

Dec. 29, 1970

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3,550,183

CLEANING TOOL FOR VACUUM CLEANER

Filed Jan. 11, 1968

2 Sheets-Sheet 1

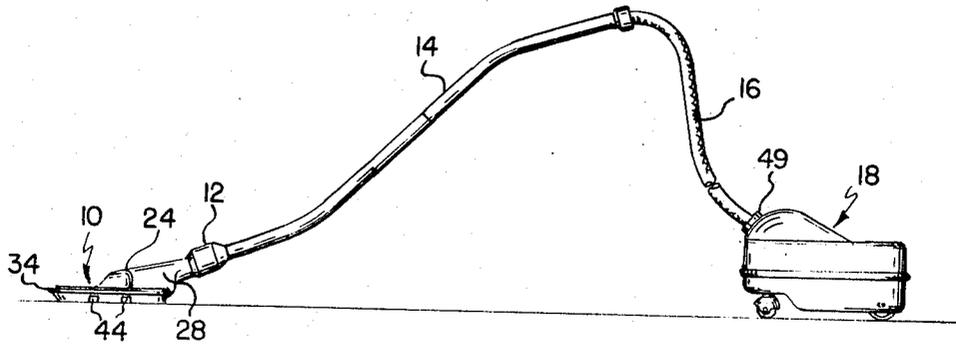


FIG. 1

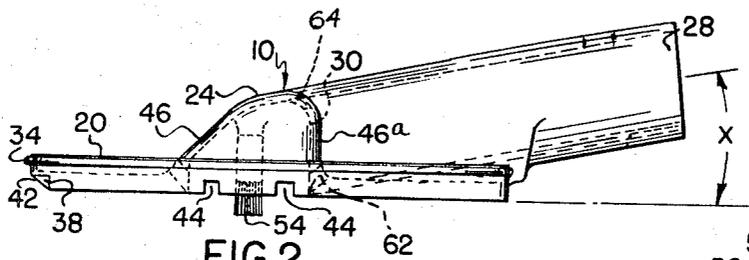


FIG. 2

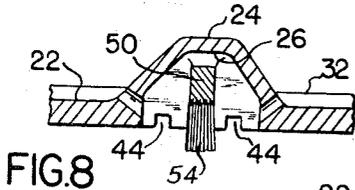


FIG. 8

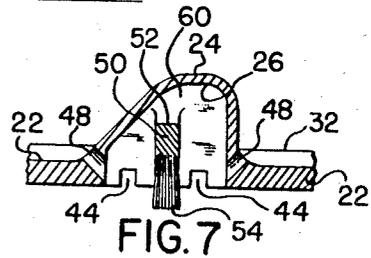


