Dec. 21, 1937. D. B. REPLOGLE 2,102,645

DOUBLE BRUSH TYPE FLOOR TOOL FOR AIR METHOD CLEANERS

Filed May 1, 1935 4 Sheets-Sheet 1

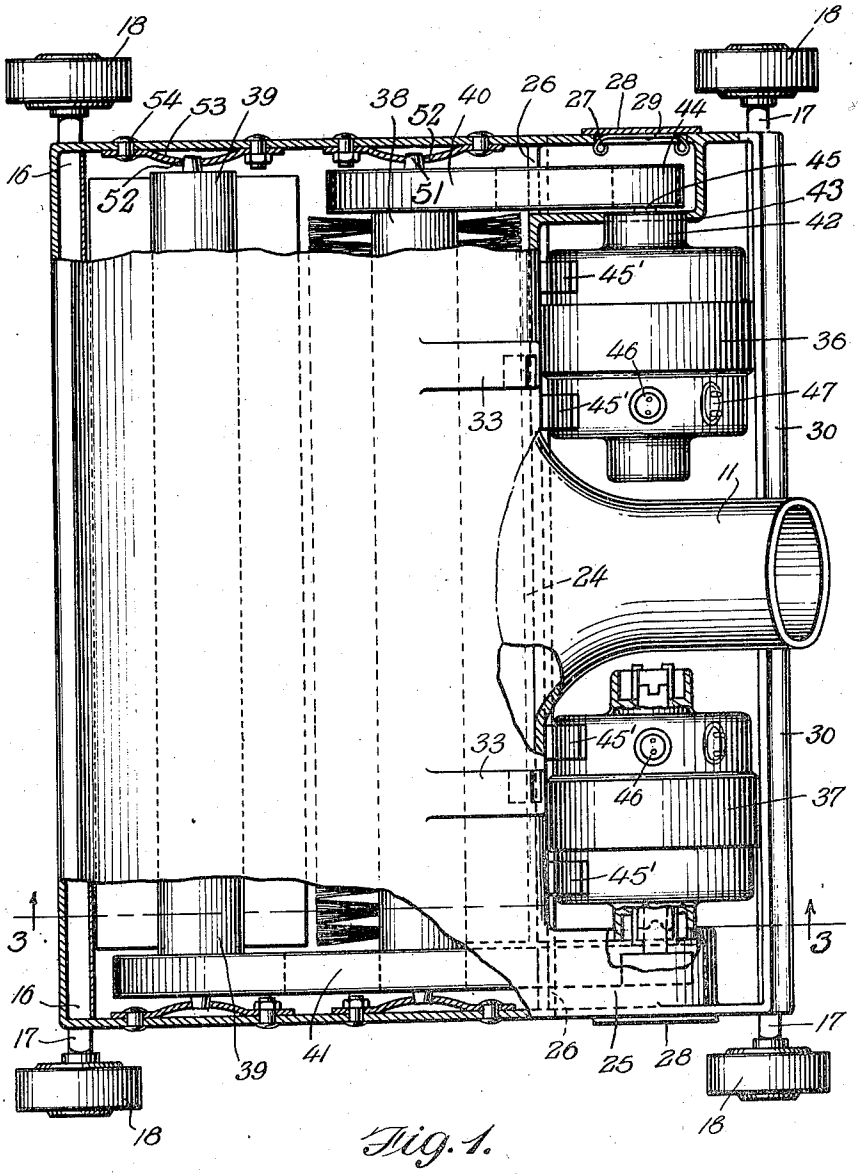


Fig. 1.

INVENTOR
D. B. Replogle,
BY Munson H. Earl
ATTORNEY

Dec. 21, 1937. D. B. REPLOGLE 2,102,645

DOUBLE BRUSH TYPE FLOOR TOOL FOR AIR METHOD CLEANERS

Filed May 1, 1935 4 Sheets-Sheet 2

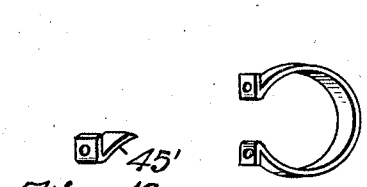


Fig. 1a.

Fig. 1b.

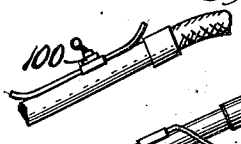


Fig. 10a.

Fig. 10.

Fig. 10b.

