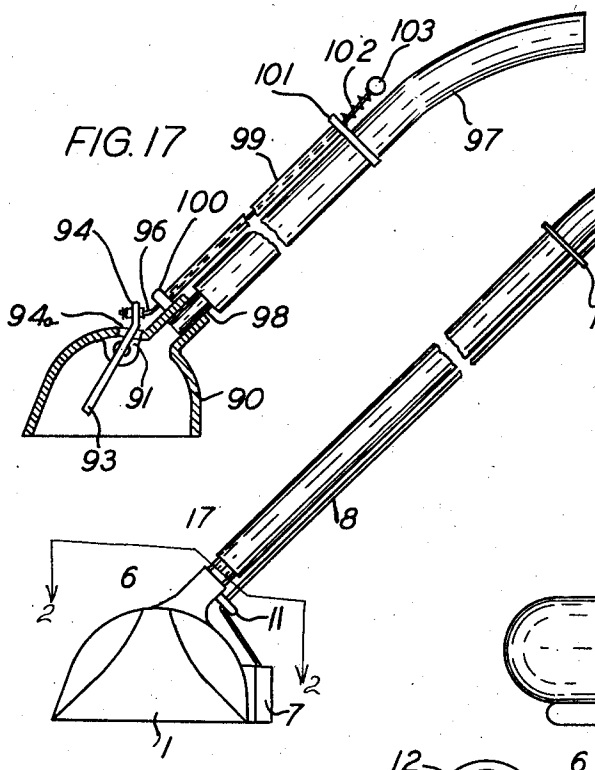
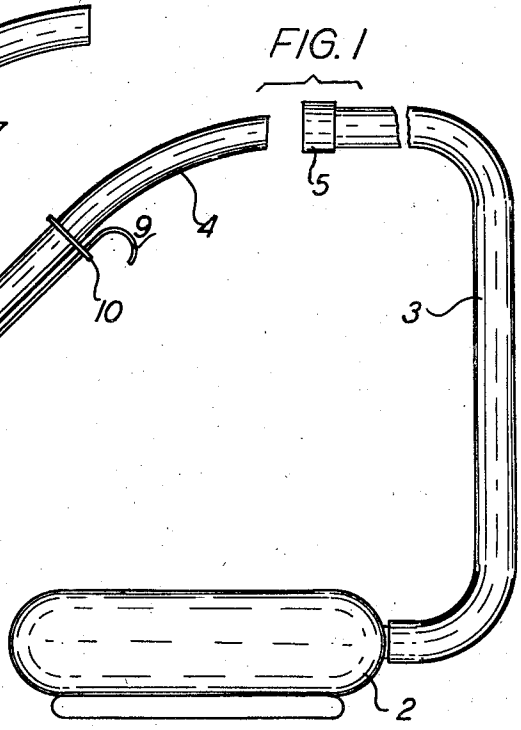
Sept. 17, 1940. F. RIEBEL, JR 2,214,862

VACUUM CLEANER

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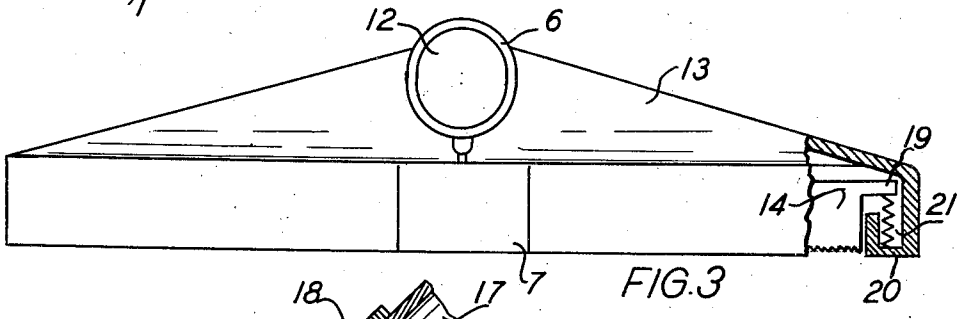