FIG. 7

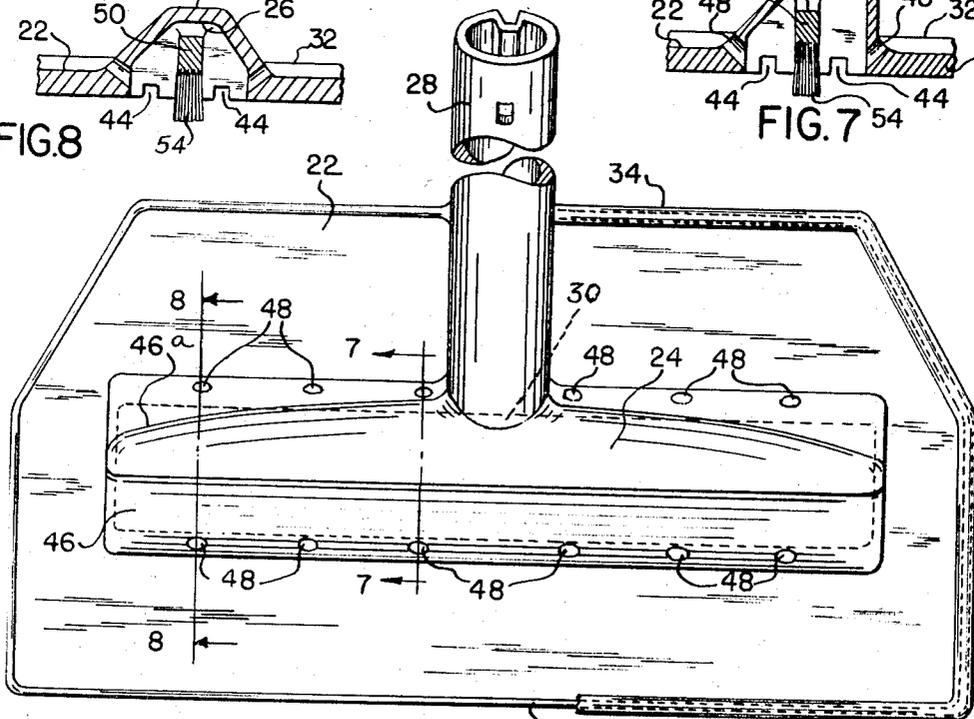


FIG. 3

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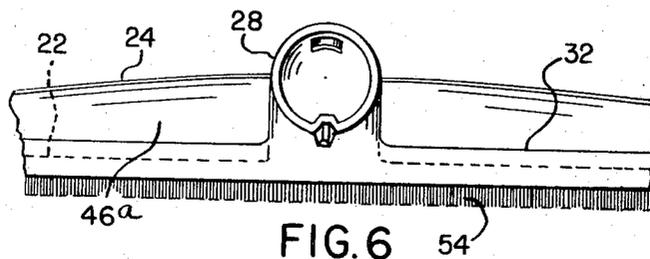
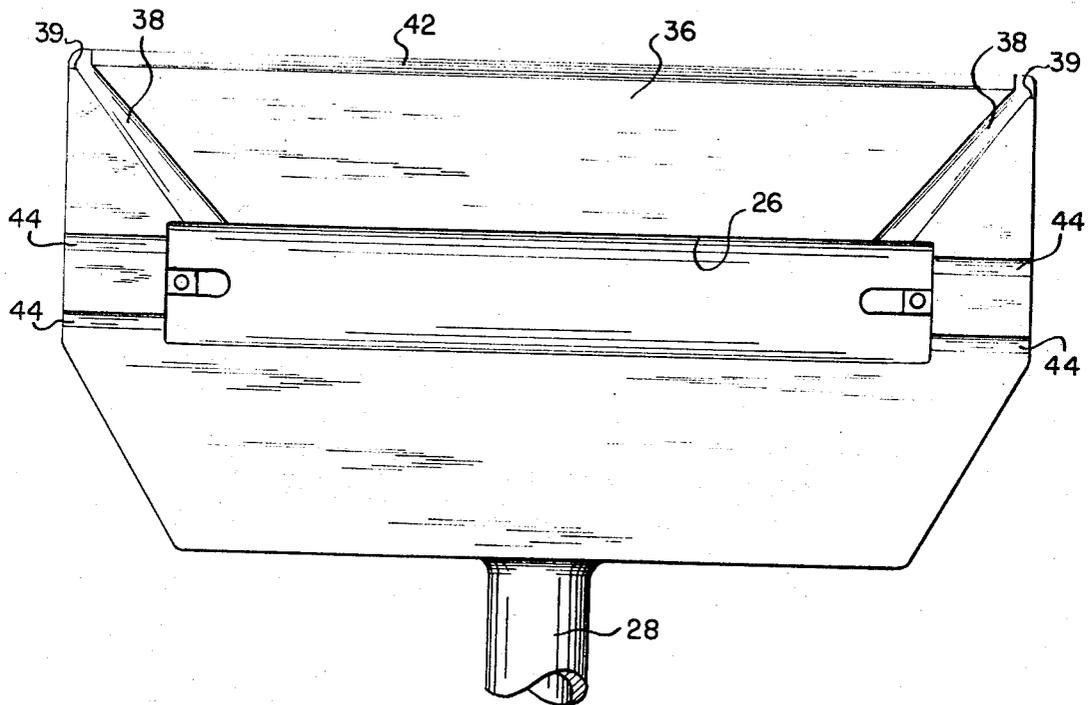
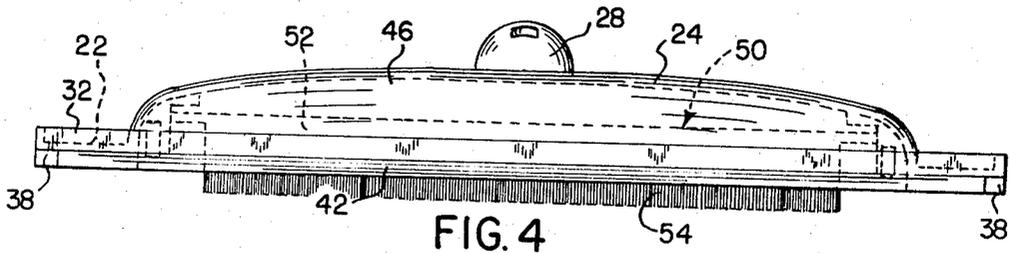
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2 Sheets-Sheet 2