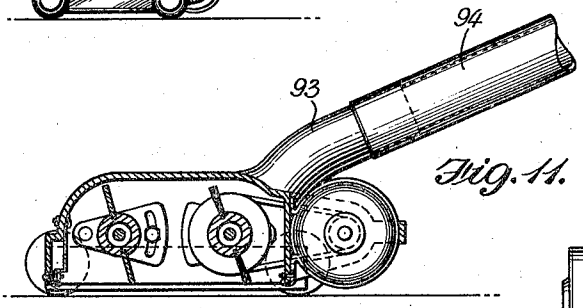


Fig. 11.

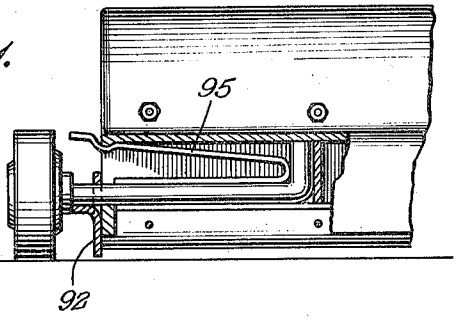


Fig. 13.

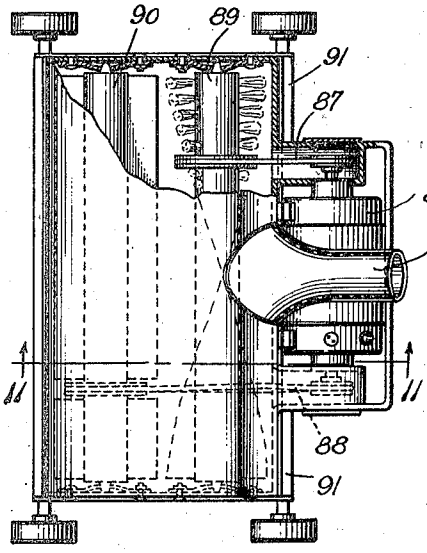


Fig. 12.

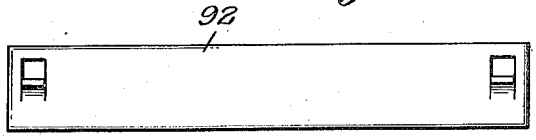


Fig. 14.

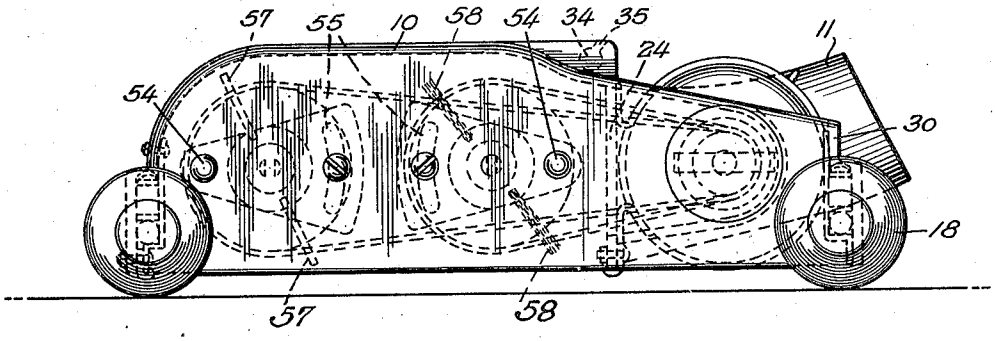
Inventor
D. B. Replogle,
Munson H. Earl
By
Attorney

Dec. 21, 1937. D. B. REPLOGLE 2,102,645

DOUBLE BRUSH TYPE FLOOR TOOL FOR AIR METHOD CLEANERS

Filed May 1, 1935 4 Sheets-Sheet 3

Fig. 2.



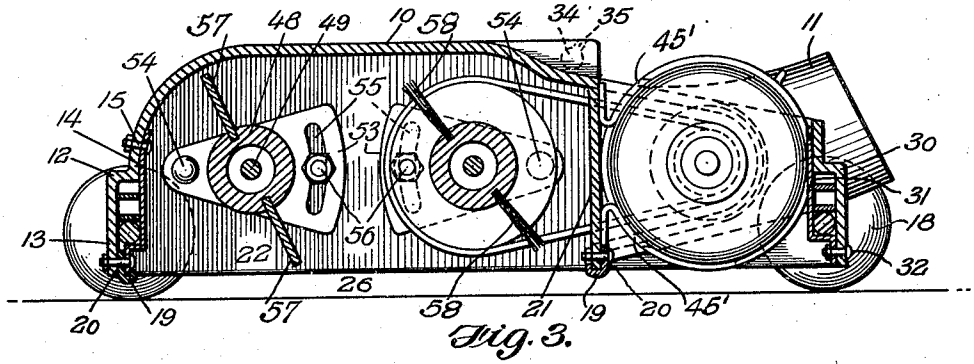


Fig. 3.

