Oct. 10, 1939. D. B. REPLOGLE 2,175,639

FRICTION DRIVEN BRUSH

Original Filed April 17, 1935 3 Sheets-Sheet 1

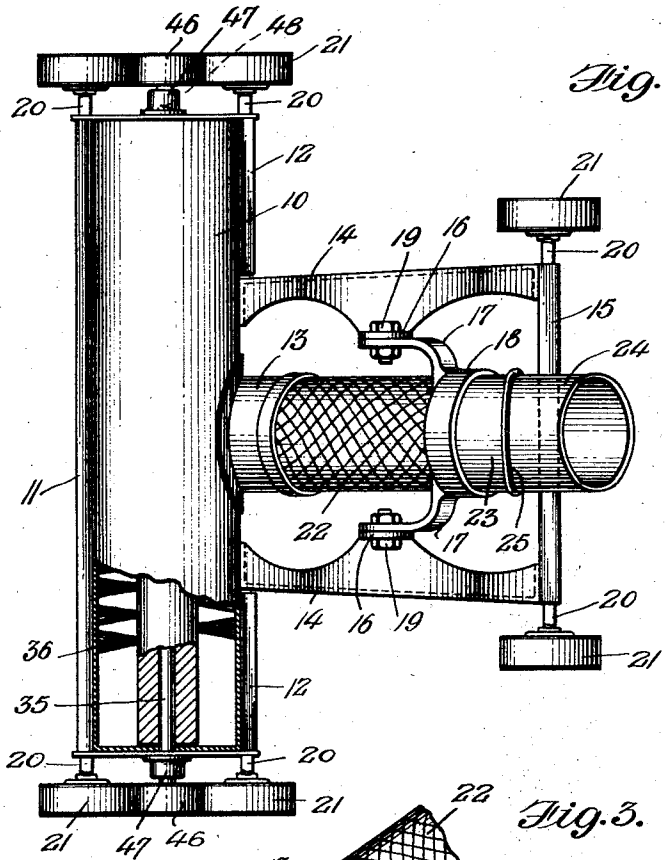


Fig. 1.

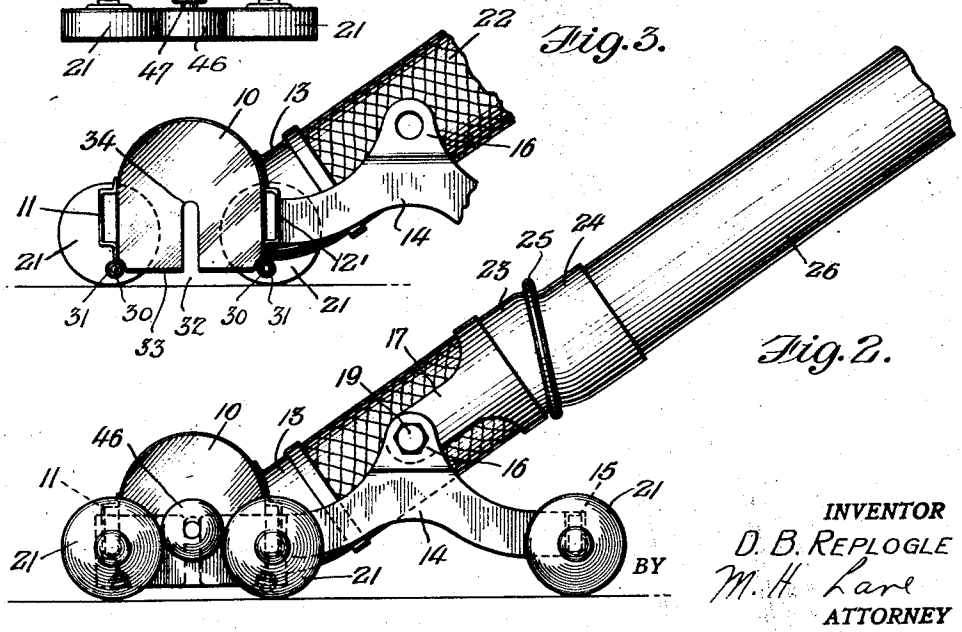


Fig. 3.