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CLEANING TOOL FOR VACUUM CLEANER

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Filed Jan. 11, 1968, Ser. No. 697,048
Int. Cl. A471 9/06

U.S. Cl. 15—375

13 Claims

ABSTRACT OF THE DISCLOSURE

A cleaning tool for use with a vacuum cleaner of, for instance, the canister type, comprising a housing adapted for connection to an operating handle such as an elongated wand, for movement of the housing over the surface, such as a rug, to be cleaned. The housing comprises a generally flat surface-engaging portion and an elongated crowned portion extending upwardly from the surface-engaging portion and defining a suction chamber, with there being an outlet in the crowned portion adapted for communication with the operating handle. A brush is generally centrally mounted in the suction chamber and extends downwardly for engagement with the surface to be cleaned. A plurality of orifices are spaced along the lengthwise extent of the crowned portion of the housing and extend from the exterior of the housing downwardly into communication with the chamber, so as to direct jet inlet air flow diagonally downwardly to impinge against the surface being cleaned for effective jet air scrubbing of the surface and "boiling" of debris upwardly from the surface. The underside of the housing is provided with passageways extending from communication with the suction chamber to the periphery of the tool housing for cleaning out corners or other hard-to-clean areas. The total cross-sectional area of the air intake orifices and passageways in the tool is preferably within a predetermined percentage range of the cross sectional area of the hose at the canister inlet, to ensure optimum suction for the tool while providing for relative ease of movement to the tool across the surface to be cleaned. The outlet from the suction chamber is defined by a tubular-like portion extending rearwardly from the crown portion of the housing, and which outlet is disposed very close to the surface being cleaned, to materially increase the debris "pick up" ability of the tool.

This invention relates in general to a cleaning tool for use with a vacuum cleaner and more particularly relates to a cleaning tool having various novel features including a novel orifice arrangement embodied therewith for directing inlet air downwardly into the surface, such as a carpet, being cleaned for impinging inlet air in jet form onto the carpet prior to passage of the air out the outlet end of the tool, thereby increasing the cleaning efficiency of the tool.

Many types of cleaning tools adapted for use with a wand of a vacuum cleaner, such as a canister type vacuum cleaner, are known in the art. However, it is conventional in such tools for the inlet air to be drawn in from the underside of the tool and then up to the outlet of the tool, with the inlet air operating to remove dust and dirt from the surface being cleaned. Such conventional arrangement in which suction is primarily utilized for cleaning the surface is not as efficient as desirable in a cleaning operation. It is also known in the art to provide slots or the like on the upper surface of a cleaning tool for permitting air to move from exteriorly of the of the tool downwardly into the surface of the carpet and then upwardly out through the suction chamber to the suction outlet. U.S. Pat. 3,217,352, issued Nov. 16, 1965 to R. M. Evans et al., discloses a cleaning tool having such general

arrangement of air slots in its top surface. However, such slots do not provide any substantial impingement, or jet scrubbing action of air against the surface being cleaned, but merely provide a source of moving air for picking up dirt and dust from the carpet surface.

