July 18, 1933. R. A. PONSELLE 1,918,713

VACUUM CLEANER

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Fig. 1,

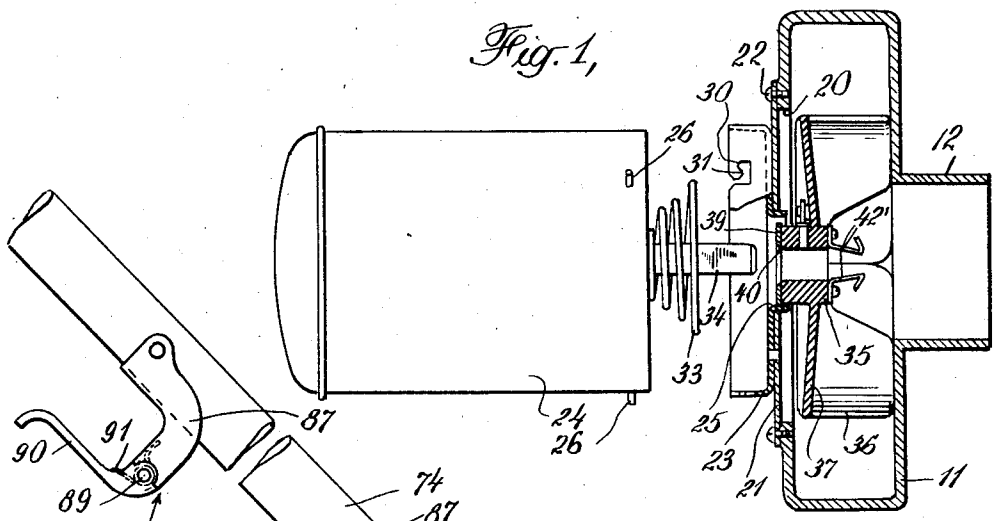



Fig. 3,

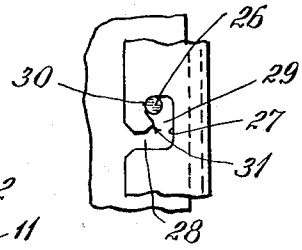
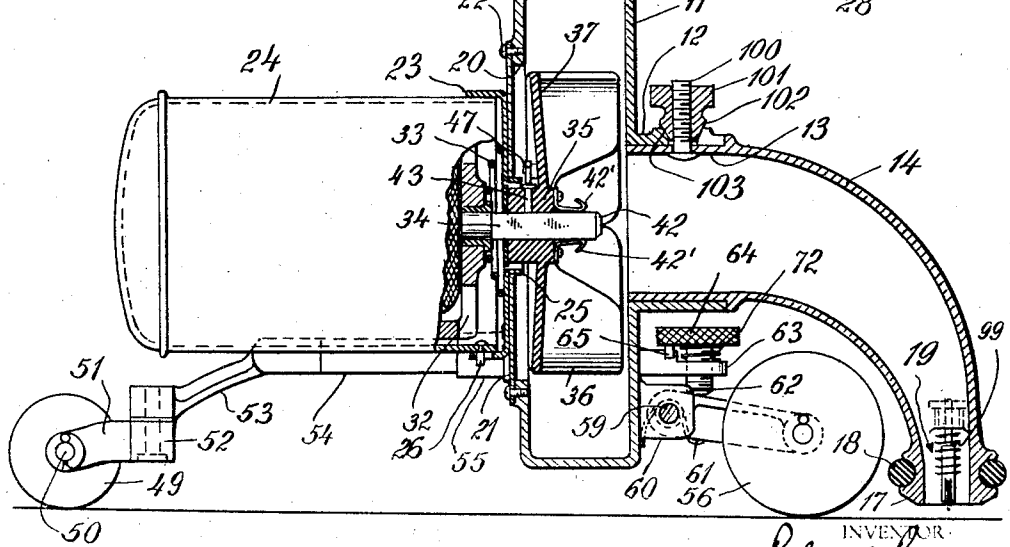



