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3,147,510

INDUSTRIAL SUCTION CLEANER WITH HAND SUCTION ATTACHMENT

Filed Sept. 20, 1962

2 Sheets-Sheet 1

FIG. 1

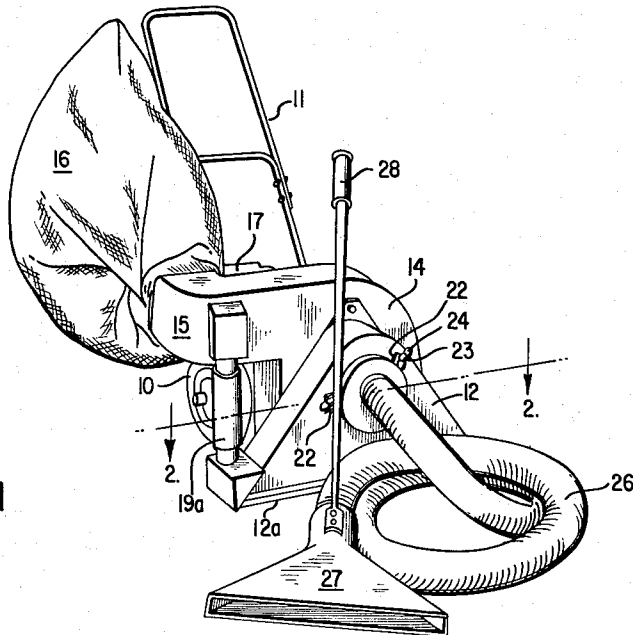
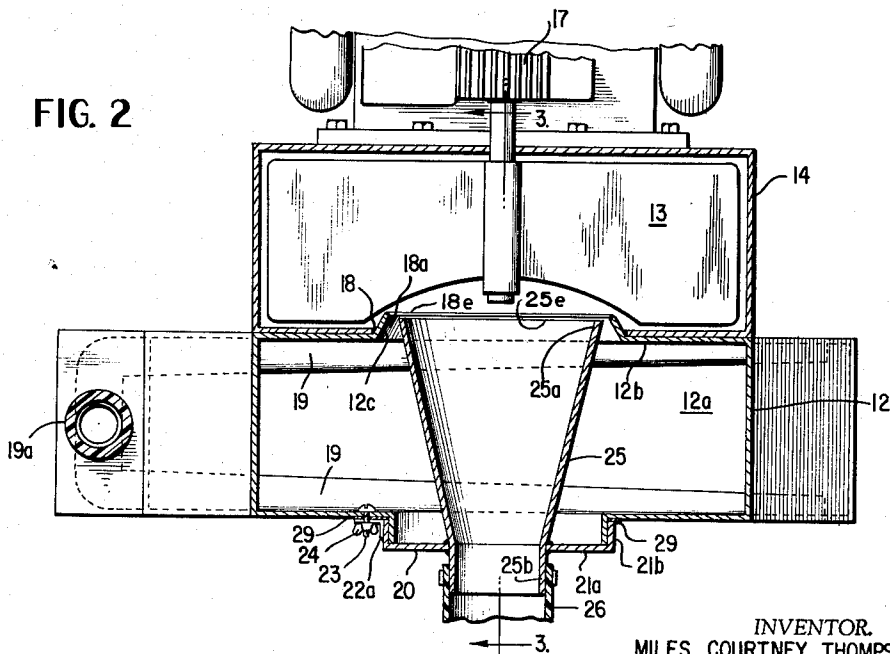