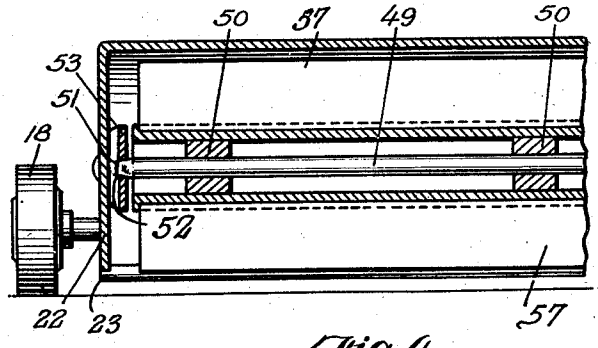


Fig. 4.

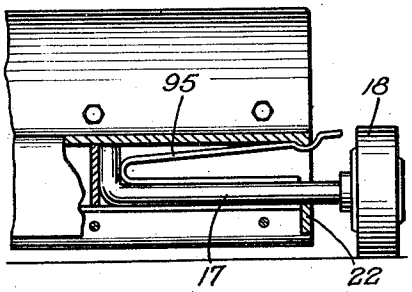


Fig. 5.

Inventor

D. B. Replogle,

Munson H. Earl.

By

Attorney

Dec. 21, 1937. D. B. REPLOGLE 2,102,645

DOUBLE BRUSH TYPE FLOOR TOOL FOR AIR METHOD CLEANERS

Filed May 1, 1935 4 Sheets-Sheet 4

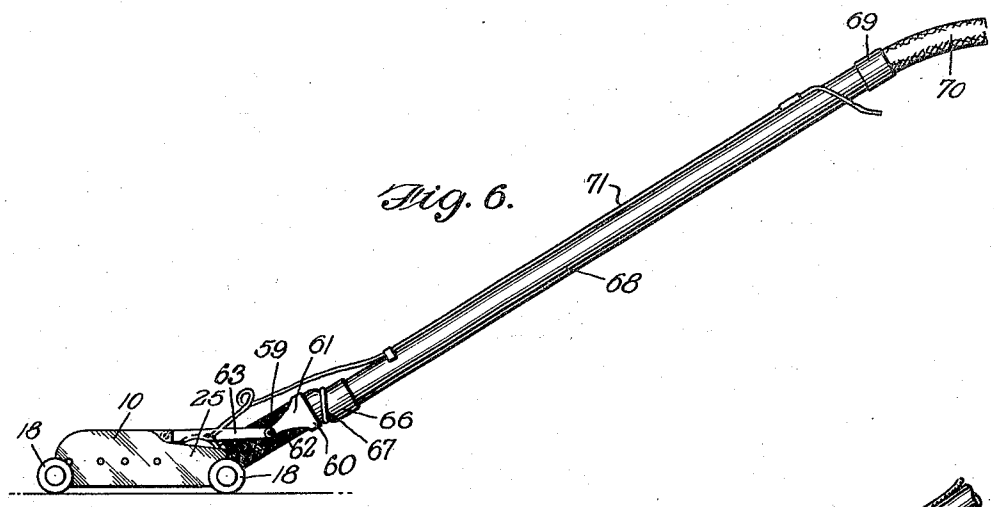


Fig. 6.

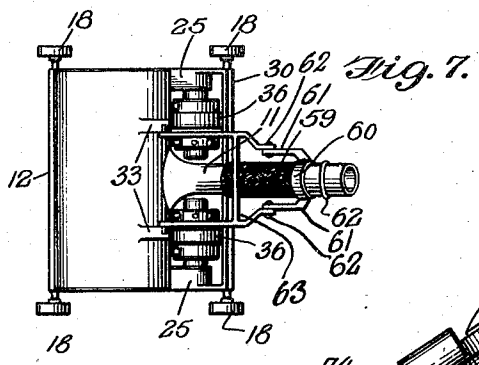


Fig. 7.