Fig. 2,




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Fig. 4,

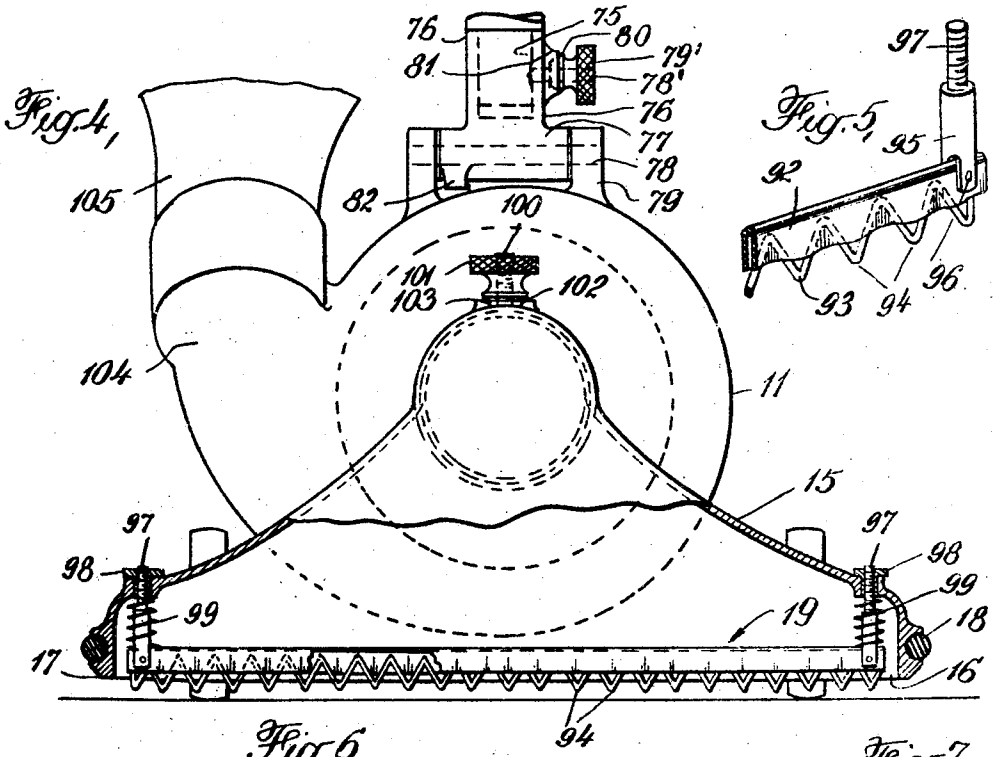



Fig. 5,




Fig. 6,

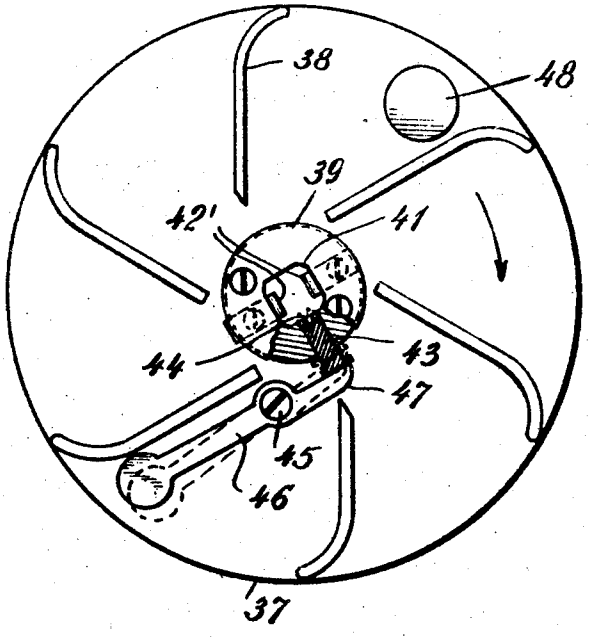



Fig. 7,

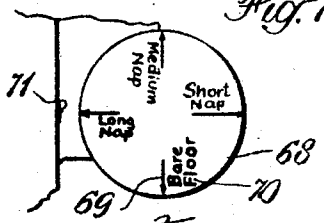
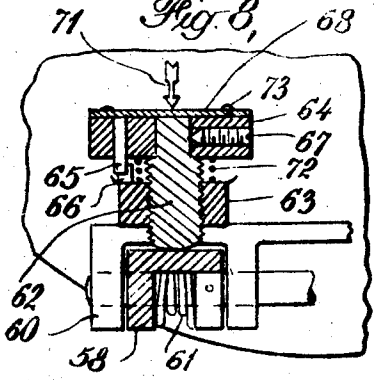



Fig. 8,




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Fig. 9.