FIG. 2



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FIG. 3

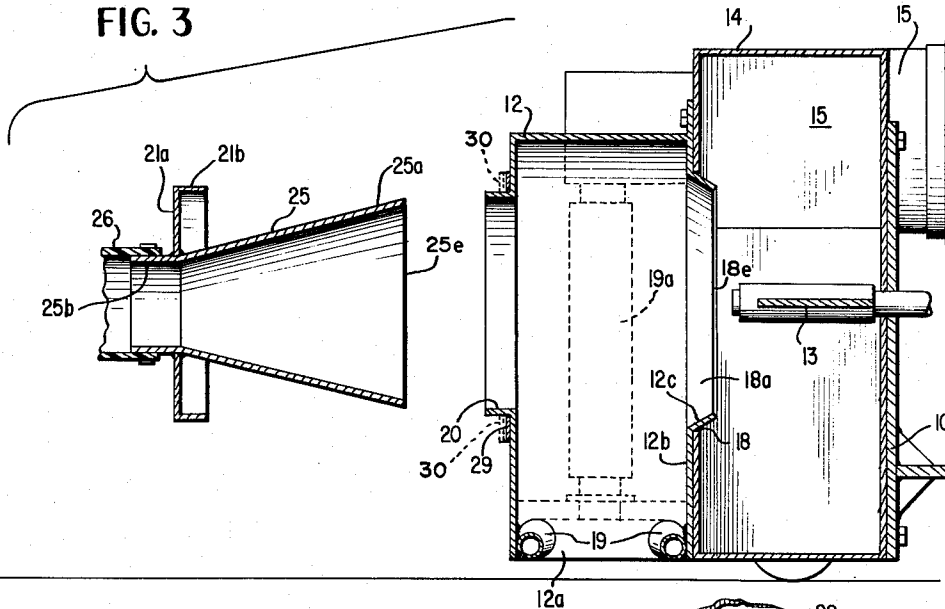


FIG. 5

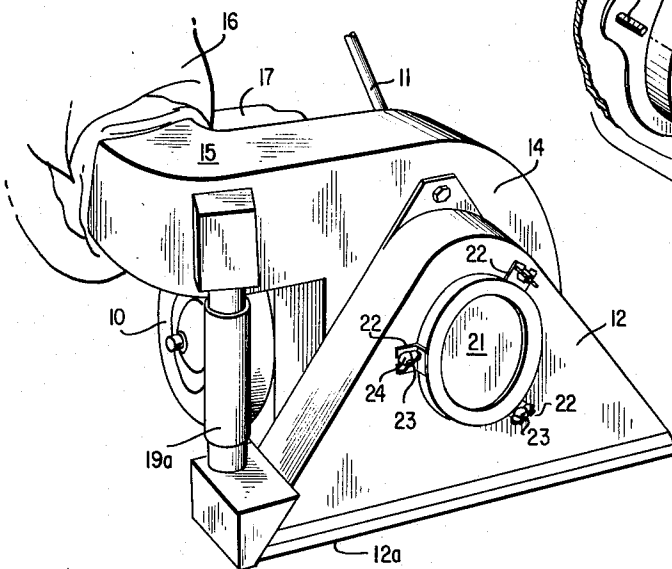
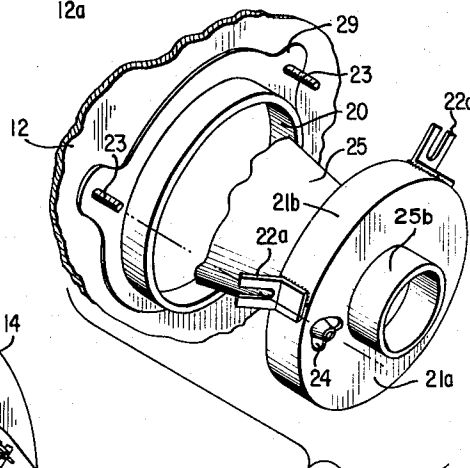


FIG. 4



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INDUSTRIAL SUCTION CLEANER WITH HAND SUCTION ATTACHMENT

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5 Claims. (Cl. 15—337)

The present invention relates to suction cleaner devices and, more particularly, to means for converting a mobile carriage-type industrial suction cleaner for collecting litter, trash particles, scraps, cuttings, shavings and other waste, dirt and dust, having a fixed suction hood movable with the cleaner, into a cleaning device having a manually guided and manipulated suction nozzle connected by a flexible hose to the suction means of said cleaner device.

