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3,112,511

VACUUM CLEANING MACHINE

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Fig. 1

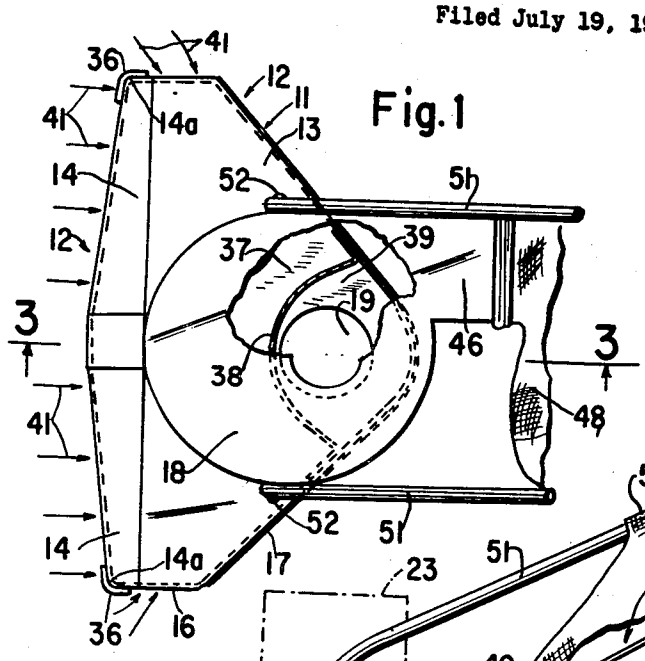

Fig. 6

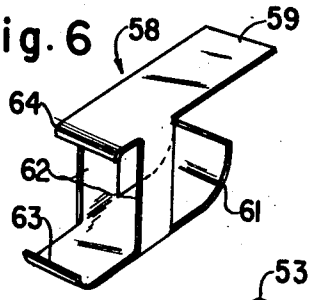

Fig. 2

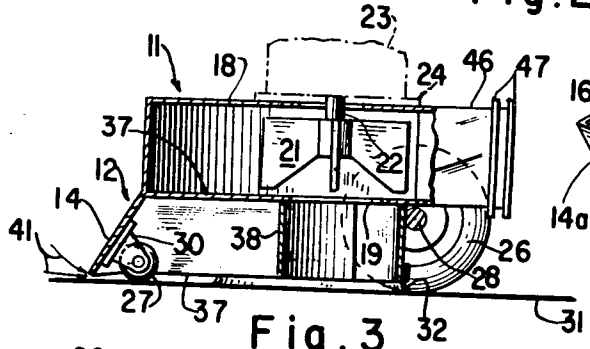

Fig. 3

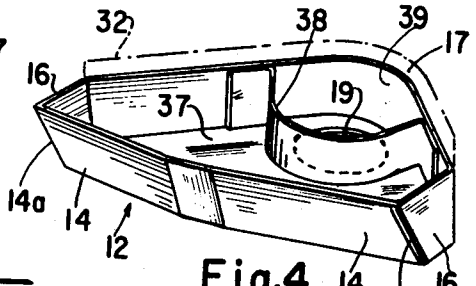

Fig. 4

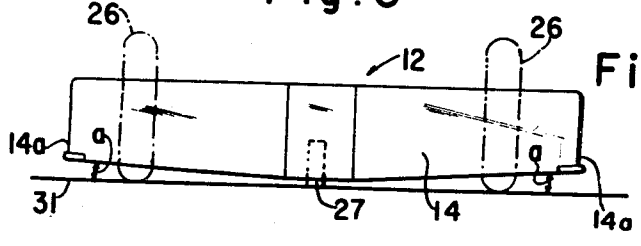

Fig. 5

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VACUUM CLEANING MACHINE

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This invention relates to vacuum cleaning machines and more particularly to vacuum cleaning machines of the type used for cleaning surfaces such as lawns, parking lots, large floor areas, etc.

In the manufacture of vacuum cleaning machines of the above type, it is desirable to provide a machine capable of removing a wide variety of debris from as large an area as possible with the use of a minimum amount of power. The use of a minimum amount of power is desired not only to reduce investment and operating costs but also to reduce size and weight of the machine, since such machines are frequently hand propelled.

