

June 4, 1940.

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2,202,980

SUCTION CLEANER

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2 Sheets-Sheet 1

Fig. 1

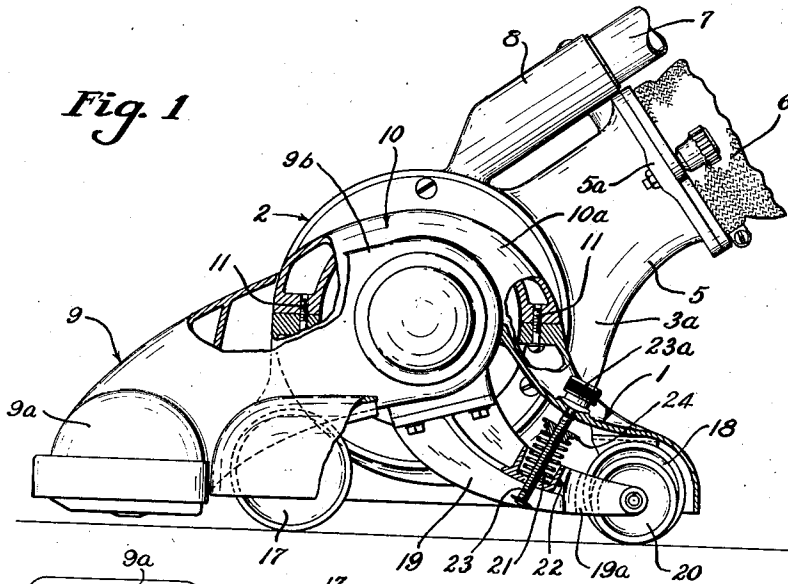
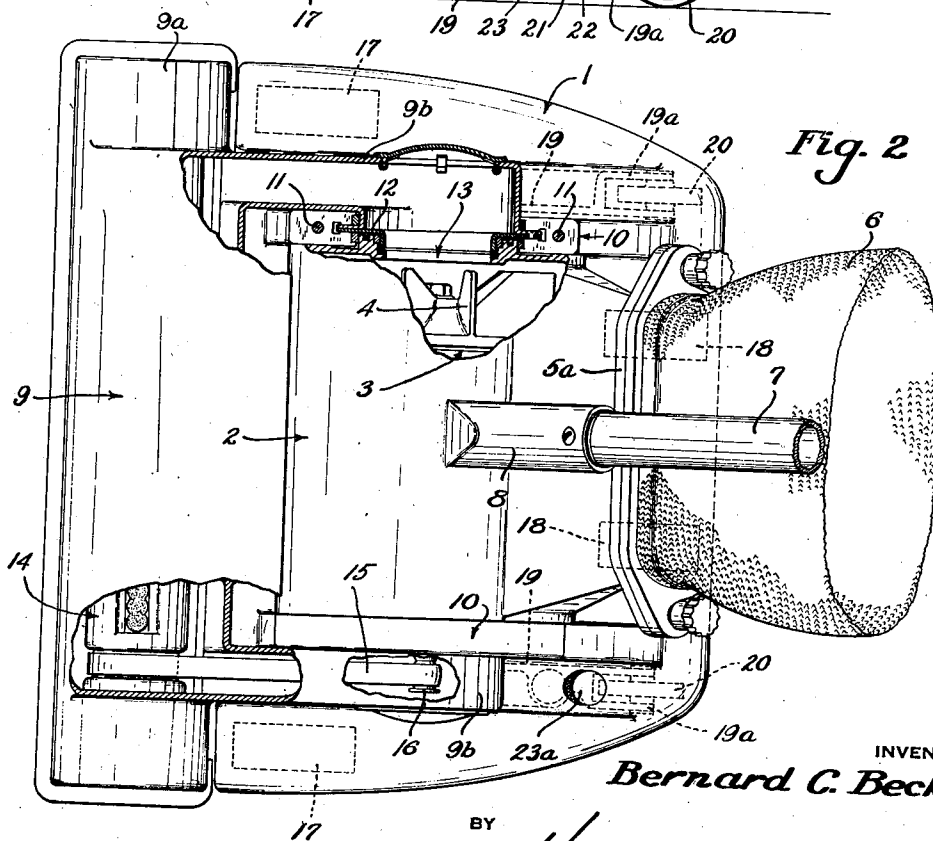


