

April 14, 1925.

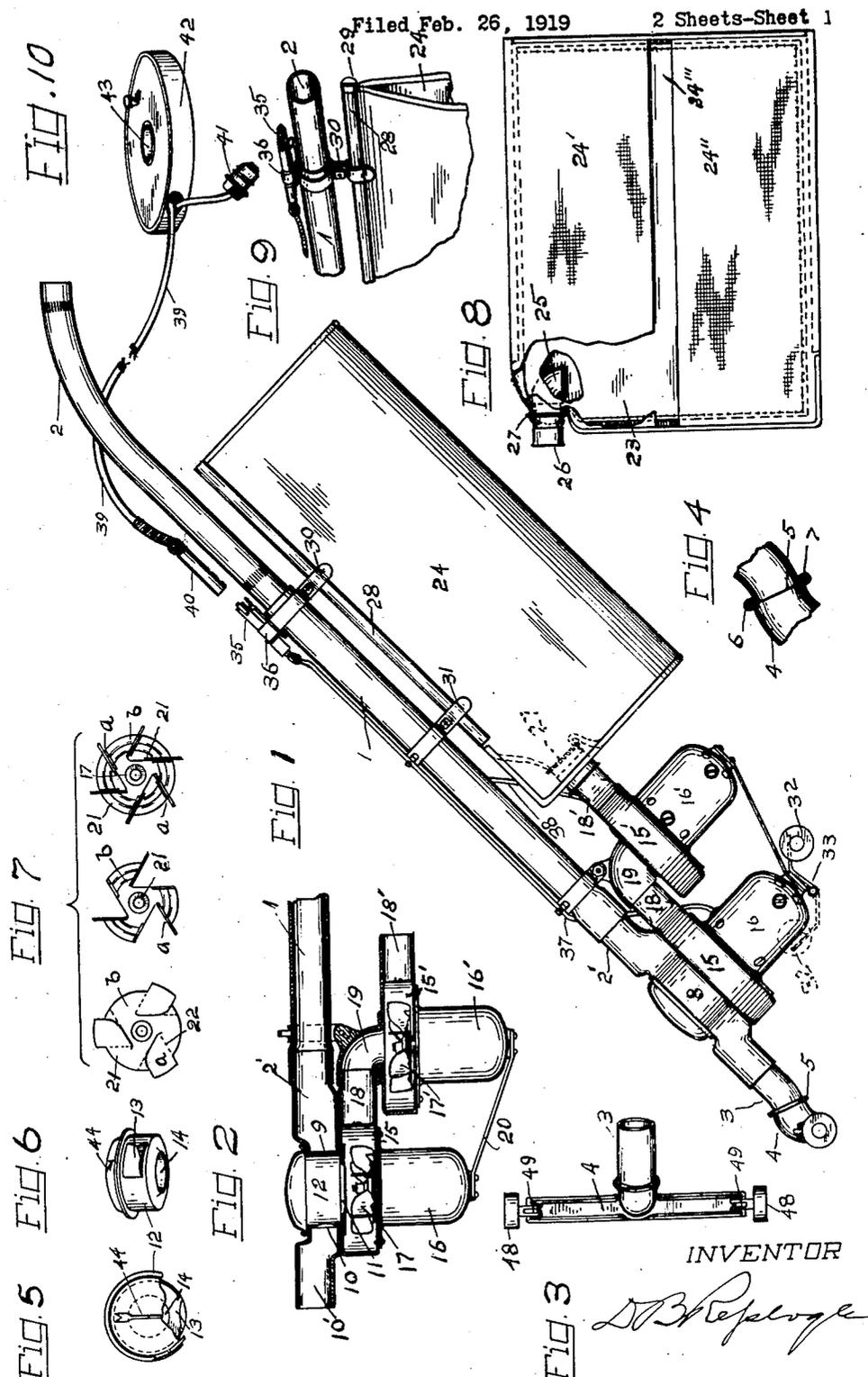
1,533,271

D. B. REPLOGLE

AIRWAY CLEANING APPARATUS

Filed Feb. 26, 1919

2 Sheets-Sheet 1



INVENTOR

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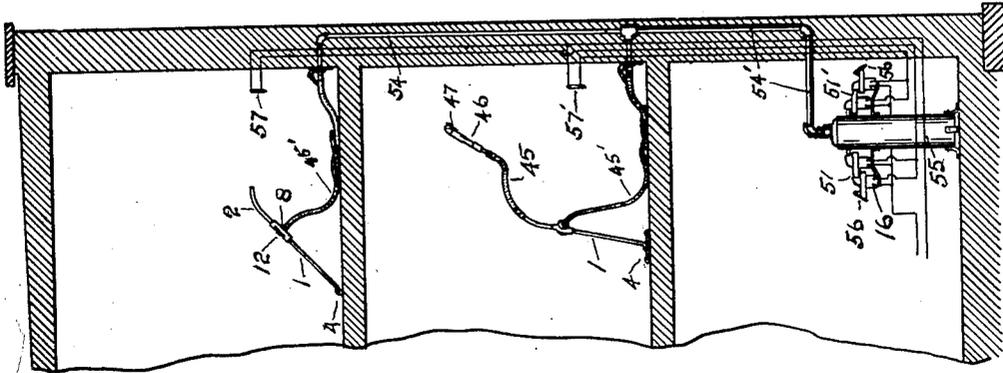


FIG. 13

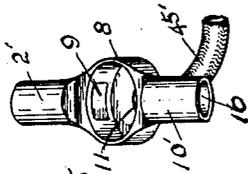


FIG. 15

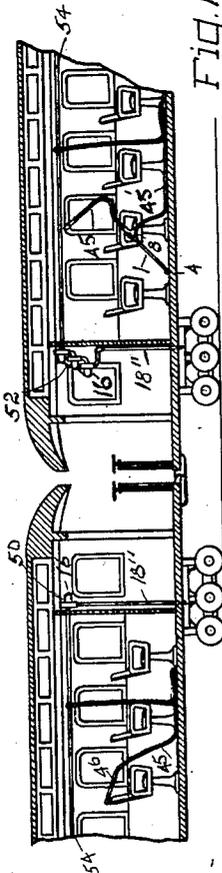


FIG. 14

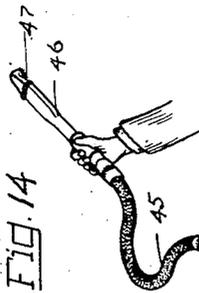
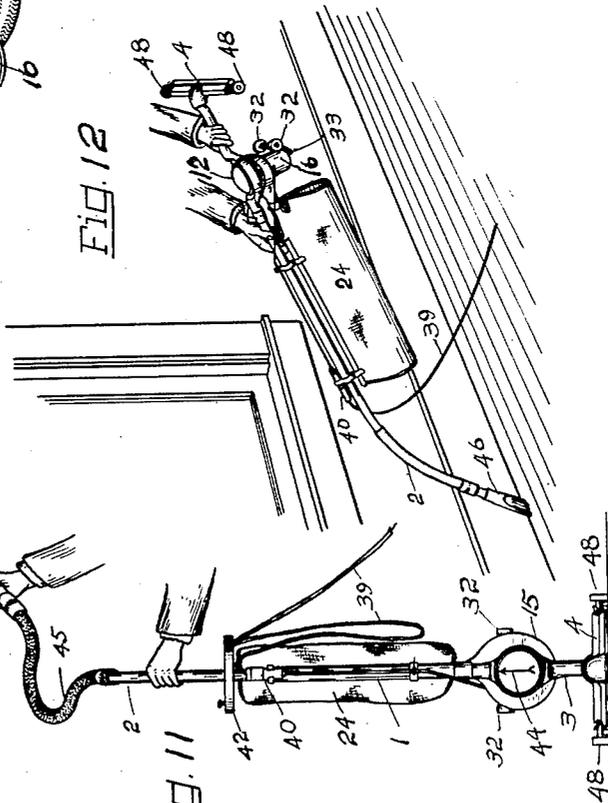


FIG. 11

FIG. 12



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UNITED STATES PATENT OFFICE.

-DANIEL BENSON REPLOGLE, OF BERKELEY, CALIFORNIA.

AIRWAY-CLEANING APPARATUS.

Application filed February 26, 1919. Serial No. 279,467.

To all whom it may concern:

Be it known that I, DANIEL B. REPLOGLE, a citizen of the United States, residing at Berkeley, county of Alameda, and State of California, have invented a new and useful Airway-Cleaning Apparatus, of which the following is a specification.

This invention relates to air-way cleaning systems commonly known as vacuum cleaners and has for its objects standardization of portable and stationary cleaning machine parts, so that the same parts and elements which are used in the portable form may be incorporated into a stationary form of cleaner. More particular objects as to portable cleaners, are to render such cleaners simple in construction, light in weight, effective, and convenient generally. The more specific objects in stationary cleaners are to make such systems less expensive, more capable of variation in capacity without multiplication of patterns, and particularly the construction of compound unit plants, providing therein for means to operate only such part of a plant at a time, as is required to serve, without running the entire plant.