Mobile suction cleaner devices, of the general type shown in my United States Letters Patent No. 2,971,210—where a downwardly directed hood is fixedly mounted to a power-driven suction means and passes, as a unit, over the surface to be cleaned with the movement of the cleaning device—are being employed successfully with great facility and economy for cleaning the floors of industrial plants, the surfaces of parking facilities, floors of trucks and truck or lorry trailers, of freight cars, of docks and platforms, warehouses, stadiums and the like.

However, in certain situations, such as in cleaning railway cars, certain types of freight box-cars, grain elevators and others, it is impossible to clean portions into which the open end of the suction hood cannot be extended or projected and it is necessary to employ a relatively flat nozzle flexibly connected to the suction means and capable of being directed and manipulated manually by the operator in order to reach the places to be cleaned. Such a so-called "hand-nozzle" with a flexible hose, that can be attached and detached from suction cleaners, has been employed heretofore, but the manner of connecting them to industrial suction cleaners has not been satisfactory or given satisfactory results from the standpoints of ease and quickness of attachment and detachment and/or the efficiency in cleaning by the "hand nozzle" so attached, particularly when the hose is of a certain convenient internal diameter relative to the area of the intake opening of the suction means.

The object of the present invention is to provide a novel and improved means by which a so-called "hand suction cleaning nozzle" may be attached and detached, without the need of tools, to an industrial suction cleaner, of the type above indicated, and by which the efficiency of the cleaner is increased.

A more specific object of the invention is the provision of a connecting means by which such a mobile industrial type suction cleaner above described may be temporarily converted into a "hand nozzle" type suction cleaner, the connecting means being of a particular construction, which when attached to and in place on the suction cleaner functions as a venturi-tube air-injector to improve the efficiency of the suction cleaner equipped with a "hand nozzle."

The above and other objects and features of the invention will be apparent from the following detailed description when read in connection with the accompanying drawings, which illustrate the presently preferred embodiment of the invention as now devised and used.

In the drawings:

FIGURE 1 is a perspective view of the front end of a mobile industrial type of suction cleaner, as disclosed in my United States Letters Patent No. 2,971,210, and equipped with a "hand nozzle";

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FIGURE 2 is an enlarged horizontal sectional view taken substantially along the line 2—2 in FIGURE 1;

FIGURE 3 is a vertical sectional view taken substantially on the line 3—3 of FIGURE 2 with the venturi-tube connecting means separate from the suction cleaner;

FIGURE 4 is a fragmentary perspective view illustrating the manner in which the venturi-tube is attached and detached from the suction cleaner; and

FIGURE 5 is a front end perspective view of a mobile industrial suction cleaner, as shown in FIGURE 1, with the "hand nozzle" removed and the open end in its fixed suction hood closed and sealed.

Referring in detail to the drawings, in which like characters of reference refer to similar and like parts throughout the several views, a suction cleaner of the general type employed for the cleaning of floor surfaces of factories, warehouses, freight cars, lorry-trailers, docks, etc., usually comprises a wheeled carriage 10 (see FIGURES 1 and 5) propelled and steered through a rearwardly extending handle 11 and having a power-driven suction means mounted thereon from which a divergingly flared hood 12 extends forwardly and downwardly and terminates at a point adjacent the floor or surface, to be cleaned, in a downwardly directed opening forming a rectangular suction nozzle whose opening 12a is relatively long and extends transversely of the direction of movement of the cleaner and is relatively narrow in its other direction.

The suction means usually comprises a suction fan 13 enclosed in a cooperating casing 14, which casing has a discharge conduit 15 extending substantially tangentially from its circumference and delivers the garnered gleanings to a collection air-filtering container 16. The fan 13 is, preferably, of the flat two-blade type, as shown, with the blades arranged in substantially the same plane to avoid clogging of the fan and its casing by large pieces of the garnered waste material. The fan 13 is driven by a motor 17 mounted on the carriage 10; and, in some cases the motor may also drive the wheels of the carriage.