Fig. 9.

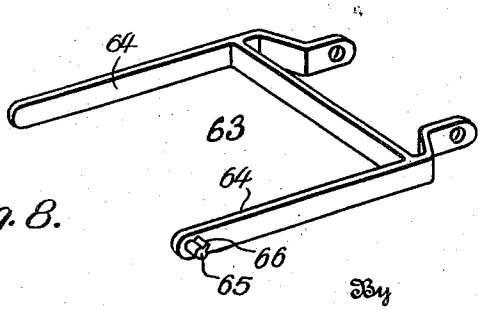


Fig. 8.

Inventor
D. B. Replogle,
By Munson H. Land
Attorney

Patented Dec. 21, 1937 2,102,645

UNITED STATES PATENT OFFICE

2,102,645

DOUBLE BRUSH TYPE FLOOR TOOL FOR AIR-METHOD CLEANERS

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

Application May 1, 1935, Serial No. 19,310

10 Claims. (Cl. 15—6)

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 positively driven surface engaging agitating means, whereby the apparatus combines the functions 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 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 of the invention is to provide a floor tool with a plurality of surface agitating means which may act either simultaneously or independently to perform their respective functions.

Another object of the invention is to provide a floor tool having two revolving agitators which may be driven in opposite directions about their axes, whereby an effective beating operation is attained.

Still another object of the invention is to provide a floor tool in which there are two revolving brushes or agitators, each driven independently by its own motor, one running in one direction, the other in the opposite direction, the motors being controllable so that the agitators may be driven one at a time to either cause movement of the tool or to assist the operator in moving the same across the floor, one of the brushes pulling the tool forward and the other backward, thus relieving the operator wholly or in part of the strain of operating the device.

Further objects are to avoid leakage of air in the nozzle, to provide detachable means for mounting the motor or motors, and to relieve strain and vibration with respect to the power means and the brush mounting. Another object is to provide an adjustable mounting for the agitators. Still another object is to provide means for releasably connecting the floor tool to a source of suction.

Other objects will be apparent from the following detailed description and the accompanying drawings, in which are set forth illustrative embodiments of the inventive thought, which, however, are not to be considered as limiting the invention to the specific details therein disclosed.

In the drawings,

Fig. 1 is a top plan view of a floor tool or nozzle embodying the invention, the parts being broken away to show the interior;

Figs. 1*a* and 1*b* are details showing two forms of motor supporting means;

Fig. 2 is an end view of the same;

Fig. 3 is a vertical section on line 3—3 of Fig. 1, extending transversely through the brushes or agitators;

Fig. 4 is a fragmentary sectional view extending longitudinally through the front agitator or beater, and showing the mounting thereof, portions being in elevation;

Fig. 5 is a fragmentary section showing the mounting of one of the end roller supports;

Fig. 6 is an end elevation on a reduced scale, largely diagrammatic in character, showing the tool equipped with a flexible and swiveled connector communicating with the source of suction through a hollow tubular member adapted to serve as a handle;

Fig. 7 is a top plan view of the same with the handle removed;

Fig. 8 is a perspective view on an enlarged scale, showing the bracket employed for attaching the handle to the tool;

Fig. 9 is a view similar to Fig. 6, but showing the tool employed in conjunction with an air-method cleaner of substantially conventional type;

Fig. 10 is a side elevation similar to Fig. 6, but showing a modified form of floor tool detailed in Figs. 11 and 12;

Figs. 10*a* and 10*b* are fragmentary views showing reversing switch arrangements;

Fig. 11 is a section on line 11—11 of Fig. 12, the parts being in elevation and a portion of a tubular connector being illustrated;

Fig. 12 is a top plan view of the modified floor tool, parts being broken away to show the interior as in Fig. 1;

Fig. 13 is a fragmentary sectional view of the form of tool shown in Fig. 12, detailing the mounting of one of the end rollers and the end cover carried thereby, and

Fig. 14 shows one of the end covers.

Referring to the drawings in detail, reference numeral 10 denotes the casing of a floor tool or nozzle which is adapted to house a pair of revolving brushes or agitators and which may be detachably secured to a source of suction through a hollow handle, tube or other means. The casing is air-tight except for the inlet and exhaust openings, although provided with removable caps or coverings to permit access to the interior at various places. A short outlet pipe 11 is shown extending rearwardly from the nozzle. The casing may be formed of any suitable material, as metal or synthetic materials such as bakelite. The casing is preferably cast, and a light-weight material is preferred, as for example, aluminum, where metal is employed, in order to facilitate movement of the apparatus across the floor. The nozzle is built low to the floor to permit the same to pass beneath furniture and the like, and the outlet pipe is preferably of no greater height than the top of the casing.