Previously available vacuum cleaning machines of the type described above have been adequate for removal of relatively light debris such as leaves, dust and small pieces of paper but have been found to be completely inadequate for removal of heavier, denser debris such as stones, acorns, etc. It is, therefore, an object of the present invention to provide an improved vacuum cleaning machine of the type described above.

In accordance with a preferred embodiment of the present invention, a vacuum cleaning machine is provided which has a suction nozzle supported above and in close proximity to the surface being cleaned to define a suction intake area. A baffle positioned within the suction nozzle forms an inner intake area which has an opening communicating with an impeller housing positioned above the suction nozzle. The baffle is so situated that air sucked in under the outer edge of the suction nozzle passes along the surface being cleaned and under the baffle into the inner intake area from which it is sucked up into the impeller housing and subsequently discharged. The front of the machine is preferably supported only by a wheel positioned at the center of the front of the suction nozzle and the front of the suction nozzle is preferably closest to the surface being cleaned at this point. From the center, the front of the suction nozzle preferably slopes upwardly toward each side in a dihedral angle so that the corners of the front are at a greater elevation than the center thereof.

For a better understanding and a more complete description of the invention, reference should be had to the accompanying drawings in which:

FIG. 1 is a partial plan view, partly in section, of a vacuum cleaning machine constructed in accordance with a preferred embodiment of the invention;

FIG. 2 is a side elevation view, partly in section, of the vacuum cleaning machine shown in FIG. 1;

FIG. 3 is a partial sectional view taken as indicated by line 3—3 of FIG. 1;

FIG. 4 is a perspective view of a portion of the vacuum cleaning machine shown in FIGS. 1–3;

FIG. 5 is a partial front elevation view of the vacuum cleaning machine shown in FIGS. 1–4; and

FIG. 6 is a perspective view of a portion of the vacuum cleaning machine shown in FIGS. 1–5.

The drawings show a vacuum cleaning machine 11 having a suction nozzle 12. As shown, suction nozzle 12 may include a top plate 13, a front wall portion 14, side wall portions 16 and a rear wall portion 17. An impeller housing 18, preferably of involute configuration, is positioned above the suction nozzle 12 and may be secured thereto by suitable means such as welding. A suction opening 19 allows passage of air and debris from the suction nozzle 12 into the impeller housing 18. The impeller

housing 18 contains an impeller 21 (FIG. 3) mounted for rotation within the impeller housing as on a shaft 22. The impeller 21 may be rotated by any suitable means such as a conventional gasoline engine 23 in order to produce suction within the impeller housing 18 and thus draw air and debris from the surface being cleaned up through the suction opening 19. Gasoline engine 23 may be mounted on the vacuum cleaning machine 11 in any suitable manner such as by attachment to the top of the impeller housing 18 by suitable means such as an engine mounting plate 24 (FIG. 2).

As shown in FIGS. 2, 3, and 5, the lower peripheral edge of the suction nozzle 12 is supported above and in close proximity to the surface being cleaned by suitable supporting means such as main wheels 26 and a front wheel 27. The main wheels 26 are preferably located near the rear of the machine and may support the vacuum cleaner 11 in any suitable manner such as by means of an axle 28 which may be secured to the impeller housing 18 as by welding and on which the wheels 26 may be mounted for rotation as by the use of conventional bearings. Likewise, the front wheel 27 may be mounted by suitable means such as a mounting bracket 30.

As best shown in FIG. 5, the front wheel 27 is preferably the sole means for supporting the lower edge of the front wall portion 14 of the suction nozzle 12 above and in close proximity to the surface being cleaned (shown in the drawings as a surface 31). In order to allow use of the single front wheel 27 without danger of having the side corners 14*a* of the front wall portion 14 of the suction nozzle 12 dig into or scrape the surface being cleaned, the lower edge of the front wall portion 14 preferably slopes upwardly in a dihedral angle from the center thereof (where the wheel 27 is mounted) to the corners 14*a*. This is best shown in FIG. 5 where the use of such a dihedral angle formed by the lower edge of the front wall portion 14 of the suction nozzle results in the lower edge of the front wall portion sloping upwardly from the surface being cleaned as indicated by angles "*a*" so that the sides of the lower edge of the front wall portion 14 at a greater elevation above the surface being cleaned than the center portion thereof. This not only prevents the corners 14*a* of the lower edge of the front wall portion 14 from contacting an uneven surface being cleaned but also induces a greater flow of air from the sides of the suction nozzle 12 to the center thereof when the machine is in operation, thereby increasing efficiency of operation near the sides of the suction nozzle.