FIG. 3

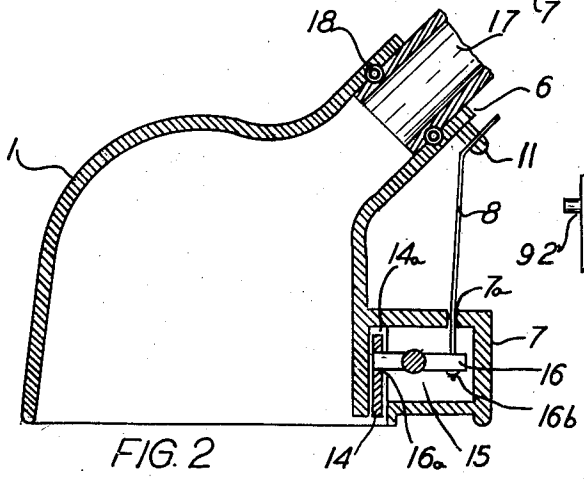


FIG. 2

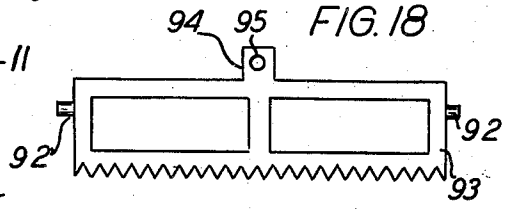


FIG. 18

INVENTOR
Frederick Riebel Jr.
BY
Alfred F. Dees
ATTORNEY

Sept. 17, 1940. F. RIEBEL, JR 2,214,862

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FIG.6

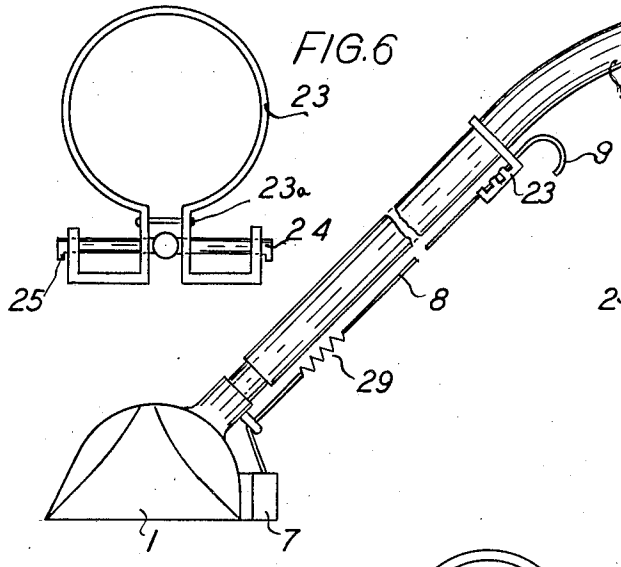


FIG.4

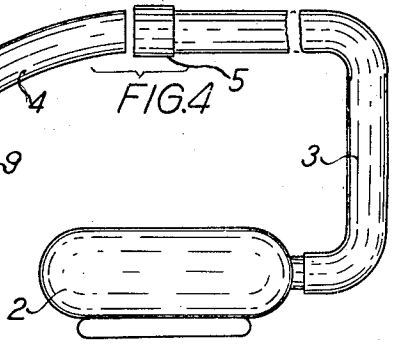


FIG.5

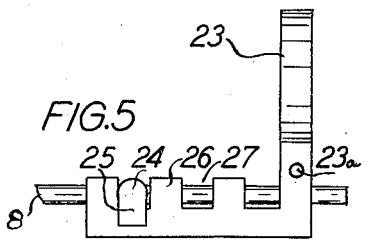