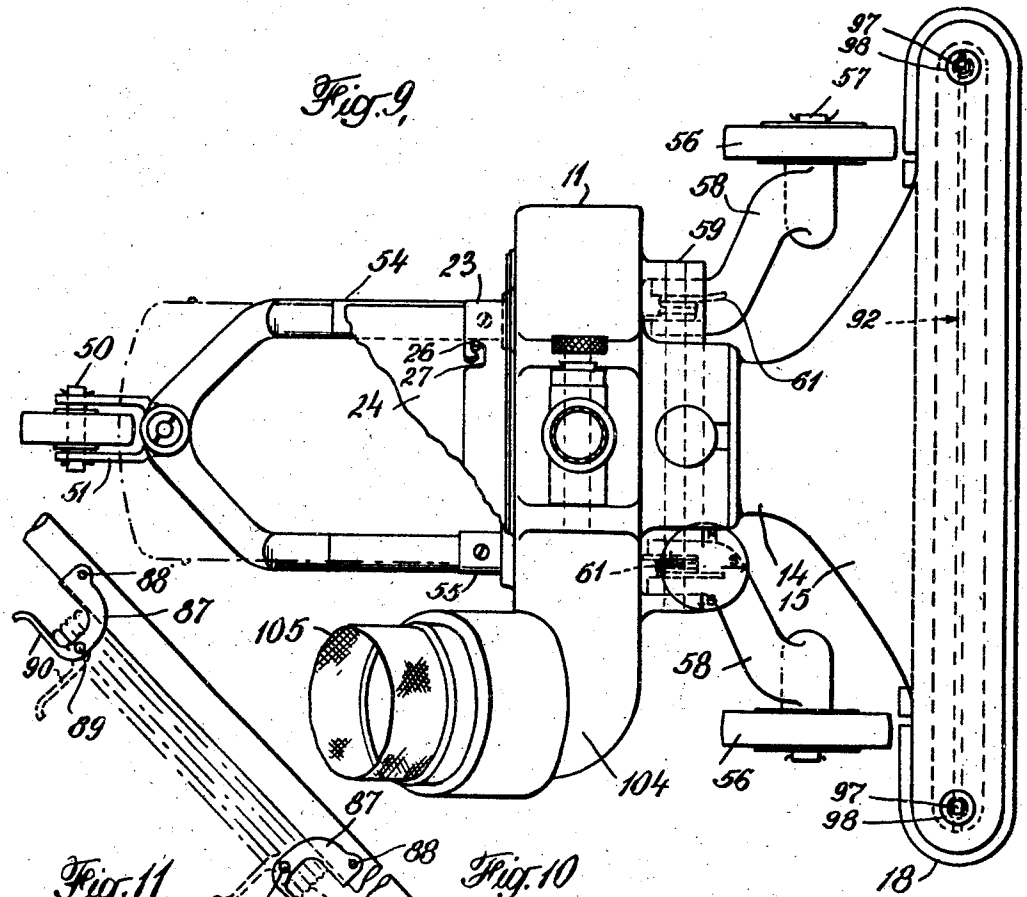



Fig. 11.

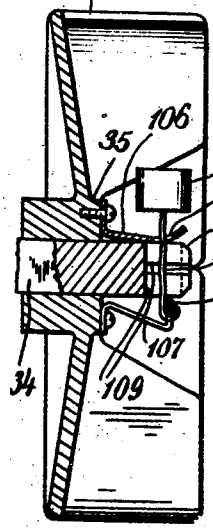



Fig. 10

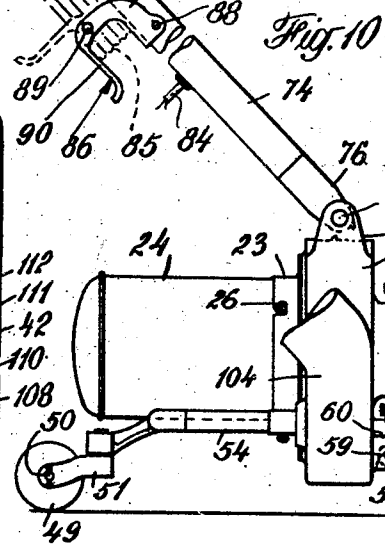
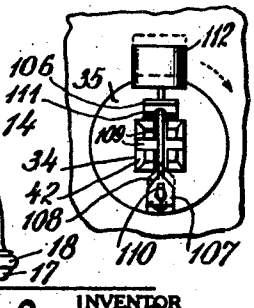



Fig. 12.




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# UNITED STATES PATENT OFFICE

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## VACUUM CLEANER

Application filed May 26, 1928. Serial No. 280,680.

This invention relates to portable motor driven devices useful for maintaining floors and floor coverings, such as carpets, rugs and the like, in sanitary and sightly condition. More particularly, the invention is concerned with the provision of a set of machines by which dirt and dust may be removed from rugs and floors, and the floors waxed and polished, the machines of this set having certain parts or elements which may be transferred from one machine of the set to another with great facility, thus avoiding the necessity of duplicating these parts and thereby reducing the cost of the set to the purchaser.