The present invention provides a novel cleaning tool wherein jet orifice means are provided in the upper portion of the cleaning head of the tool, for directing jet streams of inlet air from exteriorly of the tool head diagonally downwardly into impinging relation with the underlying surface or surface area being cleaned, to cause a scrubbing and "boiling" action by the jet streams of air, thereby increasing the cleaning efficiency of the tool. In addition, passageway means are provided on the underside of the tool communicating with the suction chamber in the tool, which passageway means communicate with the exterior periphery or corners of the tool, for providing for cleaning of corner areas and the like which are ordinarily difficult to clean by means fo a conventional cleaning tool.

Moreover, the aforementioned jet streams of air are directed toward opposite sides of a generally centrally located brush in the suction chamber of the tool, and the outlet from the suction chamber leading to the operating handle or wand is disposed very close to the surface being cleaned, with the tubular exit portion of the tool defining the outlet opening from the suction chamber, being disposed at a relatively slight upwardly extending angle with respect to the horizontal, to materially increase the debris "pick up" ability of the tool.

Accordingly, an object of the invention is to provide a novel cleaning tool for use with a source of suction such as, for instance, a canister type vacuum cleaner, for cleaning a surface such as a rug.

Another object of the invention is to provide a novel cleaning tool which comprises a crowned suction chamber having jet orifice means formed therein for directing jet streams of inlet air against the surface being cleaned.

A further object of the invention is to provide a novel cleaning tool of the above-mentioned type, wherein the tool housing includes a crowned suction chamber having a brush mounted therein for brushing engagement with the surface to be cleaned, and wherein the jet orifice means are disposed in the vicinity of the juncture of the crowned portion of the tool housing with the body portion thereof, and direct jet streams of incoming air downwardly toward the planes of the opposite sides of the brush.

A still further object of the invention is to provide a cleaning tool of the latter-mentioned type wherein the body portion on its undersurface has passageway means formed therein communicating with the suction chamber and with the exterior periphery of the tool, for cleaning areas of a surface which are generally of limited access, such as corner areas.

A still further object of the invention is to provide a cleaning tool of the above type which includes means for increasing the debris "pick up" ability of the tool.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a diagrammatic illustration of a cleaning tool of the invention as coupled to a wand, which in turn is attached by means of a flexible hose to a canister type vacuum cleaner;

FIG. 2 is an enlarged side elevational view of the cleaning tool of the invention;

FIG. 3 is an enlarged partially broken top plan view of the cleaning tool of FIG. 2 and illustrating in particular the jet orifice means formed in the crowned portion of the cleaning tool housing;

FIG. 4 is a front elevational view of the cleaning tool of FIG. 3;

FIG. 5 is a bottom plan view of the cleaning tool housing and showing in particular the passageways formed therein which enable the tool to conveniently clean limited access areas, such as corners in a room; the brush has been deleted from the FIG. 5 showing;

FIG. 6 is a fragmentary rear elevational view of the cleaning tool; and

FIG. 7 is a sectional view taken generally along the plane of line 7—7 of FIG. 3 looking in the direction of the arrows;

FIG. 8 is a sectional view taken generally along the plane of line 8—8 of FIG. 3, looking in the direction of the arrows.

Referring again to the drawings, there is disclosed in the preferred embodiment of this invention a cleaning tool 10 attached as by means of a releasable coupling 12 to a wand 14, which in turn is attached to a flexible hose 16 coupled to a source of vacuum, such as a canister type vacuum cleaner 18.

