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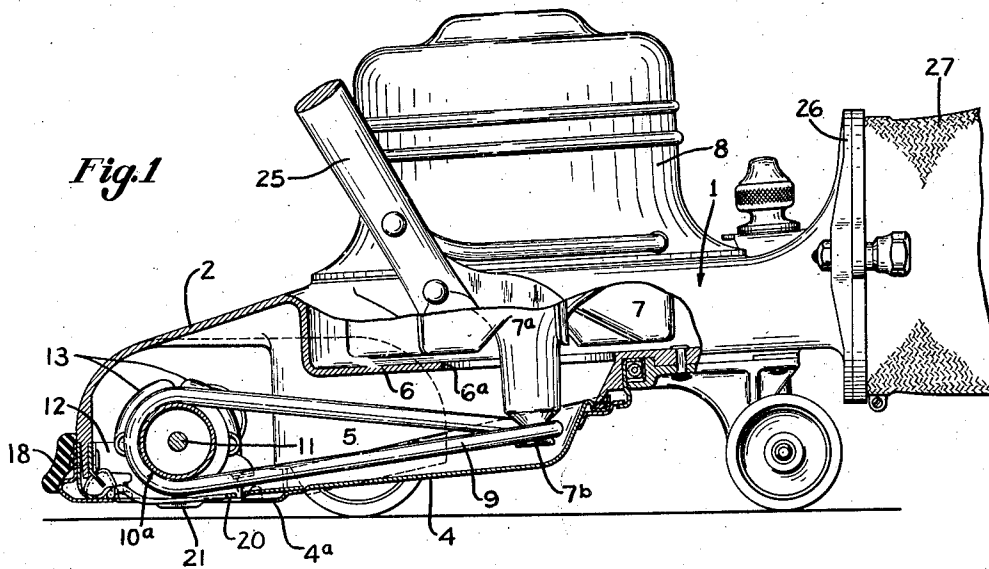
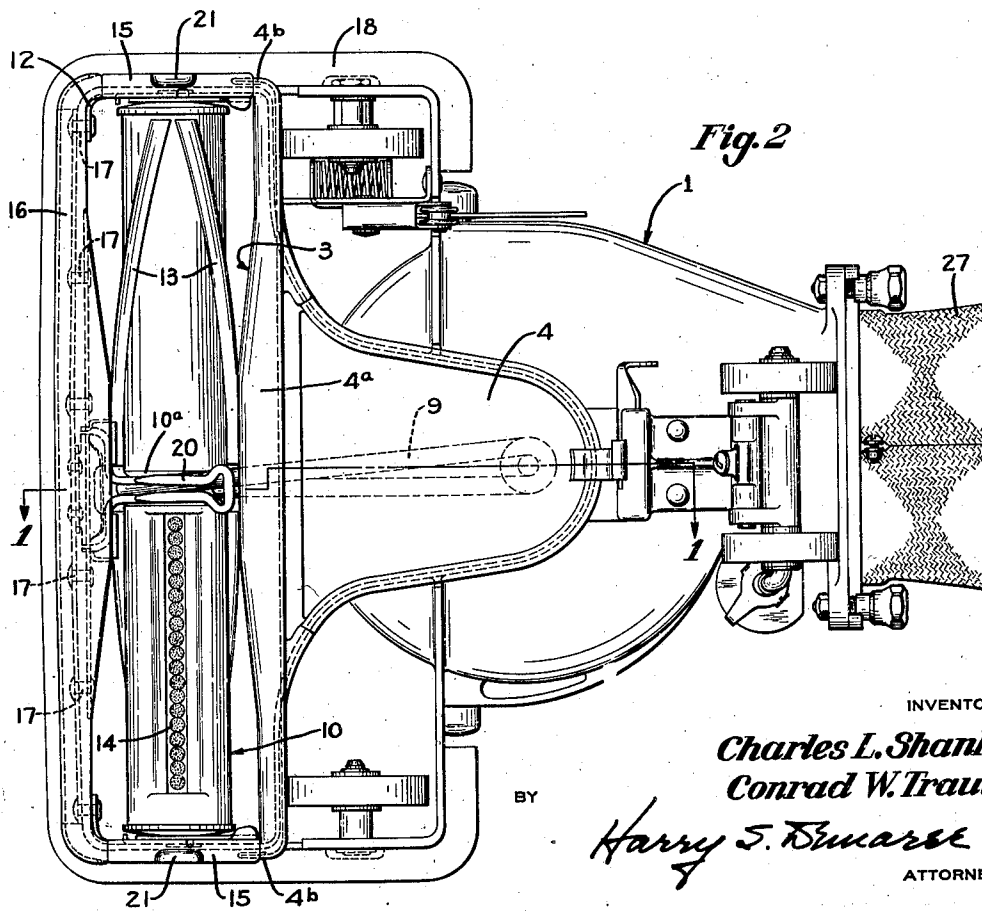
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SUCTION CLEANER