Both a vacuum cleaner and a floor polishing machine are small portable motor driven devices, and I have noted that in both machines various parts, such as the driving motor, the operating handle, and the conductor cable are duplicated. These parts, and particularly the motor, form an important element in the final cost of the machine, and I have solved the difficulty which confronts the householder by devising a pair of machines for the two different purposes, which are closely related in construction and so arranged that only a single set of these parts is provided, which may be transferred without difficulty from one machine to the other. By reason of this construction, the purchaser is enabled to secure both machines at much less than the cost of the two machines purchased separately and each machine complete in itself, so that the average household, otherwise able to afford only a single machine, is now enabled to secure both at only a slight additional cost over the cost of one.

By way of exemplification of the invention, I shall describe in detail the vacuum cleaner forming part of this set of machines and shall point out those features of the construction which make it possible for the average user to make the transfer of parts from one machine to the other, an essential in this connection being that the transfer shall not involve the use of tools or require adjustment of the parts to place the machine to which the transfer is made, in complete operating condition.

In the drawings:

Fig. 1 is a view of the motor and fan housing partly in section, illustrating the manner of attaching the motor in position and connecting its shaft with the fan;

Fig. 2 is a view partly in side elevation and partly in section of the machine with the motor in operative position;

Fig. 3 is a plan view of the detail of the motor mounting;

Fig. 4 is a front view of the machine with the nozzle shown in section;

Fig. 5 is a perspective view of a portion of the nap opener and thread loosener;

Fig. 6 is a view in front elevation of the fan;

Fig. 7 is a plan view of a part of the nozzle adjusting mechanism;

Fig. 8 is a sectional view through a part of this mechanism;

Fig. 9 is a plan view of the machine with part of the motor and its mounting broken away;

Fig. 10 is a view of the machine in side elevation showing the novel cable reel on the handle;

Fig. 11 is a view in side elevation of a modified form of locking device for the fan; and

Fig. 12 is an end view thereof.

Referring now to these drawings, the machine is seen to include a fan housing 11 of the usual spiral construction provided on its front face with a forwardly extending neck 12 in which is received the tubular end 13 of a nozzle 14. This nozzle extends from the open neck 12 downwardly toward the floor surface, flaring laterally at its lower end as indicated at 15 and terminating in an elongated intake opening or slot. The edge of the nozzle is thickened, as indicated at 17, to provide a work engaging surface contacting more or less closely with the surface to be cleaned, and seated in a suitable channel extending around the intake end of the nozzle is a rubber cord 18 serving as a bumper to protect the furniture. Mounted in the slot is a thread loosener 19, which will be described in detail hereafter.

In its rear face, the fan housing has a

central opening 20 which is partially closed by a circular plate 21 secured to the wall of the housing by any suitable means, such as screws 22. Attached to the outer face of this plate is a cup member 23 which provides a mounting for an electric motor 24 of usual construction. The plate 21 has a central opening into which projects a flange 25 on the mounting 23. The motor casing is provided with a plurality of projecting pins 26 which are receivable in bayonet slots 27 in the cup member. As shown in Fig. 3, each slot has an entrance opening 28, a passage 29 at right angles thereto and another portion 30 cut back so as to provide a projection 31. Mounted on the end frame member 32 of the motor is a coil spring 33, and when the motor is to be placed in the mounting, its shaft 34 is moved through the opening in the fan housing defined by the flange 25, and the pins 26 enter the portions 28 of the bayonet slots 27. The motor is moved into the mounting against the action of the spring 33 and then given a partial turn so that upon release of the motor the pins 26 enter their seats 30 in the bayonet slots and the motor is held against endwise and turning movement, in one instance by the projections 31 and by the walls of the undercut portions 30 of the slots, and in the other by the action of the spring 33.

It will be seen that in this mounting of the motor of the housing, the motor is first moved toward the fan housing beyond its normal position, then given a partial turn and when released the motor is moved back from the housing a short distance by the spring 33. This movement of the motor is utilized in placing the fan properly on the motor shaft.

The shaft is received directly into the hub 35 of the fan 36, disposed within the fan housing. Attached to the hub and preferably formed integral with it is a disc 37 on which are mounted the fan blades 38, the hub, disc and blades preferably being formed integrally as a single casting. Mounted on the face of the hub opposite to that from which the fan blades extend is a plate 39 having a beveled entrance opening 40 to facilitate the entrance of the shaft into the hub. The shaft and the hub opening are of such section that when engaged, the two are locked against relative rotary movement. For this purpose the shaft and opening may have various sections but as illustrated, they are square with their corners beveled off, as indicated at 41 in Fig. 6. The end of the shaft is also beveled off as shown at 42.