Fig. 2



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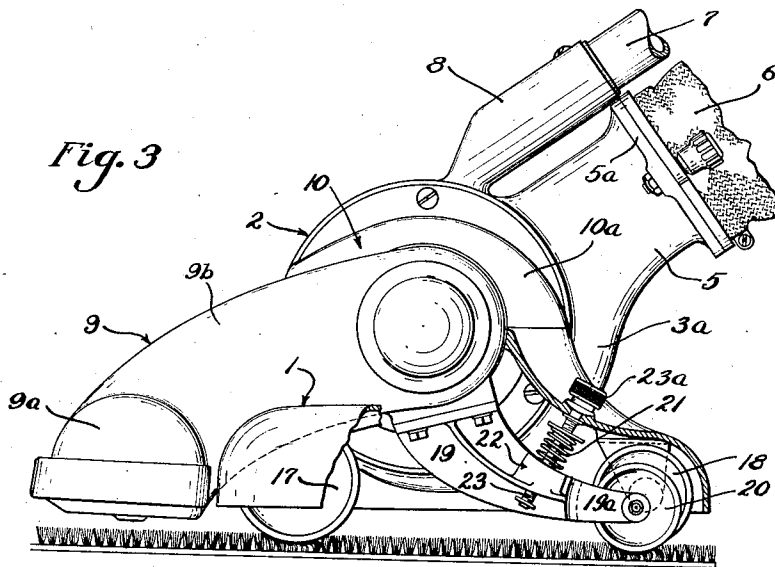
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SUCTION CLEANER

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6 Claims. (Cl. 15-16)

This invention relates to improvements in suction cleaners and more particularly to means whereby the nozzle of a suction cleaner is automatically maintained at the correct height above the surface of the floor covering to be cleaned regardless of its quality, texture or other characteristics.

Heretofore, it has been the standard practice to equip suction cleaners with some form of manually operated device for adjusting the height of the nozzle for different grades and thickness of carpet to compensate for penetration of the wheels into the nap of the carpet.

These manually operated adjusting devices are usually equipped with visual indicators for aiding the operator in making the adjustment, but no means are provided for determining the correct adjustment for a particular rug or carpet and as a consequence, any adjustment of the nozzle must necessarily be more or less an uncertain and haphazard performance.

It is therefore the object of the present invention to provide a suction cleaner having an automatic nozzle adjustment, and one that may be characterized by a set of wheels shiftable independently of the body of the cleaner and acting to raise or lower the nozzle solely by the reaction of these wheels to contact with the surface of the particular carpet to be cleaned.

And a further object of the present invention is to provide an automatic nozzle height adjusting mechanism especially adapted for a type of suction cleaner which lends itself to the pivotal mounting of the nozzle about a horizontal transverse axis.

With the foregoing introductory matter, the invention will now be more fully disclosed in connection with the accompanying drawings in which:

Figure 1 is a general view in side elevation of a cleaner embodying the invention with portions broken away to show the details of construction;

Figure 2 is a top plan view of a cleaner showing its general design and with sections of the external walls broken away to show the internal construction; and

Figure 3 is a view in side elevation corresponding to Figure 1, but with the cleaner resting upon a relatively thin carpet to show the manner in which the adjustment is accomplished automatically.

The suction cleaner herein disclosed is for the most part typical of the portable hand-manuevered appliances sold for household use and consists essentially of a wheel-supported casing hav-

ing a nozzle at its front end and housing a motor-driven fan located within a fan chamber which communicates with the nozzle and also with a dirt bag of porous material.

In the present design of suction cleaner, a main frame or casting 1 carries the supporting wheels and a cylindric housing 2 arranged transversely of and supported on the casting by means of end trunnion bearings permitting the housing to rotate about a horizontal transverse axis. One end of the cylindric housing forms a fan chamber 3 in which is located a suction fan 4 having direct driving connection with a motor (not shown) occupying the remaining part of the housing. The fan chamber has a discharge passage 5 through which it communicates with a dirt bag 6 having detachable connection with a flanged connection 5a at the outlet from the exhaust passage. A handle 7 is also carried as an integral part of the housing 2 and rotates with it, said handle being preferably mounted in a socket 8 located immediately above the exhaust outlet passage 5.