As best shown in FIG. 2, the lower edge of the rear wall portion 17 of the suction nozzle 12 is preferably provided with a depending skirt 32 of suitable flexible material such as rubber. The skirt 32 may be fastened to the suction nozzle 12 by suitable means such as a strip of metal 33 and bolts 34 and extends downwardly from the lower edge of the suction nozzle to inhibit flow of air into the suction nozzle from the rear portion thereof, thereby increasing flow of air into the suction nozzle from the front portion. The suction nozzle 12 may also be provided at the corners 14*a* of its lower front edge with suitable means such as steel rod strips 36 (FIG. 1) for preventing damage to the corners and sides of the suction nozzle.

It will be apparent from the drawings that the lower peripheral edge of the suction nozzle 12 defines a horizontally extending outer intake area designated in the drawings as 37. In the absence of the baffle means to be described below, this is the area from which debris is lifted into the suction nozzle and thence into the impeller housing by the suction created by the impeller. In order to intensify this suction effect without diminishing the area covered, suitable baffle means, shown in the drawings as a baffle 38, are provided within the suc-

tion nozzle 12. Such baffle means extend downwardly within the suction nozzle to a position above and in close proximity to the surface being cleaned to thereby define an inner intake area designated in the drawings as 39. In the form shown, the baffle 38 extends completely across the suction nozzle 12 forward of the suction opening 19 and extends from the top plate 13 to the suction nozzle downwardly to a point above and in close proximity to the surface 31 being cleaned. The baffle 38 and rearmost portion of the rear wall portion 17 of the suction nozzle 12 thus cooperate to form the inner intake area 39. The baffle 38 may be fastened to the wall of the suction nozzle by any suitable means such as welding or may be removably secured as by bolts.

When baffle means such as the baffle plate 38 are used, air sucked under the lower peripheral edge of the suction nozzle 12 forward of the baffle as indicated, for instance, by arrows 41 (FIG. 1) is forced to travel under the suction nozzle in a relatively thin, high velocity film immediately above the surface being cleaned until it reaches the inner intake area 39 because the presence of the baffle prevents the air from rising up above the elevation of the lower edge of the baffle within the outer intake area 37. As a result, the velocity of air being sucked along the surface being cleaned throughout the outer intake area 37 is considerably greater than would be the case if the baffle were not used. This greater velocity enables the vacuum cleaning machine 11 to remove relatively, dense, heavy debris such as stones, sand, acorns, etc. which could not otherwise be removed from as large an area using the same amount of power.

As shown in FIGS. 2 and 3, the impeller housing 18 includes a rearwardly projecting portion 46 terminating in an exhaust opening through which air and debris is exhausted from the impeller housing. Suitable means such as a pair of flanges 47 (FIG. 3) are preferably provided for removably securing suitable collecting means such as a bag 48 to the projecting portion 46 of the impeller housing so as to receive debris from the exhaust opening. The bag 48 may be constructed of conventional material for allowing passage of air while retaining dust and other debris. The bag 48 has a neck portion 49 adapted to fit over the projecting portion 46 of the impeller housing and may be secured thereto by suitable means such as by the use of drawstrings or of elastic material to hold the neck portion 49 in place.

Suitable handle means such as handle members 51 are provided for use in propelling the vacuum cleaning machine and in supporting the bag 48 as described below. As indicated in FIGS. 1 and 2, the handle members 51 may be secured to the impeller housing 18 by suitable means such as by the use of bolts 52 so that the handle members project upwardly and rearwardly from the impeller housing to provide convenient means for hand propelling the machine. The handle members 51 may be separate from one another but preferably cooperate to form a single U-shaped handle. As best shown in FIG. 2, the bag 48 may be supported from the handle formed by the handle members 51 by suitable means such as loops 53 of material attached to or forming part of the bag 48 and adapted to fit over the handle to support the bag. The bottom of the bag 48 is preferably supported by suitable means shown in the drawings as a dolly 54, the front portion of which is adapted to be removably secured to the main portion of the vacuum cleaning machine 11 by suitable means such as extending hook members 57 adapted to engage the axle 28 as shown in FIG. 2. The dolly 54 may comprise an open framework construction, but the portion of the dolly providing support for the bag 48 is preferably substantially solid in order to provide proper support for the bag when debris is dropped to the bottom of the bag as described below. In order to provide the maximum possible space for storage of debris without interfering with operation of the machine, the bag 48 is preferably of generally

trapazoidal vertical cross section as indicated in FIG. 2 and preferably occupies substantially the entire space defined by the rear of the projecting portion 46 at the front, the handle members 51 at the top, the dolly 54 at the bottom, and the outer edges of the handle members 51 and dolly 54 at the sides.