Filed Jan. 17, 1936

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

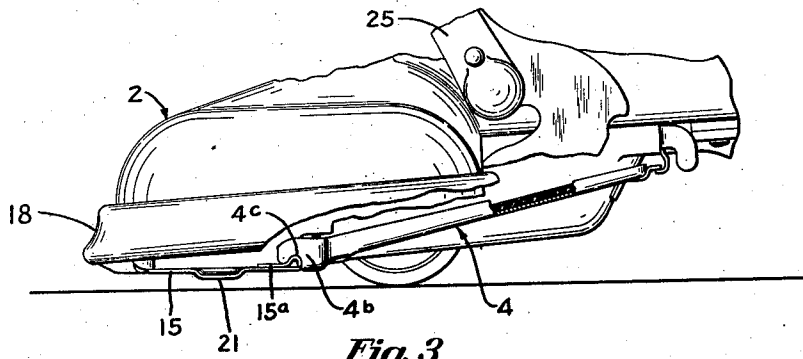


*Fig. 3*

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## UNITED STATES PATENT OFFICE

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## SUCTION CLEANER

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2 Claims. (Cl. 15—155)

This invention relates to improvements in suction cleaners, and more particularly to an improved configuration for the suction mouth of the nozzle of a suction cleaner.

As is well known in the art, the cleaning of carpets by suction is primarily the result of drawing the air through the upstanding pile and into the cleaner nozzle as it passes over the surface being cleaned. The bulk of the dirt removal, however, is performed by the air passing around or beneath the edges or lips of the nozzle and not by the air drawn directly through the carpet due to its more or less porous texture. Hence it is important that a relatively close sealing contact be maintained between the carpet and the nozzle in order to obtain the most effective cleaning.

The force of the suction is ordinarily sufficient to lift the carpet from the floor and hold it against the mouth of the nozzle, but unless there is a sealing contact entirely around the nozzle much of the cleaning effectiveness of the suction is lost due to the leakage of air between the carpet and the nozzle, that is, air entering the nozzle without producing any cleaning effect. This leakage, however, is largely confined to the end portions of the nozzle where the resistance of the carpet to lifting effect of the suction is greater due to relatively greater areas lying beyond the ends of the nozzle which have to be flexed and lifted from the floor. In short, there is a tendency for the carpet to pull away from the end of the nozzle to a considerably greater extent than elsewhere—a condition that lends itself to correction by increasing the suction at the end of the nozzle. This, however, is not a matter of merely increasing the speed of the fan or increasing the area of the nozzle mouth and using a more powerful fan, but in designing the suction mouth of the nozzle so that the suction areas at each end are increased without necessarily increasing the total suction area, except perhaps to the limited extent hereinafter set forth.

Hence, the object of the present invention is to provide an improved contour for the mouth of the nozzle of a suction cleaner, which will materially increase the cleaning effectiveness of the cleaner without otherwise altering its design or changing its operating characteristics in any essential particular.

A preferred embodiment of our invention is disclosed in the accompanying drawings, in which:

Figure 1 is a view in side elevation of a suc-

tion cleaner with parts thereof shown in section as taken on line 1—1 of Figure 2.

Figure 2 is a bottom plan view of the cleaner showing the shape and construction of the nozzle mouth and parts associated therewith,

Figure 3 is a fragmentary view in side elevation of the nozzle portion of the cleaner with parts broken away to show the mounting of the bottom plate.