The nozzle portion of the cleaner comprises a hollow casting 9 forming a nozzle chamber 9a extending transversely across the forward end of the main frame 1 and provided with a downwardly facing suction mouth. Just inwardly from either end of the nozzle chamber is a pair of hollow segments 9b, 9b extending rearwardly at right angles and, embracing the ends of the cylindric housing 2, are journaled in the same trunnion bearings that support the housing. Thus the entire nozzle casting 9 is intended to swing through a limited arc and about a horizontal axis coincident with the axis of rotation of the cylindric housing 2.

For the purpose of this disclosure it is not necessary to describe in detail the pivotal mounting of the nozzle casting 9, except perhaps to identify the trunnion bearings 10, 10 at either end of the cylindric housing 2 and to point out that these bearings are integral with the main frame 1 and, in order to permit the cleaner to be readily disassembled, are parted or split horizontally with the upper half or cap portion 10a being removable but normally held in their seats by means of screws 11. One of the nozzle segments 9b opens laterally into the fan chamber end of the housing 2 through an opening defined by an annular flanged bearing member 12 incorporated in the trunnion 10 and, registering with an opening or eye 13 in the end wall of the housing, completes the air inlet passageway from

the nozzle chamber to the fan chamber, as clearly shown in Figure 2.

Preferably mounted in the nozzle chamber is a rotary agitator 14 extending the full length thereof and suitably journaled at each end. This agitator is provided with surface-contacting elements in the form of brushes and bars and is driven from the same motor that drives the suction fan, through the medium of a belt 15 passing through the hollow nozzle segment 9b at the opposite end of the cylindric housing 2 from the air inlet passage to the fan chamber, said belt 15 being connected with a pulley 16 forming an extension of the motor armature shaft and engaging a pulley groove on the agitator 14.

Referring now to the nozzle adjusting feature of the cleaner, it will be noted that the main casting 1 carries two pairs of wheels, namely, a pair of front wheels 17, 17 located immediately to the rear of nozzle 9 and a pair of rear wheels 18, 18 located near the rear end and spaced somewhat more closely together. These front and rear wheels are mounted on fixed journal bearings of any suitable type and are in nowise adjustable with respect to the main casting 1.

Now, as clearly shown in Figure 1, there is formed integral with the rotatively adjustable nozzle casting 9, a pair of arms 19, 19 extending downwardly and rearwardly from the underside of the hollow segments 9b, 9b of the nozzle casting from a point just below the end bearings. These arms terminate at their rear ends in fork-like brackets 19a in which are journaled a pair of auxiliary wheels 20, 20 positioned substantially in transverse alignment with the rear supporting wheels 18, 18 and preferably having a slightly smaller diameter and narrower width of tread.

Now, with wheels 20, 20 contacting the surface of a carpet, it follows that the nozzle casting will swing in a limited arc to raise or lower the suction mouth depending on the depth of the penetration of said wheels into the carpet nap. But in order that the auxiliary wheels 20, 20 may respond to variations in the character of the carpet on which the cleaner is to be operated, it is necessary to apply a pressure upon the rotative nozzle casting assembly and in a direction to oppose the free rotation in a direction to lower the nozzle toward the floor surface. As clearly shown in Figure 1, this pressure is applied through a compression spring 21 acting on one of the arms 19 midway between its ends and in a downward direction tending to force the wheels into the carpet surface. The need for a compression spring is obvious, since otherwise the excess weight of the nozzle casting located forwardly of its pivotal axis, would depress the nozzle portion and raise the auxiliary wheels from the floor surface.

The compression spring 21 is provided with an adjustable mounting so that the pressure exerted on the auxiliary wheel carrying arm 19 may be varied. Thus, an upwardly facing socket 22 provides a seat for the lower end of the spring and extending axially through the spring and the socket 22 is a threaded stem 23 passing upwardly through adjacent top wall section of the main casting 1 and surmounted by an adjusting nut 23a. The stem 23 carries a flanged collar 24 forming a seat for the upper end of the compression spring 21 so that by rotating the stem in one direction or the other, the collar 24 will move along the stem and vary the tension accordingly. Ordinarily, the proper setting for the compression spring 21 is such that it just overcomes o-

over-balances the weight of the nozzle casting so that the auxiliary wheels ride lightly upon the floor or carpet surface and are thus free to respond to variations in the character of the carpet surface, as will now be explained.