To these ends the invention consists of the construction, arrangement and combination of the parts and features as illustrated in the accompanying drawings and described herein.

Referring to drawings.—

Fig. 1 shows a side elevation of a portable cleaner made up of parts which enter into this system.

Fig. 2 is a similar view of part of Fig. 1 with parts broken away showing details of the air passages and suction producing means.

Fig. 3 is a top view of the floor tool shown in side elevation in Fig. 1.

Fig. 4 is a detail section of the swivel joint connecting the floor tool to the tubular handle part of the device.

Fig. 5 is a top view of a transparent-topped valve used to control the flow of air toward the suction producing means.

Fig. 6 is a view in perspective of the valve shown in Fig. 5.

Fig. 7 is a view showing three stages of construction for a suitable centrifugal fan used in producing the suction.

Fig. 8 is a reduced size view of the dust collector unfolded so as to expose the interior paper bag, parts of the covering being

broken away so as to show the method of connecting the same to the cleaner shown in Fig. 1.

Fig. 9 is a view in perspective more clearly showing how the dust collector and switch are secured to the tubular handle.

Fig. 10 shows a suitable reel for the electric cord used in operating the portable form of my device.

Fig. 11 shows a portable form of my cleaner in which but one motor is used, and illustrates the method of using a hose from the end of the handle thereof.

Fig. 12 illustrates the use of a special cleaning tool attached directly to the handle.

Fig. 13 diagrams a general plan for using the motors, handles and other parts of my device for a stationary system in a building.

Fig. 14 illustrates how the system may be applied to railway cars.

Fig. 15 is a view in perspective of a valve member from which the fan case has been removed and hose attached thereto instead.

Similar characters of reference refer to like and similar parts throughout the views.

In the drawings 1 designates the suction pipe handle of a portable cleaner embodying that part my invention. This handle may be extended by a curved section 2 telescopically connected and having its outer end adapted to receive cleaning tools or cleaning hose pipes when not in use for pushing the device about for floor cleaning purposes. The floor tool 4 is attached to an extension 3 of the handle by a sliding or swivel joint 5, which joint is constructed by bending an annular inturning flange 6 of the shank of the floor tool over an outwardly turning flange 7 of the extension tube 3. This construction permits the floor tool taking angular positions with reference to the line of the handle 1.

The two sections, 1 and 3 of the handle are united by a valve member 8 having ports or passage ways 9 and 10 which are arranged to extend communication with the port 11 by means of a transparent-topped turn valve 12 having a registering port 13 designed to communicate as may be desired with either the port 9 or the port 10 of the valve member 8, when in position, as shown in Fig. 2. The port 14 thereof is arranged to coincide with the port 11 of the valve member 8. To the valve member 8 is secured a fan case 15 with motor 16 attached, arranged to drive a direct connected cen-

trifugal fan 17 axially in line with the port 14. This fan is arranged to draw air centrally thru the said central port 11 and drive it thru exhaust 18, which may directly lead to dust collecting means, or, may be led by an L 19 to a similar fan 17', in a similar fan case 15' and driven thru an exhaust 18', into the dust collector, 24. In the portable form more than two motors thus arranged would be inconvenient, but in stationary forms they may be extended indefinitely; that is, the exhaust 18' may exhaust into a third suction producing unit and from that to a fourth, etc. The motors used are to be capable of very high speed, for as the air is passed consecutively thru them, all the motors engaged, speed up to a corresponding higher speed proportionally with the number of them, so that their combined effect produces a very rapid current of air. When several units are connected to form a compound unit, the bases of the motors used may be connected by a brace 20.

Owing to the high speed required, a specially constructed fan is to be used, and should be constructed from two similar blanks 21, 21 having each three lug portions *a* and three base portions *b* from any of which a blade of the fan may be constructed by bending on the line 22 so that the blade stands at right angles with the base or shroud *b* as shown in the second part of Fig. 7. Two such blanked pieces superposed, one upon the other, so that the blade *a* of the one becomes diametrically opposite a corresponding blade *a* of the other, form a 6-bladed fan with a complete shroud when the parts are welded together as shown in the third part of Fig. 7.