Fig. 2.

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FRICTION DRIVEN BRUSH

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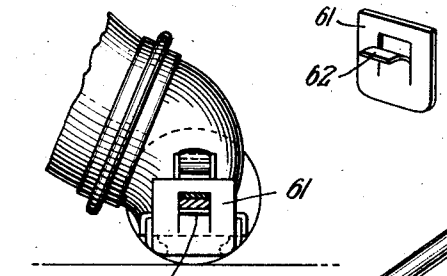


Fig. 13.

Fig. 14.

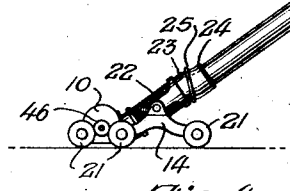


Fig. 4.

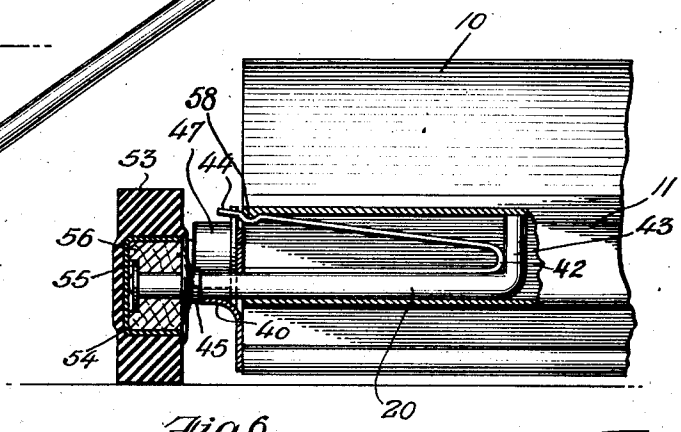


Fig. 6.

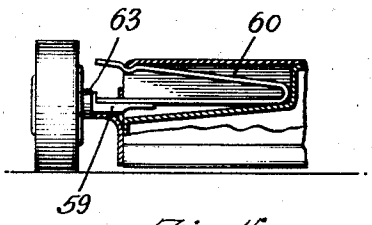


Fig. 15.

Fig. 5.

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FRICTION DRIVEN BRUSH

Original Filed April 17, 1935 3 Sheets-Sheet 3

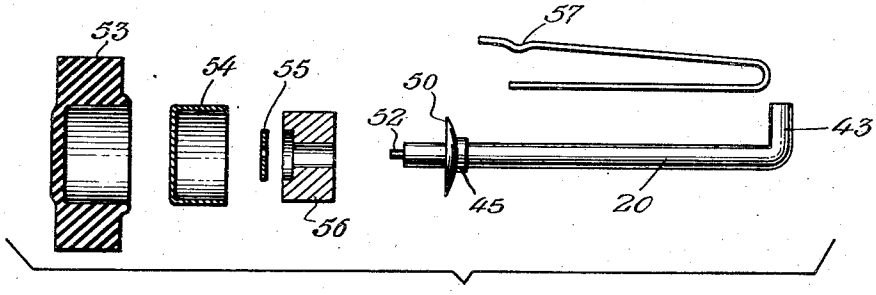


Fig. 7.

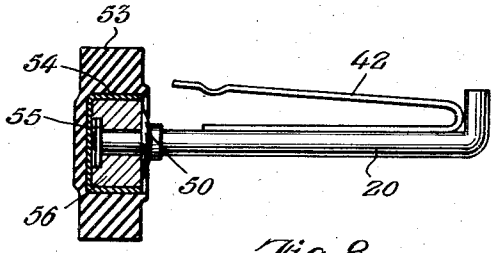


Fig. 8.

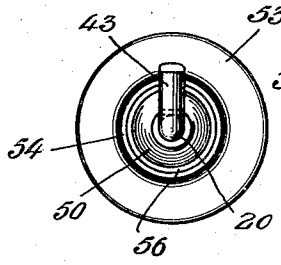


Fig. 9.