The front wall of the casing is bulged outwardly as at 12 and thence downwardly at 13 to form, in cooperation with an inner member 14 secured to the front wall as at 15, pockets 16 for receiving the supports 17 of end rollers 18, in a manner similar to what is described in my application Serial No. 16,866, filed April 17, 1935. Also engaged between the downwardly extending portion 13 and the lower end of the inner member 14 there may be secured one of a pair of front and rear stroker members 19, 19, which extend in parallel relation to each other across the tool and serve as surface engaging means. These strokers may be of hard fiber, raw-hide, hard rubber, or the like, and prevent contact between the walls of the casing and the surface to be cleaned, this being particularly important where the casing is of aluminum, which is likely to darken the floor coverings. The front stroker may be secured in place by means of a bolt 20, which likewise holds the lower end of the member 14, while the rear stroker is similarly secured to the rear wall 21. The strokers 19 extend slightly below the end walls 22 of the nozzle, and thus provide end openings 23 through which air may enter the nozzle. An outlet opening 24 in the rear wall communicates with the pipe 11.

The nozzle is provided at its ends with a pair of chambered arms 25, 25, extending rearwardly and communicating with the main portion of the nozzle through suitable apertures 26, 26. The function of these arms is similar to the chambered arms described in my application Serial No. 13,164, filed March 26, 1935, and they serve to house the belts for actuating the agitators and also for mounting the motors. By reason of the construction of these arms an air-tight chamber is insured. Openings 27, 27 are provided in the side walls of these arms which are closed fluid-tight by means of caps 28, 28, provided with springs 29, 29. Likewise suitable packing means, not shown, may be employed to avoid leakage of air.

As shown, the side walls of the nozzle extend slightly beyond the limits of the chambered arms and are connected by a rear frame member 30 which extends parallel to the wall 21. Cooperating with this frame member is an inner member 31 similar to the member 14 at the front of the casing and similarly secured to the frame member by a bolt 32. The members 30 and 31 together form pockets for receiving rear roller supports, just as at the front end of the tool.

The floor tool is adapted to be connected to any suitable source of suction, as for example, a suction handle, extension tube or cleaner body of the usual "Air-Way" type, or of the caddy or barrel type disclosed in my patents and applications. To facilitate attachment of certain types of connections, lugs 33, 33, one at each side of the outlet pipe 11, may be provided, these being shown as cast integral with the top wall of the casing, and each being provided with a socket 34 having a key-way or slot 35 extending therefrom, as best shown in Figs. 2 and 3.

In the construction shown, motors 36 and 37 are mounted within the spaces between the stub pipe 11 and the chambered arms 25, 25. These motors serve to actuate agitator members 38 and 39 through belts 40, 41, passing through the openings 26, 26 in the rear wall of the nozzle casing. These motors are preferably substantially identical in construction, and in the preferred embodiment of the invention are arranged to actuate the agitators in opposite directions about their respective axes. The motors are desirably mounted to permit ready removal and at the same time should be so mounted that vibration is avoided. As shown, the nose 42 of each motor extends through an aperture 43 in its chambered arm and a pulley 44 and pulley shaft 45 may be inserted through the opening 27 in the end wall by removing the cap 28. When the motors are in position and the caps replaced, the chambered arms are rendered fluid-tight and no leakage is possible. As shown, the motors are held in place between the rear frame members 30, 31 and the wall 21 of the nozzle, upper and lower pairs of buffer members 45', 45' one of which is shown in detail in Fig. 1*a* serving as shock absorbing devices and insuring a tight fit at the front portion. It will be noted that the lower buffer members rest upon a ledge formed by the upper edge of the rear stroker 19, as best illustrated in Figs. 2 and 3. The buffer members may be removably secured to the motor frame by means of bolts or the like, or may be welded thereto or may be in the form of straps running around the motor and provided with bent-over edges as indicated in Fig. 1*b*. They may be formed of resilient metal or of composition material with a friction surface to prevent sliding axially after the motor has been wedged in place. They may also be detachably secured to the casing by means of small bolts, not shown. Where the friction of the buffer members is relied upon to hold the motors in place, it will be obvious that they may be readily removed without the removal of any bolts or the like, but in any event the motors may be readily separated for cleaning, repairs or the like. The motors being preferably substantially symmetrical, may be reversed end for end, thereby securing reversal of the respective agitator operated by the motor. Also the motors may be electrically reversed so as to rotate in opposite directions about their axes. The motors should be strong, comparatively light of weight, and capable of actuating their respective agitators so as to produce the desired cleaning effect.