Since the improved design of the vacuum cleaning machine 11 as described above allows stones and other relatively heavy, dense debris to be ejected from the exhaust opening of the projecting portion 46 of the impeller housing 18 at high velocity, it is usually desirable to provide some protection against possible injury to the bag 48 or to the operator of the machine by such debris. This may be accomplished by providing the exhaust opening with suitable baffle means, shown in FIGS. 2 and 6 as an exhaust baffle 58, for preventing such injuries. In the form shown, the exhaust baffle 58, comprises two spaced, generally parallel members 59 and 61 which may be retained in the desired relationship to each other by connecting side members 62. As best shown in FIG. 6, the member 61 is curved upwardly at its outer end and the member 59 projects further in the general direction of exhaust than does the member 61 so that when the baffle 58 is positioned at an acute angle to the direction of exhaust from the impeller housing 18 as shown in FIG. 2, air and debris exhausted from the impeller housing at high speed are deflected into the member 59 by the member 61 and fall to the bottom of the bag 48. The exhaust baffle 58 may be detachably secured to the projecting portion 46 of the impeller housing 18 or may be permanently secured thereto. In the form shown, the member 61 of the exhaust baffle 58 has an upwardly turned lip 63 adapted to engage the bottom of one of the flanges 47 while the inner end of the member 59 has an extending portion 64 adapted to cooperate with the lip 63 to hold the exhaust baffle 58 in place as indicated in FIG. 2.

While the invention has been described above in connection with a preferred embodiment thereof, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended to cover all such changes and modifications in the appended claims.

I claim:

1. In vacuum cleaning machine of the type described, a horizontally extending suction nozzle including a rigid front wall portion the lower edge of which forms a front portion of the lower peripheral edge of the suction nozzle, such lower edge of the front wall portion sloping upwardly from a central portion thereof to side portions thereof whereby the side portions of the lower edge of the front wall portion of the suction nozzle are a greater elevation above the surface being cleaned than the central portion thereof, and means for supporting said lower edge of the front wall portion of the suction nozzle above and in close proximity to the surface being cleaned.

2. A vacuum cleaning machine as set forth in claim 1 in which the sole means for supporting the lower edge of the front wall portion above and in close proximity to the surface being cleaned consists of supporting means mounted on the central portion of said front wall portion.

3. In a vacuum cleaning machine: a suction nozzle; an impeller housing having a suction opening communicating with said suction nozzle, said impeller housing having an exhaust opening; and an exhaust baffle associated with said exhaust opening, said exhaust baffle comprising two spaced, generally parallel members extending outwardly from said exhaust opening at an angle to the direction of exhaust, a first of said members extending outwardly relatively farther than the second of said members and the second of said members being curved towards the first member at its outer end so that material exhausted from said exhaust opening at high

velocity is deflected against the first member by the second member.

4. In a vacuum cleaning machine, a suction nozzle defining a suction intake area, said suction nozzle including a front wall portion the lower edge of which forms a front portion of the lower peripheral edge of the suction nozzle, such lower edge of the front wall portion sloping upwardly from a central portion thereof to side portions thereof whereby the side portions of the lower edge of the front wall portion of the suction nozzle are at a greater elevation above the surface being cleaned than the central portion thereof, an impeller housing positioned above said suction nozzle and having a suction opening in communication with said suction intake area, and an impeller mounted for rotation within said impeller housing.

5. A vacuum cleaning machine as set forth in claim 4 including an exhaust baffle associated with the exhaust opening of the impeller housing, said exhaust baffle comprising two spaced, generally parallel members extending outwardly from said exhaust opening at an acute angle to the direction of exhaust, a first of said members extending outwardly relatively farther than the second of said members and the second of said members being curved towards the first member at its outer end so that material exhausted from said exhaust opening at high velocity is deflected against the first member by the second member.

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