FIG.8

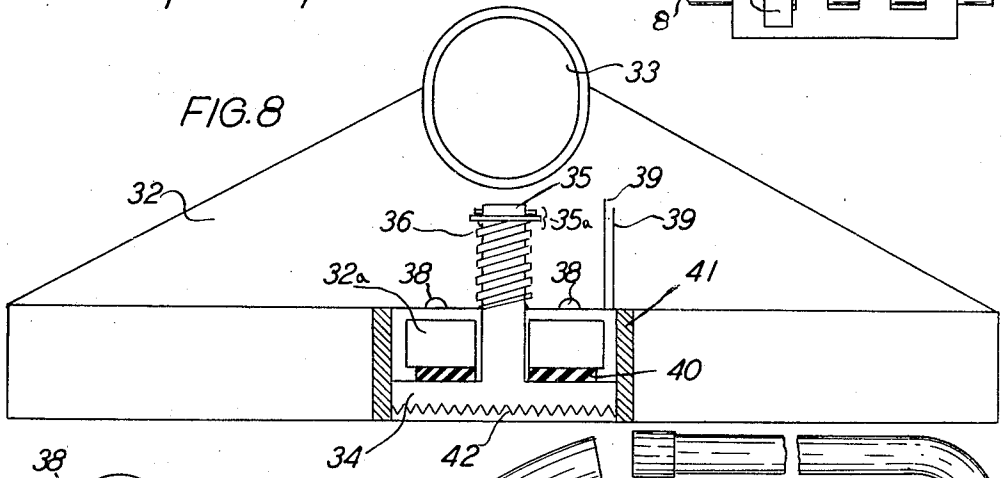


FIG 9

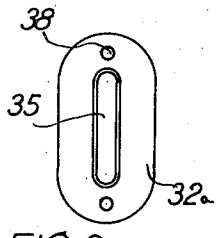
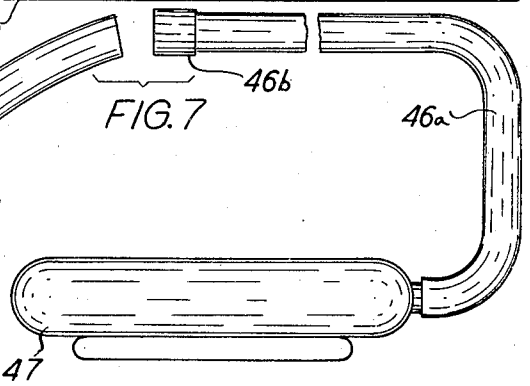
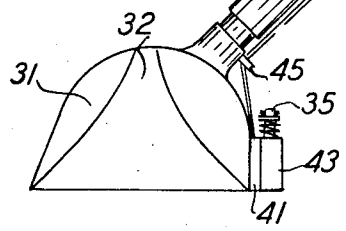


FIG. 7





INVENTOR
Frederick Riebel Jr.
BY
Alfred F. Rees
ATTORNEY

Sept. 17, 1940. F. RIEBEL, JR 2,214,862

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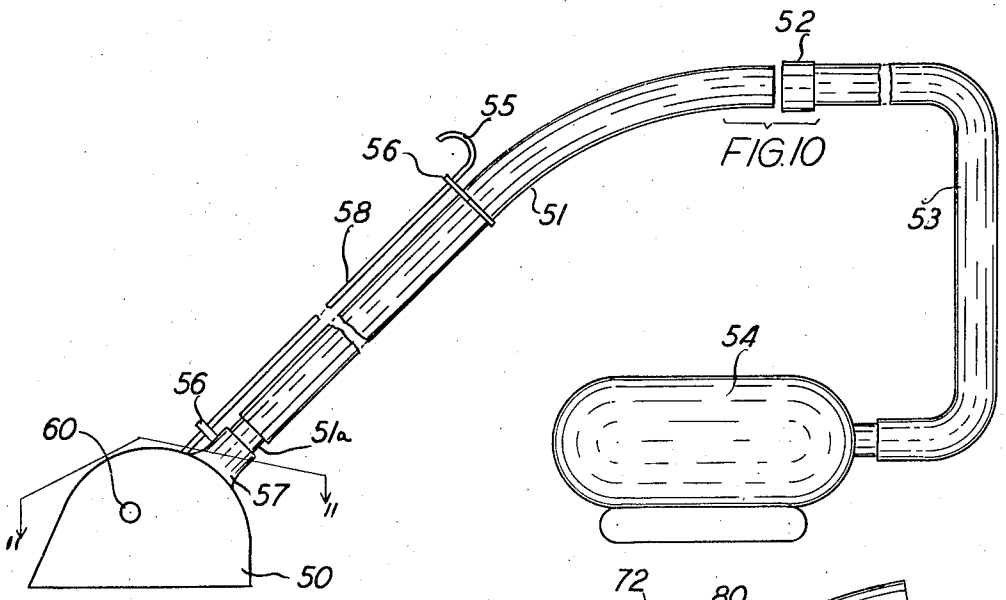