Each of the motors may have two sockets 46, 47, one to receive current from a suitable source and the other to transmit current, as for example, to the other motor of the pair, where current is supplied to one motor and a branch circuit leads to the other. It will be obvious that the windings of the motors will be so arranged as to permit this take-off arrangement. Switches, not shown, will be provided to turn the motors on or off, and it will be understood that the mo-

tors may either operate simultaneously or one at a time, and may either drive their respective agitators in the same direction about their axes or in opposite directions.

As shown, each of the agitators comprises a hollow body 48, revoluble about a fixed shaft 49, anti-friction bearings 50, 50 being interposed between the body and the shaft. The ends of the shaft 49 may be flattened as at 51 to fit slots 52 in spring bearing plates 53 carried by the end walls of the cleaner nozzle. Owing to the resiliency of the bearing plates 53 the agitators may be snapped into position and are then firmly held against accidental removal.

It is desirable to provide means for adjusting the distance of the agitators from the surface to be cleaned, and accordingly the end plates 53 have been specially formed to permit such adjustment. As shown, each plate is triangular in form and is attached to the end wall of the nozzle at the apex of the triangle by means of a rivet 54, which serves as a pivot when the plate is being adjusted. To permit of such adjustment an elongated slot 55 is provided at the other end of the plate through which an adjusting screw or the like 56 may extend. While the agitators may be made of identical construction, if desired, I have shown the front agitator as including beater flaps 57, two only being shown in the drawings for the purpose of clarity, but it being understood that any suitable number may be employed. These flaps may be composed of rubber, fiber, or any suitable material, and are intended to perform a rough beating operation. The rear agitator may be provided with bristles 58, which are preferably arranged in closely spaced parallel rows, so as to provide a comparatively stiff brush. Owing to the fact that the brush is directly actuated through a strong motor independent of the source of suction, a stiff brush is available, whereas if the brush were actuated by the motor which drives the fan, a more flexible brush would have to be employed, as in such case there would be danger of stalling the motor and reducing the suction. This danger is eliminated in the present construction. It will be noted that by employing two small brushes instead of a single large brush, the height of the casing may be reduced without decreasing the efficiency of the cleaning operation and thus cleaning under very low articles is made feasible.

In operating the tool the outlet pipe 11 may be connected to any suitable source of suction, and one or both of the agitator actuating motors started. Where one only is operated at a time, the agitator, if so adjusted as to properly contact the surface being cleaned, will serve to move the tool across the floor or to assist the operator in moving the same. When reversal of the direction of movement is desired the other agitator may be actuated through suitable switch means 100 (Fig. 10*a*), or automatic reversal may be secured on the operator's reversal of the direction of movement of the tool as a whole by the use of suitable floor engaging means 101 (Fig. 10*b*), similar to what is disclosed in my Patent No. 1,912,386, dated June 6, 1933, which may be pivotally mounted on the casing of the tool in such a manner as to engage the floor or surface to be cleaned, such members serving as switches for the reversal of the agitator driving motors. Where the agitators are operated simultaneously in opposite directions a very effective cleaning operation is secured, owing to the combined effect of the beater and brush. Where both agitators are actuated in the same direction, they may assist in the movement of the tool across the floor or may be revolved so as to work in opposition to such movement, in which case the frictional effect of the agitators may be rendered more effective. It will be understood that the agitators will be raised or lowered according to the floor covering to be cleaned. Also, if desired, the floor tool may be equipped with end covers carried by the end roller supports, as illustrated in the modifications shown in Figs. 10 to 14. It will be observed that all the parts of the floor tool are accessible for cleaning and repair, and there is no danger of leakage of air.