The dust collector is of special construction and consists essentially of an interior porous paper envelope or liner 23 inserted into a cover 24 made from coarse mesh. The cover 24 when unfolded presents an upper pocket 24' and a lower pocket 24'' with an open slit 24''' thru which the paper liner 23 may be inserted and attached to the curved mouth tube 25. It is thus arranged to communicate with the exhaust 18 of the cleaner when attached thereto by the nipple 26. When the cover and liner are thus assembled, the liner is held in place upon the mouth tube 25 by means of an elastic band 27 arranged outside of the cover and slid over the mouth of the liner from the exterior of the cover. The cover is provided with suitable strips 28 and 29 secured to its upper and lower edges respectively, which strips are brought together, folding the lower edge of the cover in line with the upper edge; and the strips when thus brought together are slid within spring clamps 30 and 31 on the handle 1, whereby the combined dust collector is held securely in line with

the exhaust and with the handle aforesaid.

A pair of rollers 32, 32 secured to a hinged base plate 33 may be attached to the base of the motor 16 so as to serve as a support for the portable machine when not in action, and also as a fulcrum whereby the nozzle 4 may be tilted from the floor when the handle is depressed, during action.

The connector switch 35 is arranged to be clasped by an upward extension 36 of the clamp 30 and connects with electric cords 37 and 38 extending to the motors 16 and 16' respectively. The service cord 39 has a socket 40 to connect with the switch 35, and a plug 41 to connect with any lamp socket having a source of electricity. A reel 42 having an open center 43 is adapted to have said cord wound upon it and to be slid over section 2 of the handle, as shown more particularly in Fig. 11.

An indicating arrow 44 is printed on the transparent-topped valve surface to indicate the direction in which port 13 is turned. When it is turned toward the handle 1, as shown in Fig. 11, the hose pipe 45 or other suitable appliance may be attached; for example the tool 46 which, in turn may have attached to it a brush 47, as shown in Fig. 11.

The floor tool 4 is provided with spring supported rollers 48, 48. The spring supports 49, 49 thereto being arranged to normally hold the mouth of the floor tool a distance above the floor or covering to be cleaned.

In the operation of the portable device, the handle 1 is grasped and when lifted upward the main weight is thrown on the roller support springs 49, 49, bringing the floor tool into acting relation. The electric service cord 39 being attached, suction proceeds from the floor tool 4, but when the valve is reversed suction proceeds thru the handle, and appliances as 45, 46 and 47 may then be used by resting the machine either on the rollers 32, 32, or by standing it on end, resting it on the floor tool 4, as shown in Fig. 11. Or the section 3 of the handle may be grasped by the hand so that out-of-the-way places may be reached by the end of the handle 2, to which any suitable form of tool is applied, as suggested in Fig. 12.

When the paper dust bag becomes fouled or sufficiently filled, the cover containing it is removed from the clamps 30, 31, the elastic band 27 is slid forward toward the nipple connection of the bag, and the paper envelope with its contents is removed and destroyed. The cover is then replenished with a similar envelope and attached as before. The cord reel 42 may be conveniently carried on the handle by sliding section 2 thereof thru the opening 43 of the reel. For stationary service it is obvious that the bag form of dust collector and the electric cord described are not required. The

motors or any required number of them, with their fans connected and arranged to operate within the same or similar fan-cases with intakes and exhausts, may be arranged at any distant point; as for instance, the basement of a house, as shown in Fig. 13, or the closets of railway cars, as shown in Fig. 14. A single unit may be placed for such purpose as shown at 50 Fig. 14, or the units may be compounded in pairs as shown at 51 and 51' Fig. 13, or compounded in threes or any greater number as shown at 52 Fig. 14.

Where several compounded or single units are attached to a common or conduit receptacle as the tank 55, a single pipe 54 may extend to the said receptacle and have several openings leading into the pipe, but it will be found best to increase the diameter of the pipe as at 54' when several connections have been made, so that if more than one of the units may be in operation at one time the pipe may carry the greater volume of air thus required of it. In such cases also the common enlarged conduit settling tank 55 may be interiorly arranged so that the filtering takes place before the air passes thru the fans. When several units are thus connected to a common tank, a valve 56 should be arranged to automatically close the exhaust when the particular unit to which it is attached is not in operation. The several units when thus arranged may be started from separate connections, such as 57 and 57', the wiring from which extend to the respective units to be controlled.

Where, as in railway cars no common tank or receptacle for several units is required, the exhaust may be thru a pipe as 18' extending thru the floor and exhausting into the open air.