FIG. 10

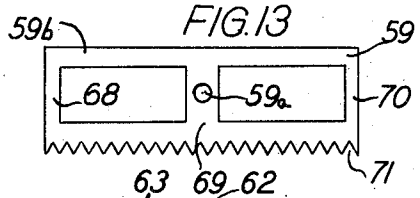


FIG. 13

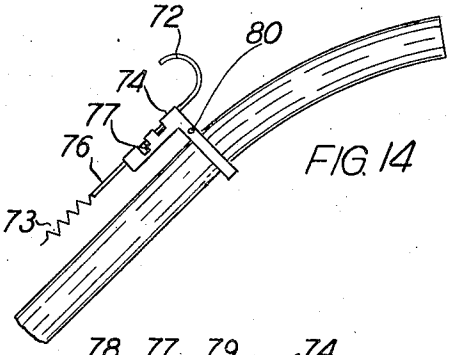


FIG. 14

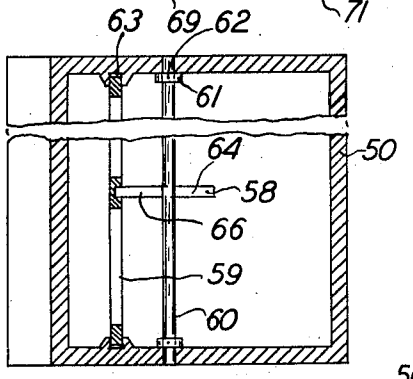


FIG. 12

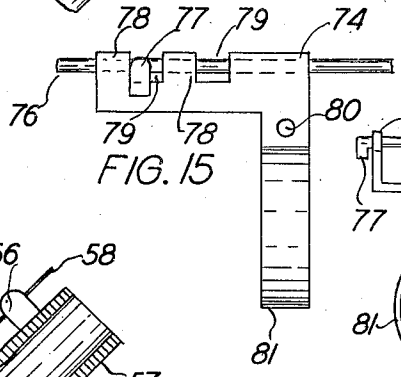


FIG. 15

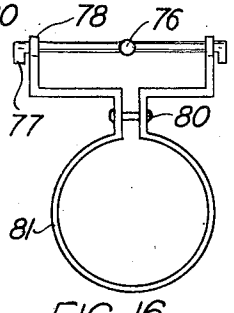


FIG. 16

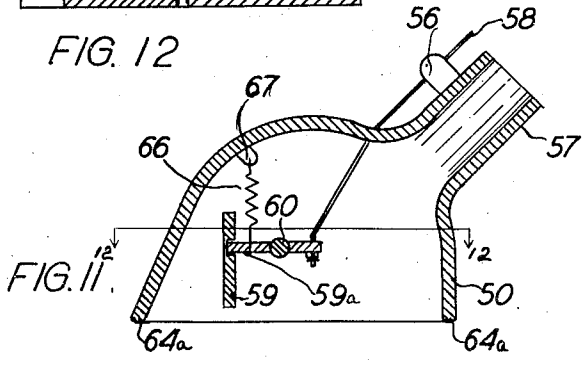


FIG. 11.

INVENTOR
Frederick Riebel Jr.
BY
Alfred F. Dees
ATTORNEY

Patented Sept. 17, 1940 2,214,862

UNITED STATES PATENT OFFICE

2,214,862

VACUUM CLEANER

Frederick Riebel, Jr., Miami Beach, Fla., assignor to Air-Way Electric Appliance Corporation, Toledo, Ohio, a corporation of Delaware

Application September 13, 1937, Serial No. 163,562

7 Claims. (Cl. 15—4)

This invention relates to vacuum cleaners and in its more specific aspects relates to a retractible agitator to be applied to the floor tool of a cleaner.

One of the objects of the invention is to produce a floor tool for a cleaner in which a comb type agitator is employed and which is capable of a ready selection for its use or for its retraction into the body of the floor tool.

Another object of the invention is to produce a mechanism in which the retractible agitator is capable of a selective operation from a position remote from the floor tool.

Another object of the invention is to produce an actuating mechanism for the control of a retractible agitator in which the comb after adjustment may be selectively retained in any one of its selected positions.

A still further object of the invention is to produce such a retractible comb type agitating device in which electrical means are utilized to selectively employ the agitator.

A still further object of the invention is to produce a structure in which the agitator is normally in the retracted position and in which the control device must be actuated in order to bring the agitator into use.

A still further object of the invention is to produce a structure in which the comb type agitator is either assembled into either one of the lips of the floor tool or in which the agitator is assembled in a position intermediate or between the lips of the floor tool.

Further objects and uses of the invention will appear as the description proceeds, and it is to be distinctly understood that the disclosures herein are not to be taken as limitations of the invention but any and all variations, modifications, and alterations of structure which come within the spirit and scope of the invention are included herein and limited only by the definition of the structure set forth in the appended claims. The accompanying drawings set forth the preferred embodiment of the structure and modifications thereof, in which:

Fig. 1 shows a general side plan view of a floor tool handle and portable suction unit;

Fig. 2 shows a cross sectional view of line 2—2 of Fig. 1 of the floor tool and the comb agitator construction;

Fig. 3 shows a rear elevational view of the nozzle, a portion thereof in section to show the assembly of the agitator therein;

Fig. 4 shows a modification of the structure set forth in Figs. 1, 2, and 3, in which there is a latching device to retain the agitator in any one of a series of selected positions;

Fig. 5 shows a detail side view of the latching device;

Fig. 6 shows an end view of the latching device;

Fig. 7 shows a further modification of the device of Fig. 1 in which the agitator is electromagnetically actuated;

Fig. 8 shows a rear elevation of the floor tool and agitator device, the view being somewhat distorted to show detail;

Fig. 9 shows a detail plan view of the electromagnet device;

Fig. 10 shows another modification of the structure of Fig. 1;

Fig. 11 is a sectional view taken along the line 11—11 of Fig. 10;

Fig. 12 is a top sectional view taken along the line 12—12 of Fig. 11;

Fig. 13 is a detail plan view of the comb type agitator;

Fig. 14 shows a latching device used in connection with the structure of Fig. 10; and

Fig. 15 shows a detail side view of the latching device of Fig. 14; and

Fig. 16 shows a detail end view of the latching device of Fig. 14;

Fig. 17 is a view of another form of the invention with the floor tool in section; and

Fig. 18 is a side view of an agitator to be used with the floor tool of Fig. 17.