The hub 35 of the fan is preferably sufficiently long to extend into the opening defined by the flange 25 and when the motor is detached from the housing, the fan is supported in substantially normal operating position. For this purpose the hub contacts with the lower part of the flange as shown in Fig. 1, the fan blades then resting in contact with the inner surface of the front wall of the housing. The opening defined by the flange 25 is only slightly greater than the diameter of the hub and end plate 39 so that the opening through the plate and hub when the motor is detached from the housing is not far removed from the position it occupies when the fan is in normal operating position. Other arrangements may be used for this purpose. When the motor is to be mounted in position, the beveling of the end of the shaft and of the entrance opening through the plate into the hub permits the shaft to enter the hub without the necessity of the operator moving the fan to normal position.

Attached to the front face of the hub are two leaf springs 42′ arranged to bear against opposite flat surfaces of the shaft when the latter projects beyond the hub. With this arrangement, the moving of the motor into its mounting causes the shaft to pass through the hub and be engaged by the springs. The springs grip the shaft firmly but not sufficiently so as to interfere with the insertion of the motor into position and in such movement of the motor the fan is raised to normal operating position, with the edges of its blades remaining in contact with the inner surface of the housing. When the motor is given a partial turn and allowed to move away from the mounting to permit the pins to seat properly in their slots, the grip of the springs 42 on the shaft 34 causes the fan to move with the shaft in the rearward movement of the latter. The bayonet slots are so formed that as the motor is moved away from its mounting to seat the pins 26 in slot 30, the fan is moved away slightly from the inner surface of the front wall of the housing and is in proper operating position, so that upon rotation it will not contact with any part of the housing. Preferably, the end of each projection 31 lies spaced from the opposite wall of the passage 29 a distance only slightly greater than the diameter of one of the pins 26. The motor must therefore be moved so that the pins lie close to the far walls of the passage 29 when the pins are to enter the passage 29, and then when the motor is released, its spring moves it back until the pins seat at 30. The distance between a seat and the far wall of passage 29 determines the spacing of the fan from the fan housing wall and this may be greater or less as desired by properly forming the seats 30. The spacing is therefore always uniform and does not depend on the judgment of the operator.

When the motor is mounted in place on the machine, it occupies the position shown

in Fig. 2 and the operative position of the fan is likewise illustrated in that figure. The fan is shown properly positioned lengthwise of the shaft and this positioning of the fan on the shaft has been accomplished without intervention of the operator, that is, without the operator doing anything other than positioning the motor in place on the frame. When the motor is to be removed from the housing, it is first forced into its mounting against the action of the spring 33, so that pins 26 may clear the projections 31 in the slots. The motor is then given a slight turning movement and withdrawn from the mounting, the pins passing out through the entrance openings 28 of their slots. During this movement of the motor the fan moves with the shaft until the disc 37 engages the rear housing wall and when the motor is entirely disengaged the fan rests in the position illustrated in Fig. 1 and is supported with its hub in contact with the flange which forms a part of the housing, in substantially normal operating position.

In order to prevent movement of the fan lengthwise of the shaft while it is rotating, such movement being produced by different air pressures on opposite faces of the fan or for other reasons, the fan may be provided with locking devices of different kinds, two of which are illustrated in Figs. 6 and 11. The form shown in Fig. 6 consists of a pin 43 mounted in a bore in the hub of the fan and having a double pointed end 44 which may contact with the surface of the shaft. Mounted on a pivot 45 attached to the fan disc 37 is a weighted lever 46, one end 47 of which bears against the head of the pin 43, a counter-weight 48 being disposed diametrically opposite to the lever to maintain the fan in balance. The lever 46 is so mounted that when the fan is rotated the centrifugal action swings the lever to the dotted position illustrated in Fig. 6, in which position its end 47 engages the head of the pin 43 and forces the inner end of this pin into contact with the shaft. The force exerted by the lever due to centrifugal action is sufficient to hold the fan against axial movement with reference to the shaft, but this locking action is only effective while the fan is in rotation and thus in no way interferes with the free removal and replacement of the motor when required.