In every case where the motors are separate or removed from the handle 1, the valve member 8 may be equipped directly or indirectly with a hose 45' extending from a connection with the port 11 thereof. If the fan-case be not removed with the motor and fan, the hose 45' may be connected to the part forming the exhaust 18 and the underside of the case suitably closed so that it becomes part of the suction conduit; also the curved handle 2 may be connected to the socket 2' and the straight handle 1 may be connected to the socket 10', with the floor tool 4 operatively connected to its outer end. A hose pipe 45' is then to be connected with any suction pipe as 54 to furnish the required air current for operating the cleaner. It is apparent of course that the transparent-topped valve will in either case serve to indicate the direction of the current and passing of dust, in a similar manner as when applied to the portable device. It is designed to serve as a true indication as to

whether or not dust is being obtained, and is always readily removable for the purpose of removing obstructions which may clog the passage ways.

While not required, the combined paper dust bag and cover may be applied to the exhaust provided with valve 56, so as to arrest the finer particles of dust which may not have settled with the coarser dust in the tank 55.

The air carrying capacities are so proportioned with fans and motor efficiency speeds, that the speed of one motor, or less than all, acting alone without air passages being obstructed, becomes automatically reduced to lower than its maximum efficiency speed; but in conjunction with an added motor, or with passage way obstruction, is automatically increased towards its maximum efficiency speed.

Having thus described the invention and the operation thereof, it is evident that many of the parts and arrangements may be modified and varied without departing from the spirit of the invention.

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

1. A cleaning system of the kind described, comprising portable and stationary conduits and suction cleaning tools operatively connectable to portable conduits of the system; in combination with compound suction producing power units, having serially arranged motor driven fans detachably and interchangeably connectable to either a portable or a stationary conduit of the system; for the operation thereof.

2. In a cleaning system of the kind described, having portable and stationary conduits adapted to have operatively connected to either of them, a suction producing power unit; a compoundable suction producing power unit comprised in two or more single units of automatically variable speed motor driven serially arranged fans, one or more of which is operatively connectable to either or both the portable or stationary conduits.

3. A cleaning system of the kind described comprising cleaning tools operatively connectable to air conduits, air conduits and means for producing accelerated air current therethrough, said means being a plurality of variable speed electric motor driven rotary fans, said fans being arranged serially operative within conduits of the system, and each fan being driven by an independent motor, independent motors arranged to drive said fans, and said motors having similar automatic speed increasing characteristics, whereby a highly accelerated air current is attained through the system for the purpose set forth.

4. In an apparatus of the kind described, having a system of air passage conduits a plurality of serially arranged fan-cases in

said system, fans therein severally driven, variable speed motors arranged to severally drive said fans, and adapted automatically to vary their speeds in inverse ratio with the quantity of air permitted to flow thru said conduits.

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5. An air-way cleaning system of the kind described comprising operatively connected cleaning tools, air conduits and dust collecting means, in combination with air propelling means consisting of several power-operated serially arranged rotary fans, and variable speed motors arranged severally to drive said fans, constituting suction producing units, whereby said units are designed to automatically accelerate in speed in accord with the number of them in serial operation within the conduits of the system.

6. An air suction producing unit compounded from two or more fan-cases serially arranged having the exhaust of one leading into the intake of the next, fans therein severally driven to cause a flow of air consecutively therethru, and variable speed motors arranged to severally drive said fans.

7. In an air-way system adapted for cleaning and the like, wherein motor driven centrifugal fans are used for driving air thru the system, a plurality of attachment devices for the air driving means, and a plurality of equipped centrifugal fan air driving units adapted to be serially and op-

eratively attached to either of the attachment devices aforesaid.

8. In an air-way system of the kind described, for cleaning and the like, wherein suction is produced by electric motor driven centrifugal fans, a suction producing means comprising a plurality of serially arranged fan-cases, the exhausts of the first leading into the intakes of the next, fans therein driven by variable speed motors, motors arranged to drive said fans and said motors having similar speed increasing characteristics whereby they are adapted to simultaneously increase to higher speed in degree as air-flow thru the system is obstructed.

9. In a pneumatic cleaner, suction producing means comprising a pair of fan cases with exhausts serially arranged in tandem, operative associated motors and fans in each, each motor and fan associated being in separate parallel planes, but having common axes and that of both in a common plane; together with a flexible dust collecting receptacle arranged to receive the discharge from said exhausts, a rigid suction pipe usable as a handle, operatively connecting with the suction producing means, and aligning the dust collecting receptacle therewith into the common plane of said axes.

In witness whereof I affix my signature.

DANIEL BENSON REPLOGLE.