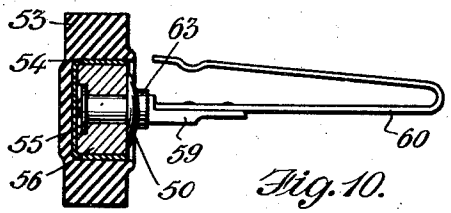


Fig. 10.

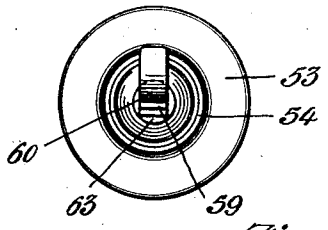


Fig. 11.

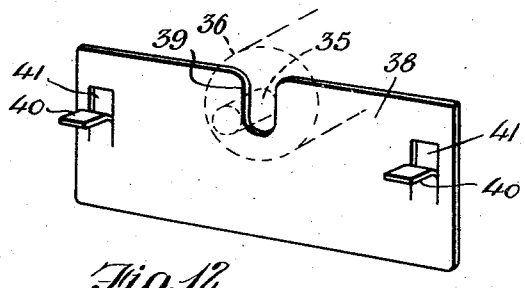


Fig. 12.

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Patented Oct. 10, 1939 2,175,639

UNITED STATES PATENT OFFICE

2,175,639

FRICTION DRIVEN BRUSH

Daniel Benson Replogle, Berkeley, Calif., assignor to The Ohio Citizens Trust Company, Toledo, Ohio, a corporation of Ohio, as trustee

Application April 17, 1935, Serial No. 16,866
Renewed August 7, 1939

17 Claims. (Cl. 15—158)

The invention relates to cleaning apparatus, and more particularly to apparatus of this type utilizing the cleaning effect of swiftly moving air in conjunction with the cleaning action of a positively driven surface engaging agitator, preferably a revolving brush. Thus the apparatus combines the function of an air-method cleaner and a carpet sweeper.

In designing the apparatus it is my aim to utilize to a large extent standard and interchangeable parts, connections and the like, which are covered by my prior patents and pending applications, and which are included in what is known as the "Air-Way" system, the term "Air-Way" being covered by a registered trade-mark.

One of the general objects of my invention is to provide an improved detachable floor tool which may be used with various kinds of equipment and which may be manipulated to pass under furniture and the like.

A further general object of the invention is to improve various of the interchangeable detachable elements or parts of the apparatus making up the "Air-Way" system, without interfering with their interchangeability and utility in the system as a whole.

A further object is to provide a floor tool which may be rigidly and adjustably connected to a handle member, with a rotatable joint between the tool and handle, whereby the handle may be rotated and thus brought to lowered position for sweeping under beds and the like, the apparatus being readily convertible into the swinging handle type of cleaner in which the handle may be swung downwardly about a pivot or hinge to permit the same to pass beneath furniture or the like.

Another object of the invention is to provide an air-method cleaner having a flexible hollow conduit between the floor tool and a suction handle, and means for selectively connecting the handle rigidly or swingingly to the tool as desired.

Another object of my invention is to provide means for frictionally driving a surface agitating means or brush with which the floor tool is equipped from supporting end rollers of the floor tool or nozzle.

Another object is to provide improvements in the mounting of the supporting rollers.

A further object of the invention is to improve the closure pieces or lids which are employed for varying end openings of the tool according to the downward pressure applied to the tool.

Other objects of the invention will be apparent from a consideration of the accompanying drawings and the further detailed description. It will be understood that the drawings are intended as illustrative only of the inventive thought, and not as limiting the invention to the precise details herein set forth.

In the drawings:

Fig. 1 is a top plan view of an improved floor tool embodying the invention and provided with a frictionally driven agitator or brush, parts being broken away to show the brush at the interior of the tool;

Fig. 2 is an end elevation of the same, the tool being shown equipped with a suction tube or handle;

Fig. 3 is also an end view of the tool, the brush and one set of the end rollers being removed and parts of the structure being broken away;

Fig. 4 is an end view on reduced scale, largely diagrammatic in character, and showing a plurality of extension devices connected to the floor tool;

Fig. 5 is a similar view showing the tool employed in conjunction with a portable electric cleaner of the "Air-Way" type;