As shown in Fig. 6, a flexible hose connector 59 is fitted over the pipe 11 and at its other end fits into a collar 60. This collar is provided with forked arms 61, 61, which are pivoted at 62 to a bracket 63 having arms 64 provided with gudgeons 65 and keys adapted to fit in the sockets 34 and keyways 35 of the castings 33 extending from the casing of the motor. The arms of the bracket 63 possess sufficient flexibility to permit them to be contracted slightly to permit withdrawal of the gudgeons from their sockets and to allow for outward expansion when placed therein. Thus the bracket forms a ready means for connecting the tool to suction pipes and the like. The collar 60 is shown connected to a stub pipe 66 through a joint 67 inclined at an angle to the axis of the pipe and into the stub pipe 66 may be fitted a tubular handle 68, preferably composed of hard fiber. The suction pipe or handle 68 may be removably connected through collar 69 to a flexible tube 70 which in turn communicates with a source of suction, not shown. An electric conduction cord 71 may be attached to the handle 68 and extends to the motors 36, being suitably branched for this purpose. Switches, not shown, may be furnished for controlling either one or both of these branches. It will be understood that the connections to the motors are through detachable plugs, so that by pulling out either plug the other motor will continue to operate.

In the modification shown in Fig. 9, the same type of floor tool is shown provided with a socket 72 which is directly connected to the outlet pipe of the tool by means of the angular joint 73. Into this socket may be fitted the end of a suction pipe 74 of an "Air-Way" cleaner of conventional type, provided with a two-way valve 75, a suction pipe or handle 76, a fan motor 77, and a fan casing 78 housing a high speed fan driven by the motor and discharging at 79 into a dust collector bag 80 carried by the handle 76, which bag may be and preferably is composed of an inner bag of porous paper, not shown, and an outer cloth cover. The motor 77 is shown provided with detachable plugs 81 and 82, one of which is connected to a cord 83 which supplies current to the motor and the other is connected to a cord 84 which conveys current to the motors which drive the agitators. This form of my invention is particularly desirable, since it involves the combination of a direct motor-connected centrifugal high-speed fan arranged to produce a nozzle-entering swift air current, and separate motors for driving the agitators within the air current produced by the fan. There is thus no slowing down of the fan motor by the driving of the agitators, their operation being separate and independent. The fan motor 77 is shown as supported by one or more rollers 85, and it is possible to fulcrum the apparatus about these

rollers to raise the floor tool for any desired purpose.

In Figs. 10 to 13 a floor tool similar to that described in the preferred embodiment is shown, but differing therefrom in that the rear rollers are set just back of the rear brush, and each pair of front and rear rollers on one side of the machine conjointly carry end closure plates or strips similar to what is described in my application Serial No. 16,866, referred to above. In this embodiment of the invention also a single motor 86 is shown having a pulley on each end of its shaft, the motor being mounted in a manner similar to that described for the two motors in the previous embodiment of the invention. Belts 87 and 88 serve to drive the agitators 89 and 90. The bristles of the rear brush or agitator may be omitted for a short distance to permit the belt for driving the other agitator to pass and the flaps of the beater are likewise cut away for a short distance to receive the driving pulley. By twisting either of the belts the agitator driven thereby may be reversed with reference to the motor drive. By removing either belt from its pulley or by withdrawing the pulley shaft from contact with the motor shaft, either brush may be rendered inoperative while the other is actuated. Sockets 91, 91 may be provided at the rear portion of the casing to receive the rear rollers. End covers 92, shown in detail in Figs. 13 and 14, are jointly supported by each pair of front and rear rollers. It will be noted that in order to accommodate the single motor the outlet pipe 93 leading from the floor tool or nozzle will have to be directed upwardly so that it is at a somewhat higher level than the corresponding outlet pipe 11 in the preferred embodiment of the invention. If desired, a rigid suction handle 94 may be fitted into the pipe 93 without the use of intermediate connections. A tight joint may be obtained by drying the end of the fiber tube below its normal moisture content and then allowing the same to expand within the socket. In Fig. 11 the pipe 94 is shown fitted over the outlet tube 93, and in such case a tight joint may be secured by moistening the end of the fiber tube and allowing the same to dry and contract over the other tube. In either case the fiber tube may be withdrawn when desired to permit the tool to be connected to other sources of suction or to permit the handle to be applied to a different tool.

It will be understood that the various modes of connecting the floor tool to sources of suction are intended as illustrative only and that the floor tool is adapted for use with any type of suction handle pipe or suction cleaner, including a tubular pipe connected to a source of suction or fan motor. Various types of cleaners with which the tool may be employed are illustrated in my prior Patents Nos. 1,167,219, dated Jan. 4, 1916; 1,345,550, dated Dec. 15, 1925; 1,533,271, dated Apr. 14, 1925 and 1,887,600, dated Nov. 15, 1932, these forms being intended as illustrative only. Various methods of connecting the tool to a source of suction are illustrated in my application Serial No. 16,866, hereinbefore referred to.