The hood 12 is in communication with the fan casing 14 by means of an intake opening 18, extending through the front of the casing 14 and substantially concentric with the axis of the fan 13. Where, as shown in FIGURE 3, the hood 12 has a rear wall 12b, it is provided with an opening 12c corresponding to and registering with the opening 18.

However, in either case just mentioned above, the improvement comprises the edge of the opening 18 or of opening 12c being provided with a circular rimming laterally extending flange 13a which converges toward its free projecting edge 18e to form a frusto-conical constricting throat projecting for a short distance into the fan casing 14.

The cross-sectional area of discharge side of the throat intake opening 18 and of the discharge conduit 15 are determined by the size of the fan 13 for creating the required suction for any given size of cleaning device when operated in the condition shown in FIGURE 5. As shown, the suction cleaner may be equipped with air jets 19, fed from the discharge conduit 15 through pipe 19a, for dislodging litter or other particles that may cling in crevices, grooves, depressions and the like, as described in my aforesaid patent.

When it becomes necessary, or at least desirable, to attach a "hand nozzle" and a flexible hose to an industrial suction cleaner of the type described, attempts have been made to connect the same to the usual hood opening 20 provided in the front wall of the hood-nozzle 12 and aligned with the opening 18 for cleaning and inspection of the fan 13. The hood opening 20 is normally closed tightly by a cap 21 having peripherally disposed slotted

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lugs 22 which receive stud bolts 23 and held in place by wing-nuts 24. These attempts have been unsuccessful, even when the hood-nozzle opening 12a has been closed, as sufficient suction is not created at the "hand nozzle" (with a suction means that is more than adequate for the normal operation of the cleaner) to entrain the trash, dirt and litter and convey it through the flexible hose of a length required for reasonable operation.

According to the present invention, a tube 25, preferably frustoconical, is provided, the larger end 25a of which is dimensioned to be inserted through the front hood opening 20 and projects into the constricting throat 18a of the intake opening 18 in the fan casing 14 with its projecting end edge 25e planar, or substantially planar as shown, with the edge 18e of said constricting throat and spaced concentrically therefrom; and its smaller end portion 25b is provided with a circular flange spaced inwardly for a distance from said smaller end to form a closure-cap 21a having a rimming edge lip 21b to fittedly engage over and around the rim flange of the hood opening 20 to bear against a gasket 29, which may be provided to form a seal. The cap 21a is provided with lugs 22a to cooperate with the stud bolts 23 and nuts 24 for holding the tube 25 in the position shown in FIGURE 2. The cap 21a is so related to the end edge 25e of the tube 25 that, when the cap 21a is positioned properly and secured in place, the edge 25e is in the position shown in FIGURE 2 to give maximum efficiency.

One end of a flexible hose 26 is suitably connected to the end 25b and has a flat and outwardly flared hand-nozzle 27 connected to and in communication with its other end. An elongated handle 28 is connected to the hand-nozzle 27 for its convenient manipulation by the operator.

The tube 25 functions with the throat 18a as a venturi-injector. When the fan 13 is operating, in addition to exerting an air suction-draw through the tube 25 and the flexible hose 26, it draws air through the nozzle opening 12a of the hood 12 and through the throat 18a of the intake opening 18 of the fan casing 14 (which surrounds the discharge end 25a of the tube 25) in such volume and with such velocity as to create a vacuum effect at and around the discharge end 25a of the tube 25, resulting in the most efficient operation of the hand-nozzle attachment.

Under certain conditions of the cleaning operation, particularly when a hose 26 of exceptionally long length (i.e., in excess of about 10 feet) and/or different internal diameters are employed, this variation in spacing the edges 18e and 25e may be accomplished by varying the distance of the discharge end 25e of the tubular member 25 within and relative to the converging surface of the constricting throat 18a of the intake opening 18 in the impeller casing 14. The present construction of the "hand-nozzle" attachment of this invention permits such adjustment to be made readily and conveniently by applying a shim or shims 30 (shown in dotted lines in FIG. 3) over the washer 29; but it is preferred to employ tubes 25 having their discharge ends dimensioned to provide the required spacing between the end edges 18e and 25e while in a substantially planar position, as shown.