Fig. 6 is a view partly in elevation and partly in section, and showing the mounting of one of the supporting rollers and the end closure plate;

Fig. 7 is an exploded view showing in detail the parts of the roller and support;

Fig. 8 is an assembled view of the parts shown exploded in Fig. 7;

Fig. 9 is an end view thereof;

Fig. 10 is a view similar to Fig. 8, showing a modification;

Fig. 11 is an end view thereof;

Fig. 12 is a detail view of one of the end closure lids shown assembled in Figs. 1, 2 and 6;

Fig. 13 is a detail view showing a modified form of closure lid intended for use with a single end roller;

Fig. 14 is a view partly in section and partly in end elevation, showing the mounting of the lid in a different form of tool, one of the rollers being cut away to show the lid more clearly; and

Fig. 15 is a fragmentary longitudinal section of the same, portions being broken away and the end roller being shown in elevation.

Referring in detail to the drawings, and particularly to Figs. 1 to 6 inclusive, reference numeral 10 denotes the casing of a floor tool or nozzle which may be similar to that disclosed in my prior Patents Nos. 1,912,386 dated June 6, 1933 and 1,994,870, dated March 19, 1935. The casing is preferably of sheet metal, although a similar

tool may be cast from any desired material. Aluminum has been found satisfactory, owing to its lightness, but I also propose the use of "Bakelite" or other moldable synthetic material. Secured at the front of the tool and preferably welded to the casing is a socket **11**, open at its ends to receive shanks **20** of end rollers **21**, which may be similar to those described in my Patent No. 1,541,280, dated June 9, 1925, although refinements in detail will be hereinafter described in the present application, it being understood that the old form of end roller is applicable.

Secured at the rear of the tool are similar socket members **12, 12**, which, however, extend only part-way across and are open at the ends of the tool to receive the shanks of end rollers similar to those employed at the front. Extending upwardly and rearwardly, preferably at an angle of about 45 degrees, is an outlet nipple **13**, which may be welded to the casing **10** to communicate with an opening in said casing. On each side of the outlet nipple and preferably in close proximity to the inner ends of the socket members **12, 12**, are a pair of bracket arms **14, 14**, which extend rearwardly and as shown are connected adjacent their rear end by a hollow member **15** open at its ends to receive shanks **20** of supporting end rollers. The bracket arms may be welded to the casing **10** or, where the tool is made of cast material, they may be cast integral therewith.

Each of the rearwardly extending bracket arms **14** is provided with an upward projection or ear **16**, the top of which is at about the height of the top of the casing **10** of the floor tool, and to the ears **16** are hingedly mounted the forked arms **17** of a collar **18**, by means of adjustable hinge connections **19, 19**. The connections may be tightened sufficiently so that the collar **18** is held in alignment with the nipple **13** and is substantially rigid, or by loosening the connection a free swinging movement is permitted. A flexible conduit or hose **22** is included between the members **13** and **18**, somewhat in the manner described in my Patent No. 1,292,963, dated January 28, 1919. It will be noted, however, that in the present device the bracket arms extend from the floor tool, whereas in the previous patent the bracket arms are secured to the fan casing. From the collar **18** extends a stub portion **23**, preferably secured to the collar in any suitable manner, or a tight but removable fit may be employed if desired. This stub portion **23** is shown connected to a short pipe member **24** by means of a rotatable joint **25** such as is illustrated in my Patent No. 1,836,336, dated December 15, 1931. Where the hinge connection **19** is intended to be maintained loose, the oblique rotatable joint may be omitted, if desired. Where, however, the hinge connection is tightened so that the collar **18** is substantially rigid, the joint functions in a manner similar to that described in my Patent No. 1,994,868, dated March 19, 1935.

To the pipe or nipple **24** there may be removably connected an elongated tubular member **26** shown in Figs. 2 and 4, and to this may be connected additional extension members, as for example the flexible hose **27** shown in Fig. 4. The member **26** is preferably of hard fiber and is adapted to function as a handle for the floor tool, as well as a conduit through which dust laden air is drawn in the cleaning operation. It will be understood that these extension members are secured to a suitable source of suction in a manner similar to that described in my Patent No. 1,533,271, dated April 14, 1925. Any of the variations described in that patent are applicable to the present invention.