The invention is particularly directed to the use of a retractible agitator to be employed in a floor tool of an ordinary household vacuum cleaner by which it will be possible to selectively use such agitator depending upon the working conditions to be encountered. It is frequently desirable when a surface is undergoing cleaning treatment and the clinging type of litter and dirt adhering thereto is not subject to removal by ordinary suction to apply mechanical agitation of the surface, and at the same time it is rather highly undesirable in normal cleaning operations to have the mechanical agitation means in constant use because of its obvious characteristic of subjecting the surface undergoing cleaning treatment to extreme wear. Consequently, it is the purpose of this invention to propose a structure in which a comb or other similar type agitator may be selectively employed such that the operator of the machine can bring the agitator into engagement or may depend upon straight suction cleaning, whichever in his or her opinion is necessary to the occasion.

It is further desirable to make the retractible

agitator operable from a mechanism disposed near the upper end of the handle or close to that portion of the handle normally grasped by the operator. The essential object of locating it in this position is that it inhibits the necessity of the operator's stooping over or picking up the floor tool and making a hand adjustment on the floor tool itself and coming into contact with the dust and grit, etc., that may be collected on or about the nozzle lips. It is, therefore, desirable to have the retractible agitator controlled from a remote position and it is to that end that the instant invention is directed. Several means and methods are hereinafter set forth by means of which the operator can selectively control the application of the retractible agitator to the surface undergoing treatment.

Fig. 1 sets forth a construction that accomplishes the intended desirable results described in the previous paragraph and to that end there is provided a floor tool adapted to be employed in conjunction with a wand or similar device and having an exhaust outlet 6 to which a hollow handle 4 is connected by means of a connection or nipple 17, the nipple 17 being swivelly connected with respect to the outlet 6 of the floor tool by means to be hereinafter set forth. In order to render the device easy of operation a combination suction unit and collecting chamber 2 is provided to which an appropriate hose connection 3 is secured. This hose in turn has integrally connected therewith a nipple 5, preferably of rubber or other resilient material, which is capable of being fitted over the end of the handle 4 to complete the connection for the transmission of suction from the suction producing device 2 to the floor tool or nozzle 1.

Referring to Figs. 2 and 3, it will be noted that the nozzle has the opening 12 therein and portion 13 for producing a rather smooth pleasing effect to the appearance of the nozzle from the extremities thereof to the outlet 6. Arranged on the rear and near the center of the floor tool is a small housing preferably in line with the outlet 6 at its opening 12. Within this housing 7 there is a mechanism provided for vertically shifting the agitator 14 in order to bring it into engagement or disengagement with the surface undergoing cleaning treatment. The agitator 14 proper with its agitating surface shown in Fig. 3 is mounted in a slot 14*a* immediately to the rear of the rear lip of the nozzle. The agitator has an opening 16*a* preferably centrally disposed with respect to the housing 7 and to the agitator 14 and into which the bar member 16 is fitted. The bar member, in turn, is rigidly connected to the shaft 15 which is journalled in the end walls of the housing 7.

In order to maintain the agitator in its retracted position there is provided a spring 21 which is inserted in an oppropriate housing 20 disposed in each end of the floor tool. The agitator 14 has a shoulder or ledge 19 at its ends which rests upon the springs 21, one only of which is shown. It will be observed that the spring 21 normally holds the agitator in its retracted position.

The mechanism untilized to bring the agitator into engagement with the surface undergoing cleaning treatment consists of a semi-flexible wire arrangement 8 that is connected to the bar element 16 by an appropriate heading 16*b* or other suitable retaining means on the wire which prevents the semi-flexible wire from being drawn through the bar element 16. The semi-flexible wire 8 is led through a small apropriate opening 7*a* in the top of the housing 7 and thence through an opening in the bracket or lug 11 that is integrally associated with the outlet 6 of the nozzle. The semi-flexible wire finally extends to the upper part of the handle, and preferably beneath the handle to and through another bracket 10 in which it is slidably mounted. The semi-flexible wire 8 is provided with a handle 9 or finger grip such that by axially moving the semi-flexible wire the agitator is brought into engagement with the surface undergoing cleaning treatment and, as pointed out above, when the finger grip is released the spring 21 will retract the agitator and consequently the handle or finger grip and the semi-flexible wire normally connected thereto.