After the need of the use of the hand-nozzle attachment has been satisfied, it may be quickly detached by removing the nuts 24 and withdrawing the tube 25 from the cleaner, as indicated in FIGURES 3 and 4, and then replacing the normal cap 21 and locking it in position with the nuts 24, as shown in FIGURE 5.

From the above it will be apparent that a very simple and novel device has been provided for the attachment and detachment of a so-called "hand-nozzle" to mobile industrial suction cleaners and which permits such cleaners to function with greater efficiency with said "hand-nozzle" attachment and that the objects of the invention are attained thereby.

Having thus described the invention and the manner

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in which it is to be performed, it is to be understood that changes and modifications may be made in the device without departing from the spirit of the invention and that the invention is only to be limited by the scope of the appended claims.

That which is claimed as new and to be secured by Letters Patent, is:

1. An improvement in mobile air suction cleaners having a suction fan, a casing enclosing said fan and having an intake opening concentric with the axis of said fan and having a discharge opening, a suction hood fixedly mounted on said casing and diverging downwardly from said intake opening in said casing to form a floor suction nozzle and having a normally closed access opening in the front wall thereof aligned with the said intake opening in said fan casing; said improvement comprising the provision of a rimming flange around the edge of the intake opening of and converging inwardly of the casing, a tubular member of a diameter to be insertable into and removable from said access opening in the hood when said access opening is opened, means external of said tubular member and disposed thereon to form a removable closure for said access opening and supporting said tubular member in inserted position; the said tubular member being of a length between said closure means and its discharge end as will position the discharge end of said tubular member within and concentric with and spaced from the inner side wall of said rimming flange at the intake opening in the fan casing to provide an air injection nozzle surrounding the discharge end of said tubular member, when said tubular member is inserted in position, a flexible hose connected to the inlet end of said tubular member, and a hand-suction-nozzle connected to the other end of said hose.

2. An improvement for air suction cleaners as set forth in claim 1, further characterized by cooperating means on said hood and on said removable closure for detachably securing said removable closure in position on said hood to close the access opening thereof, when said tubular member is inserted into position, and for varying the spacing between the discharge end of the tubular member and the edge of the discharge opening in said hood to regulate the volume of air drawn through the air injection nozzle.

3. In a mobile air-suction cleaner of the kind described having an air impeller, including a casing therefor provided with an intake opening rimmed by an annular flange forming a frusto-conical constricting throat projecting towards said impeller, a suction hood fixed on said casing and having a downwardly directed inlet nozzle-opening and communicating with the intake opening of said impeller, a length of flexible hose having a hand suction nozzle carried by and in communication with one end thereof, and means carried on the other end of and in communication with said hose and detachably connecting and supporting said other end of said hose in communication with the intake opening of said impeller casing, said means including a rigid tubular member having its discharge end extending into and substantially concentric with and spaced from the discharge end of said constricting throat to form therewith an injector-nozzle surrounding the discharge end of said tubular member.

4. A mobile industrial suction cleaner having a fixed suction-hood mounted thereon and provided with a downwardly directed suction opening and with an upper discharge opening communicating with a power driven suction means and an oppositely positioned access opening, said discharge opening being formed with an outwardly extending rimming lateral flange forming a venturi-throat having a constriction at its free end portion and the access opening being adapted to be closed by a detachable sealing cap; a hand-nozzle attachment comprising a rigid tubular member adapted to be inserted through the access opening, when the sealing cap is removed, with its dis-

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charge end positioned in said throat and in substantially planar and concentrically spaced relation with said constriction of said throat, means for locating and detachably supporting said tubular member to said hood, in its said inserted position, and to close the space between the edge of said access opening and said tubular member, thereby forming an air-injector nozzle between said throat and said tubular member, and a hand-nozzle flexible hose connected to the inlet end of the tubular member.

5. The device as set forth in claim 4 further characterized by the discharge opening in the hood being of greater diameter than the inlet end of said tubular member and wherein the tubular member diverges from its inlet end to its discharge end.

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