In utilizing a device such as is illustrated in Fig. 4, it will be understood that the hinge connection may be tightened so that the handle is substantially rigid with the floor tool, with the exception of the rotatable joint. The apparatus will remain in the position illustrated, with the handle rearwardly inclined and supported by the three pairs of rollers with which the floor tool is equipped. In such case the floor tool may be tilted about the rearmost set of rollers by pressing down upon the handle, the rear rollers serving as a fulcrum. To sweep under low furniture the handle may be rotated about the inclined joint, thereby lowering the same.

Preferably, however, in the embodiment shown in Fig. 4 the connection **19** is loose, so that the handle may be swung about this connection as a pivot, thus permitting the apparatus to go under very low objects, the top of the casing **10** or the top of the bracket being the highest points. Also the handle may be rotated about the inclined joint **25** as described above, if desired.

The flexible and swivel connections may be concomitantly used; so that by means of the flexible connection the face of the tool is kept flat on the floor, while the swivel connection simultaneously permits of angular positions to reach into corners or diagonally to align the tool to reach otherwise inaccessible places.

In Fig. 5 the floor tool is shown as a part of a complete portable electric cleaner equipped with a power plant **28** and dust collector **29** in a manner similar to that disclosed in Fig. 1 of my Patent No. 1,533,271, referred to above. In the present instance the power plant is shown as equipped with supporting rollers **20'**, and the entire apparatus may be tilted about these rollers as a fulcrum. It will be understood that, when using this assembly, the hinge connection **19** between the floor tool proper and the rest of the mechanism may be tightened so that a substantially rigid relation exists except for the joint **25**, and the operation is similar to what is set forth in my Patent No. 1,345,550, dated July 6, 1920, wherein the handle, carrying with it the power plant, is adapted to be rotated about the inclined joint, thus bringing the level down to substantially the height of the floor tool and permitting sweeping under low objects. A limit stop (not shown) is contemplated, to permit swinging the handle to 25° from the floor.

Where the floor tool is composed of aluminum or other material which might result in discoloring or marring the surface covering being cleaned, I preferably provide non-metallic strokers or the like as surface engaging means. As shown in Fig. 3, the lower ends of the front and rear sockets extend downwardly below the level of the ends of the casing **10**, these downwardly extending portions being curled inwardly as at **30**. Stroker members **31, 31**, preferably composed of hard fiber or the like, are then slipped endwise over these members in a manner similar to that described in Replogle and Queen application Serial No. 606,046, filed April 18, 1932, now Patent No. 2,012,287, dated August 27, 1935. These non-metallic strokers thus serve as the surface contacting means, and owing to the fact that they extend below the level of the ends of the nozzle, there are provided end openings **32** below the ends **33** of the casing, so that air may be admitted endwise into the nozzle. As shown, the ends of

the casing are slotted as at 34 to receive a shaft 35 of a revoluble brush having bristles or tufts 36 spirally arranged thereon in conventional manner.

I preferably employ a yielding mounting for the brush similar in some respects to what is set forth in my Patent No. 1,912,386, but of simplified construction. This mounting includes plates 38 of identical construction employed as lids or end covers and preferably composed of hard fiber or other suitable material. One of such covers is shown in detail in Fig. 12. These lids are intended to function as means for adjustably varying the size of the end openings 32 in a manner similar to what is set forth in my Patent No. 1,895,584, dated January 31, 1933. As shown, each lid or end plate 38 is cut away on the upper edge thereof as at 39, to allow an end of the brush shaft 35 to pass therethrough. Tabs 40, 40 are preferably struck out to form openings 41, 41 through which the shanks 20, 20 of the end rollers may pass, as illustrated in Fig. 6. While the structure shown in Fig. 12 is preferred, it will be understood that, owing to the fact that two supporting rollers are employed at each end of the tool, the openings 41 may be round instead of rectangular, if desired. It will be noted by reference to Fig. 6 that the shank 20 is cushioned in its socket by means of a bent spring 42 which abuts at one end against the turned up end 43 of the shank. A finger piece 44 extending out of the pocket permits release of the roller and support from the pocket. The tabs 40, with which the end plate is equipped, bear against collars 45 on the roller shanks to hold the parts in position, as illustrated in Fig. 6. From the construction described, it will be apparent that the end plates 38 serve to vary the size of the end openings in accordance with the downward pressure applied to the floor tool, as set forth in my prior patents, particularly No. 1,895,584, dated January 31, 1933.