The cleaning tool 10 comprises a housing 20 which may be formed of any suitable material such as, for instance, light weight aluminum, and which includes a generally polygonal-shaped, substantially flat body portion 22 and elongated crowned portion 24 extending upwardly from body portion 22 and defining a suction chamber 26, and a tubular-like exit portion 28 extending rearwardly from the crowned portion 24 and communicating with suction chamber 26 at an outlet opening 30 (FIG. 2). The body portion 22 preferably has an upstanding flange being adapted to receive thereon in snug, frictionally-mounting relation, a bumper 34 formed of resilient material such as rubber, to protect surfaces engaged by the cleaning tool during movement of the latter over a surface being cleaned.

As can be best seen in FIG. 5, the bottom surface 36 of the tool is generally planar, with the suction chamber 26 opening onto such bottom surface. Diagonally extending passageways 38 are formed in such bottom surface and extend from communication with the suction chamber 26 diagonally outwardly to terminate at the respective forward corners of the tool housing. Passages 38 preferably initially converge as at 39 and then diverge in an inward direction to communicate with chamber 26. The lower portion of the front edge of the tool may be sloped inwardly as at 42, as best illustrated in FIG. 2. Passages 44 are provided in the bottom surface of the tool housing, which passages communicate with the suction chamber 26 and at their outer ends open onto the exterior perimeter of the housing, for providing suction action from the suction chamber to the side edges of the tool. Passages 38, 44 facilitate cleaning of difficult access areas, such as corners and edges along walls and the like, by the tool, thus increasing the cleaning efficiency of the tool.

The aforementioned crowned portion 24 comprises a generally diagonally-sloping front wall 46 and a back wall 46a, with the front wall 46 and back wall 46a being connected by an upper wall section and end wall sections, and with the front, back and end wall sections merging at their lower ends with the generally planar body portion 22 of the tool housing. Spacing along the juncture of the front and rear walls of the crowned portion with the body portion of the tool housing are jet orifices 48, which extend from the exterior of the housing diagonally inwardly, as best shown in FIG. 7, to communicate adjacent their inner ends with the suction chamber 26 adjacent the bottom of the suction chamber. Orifices 48 are preferably angled at approximately 45° with respect to the horizontal, and may be for instance of approximately $\frac{3}{16}$ inch diameter, for creating jet streams of inlet air which are adapted to impinge against the surface being cleaned, such as the nap of a carpet, and scrub the carpet fibers and cause an upward "boiling" of debris

material in the carpet, prior to movement of the intake air through the outlet opening 30 from the suction chamber, after which the inlet air passes out the exit portion 28 to the wand 14 and thence to the vacuum cleaner 18 via the hose 16. As can be seen, the jet orifices 48 are preferably generally evenly spaced apart along the juncture of the crowned portion with the body portion of the tool housing to, more or less, uniformly direct impinging jet streams of intake air against the surface being cleaned. Also, it is preferable to have the jet orifices on opposite sides of the crown portion disposed in generally opposing relationship with one another so that the jet streams of intake air are directed to both sides of the suction chamber at the same general vicinity, downwardly against the surface being cleaned. This not only aids in "boiling" the debris upwardly out of the carpet, but also aids in maintaining the mobility of the tool as the latter is moved across the floor, in a ski-like effect without undue drag on the tool due to the suction.

It will be seen that the passages 44, 38 formed in the underside of the tool head coact with the jet orifices 48 for completely cleaning a surface engaged by the tool and enabling an effective cleaning operation to occur as the intake air is sucked through the air passages 44, 38 and jet orifices 48, into the suction chamber 26.

In this connection, the sum of the individual average cross sectional areas of the air passages 44, the air passages 38, and the jet orifices 48, is preferably within a range of approximately 50% to 80% of the cross sectional area of the hose at the inlet 49 to the vacuum cleaner. A particularly expeditious ratio of the sum of the cross sectional areas of the intake passages and jet orifices with respect to the cross sectional area of the hose at inlet 49, has been determined to be approximately 63%, which is of course within the above specified range of approximately 50% to 80%. With a vacuum suction of between approximately 55 to 100 inches of water lift at the cleaner tank inlet 49, the tool with a ratio of intake passage and orifice area to hose area within the aforementioned range, performs highly satisfactorily to effectively clean rug surfaces and lift debris from the rug fibers, while preventing excessive drag on the tool due to the suction effect, as the tool moves in ski-like fashion over the surface being cleaned. The internal cross sectional areas of the exit portion 28 of the tool, of the wand 14 and of the hose 16, are preferably substantially equal.

