaning apparatus comprising a flexible tube, a dust inhaling nozzle on one end of the tube, a fan, motor, and housing on the other end of the tube, the junction of the tube located centrally over the top of the housing, the housing having a peripheral extension near its junction with the flexible tube and adapted to rest on a floor and to be easily drawn about by the tube when tipped sidewise and partially supported by said extension.

9. Vacuum cleaning apparatus comprising a flexible tube, a dust inhaling nozzle on one end of the tube, a motor and suction apparatus on the other end of the tube and adapted to rest directly on and be drawn over the floor, and an annular dust collecting receptacle surrounding the flexible tube.

10. Vacuum cleaning apparatus comprising a flexible tube and a nozzle, a fan, a motor, a round sided flat bottomed housing for the motor, an induct to the fan coaxial therewith, a flexible tube attached to said induct, an educt from the fan disposed about

the periphery thereof, a dust collecting receptacle having an annular mouth surrounding and engaging with said peripheral educt, the said housing adapted to rest on a floor.

11. Vacuum cleaning apparatus comprising a flexible tube and a nozzle, a fan, a fan-motor, and a housing having near its top a peripheral extension, an induct to the fan, a flexible tube attached to said induct, a dust collecting receptacle disposed about the tube, the said peripheral extension adapted to support the housing in inclined position while resting on a floor and to hold the dust collecting receptacle clear of the floor.

12. Vacuum cleaning apparatus comprising a flexible tube and a nozzle, a fan, fan-motor, a round sided flat bottomed housing having its axis substantially coincident with that of the motor and fan shaft and having a peripheral extension near its top, an induct to the fan coaxial therewith, a flexible tube attached to said induct, an educt from the fan disposed about the periphery thereof, a dust collecting receptacle having an annular mouth surrounding and engaging with said peripheral educt and surrounding the induct, the said peripheral extension near the top of the housing adapted to support the casing in an inclined position while resting on a floor and to hold said dust collecting receptacle clear of the floor.

Signed by me at Boston, Mass., this 28th day of May 1920.

STANLEY McCLATCHIE.