Referring now particularly to Fig. 1, it will be noted that the brush shaft 35 is provided at each end with a friction roller, pulley or the like 46, adapted to rest between end rollers 21, 21. Owing to the fact that these end rollers are provided with large size flat rubber tires, as described in my Patent No. 1,541,280, dated June 9, 1925, a good friction surface is provided. It will be understood that the members 46 and the brush body 36 are rigidly secured to the shaft 35, and intermediate the end of the brush body and each roller 46, bearings 47 are employed suitably held in place by a screw or other means.

It will be apparent that where only light downward pressure or no pressure at all is applied to the floor tool or nozzle, the same may be moved to and fro without causing rotation of the brush, and the cleaning operation in such case will be due entirely to the erosive force of the swiftly moving air. When, however, substantial pressure is applied, the nozzle will be forced downwardly between the pairs of end rollers so that they are driven into frictional engagement with the pulley or roller members on the ends of the brush shaft, causing rotation thereof as the tool is moved across the floor, the direction of rotation being reversed with reversal of the movement of the floor tool. It will also be apparent that the frictional engagement between the supporting end rollers 21 and the friction members on the ends of the brush may be varied as desired, according to the pressure applied, and thus the force of rotation of the brush may be automatically varied. At the same time the flow of air entering the nozzle from the ends thereof is variable by reason of the mounting of the end caps or lids which are carried by the roller supports, the flow augmenting with the force of rotation of the brush. Thus both the amount of air and the amount of agitation may be varied according to the requirements of a particular case. Where special difficulty is met with in cleaning a surface, the rotation will be rigid and the cleaning more effective. It will be apparent from the showing in Figs. 2, 3 and 12 that the brush shaft may be stopped either by the top portion of the slots 34 of the casing or by the bottom portions of the end slots 39 of the lids, depending on the pressure applied to the tool, and in this manner the engagement or disengagement of the brush pulleys with the end rollers is permitted.

As previously stated, the rollers and supports therefor operate in a manner generally similar to what is set forth in my Patent No. 1,541,280, but particular refinements have been designed which render the supports especially applicable in the present embodiments of the invention, although it will be understood that these supports may be used with other types of cleaning apparatus or for supporting articles other than suction cleaners. In Figs. 7 and 8 details of one form of support are set forth. As shown, the shank 20, instead of being of flat sheet metal, as in my prior Patent No. 1,541,280, may be a metal bar or wire, herein shown as round in cross section. The shank is bent up at one end at 43 so as to engage the top of the socket in which it is assembled, and adjacent the other end there is provided an abutment 45 for engagement by one of the out-turned tabs 40 of the end plate 38, as previously set forth, a shield 50, and a projection 52, which is adapted to be up-set in the assembled construction shown in Fig. 8. The roller itself comprises a thick tire 53 of rubber or other suitable material, such as is described in my Patent No. 1,541,280, within which fits a metal cap or thimble 54. In this cap a hub 56 is mounted, which is attached to the shank by means of a washer 55 having an opening therein through which the projection 52 of the shank 20 extends and is up-set to hold the same in secured position. The assembly of the parts is similar to what is described in my patent referred to above.

With the roller and shank there is supplied a spring 42 substantially U-shaped in form which is provided with an indentation 57 bent to fit a lug 58 in the interior of the end socket of the cleaner nozzle, as shown in Fig. 6. To facilitate removal of the spring roller and roller support in the socket a finger piece 44 is provided.