Referring to Figure 1, it may be assumed that the cleaner is resting upon a hard surface floor covering or a thin carpet having a very short nap. Under such conditions, the auxiliary wheels 20, 20 and the adjacent supporting wheels 18, 18 contact the floor surface at points in the same horizontal plane. Moreover, it is to be assumed that when this condition exists, the distance between the plane of the suction mouth and the floor surface constitutes the proper spacing for effective cleaning, the initial setting of the nozzle being, say $\frac{3}{8}$ of an inch, with the auxiliary wheel mounting designed to give this setting with the cleaner resting upon a hard surface as in Figure 1.

Now referring to Figure 3, it may be assumed that the cleaner has been transferred onto a carpet having a relatively thick and soft nap. Under the counterbalancing pressure of the compression spring 21 upon the auxiliary wheel carrying arm 19, the auxiliary wheels 20, 20 are depressed into the carpet nap to a depth substantially equal to the depth of penetration of the front supporting wheels 17, 17, which carry a somewhat greater part of the load than the rear wheels 18 and therefore tend to sink into the carpet to a proportionately greater depth. Obviously then, the forward portion of the cleaner is depressed under operating conditions as evidenced by the sinking of the front wheels into the carpet nap, and this action would necessarily bring the suction mouth closer to the carpet surface but for the fact that the auxiliary wheels sinking into the carpet nap to the same or approximate depth as the front wheels 17, 17, permit the entire nozzle casting to rotate about its axis and in a direction to lift the nozzle a distance sufficient to compensate for the sinking of the front wheels into the carpet nap. Thus by initially adjusting the compression spring 21, it follows that thereafter the nozzle will be raised or lowered in proportion to the penetration of the front supporting wheels into the carpet surface, this penetration in turn being dependent upon the particular grade and texture of the carpet being cleaned.

And in connection with the adjustment of the auxiliary wheels 20, 20, it should be pointed out that, owing to their somewhat decreased diameter and relatively narrow tread surfaces, their ability to penetrate the carpet nap is considerably greater than that of the adjacent rear supporting wheels 18, 18. Thus it follows, that with the compression spring 22 exerting a pressure but slightly in excess of that required to overcome the weight of the nozzle casting, the auxiliary wheels will penetrate the carpet nap to at least the same depth as the front supporting wheels, while the rear wheels may penetrate only to a fraction of the depth of the auxiliary wheels. In other words, it is not only the spring pressure acting upon the auxiliary wheels but also their dimensions that accounts for their response to varying carpet conditions and bring about the automatic adjustment of the nozzle.

It perhaps should be added that the particular type of nozzle adjusting device herein disclosed is primarily applicable to a suction cleaner design which permits of a pivoted nozzle casting, that is, a nozzle member that can be sup-

ported upon wheels for limited vertical adjustment independently of the remaining parts of the cleaner assembly, and, except for this one limitation however, the same means for maintaining the suction mouth at a uniform height above the carpet surface, may be applied to other designs of suction cleaners.

Having set forth a preferred embodiment of the invention,

10 I claim:

1. In a suction cleaner, the combination of a frame carrying suction-creating means and having wheels at the front and rear ends thereof capable of supporting the weight of the cleaner upon the carpet being cleaned with relatively limited penetration of the carpet nap, a nozzle pivotally mounted on said frame and communicating with said suction-creating means, auxiliary wheels journaled on said nozzle rearwardly of the pivotal axis of said nozzle, and tension means adapted to exert a force on said nozzle sufficiently in excess of that required to counterbalance the weight thereof to depress said auxiliary wheels into the carpet nap and thereby tilt the nozzle upwardly to compensate for the increased depth of penetration of said front supporting wheels under the operating load of the cleaner.