The comb type agitator, as particularly set forth in Fig. 3, has teeth thereon which may be of the variety as shown or the surface thereon may be configurated as set forth in the following United States Patents No. 2,051,203; 1,992,238; 1,990,710, and 1,980,438. The type of agitating surface to be applied to the retractible agitator is optional and dependent upon the surface to be cleaned or upon such other characteristics as may be desired in the device in question. It is distinctly understood, however, that the invention is not limited to the comb type of agitating surface and any type of such surface may be employed and is intended to come within the spirit and scope of the invention. Attention is further invited to the fact that the invention contemplates the assembly of the agitator in the forward lip of the floor tool as well as the rear lip, or between the lips.

Attention is now further directed to the disclosures set forth in Fig. 2 in which the nipple 17, previously referred to, is shown as swivelly connected in the outlet 6 of the floor tool by means of element 18 which is in the form of a spring and of such a diameter that upon insertion it will fit into an exterior circumferential groove in the nipple 17 and when in position the spring will expand into an internal circumferential groove in the outlet 6 and thereby retain the nipple 17 in position and permit its rotation with respect to the outlet 6 of the floor tool. The wire of the spring is of such diameter as to normally prevent axial separation of the two, but they may, of course, be separated if desired.

The disclosure set forth in Fig. 4 shows a modification of the above described device in which a means is provided for maintaining the agitator in one of its two selected positions; i. e., engaged or disengaged with the surface being cleaned. The basic structure of the cleaning device with respect to suction unit 2, floor tool 1, handle and hose connections 3, 4, and 5, etc., is identical with that set forth above. The same type of agitator 14 is employed and there is added thereto the latching device by means of which the agitator is selectively retained in one or two above described positions.

The mechanism preferred to accomplish this purpose consists of an appropriate latching device 23, more particularly set forth in Figs. 5 and 6, which latching device consists of a band ring 23 firmly secured around the handle 4. A screw or rivet device 23*a* is provided by means of which the ring is firmly clamped about the handle. The latching device has two extensions thereon which project longitudinally of the handle and that contain tooth-like formations 26 with depressions 27 therebetween into which a crossbar member 24

may be fitted. The crossbar member 24 is integrally connected to the semi-flexible wire 9, and it will be observed from an inspection of the drawing that the bar member may be positioned in one depression wherein the agitator will be retracted and in the second position in which the agitator will be in engagement with the surface undergoing cleaning treatment. In order to provide a constant tension or adequate tension in the semi-flexible wire element, the semi-flexible wire has assembled in connection therewith, a spring 29 so arranged that the crossbar member 24 when seated in one of the upper depressions of the latching device may be placed thereon with the definite assurance that the agitator will be in an operable position. The spring 29, furthermore, will obviate the necessity of a very fine and accurate adjustment of the latching device 23.

A further modification of the device described and set forth above is disclosed in Figs. 7, 8, and 9. The essential, basic structure as to floor tool, suction creating device, tube connection, and handle is identical with that defined above. Instead of having the semi-flexible wire mode of control for the retractible agitator, an electromagnetic device is provided for causing the agitator to come into engagement with the surface undergoing cleaning treatment. It will be noted that the agitator in general is of the same construction as that set forth above.

The agitator 34 is vertically slidably mounted in the housing 41 disposed in the rear of the floor tool 31, and having appropriate slots, not shown, to receive the agitator. There is also provided the outlet 32 from the nozzle by means of which the handle 48 is swivelly connected thereto, and then in turn the nipple 36 to the hose 68, and thence to the suction producing unit. Attention is invited to the fact that the portion 32 of the floor tool has been distorted to show the relationship of the housing for the electromagnetic device thereto.

The agitator housing 41, integral with the floor tool 31, has an auxiliary housing 43 secured thereto which contains the electromagnetic device secured and held in position therein by screws 38. The electromagnet 32 is thereby rigidly and firmly held in position and has its armature at 35 centrally disposed with respect thereto. Leads 39 and 39 are connected to appropriate sources of supply through a switch 44 which may be similar to that disclosed and set forth in United States Letters Patent No. 1,901,671 for the control of the agitator.