In Figs. 10 and 11 a somewhat similar construction is shown, but in this case the shank 59 is cut off a short distance from the abutment 63 and is of rectangular cross section. A resilient member or spring 60 corresponding to the spring 42 shown in Fig. 8 is secured to the cut-off shank in any suitable manner and forms a permanent part of the roller support. This form of support is shown in Figs. 14 and 15 assembled with a nozzle of the type described in my Patents Nos. 1,895,584 and 1,994,868, employing an end cover 61 of the type shown in Fig. 13, which is provided with a single tab 62 extending outwardly therefrom and adapted to engage the abutment 63 on the shank of the roller support, as illustrated in Fig. 15. When assembled the rear portion of the U-shaped spring member 60 extends to the rear of the end pocket in the floor

tool. The operation is similar to what is described in the two patents referred to above.

It will be noted that the roller shanks or supports in the herein described embodiments of the invention are relatively narrow as compared with the support set forth in my Patent No. 1,541,280, and this permits of the use of relatively narrow pockets on the floor tool. This is a particular advantage where the rollers are applied in pairs as illustrated in Fig. 1.

Various embodiments of the invention have been described in detail for the purpose of illustration, but it will be understood that many other variations and modifications are contemplated within the scope of the invention, and it is possible to utilize the different elements herein described in many different relations, as is suggested in my prior patents and applications. Thus, for example, the floor tool has been illustrated with two types of cleaning apparatus, but many other types may be employed. Two forms of end roller supports have been illustrated, but others may be utilized within the scope of the invention. The end covers, while particularly adapted in the combinations herein shown, may be used in other relations, and the particular mounting of the revolving brush is not to be restricted by other details in the case. However, in the particular relations herein described, the parts cooperate with one another in a manner which accomplishes new and improved results.

What I claim is:

1. In a suction cleaner, a suction nozzle, a suction conduit swingingly connected to the nozzle and adapted to serve as a handle which may be raised or lowered by the operator, and a rotatable joint between the conduit and nozzle which is oblique to the axis of the conduit, whereby the angular relation between the nozzle and conduit may be varied simultaneously with the swinging movement.

2. In a device of the character described, a suction nozzle having an outlet opening below the top thereof, a conduit hingedly mounted on said nozzle in spaced relation to said outlet opening, a flexible tube connecting the nozzle outlet and said conduit, and a pipe section adapted to be operatively connected to a source of suction and connected to said conduit by means of a rotatable joint which is oblique to the axis of the conduit.

3. In a suction cleaner, a suction nozzle, a suction conduit swingingly connected to and communicating with the nozzle, adapted to serve as a handle which may be raised or lowered by the operator, and a rotatable joint between the conduit and nozzle which is oblique to the axis of the conduit, whereby the angular relation between the nozzle and conduit may be varied simultaneously with the swinging movement.

4. A suction cleaner comprising a nozzle having an outlet extending rearwardly therefrom, bracket arms extending from the nozzle on each side of the outlet, said bracket arms having floor engaging means at the rear end thereof, a conduit pivotally supported by said bracket arms at a point between the nozzle and said floor engaging means and adapted to be connected to a source of suction, and a flexible tube connecting said nozzle outlet and said conduit.

5. A portable suction cleaner comprising a nozzle having supporting end rollers, a stub outlet pipe extending rearwardly from the nozzle, bracket arms extending from the nozzle on each side of the outlet pipe, an elongated rearwardly extending rigid conduit pivotally carried by said bracket arms and adapted to be operatively connected to a source of suction, a flexible tube connecting said nozzle outlet and said conduit, said bracket arms having floor engaging rollers mounted rearwardly of the point of attachment of said rigid conduit, the rollers carried by the nozzle cooperating with the rollers carried by the bracket to support the weight of the combined apparatus.

6. In a device of the character described, a suction nozzle having an outlet; a flexible tube connected to the outlet, a rigid hollow handle communicating with a source of suction at one end and operatively connected to the flexible tube at the other, the connection between said handle and tube including a rotatable joint oblique to the axis of the handle, and a hinged bracket connection carried by the nozzle and yieldingly supporting the hollow handle.

7. A suction cleaner comprising a suction nozzle having an outlet, a flexible tube connected to the outlet, a pair of bracket arms extending from the nozzle on each side of the flexible tube, a stub conduit communicating at one end with said flexible tube, hingedly connected to said bracket arms at a point intermediate the ends of the flexible tube, a rigid handle communicating at one end with a source of suction and adapted to be connected at its other end with said conduit, the connection between the handle and conduit including a rotatable joint oblique to the axis of the conduit.