In the form of fan locking device shown in Fig. 11, the fan 36 carries a single spring 106 similar in purpose to the springs 42'. The hub also carries a second spring 107 provided with a flat end 108 terminating in a point which extends toward the projecting end of the shaft 34. The end of the shaft has a slot 109 formed diametrically in it, or it may have two such slots at right angles. Attached to the end 108 of the spring 107 is a wire 110 which extends through a slot 111 in the spring 106 and carries a weight 112 at its end. If the shaft is square, two slots 109 will be preferable but if the shaft is so formed, as for instance, with a pair of oppositely disposed flats, so that it can be introduced into the fan only with one or the other of the flats in a definite relation to the spring 107, only one such slot is required.

With this arrangement, when the shaft is introduced into the hub, the slot receives the wire 110, and the pointed end 108 of spring 107 lies clear of the shaft. When the shaft is rotated, centrifugal force acting on the weight 112 pulls the end 108 into contact with the shaft and the pointed end enters the slot slightly so that the converging edges of the spring are forced into contact with the edges of the slot with a force depending on the size of the weight and the speed of rotation. The engagement of the spring and shaft holds the fan against movement axially of the shaft and the device operates only when the shaft is rotating and thus in no way interferes with removal or insertion of the shaft.

The machine is mounted on a three-point rolling support provided by the casters 49 and 56, the rear caster being mounted on a pin 50 in a yoke 51, pivotally mounted on a vertical pin 52 in the end of a U-frame 53. This frame is mounted on the ends of a pair of bars 54, the other ends of these bars being received in cups 55 attached to the rear face of the fan housing. With this arrangement, the motor is free to be placed in its mounting and when in that position, it lies partially between and free of the rods 54, the U-member 53, being formed at an angle so that the pivot mounting for the yoke 51 lies clear of the rear end of the motor and below it.

Each of the front casters 56 is mounted on a stud shaft 57 secured in the end of an arm 58 rigidly mounted on a shaft 59 supported within the ends of a bracket 60, projecting forwardly from the front face of the fan housing below the nozzle. Springs 61, engaging the housing and the arms 58, tend to swing these arms upwardly from the floor and by varying the position of the arms, the nozzle intake opening may be raised and lowered from the floor surface as may be required in cleaning rugs or carpets having naps or piles of different lengths.

The adjustment of the nozzle is accomplished by means of a screw 62 threaded through a lug 63 projecting from the front face of the housing above the bracket 60 and bearing at its lower end against the top surface of one of the arms 58. On the top of this screw is a circular disc 64 in which is mounted a pin 65 projecting downwardly from its under surface and adapted to en-

gage a stop 66 on the lug 63. The disc is held in position on the end of the screw by a set screw 67, extending through a bore in the periphery of the disc and engaging the screw at its inner end. On the top of the disc is mounted a dial 68 having index arrows 69 with legends 70, and a reference arrow 71 is placed on the wall of the fan housing adjacent the index plate 68. A spring 72 encircling the screw 62 bears at one end against the top surface of the lug 63 and at the other against the under surface of the disc 64. By turning the disc 64 to force the lower end of the screw 62 into contact with the top of the arm 58, the front end of the machine is raised from the floor, thus carrying the intake slot in the end of the nozzle further from the floor surface.

The screw 62 has a coarse thread so that the entire range of adjustment of the nozzle necessary for the nap of rugs of different kinds is secured by less than a complete turn of the screw and for this reason the dial plate and reference arrows may be used. The arrows on the index plate are properly positioned so that by bringing these arrows into registry with the reference arrow 71 the nozzle will be positioned at the proper height for the different naps indicated on the index plate. The engagement of the pin 65 with the stop 66 limits the movement of the screw and therefore of the nozzle in both directions, the pin engaging one face or the other of the stop 66 to determine the range of adjustment. The purpose of making the screw and the operating disc separate is to provide for a close adjustment of the parts without the necessity of making the screw and the thread in the lug 63 with extreme accuracy. In assembling the parts, the screw is threaded into the lug and turned to the position which it occupies to position the nozzle at one end of the range of adjustment, then the disc 64 is placed on the end of the screw and moved until the pin 63 is against the proper face of the stop. With the parts in this position, the set screw 67 is turned against the end of the screw 62 to hold the disc rigidly in position thereon and the index plate 68, which has been previously attached to the top of the disc 64 by rivets 73, is now in proper relation to the reference arrow.

The nozzle adjusting device thus constructed, permits the operator to adjust the height of the nozzle for different kinds of surfaces or carpets with different naps without difficult, less than a complete turn of the adjusting screw being required, the proper position being readily obtained by bringing one or the other of the index arrows on the dial plate into registry with the reference arrow.