The agitator, as in the cases set forth above, is held in a normally retracted position by means of a coil spring 36 disposed about the upper end of the armature. The spring bears against a combination pin and washer arrangement 35a against which the spring 36 bears and thereby holds the agitator 34 in retracted position. The leads are so connected to the electromagnetic device and power is transmitted thereto such that when it is applied the armature will move downwardly with respect to the disclosure set forth in Fig. 8. In order that there may be a positive actuation of the electromagnetic device, a washer or spacer 40 which may be of either brass or rubber is interposed between the agitator and the electromagnetic device proper such that residual magnetism will not cause the same to stick and at the same time will act as a silencer on the actuation of the magnetic device. Attention is further called to the fact that the armature is preferably made of a laminated construction and it may even be desirable to have the comb in this particular instance of a non-magnetic material, although this need not necessarily be so, and furthermore, it is considered an item of design rather than an element requiring invention and to that end the point of materials is in the sound discretion of the designer. The electromagnet is preferably of oblong shape as well as its armature, as fully set forth in Fig. 9. Shading coils, polarizers and other devices may be employed depending on whether alternating or direct current is used. Where radio reception interference is encountered, suitable corrective devices may likewise be adapted although such devices are not essential to the operation of the invention, there being many commercial expedients readily available, the individual use of which is a matter of choice and designing skill.

From the above it is obvious that as the switch 44 is actuated the electromagnetic device is energized and causes the agitator to go into engagement with the surface undergoing cleaning treatment. Further attention is invited to the fact that there is a suitable bracket or lug 45 secured to or integral with the outlet 32 having an opening therein at the connection for holding the leads 39 in position with respect to the handle.

The disclosures set forth in Figs. 10 through 16 inclusive show a further modification of the device set forth above. Attention is invited to the fact that herein the agitator instead of being disposed adjacent or in connection with the rear lip of the cleaner is assembled within the floor tool and entirely detached from the lips of the floor tool.

In order that the agitator may be firmly and positively actuated with respect to the floor tool 50 there is provided within the floor tool 50 a pair of slots 63 into which the agitator is firmly although slidably held. In order that the agitator may be vertically adjusted there is provided a shaft 60 journalled in the end walls of the nozzle 50 and retained in position thereon by collars 61 which, in turn, are prevented from relative rotation with respect to the shaft 60 by screws or pins 62. The shaft 60 has a bar member 64 mounted at right angles to the shaft which engages an opening 59a in the agitator 59. A spring 66 is secured to appropriate means 67 at the top of the housing and is connected between it and the lefthand end of the bar member 64 in order that the agitator may normally be in the retracted position.

The agitator is selectively engaged with respect to the surface undergoing cleaning by means of a semi-flexible wire 58 connected to the righthand end of the bar member 64 and retaining it in position by means of a head 65 or other appropriate means to prevent the wire from being drawn through the bar 64. At this point attention is invited to the fact that the agitator 59 is disposed beween the lips 64a of the floor tool 50 and preferably as near the center thereof as it is possible to place it. The semi-flexible wire 58 is then led through a more or less air-tight opening in the top of the floor tool and thence through a pair of brackets or lugs 56—56, one on the floor tool exhaust 57 and the other at the upper part of the handle The handle, in turn, is connected to the exhaust outlet of the nozzle 57 by means of a swivelled nipple construction 51a which, in turn, is connected with the handle 51. The semi-flexible wire has secured thereto at its upper end a finger or hand grip device 55 for controlling the actuation or application of the

agitator to the surface undergoing cleaning treatment. The handle, then, in turn, is connected to the hose **53** by means of a nipple **52** and thence, in turn, to the suction creating unit **54** which may be of any conventional type.

Attention is invited to the fact that in order to decrease the weight of the agitator, for the instant modification and for the form shown in Figs. 1–6, it is made up of a structure similar to that set forth in Fig. 13 in which there are three vertical members **68**, **69**, and **70**. The element **69** has the opening **59***a* therein to receive one end of the bar member **64**. The agitator surface of the comb **71** is in the lower bar member and an upper or stiffening bar member **59***b* is provided to complete the structure.

It is desirable in connection herewith to point out that there may be instances in which it is desirable to retain the semi-flexible wire in its normally applied position, and to this end a latching device **74** is provided which is similar to that set forth in connection with Figs. 4, 5, and 6. The latching device **74** is preferably in the form of a ring **81** having extensions thereon containing the tooth elements **78—78** and depressions **79—79**. The semi-flexible wire **76** has secured thereto a bar member **77** which is capable of being retained in depressions **79—79**, which are the retracted and applied positions of the agitator. Portions **78—78** are tooth constructions similar to that described above. The ring **81** is maintained in its normal clamped position about the handle by a screw or pin device **80**. The ring **81** of latch **74** as previously intimated is in that manner clamped about the handle device. Attention is at this point invited to the fact that a spring **73** is adapted to be connected in the semi-flexible wire **76** such that the bar element **77** may be placed in either one of two selected positions of adjustment of the retractible agitator and thereby inhibit an accurate positioning of the latching device **74** at the end of the handle, the spring **73** serving the purpose of assuring and having the retractible agitator in firm positive engagement with the surface undergoing cleaning treatment.