8. In a device of the character described, a suction nozzle having spaced pairs of yieldingly mounted end rollers, an agitator within the nozzle adapted to be positively actuated by said end rollers, and spring supports for said rollers, said nozzle being provided with end openings to permit air to enter endwise, and end covers for said openings carried by said end rollers, serving to automatically vary the end openings according to the pressure applied to the nozzle.

9. In a device of the character described, a suction nozzle having spaced pairs of end rollers, an agitator within the nozzle adapted to be positively actuated by said end rollers, and spring supports for said rollers, said nozzle being provided with end openings to permit air to enter endwise, and end covers for said openings carried by said end rollers serving to automatically vary the end openings according to the pressure applied, the end covers being provided with two openings to permit the shanks of a pair of rollers to pass therethrough.

10. In a device of the character described, a suction nozzle having spaced pairs of end rollers, an agitator within the nozzle adapted to be positively actuated by said end rollers, and spring supports for said rollers, said nozzle being provided with end openings to permit air to enter endwise, and end covers for varying said openings, carried by said end rollers, the end covers being provided with two openings to permit the shanks of a pair of rollers to pass therethrough, and having a central opening to pass the ends of said agitator.

11. In a device of the character described, a suction nozzle having spaced pairs of end pockets, supporting end rollers having spring-pressed shanks projecting into said pockets, and spacing end plates carried by said roller shanks, each having a pair of openings to permit passage of said shanks, said plates serving to hold the shanks a fixed distance apart and to avoid frictional con-

tact between the shanks and the sides of the pockets.

12. In a device of the character described, a suction nozzle having spaced pairs of end rollers, an agitator within said nozzle adapted to be positively actuated by said end rollers, spring supports for said rollers, end plates yieldingly carried by said supports and serving to hold the same a substantially fixed distance apart, said end plates each having two openings to receive a pair of roller shanks to pass therethrough and having a central opening to pass the ends of the agitator.

13. In an apparatus of the character described, an end plate having a pair of spaced openings, each adapted to permit passage of a roller shank, outwardly projecting tabs adjacent each opening adapted to engage projections on the roller shafts to space the roller a proper distance from the plane of the end plate, said plate being cut away to provide a slot extending from one of the longitudinal edges of the plate located substantially equidistant from the aforementioned openings, said slot having parallel sides and a rounded bottom and being adapted to receive the end of a revolving brush.

14. In a suction cleaner, a floor tool having end openings, spring-pressed shanks extending beyond the ends of the tool, end rollers for said floor tool mounted on spring shanks, and lids for said openings mounted on said shanks each lid having an opening to permit the roller shank to pass therethrough, and an outwardly projecting tab contiguous to the opening and engaging a portion of the roller shank to cause the lid to tightly fit the ends of the floor tool.

15. In a device of the character described, a suction nozzle, having spaced pairs of end pockets, spaced pairs of end rollers for supporting said nozzle, axially extending spring-pressed shanks for said rollers projecting into said pockets, and a brush adapted to be revolved within said nozzle and having members on the ends of its shaft adapted to be frictionally supported between adjacent pairs of the end rollers, and means carried by said roller shanks and serving to hold the shanks a fixed distance apart and to avoid frictional contact between the shanks and the sides of the pockets.

16. In combination with a suction nozzle having end openings and end pockets, end rollers having yielding supports adapted to be engaged in said pockets, and adjustable cover plates for said end openings, each plate having an opening to permit passage of a roller shank, and an outwardly projecting tab adjacent said opening adapted to engage a portion of the roller shank to press the cover plate against the end of the nozzle.

17. In a device of the character described, a caster attachment comprising a spindle, a roller journalled thereon, a stub shank extending axially of the spindle, and a U shaped spring cooperating with the shank and having one arm secured to the cut off shank and the principal portion projecting beyond the shank, said spring being adapted to be received in an end pocket of a suction nozzle or the like, with the bend of the U abutting an interior wall of the pocket.

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