A brush member 50, which may include an elongated mounting portion 52 and flexible bristles 54 extending outwardly from the mounting portion 52, is mounted in the suction chamber and extends lengthwise thereof generally centrally of the suction chamber. Brush 50 may be adjustably mounted for varying its vertical position with respect to the floor or surface being cleaned. Since the jet orifices direct jet streams of air downwardly toward the plane of both sides of the brush, the latter is effective in both the forward and rearward movement of the tool for removing debris from a rug. As can be best seen in FIG. 7, there is space, as at 60, above the brush in the suction chamber for permitting the movement of the incoming air and debris "boiled" out of the rug upwardly above the brush and out exit opening 30 from the suction chamber. The inwardly sloping front wall 46 and crowned interior configuration of suction chamber 26 acts to direct the air and debris "boiling" up from the rug, out outlet opening 30 at the juncture of tubular-like portion 28 with housing portion 24.

As may be best seen from FIG. 2, the tubular-like portion 28 extends diagonally upwardly in an outward direction, at a relatively small angle X with respect to the horizontal. A suitable angle X has been found to be $7\frac{1}{2}$ degrees although it will be understood that this may be varied without departing from the scope of the invention. Maintaining the exit portion 28 relatively close in a horizontal direction to floor level materially increases the debris "pick-up" ability of the tool, making the tool

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operative to readily remove high density debris, such as hair pins, B.B.'s, staples, sand and the like from the rug, as the jet streams from the orifices 48 "boil" such debris upwardly from the rug. It will be noted that the lower periphery 62 of outlet opening 30 (FIG. 2) is substantially at floor level providing for ready and highly efficient movement of debris from suction chamber 26 through outlet opening 30 and exit portion 28 of the tool. The smooth juncture of the upper periphery of outlet opening 30 with the suction chamber, as at 64 (FIG. 2) also materially aids in the efficient movement of debris from the suction chamber out through opening 30 and exit portion 28.

The tubular portion 28 of the housing may be readily coupled to and uncoupled from the wand 14 by the aforementioned coupling 12 which may encompass any suitable form of coupling mechanism, with the coupling member 12 receiving the outer or distal end of the tubular outlet portion 28 therein in held relation.

From the foregoing discussion and accompanying drawings, it will be seen that the invention provides a novel cleaning tool for use with a vacuum cleaner and wherein the tool includes orifice means thereon for providing jet streams of inlet air to impinge upon and scrub the underlying surface to be cleaned, causing debris to the "boiled" up from such surface, and wherein means is provided on the tool for providing cleaning of the complete area engaged by the tool as well as cleaning difficult access areas in a room being cleaned. The invention also provides a tool embodying means for materially increasing the debris "pick-up" ability, and a tool that is readily movable in ski-like fashion across the surface being cleaned, and a tool that is highly efficient and effective for cleaning floor surfaces.