The machine is moved about the floor surface by means of an operating handle 74, the end 75 of which is receivable in a shank 76 of a member 77 pivotally mounted on a pin 78 extending between lugs 79 projecting upwardly from the top of the fan housing. The shank 76 of the member 77 has a longitudinal slot through which may pass a screw 78′ on the end 75 of the handle and on the end of this screw is a nut 79 with a knurled periphery, this nut having a conical face 80 which may be seated in a boss 81 on the shank 76. The slot enters the boss so that by unscrewing the nut 79′, the handle with the screw and nut may be readily removed from the member 77. When the handle is placed in position, the nut may be turned to seat its end in the recess in the boss, the nut and boss thus holding the handle securely in position. The member 77 is provided with a projection 82 which may contact with a stop 83, formed on the housing to limit the swinging movement of the handle in one direction.

Extending through the handle to a motor control switch, not illustrated, is one end of a conductor cable 84 which is provided at its end with a quick attachable connector by which the cable may be connected to the motor terminals. Leading from the switch is a length of conductor cable 85 by which the machine may receive power from an ordinary wall or floor socket and this cable is ordinarily carried on a reel formed by a pair of arms 86 attached to the handle. Each reel arm consists of a part 87 fitting the curved surface of the handle and secured thereto by any suitable means as by pins 88. Pivotally mounted on a pin 89 at the end of the member 87 is the terminal portion 90 of the arm, and a spring 91 encircles the pin 89 and holds the terminal portion normally in position shown in Fig. 2. This portion 90 of the arm 86 extends parallel with the handle to form a U-shaped recess in which convolutions of the cables may be received, the two arms thus forming a reel about which the cable may be wound. Under normal conditions the cable occupies the position shown in dotted lines in Fig. 10 but when the cable is to be removed, the terminal portions 90 of the arm may be swung to the dotted line positions illustrated in Fig. 10 in which they permit the entire coil of cable to be removed bodily from the handle without necessitating its being unwound one convolution at a time. When the terminal portions of the line are released they are restored to normal position by the spring 91. This construction of the reel arms greatly facilitates the removal of the cable when the machine is to be put into use and in no way interferes with the normal purpose of the reel to support the coil of cable.

The thread loosening device 19 previously referred to, comprises a U-shaped substantially rigid strip of metal 92 between the

legs of which is mounted a wire 93 bent to zig-zag form and held in position by crimping together portions of the sides of the strip 92 between successive teeth formed by the wire 93. The mounting of the wire in this manner in the strip provides a plurality of projecting teeth 94, which act as a comb to loosen pieces of thread and lint which may cling to the surface being cleaned. The projecting points also enter and loosen the nap so that the air currents may reach more deeply into the carpet or rug and clean it more effectively. Each end of the strip is mounted in a slot formed in the lower end of a short rod 95, the strip being held in position therein by means of a pin 96. Each of the rods 95 has a threaded portion 97 at its upper end, these portions being threaded into nuts 98 mounted for free movement in apertures in the nozzle. Encircling each rod is a spring 99 which bears at one end against the top of the strip 92 and at the other at the inner wall of the nozzle. This construction provides a mounting for the strip which is yielding in a direction away from the floor, and also permits the strip to swing to a slight extent. The strip and teeth however are rigid and so capable of loosening thread or lint and opening the nap as described. In normal use the position of the strip with its wire is adjusted so that the points of the wire will engage and open the nap and the springs provide the desired pressure against the surface to be cleaned.

The entire machine may readily be assembled and dismantled by removal of the plate 21 which partially closes the motor housing. When this plate is removed the fan may be taken from the housing for inspection or repair as may be required. The rear or circular end of the nozzle 14 is provided with a threaded bolt 100 carrying a knurled head nut 101 with a conical end 102, and the projecting neck 12 of the housing is slotted to receive the screw as the end of the nozzle enters the neck. This slot is provided with a conical seat 103 at its inner end so that the nut may be turned down so as to bring its conical surface into engagement with its seat. This holds the nozzle in rigid position and permits ready removal when required.

The fan housing is at one side provided with the usual tubular outlet 104 to the end of which may be attached one end of a dust bag 105 of the usual form, the upper end of the back being secured to the handle by any suitable means.

It will be seen that with this machine, the motor and the operating handle with its conductor cable may be quickly removed without the use of tools and as easily replaced. When the motor is out of its mounting, the rotary element, in this instance the fan, driven thereby, is held substantially in normal operating position and when the motor is placed on the mounting and its shaft enters the hub of the fan the insertion of the motor in the mounting at the same time brings about a proper spacing of the fan lengthwise of the shaft. This positioning of the fan on the shaft is automatic and requires no manipulation or adjustment of the parts by the operator. I construct the floor polisher forming a part of the set of machines so that the same motor mounting is provided and the same adjustment of the rotary element of this polisher driven by the motor shaft is secured. In each instance, the motor is disengageable from the fan and removable from the machine solely by an axial movement, although a slight turning of the motor is required to place it in a position on the mounting so that removal can be accomplished. However, no turning of the motor shaft relative to the fan is required and thus it is not necessary for the operator to hold the fan or the motor shaft against movement or to rotate these parts relative to one another to bring about their disengagement.