The form of the invention set forth in Fig. 17 shows a floor tool in which the agitator **93** is pivotally mounted therein. To this end the floor tool **90** is equipped with pivot bearings **91** properly socketed to receive pivots **92** more particularly set forth in Fig. 18. Suitable means (not shown) well known in the art, may be provided for retaining the pivots in position in the pivot bearings mounted at each end of the floor tool.

The agitator **93** is equipped with an operating lever **94**, integral therewith, and having an aperture **95** to receive a semi-flexible wire **96**. The portion extends through a slot **94***a* in the floor tool in order that the semi-flexible wire may be connected thereto. To prevent leakage suitable flexible means may be provided over said slot in connection with portion **94**. The agitator is preferably made up in the form set forth in Fig. 18 but any other type of agitating surface may be employed.

A handle **97**, capable of having some form of suction creating means attached thereto, is swivelly connected to the floor tool **90** by means **98** in a manner similar to elements **17**, **18** of Fig. 2.

A lug **100** properly apertured to pass semi-flexible wire **96** is provided in connection with the exhaust of the floor tool. Near the opposite end of the handle a second guide **101** is clamped about the handle also properly apertured for the semi-flexible wire. In order to safely guide the choke wire and inhibit its bending, a tubular casing **99** is disposed between elements **100** and **101**. This tubing may be rigid or flexible depending upon its length. The semi-flexible wire is equipped with suitable collar-like clamps to connect same to agitator **93** through aperture **95**.

The operator's end of the semi-flexible wire **96** is formed into a ring **103**. Between ring **103** and guide **101** is a spring adapted to maintain the agitator **93** in retracted position. The operator to engage the agitator with the surface being cleaned merely pushes on ring **103** and holds same down as long as desired. Suitable holding means such as disclosed in Figs. 5 and 15 may be provided if necessary and desirable. Their provision is contemplated within the spirit and scope of the invention.

It is thought that the above so fully sets forth and reveals the gist of the invention that anyone skilled in the art to which it pertains may by a reading of the specification and a study of the drawings herewith readily reproduce and manufacture the same.

That which is considered new and which it is desired to protect by Letters Patent of the United States is as follows:

1. In a vacuum cleaner, a floor tool, a longinally extended rigid hollow handle secured to said floor tool and adapted to carry a dirt and air stream coming from said floor tool, an agitator relatively movable mounted in said floor tool for selective application to a surface being cleaned, means extending exteriorly along said handle in parallel relation to said handle and operable from the operator's end of said handle for controlling the selected application of said agitator to said surface and linkage means connected between said last mentioned means and said agitator, whereby motion imparted to said means extending exteriorly along said handle is transmitted to said agitator for controlling the said selective application of said agitator to said surface.

2. In a portable vacuum cleaner having in combination, a floor tool, a longitudinally extended rigid hollow handle connected therewith and adapted to carry a dirt and air stream from said floor tool, a retractible agitator mounted in and movable relative to said floor tool, wire means extending along said handle and operatively connected with said agitator, said wire being constructed and arranged such that the retractible agitator may be controlled by the operator from a position remote from the floor tool.

3. In a portable vacuum cleaner in combination, a floor tool having a suction nozzle defined by a pair of lips, a rigid hollow handle interiorly connected to said nozzle, a retractible agitator associated with and movable relative to one of said lips, means extending exteriorly along said handle to the operator's grip and movable relatively longitudinally of said handle for actuating and controlling the relative movement of said agitator and means to operatively connect said means to said agitator.

4. A structure defined in claim 3 which includes means on said handle adapted to engage said means extending exteriorly along said handle to retain said agitator in a selected position of adjustment.

5. A structure as defined in claim 3, which includes means mounted on the operator's end of the handle and associated with said means

extending exteriorly along the handle to maintain the agitator in retracted position.

6. A structure as defined in claim 3 which includes means to retain said retractible agitator in an adjusted position, said means including a ring clamped about the upper end of the handle, said ring having means thereon for holding said means extending exteriorly along said handle in adjusted position, and holding means for said means extending exteriorly along said handle, adapted to cooperate with the means on said ring to hold same in position.

7. In a portable vacuum cleaner, a floor tool including a nozzle bounded by a pair of lips, a retractible agitator associated with one of said lips, hollow handle means connected to said nozzle to transmit suction from said nozzle to a suction creating and dirt collecting means, means mounting said agitator for retraction and application to a surface being cleaned, including means to retract said agitator and remote control means disposed near the end of the hollow handle to control the application thereof, and means connecting said remote control means mounting said agitator for retraction and application, said means to retract said agitator including a semi-flexible wire means extending exteriorly of said hollow handle and terminating near the operator's end thereof.

FREDERICK RIEBEL, JR.