The terms and expressions which have been used are used as terms of description and not of limitation and there is no intention in the use of such terms and expressions of excluding any equivalents of any of the features shown or described, or portions thereof, and it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. A cleaning tool adapted for connection with a flexible hose to a suction type cleaner for use in the cleaning of a surface, such as a rug and the like comprising, a housing having a generally planar bottom surface, a suction chamber in said housing, said chamber opening onto said bottom surface in inwardly spaced relation to the outer periphery of said bottom surface, outlet means communicating with said chamber, said outlet means being adapted for connection to a vacuum source for exhausting said chamber, non-rotatable brush means mounted on said housing and coacting with said chamber in the operation of cleaning a surface, said bottom surface including a leading edge, said chamber being of elongated configuration and having forward and rearward defining surfaces extending lengthwise in the general direction of extension of the leading edge of said bottom surface, and laterally spaced jet orifice means communicating with said chamber from exteriorly of said housing, said jet orifice means being disposed along said forward and said rearward defining surfaces of said chamber substantially intermediate the ends of said chamber, said jet orifice means opening into said chamber above said bottom surface and adapted to direct intake air toward the surface to be cleaned, and wherein said brush means comprises an elongated brush member mounted in said chamber and extending lengthwise generally parallel to said forward defining surface of said chamber, said jet orifice means being so oriented on said housing and with respect to said chamber so as to direct the jet streams of intake air diagonally toward the vertical planes of both sides of said brush means, the axes of said orifice means on opposite sides of said brush means, in the side elevation of said tool intersecting adjacent the lower end of said brush means.

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2. A tool in accordance with claim 1 wherein said orifice means comprises a plurality of laterally spaced circular openings disposed in generally paired confronting relation on opposite sides of said brush means.

3. A tool in accordance with claim 1 wherein said chamber is defined by a crowned portion of the housing disposed generally centrally with respect to the remainder of said housing and projecting upwardly therefrom, said forward defining surface being generally vertically oriented, said certain orifice means being disposed adjacent the base of said crowned portion and extending diagonally inwardly to terminate on said forward surface in said chamber just above said bottom surface so that none of the orifice means openings are disposed in said bottom surface.

4. A tool in accordance with claim 3 wherein said crowned portion is of elongated configuration in a direction transverse of said tool and said orifice means comprises spaced openings disposed along the lengthwise dimension of the base of said crowned portion and on both the forward and rearward sides thereof.

5. A tool in accordance with claim 3 wherein said crowned portion includes a top wall and a front defining wall sloping rearwardly in an upward direction, to define the upper interior defining surface of said suction chamber, said outlet means comprising a tubular-like portion extending obliquely rearwardly from said housing with respect to the horizontal and encompassing an outlet opening disposed in the rear wall of said crowned portion, the upper periphery of said outlet opening merging smoothly with said upper defining surface of said suction chamber and with the interior defining surface of said tubular-like portion at the juncture of the latter with said crowned portion, the lower periphery of said outlet opening being disposed immediately adjacent said bottom surface of said housing.

6. A tool in accordance with claim 1 wherein said brush means extends vertically below said bottom surface, said orifice means comprising laterally spaced jet openings extending obliquely with respect to the horizontal so that inlet air is directed angularly downwardly toward the surface to be cleaned, said jet openings being disposed in direct opposing relation on opposite forward and rearward sides of said chamber so that the opposing jet streams of intake air on opposite sides of said chamber are directed to the same general location adjacent the lower end of said brush means.

7. A tool in accordance with claim 1 wherein said outlet means comprises a tubular-like portion extending rearwardly from said housing at an oblique angle with respect to the horizontal and encompassing an outlet opening which is disposed in the rear wall of said suction chamber portion of said housing, the lower periphery of said outlet opening being disposed immediately adjacent said bottom surface of said housing, said oblique angle being less than 10 degrees.

8. A tool in accordance with claim 1 including passageway means formed in said bottom surface comprising spaced diagonally arranged passages extending from communication with said chamber adjacent the latter's ends to said outer periphery and providing for the intake of air as the tool moves across the surface to be cleaned, and wherein said passageway means generally diverge in an inward direction toward their junctures with said chamber.

9. A tool in accordance with claim 8 wherein said outlet means comprises a tubular-like portion, the sum of the cross sectional areas of said passageway means and said orifice means being within a range of approximately 50% to 80% of the internal cross sectional area of said tubular-like portion.