It will be understood that where end covers 92 are employed as in the modification disclosed in Figs. 10 to 14, spring members 95, shown in Fig. 13 and likewise illustrated in Fig. 5, permit variation of the size of the end openings according to the degree of downward pressure applied to the floor tool, this being varied in accordance with the cleaning operation. Likewise the position of the agitators will be adjusted according to the type of surface being cleaned, and the combined effect of the automatic adjustment of the end openings and the manual adjustability of the agitators permits the most effective cleaning operation.

The floor tool being built low to the ground and in the preferred embodiment of the invention having an outlet pipe no higher than the top of the floor tool casing, permits sweeping under extremely low objects, and the combined use of a flexible hose connector and inclined joint contributes to this desired result, in that the suction handle may be tilted downwardly and rotated angularly so that it is on a level with or below the nozzle. The angular tilting permits the tool to be moved at an angle with reference to the handle itself, as described in my previous patents and applications.

Various modifications and variations of the invention will be apparent to those skilled in the art.

What I claim is:

1. In an apparatus of the character described, a suction nozzle having an inlet mouth and a rearwardly extending outlet pipe adapted to be connected to a source of suction, a pair of chambered arms also extending rearwardly from the casing and communicating therewith and having aligned transverse openings, surface agitating means rotatably mounted within the nozzle, a pair of motors mounted one on one side and the other on the other side of the outlet pipe, each having a portion extending into one of the transverse openings in the adjacent chambered arm and closing said opening fluid-tight, said motors having actuating pulleys within said arms, belts extending from the pulleys to said agitators, the openings opposite said pulleys being of sufficient size to permit insertion of the pulleys through said openings and having fluid-tight removable covers.

2. An apparatus as set forth in claim 1 wherein the chambered arms are connected by a frame member and the motors are removably mounted between said frame member and the rear wall of the nozzle proper.

3. An apparatus as set forth in claim 1 wherein shock reducing buffer members are included between the motors and the rear of the nozzle.

4. In an apparatus of the character described, a suction nozzle having a pair of agitators mounted therein, said nozzle having parallel chambered arms communicating with the interior of the nozzle and extending rearwardly therefrom, corresponding openings in each of said arms facing each other, and motors for actuating said agitators having hubs closing said openings air-tight, and power transmission means extending through said chambered arms from said motors to said agitators.

5. In an apparatus of the character described, a suction nozzle having a pair of agitators mounted therein, said nozzle having parallel chambered arms communicating with the interior of the nozzles and extending rearwardly therefrom, corresponding openings in each of said arms facing each other, motors for actuating said agitators having hubs closing said openings air-tight, and capped access holes opposite said hub openings, and power transmission means extending through said chambered arms from said motors to said agitators.

6. In an apparatus of the character described, a nozzle having front and rear strokers, the upper

edge of the rear stroker forming with the rear wall of the nozzle an external ledge, agitating means within the nozzle, a frame member spaced in rear of said rear wall and connected thereto at its ends, and means for actuating said agitating means and including a motor wedged between the rear wall of the nozzle and said frame member and supported upon said ledge.

7. A floor tool comprising a suction nozzle having a pair of rotatable agitators therein, and means for selectively actuating said agitators to rotate singly, or simultaneously, in the same or in opposite directions, at the will of the operator.

8. A floor tool as set forth in claim 7, wherein the actuating means includes a pair of independent motors, at least one of which is reversible end for end.

9. A floor tool comprising a suction nozzle, a pair of rotatable agitators therein, a pair of chambered arms extending rearwardly from the nozzle and communicating with the interior thereof, and driving means for said agitators, mounted between said chambered arms and having portions extending into openings therein and closing the same air-tight, and motor transmission means extending through said chambered arms from the driving means to the agitators.

10. A floor tool comprising a suction nozzle, having a pair of rotatable agitators therein, said nozzle having a centrally located, rearwardly extending outlet pipe and a pair of chambered arms, one on each side of the outlet pipe, and communicating with the interior of said nozzle, and a pair of motors for driving said agitators, and having their hubs extending into openings in the chambered arms and closing the same air-tight, and power transmission means extending through said chambered arms from said motors to said agitators.

DANIEL BENSON REPLOGLE.