2. In a suction cleaner, the combination of a frame carrying suction-creating means and having wheels at the front and rear ends thereof capable of supporting the weight of the cleaner upon the carpet being cleaned with relatively limited penetration of the carpet nap, a nozzle casing pivotally mounted on said frame for limited movement about a horizontal transverse axis and having a nozzle portion forwardly of its axis communicating with said suction-creating means, an auxiliary wheel journaled on said nozzle casing rearwardly of the pivotal axis of said nozzle casing, and having a carpet contacting area substantially less than that of said frame supporting wheels, and tension means acting on said nozzle casing to counterbalance the weight thereof and to depress said auxiliary wheel into the carpet nap to a depth calculated to tilt said nozzle and compensate for the increased depth of penetration of said front supporting wheels under the operating load of the cleaner.

3. In a suction cleaner, the combination of a frame including suction-creating means and provided with supporting wheels adjacent the ends thereof, the foremost of said wheels having tread surfaces of an area capable of supporting the weight of the adjacent portion of said cleaner upon the carpet being cleaned with limited penetration of the carpet nap, a nozzle pivotally mounted on said frame for limited movement about a horizontal transverse axis and communicating with said suction-creating means, an auxiliary wheel carried by said nozzle and adapted to contact the carpet surface on the opposite side of its pivotal axis from the nozzle proper, and a spring acting on said nozzle to counterbalance its weight and to depress said auxiliary wheels into the carpet to a depth sufficient to raise said nozzle and thus compensate for the increased depth of penetration of said front supporting wheels when said cleaner is placed in operation.

4. In a suction cleaner, the combination of a frame including suction-creating means and provided with supporting wheels adjacent the ends thereof, said wheels having tread surfaces of an area capable of supporting the weight of said

cleaner upon the carpet being cleaned with limited but substantially equal depths of penetration of the carpet nap, a nozzle casing pivotally mounted on said frame for limited movement about a horizontal transverse axis and having a nozzle portion positioned forwardly of the pivotal axis of said nozzle casing and communicating with said suction-creating means, an auxiliary wheel carried by said nozzle casing and adapted to contact the carpet surface adjacent the rear supporting wheels and on the opposite side of said axis from the nozzle and having a relatively narrow tread surface, and tension means acting on said nozzle casing to counterbalance its weight and depress said auxiliary wheel into the carpet to a depth calculated to compensate for the increased depth of penetration of said front supporting wheels when said cleaner is placed in operation.

5. In a suction cleaner, the combination of a frame including suction-creating means and provided with wheels at the front and rear ends thereof, the foremost of said wheels having relatively wide tread surfaces capable of supporting the front portion of the cleaner upon the carpet being cleaned with a minimum of penetration into the nap thereof, a nozzle casing tiltably mounted on said frame and having a nozzle at its forward end communicating with said suction-creating means and a rearwardly extending radial arm, auxiliary wheels with relatively narrow tread surfaces journaled on said arm and adapted to ride in contact with the carpet being cleaned rearwardly of the pivotal axis of said nozzle casing, and an adjustable compression spring intermediate said frame and said arm and adapted to exert pressure on said arm sufficient to counterbalance the weight of said nozzle and to force said auxiliary wheels into the carpet nap beyond the depth of penetration of said rear wheels to tilt said nozzle in a direction to raise the nozzle and compensate for the increased penetration of the front wheels under operating load and thereby to maintain the nozzle at a substantially uniform height regardless of the kind and grade of carpet being cleaned.

6. In a suction cleaner, the combination of a frame carrying suction-creating means and provided with wheels at the forward and rear ends thereof having wide tread surfaces capable of supporting the weight of the cleaner with relatively limited penetration of the nap of the carpet being cleaned, a nozzle casing pivotally mounted on said frame for limited rotation about a horizontal transverse axis and having a forwardly disposed nozzle portion communicating with said suction-creating means and an arm disposed radially with respect to the axis of said nozzle casing and extending rearwardly and downwardly therefrom, an adjustable compression spring intermediate said frame and arm and adapted to exert sufficient pressure to counterbalance the weight of said nozzle portion, and an auxiliary wheel journaled on said casing adjacent the rear supporting wheels and having a relatively narrow tread surface, whereby the same is capable of penetrating the carpet nap to a greater depth than said rear supporting wheels thereby to permit said nozzle casing to tilt in a direction to raise said nozzle sufficiently to compensate for the increased depth of penetration of said front wheels when the suction load is exerted at said nozzle.

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