10. A cleaning tool adapted for connection with a flexible hose to a suction-type cleaner adapted for use in the cleaning of a surface, such as a rug and the like comprising, a housing, said housing comprising a generally

planar bottom surface, a suction chamber in said housing, said suction chamber opening onto the bottom surface in inwardly spaced relation to the outer periphery of said bottom surface, said bottom surface including a leading edge terminating in forward corner portions and side edges extending rearwardly from said corner portions, brush means mounted in said chamber generally centrally thereof and extending downwardly for engagement with the surface to be cleaned, said chamber being of elongated configuration and having spaced forward and rearward defining surfaces extending lengthwise in the general direction of extension of said leading edge, said brush means extending lengthwise substantially parallel to said forward and rearward defining surfaces of said suction chamber, said chamber having space above said brush means for permitting movement of intake air from one side of said brush means to the other side thereof above said brush means, outlet means communicating with said chamber at said rearward surface, said outlet means being adapted for connection to a vacuum source, jet orifice means in said housing communicating with said chamber from exteriorly of said housing for directing jets of inlet air against a surface to be cleaned prior to passage of the inlet air to said outlet means, passageway means formed in said bottom surface and communicating with said chamber from points on the periphery of said bottom surface, said passageway means comprising at least one pair of spaced passages extending from lateral end of said chamber to communication with the respective confronting side edge of said bottom surface, said brush means being disposed in said chamber in generally centrally oriented relation to the passages on each end of said chamber, said jet orifice means being disposed along both said forward and rearward defining surfaces and being so oriented with respect to said chamber so as to direct jet streams of air diagonally toward the vertical planes of both sides of said brush means and opening into said chamber above said bottom surface, said orifice means in conjunction with said passageway means providing inlet air to both sides of said brush means for boiling up debris from the surface being cleaned and then passing it from both sides of said brush means to said outlet means.

11. A tool in accordance with claim 10 wherein said orifice means comprises a plurality of laterally spaced substantially circular openings disposed in generally paired confronting relation on opposite sides of said brush means, each of said openings extending diagonally toward the confronting plane of the respective side of brush means at an angle of approximately 45°, with the axes of said openings on opposite sides of said brush means intersecting adjacent the lower end of said brush means.

12. A tool in accordance with claim 10 wherein said outlet means includes an outlet opening disposed in the rearward defining surface of said chamber, the lower periphery of said outlet opening being disposed immediately adjacent said bottom surface, and said outlet means comprising a tubular-like portion extending rearwardly of said housing and obliquely with respect to the horizontal, said tubular-like portion encompassing said outlet opening, said tubular-like portion being disposed at a rela-

tively small predetermined angle with respect to the horizontal whereby the pickup ability of the tool is materially increased.

13. A cleaning tool adapted for connection with a flexible hose to a suction-type cleaner for use in the cleaning of a surface, such as a rug and the like comprising, a housing, said housing comprising a generally planar bottom surface, a suction chamber in said housing, said suction chamber opening onto the bottom surface in inwardly spaced relation to the outer periphery of said bottom surface, said suction chamber having forward and rearward defining surfaces, brush means mounted in said chamber generally centrally thereof between said forward and rearward defining surfaces and extending downwardly for engagement with the surface to be cleaned, said brush means extending lengthwise substantially parallel to said forward and rearward defining surfaces, said chamber having space above said brush means for permitting movement of intake air from one side of said brush means to the other side of said brush means above said brush means, outlet means communicating with said chamber at said rearward surface, said outlet means being adapted for connection to a vacuum source, said outlet means including an opening disposed in said rearward defining surface of said chamber with the lower periphery of the last mentioned opening being disposed immediately adjacent said bottom surface, said outlet means also including a tubular-like portion extending rearwardly from said housing at a relatively small predetermined oblique angle with respect to the horizontal and encompassing said outlet opening, and laterally spaced jet orifice means communicating with said chamber from exteriorly of said housing, said jet orifice means being disposed along said forward and rearward defining surfaces of said chamber and being so oriented on said housing and with respect to said chamber so as to direct jet streams of intake air diagonally toward the vertical planes of both sides of said brush means, the axes of said orifice means on opposite sides of said brush means intersecting adjacent the lower end of said brush means.

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U.S. Cl. X.R.

15—420, 421