The transfer of the handle from one machine to the other is accomplished simply by unscrewing the holding nut and in a set of machines constructed in accordance with the principle of this invention, there is no duplication of the motor, the handle, the motor switch or the conductor cable. These parts together represent approximately one-half the cost of a single machine and by constructing these machines in accordance with my invention, the total cost of a set is reduced to an extent indicated below the ordinary cost of two machines complete in themselves. This invention, therefore, places within the means of an ordinary householder, equipment necessary for maintaining all of the floors of his dwelling in sanitary and sightly condition.

I claim:

1. In a floor treating machine, a casing, a motor removably mounted on said casing so that the end of the shaft thereof extends within the casing, said end being non-cylindrical in form, a rotatable element within the casing having a non-cylindrical opening therein to receive said shaft, spring clip means on said rotatable element engaging said shaft when its motor is mounted on the casing to hold said element in position thereon, and clamping means on said element to clamp said element in position on said shaft.

2. In a floor treating machine, a casing, a motor removably mounted on said casing so that the end of the shaft thereof extends within the casing, said end being non-cylindrical in form, a rotatable element within the casing having a non-cylindrical opening therein to receive said shaft, spring clip

means on said rotatable element engaging said shaft when its motor is mounted on the casing to hold said element in position thereon, clamping means on said element to clamp said element in position on said shaft, and means operated by centrifugal force to operate said clamping means.

3. In a floor treating machine, a casing, a motor removably mounted on said casing so that the end of the shaft thereof extends within the casing, said end being non-cylindrical in form, a rotatable element within the casing having a non-cylindrical opening therein to receive said shaft, spring clip means on said rotatable element engaging said shaft when its motor is mounted on the casing to hold said element in position thereon, clamping means on said element to clamp said element in position on said shaft, and means operated by centrifugal force to operate said clamping means, said means comprising a pivoted lever having a weight on one end thereof moved outward by centrifugal force to operate the clamping means.

4. A combination of a fan having a hub, a housing for the fan having an opening, a motor having a shaft removably entering said opening and the fan hub, the hub having a non-cylindrical opening and the end of the shaft being correspondingly shaped so that it may enter the opening to support and drive the fan, said housing including a mounting for the motor having bayonet-shaped slots therein, and also including means for positioning the hub of the fan upon the shaft of the motor, said motor having pins engaging said slots when said motor has been pressed against the housing, turned and released, and a spring for holding said motor outwardly with the pins engaging said slots.

5. A combination of a fan having a hub, a housing for the fan having an opening, a motor having a shaft removably entering said opening and the fan hub, the hub having a non-cylindrical opening and the end of the shaft being correspondingly shaped so that it may enter the opening to support and drive the fan, said housing including a mounting for the motor having bayonet-shaped slots therein, and also including means for positioning the hub of the fan upon the shaft of the motor, said motor having pins engaging said slots when said motor has been pressed against the housing, turned and released, a spring for holding said motor outwardly with the pins engaging said slots, and spring clip means on the hub for retaining it in position upon said shaft.

6. A combination of a fan having a hub, a housing for the fan having an opening, a motor having a shaft removably entering said opening and the fan hub, the hub having a non-cylindrical opening and the end of the shaft being correspondingly shaped so that it may enter the opening to support and drive the fan, said housing including a mounting for the motor having bayonet-shaped slots therein, and also including means for positioning the hub of the fan upon the shaft of the motor, said motor having pins engaging said slots when said motor has been pressed against the housing, turned and released, a spring for holding said motor outwardly with the pins engaging said slots, and means on said hub actuated by centrifugal force to retain the hub in position upon said shaft.

7. In a floor treating machine, a frame, a rotatable element within said frame and held loosely thereby, said rotatable element having a non-cylindrical opening for receiving a shaft and a resilient means for holding a shaft received in said opening, a motor having a shaft with a non-cylindrical end, mounting means on said frame for receiving said motor with its shaft extending into the opening of said rotatable element, means tending to move said motor away from the frame, and means limiting the movement away from the frame to stop the motor at a position where the shaft will support the rotating member out of contact with the frame.

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