Referring to Figures 1 and 2, a suction cleaner to which the present invention is especially applicable, consists generally of a wheeled casing 1 extended transversely throughout its forward portion to form an elongated nozzle section or chamber 2, having a downwardly opening suction mouth 3 formed in part by the forward edge of a removable bottom plate 4 for the suction chamber 5, extending rearwardly from the nozzle 2. Immediately above the suction chamber 5, and separated therefrom by a wall 6 is a fan chamber enclosing a fan 7 driven directly by a motor enclosed within its casing 8 supported on top of the main casing 1. Extending downwardly into the suction chamber 5 and axially through a circular opening 6a (termed the "fan eye") from the fan chamber, is an extension of the fan hub 7a having at its lower end a pulley 7b carrying a belt 9 extending forwardly through the suction chamber 5 and driving an agitator 10 extending lengthwise of the nozzle 2 and disposed symmetrically with respect to the suction mouth 3 with its periphery tangential with the plane thereof. The agitator consists primarily of a cylindric metallic shell journaled upon an axial shaft 11, which in turn is supported in bearing plates 12 so designed that on removing the bottom plate 4 the entire agitator may be removed from the nozzle for the purpose of making adjustments or repairs. However, mounting of the agitator forms no part of the present invention and therefore further details will be omitted. Similarly, the agitator, being of standard design, need not be described in detail except to identify the pair of beater bars 13 extending throughout the length of the agitator, each traversing an angle of 180 degrees while following helical paths from a common meeting point at one end of the agitator to a meeting point at the opposite end and two brushes 14, each extending throughout one-half the length of the agitator between the beater bars and one spaced 180 degrees from the other. And finally, midway the ends of the agitator is provided a groove 10a forming the pulley for the driving belt 9. And as to the action and function of the

agitator, it is sufficient to say that it rotates at a high rate of speed, and the beater bars 13 and brushes 14 striking the carpet produce a beating effect that dislodges the dirt and renders it more easily removable by the suction.

Now, the nozzle opening or suction mouth 3, in accordance with the standard practice, is preferably surrounded by flat horizontal surfaces termed lips. Moreover, these lips are preferably shaped or stamped from sheet metal, and either fastened to the nozzle section 2 or formed integral with some other member mounted within the nozzle section. Thus for example, the rear lip of the nozzle opening or mouth is a transverse extension 4a formed integral with the front edge of the bottom plate 4 and having the form of a flat loop as clearly shown in Figure 1. Again, the end lips 15 at either end of the suction mouth 3 are formed integrally with the bearing plates 12—12 mounted in each end of the nozzle casing 2 for supporting the agitator shaft 11. In fact, the lips 15 are merely right angular flanges along the lower edges of the bearing plates 12—12 which project outwardly from the ends of the nozzle as clearly shown in Figures 2 and 3. Now, as a means of anchoring the rearmost ends of the end lips 15 to the outer ends of the rear lip 4a, the outer extremities of the latter are preferably bent forwardly at right angles to form fingers 4b—4b, each provided with a downwardly facing notch 4c (Figure 3) adapted to engage a detent 15a fixed to the upper surface of each end lip 15. In this way the bottom plate 4 may be removed for access to the chamber 5, housing the pulley shaft 7a and the driving belt 9, whereupon the lips may be again joined together when the bottom plate is replaced. And, to complete the suction mouth 3, a sheet metal lip forming member 16, generally L-shaped in section, is permanently fastened to the front upright wall of the nozzle section 2 by means of rivets 17, the extreme ends of said member being preferably curved rearwardly through an angle of 90 degrees to abut the adjacent ends of the lips 15, 15. And finally, a strip of relatively soft rubber 18 extends around the three exposed sides of the nozzle section 2 and serves as a resilient guard to protect furniture from damage by contact with the cleaner during its operation.

Referring now to the shape of the nozzle mouth or opening as it appears in Figure 2, it will be noticed first of all that it is somewhat wider throughout its end portions than at its central portion, or to state it in another way, the suction mouth gradually increases in width from its central portion outwardly toward its ends. Thus, if the suction mouth is divided lengthwise into five sections it will be found that the center or mid-section is formed by two complementary parallel edges of the front and rear lips extended inwardly to form a relatively narrow or restricted portion of the suction mouth, and which is flanked on either side by the two divergent portions gradually increasing in width and merging into the two end sections of uniform width and of materially increased areas. It may be stated in this connection, that the advantages of widening the end portions of the suction mouth may be attained without adopting the exact contour herein disclosed, providing the central portion of the suction mouth is somewhat narrower and the end portions correspondingly wider than would otherwise be specified for a cleaner of the same size and rating. In short, the advantages attained are essentially the result of altering the shape without increasing the size or area of the suc-

tion mouth, although a limited increase in the area may also be advantageous. However, enlarging the area of the suction mouth increases the load on the motor, but so long as the additional load does not exceed the overload capacity of the motor it is possible to take advantage of the increased cleaning effectiveness, resulting from the increase in the area of the nozzle mouth. For example, an increase of say 15% in the area of the suction mouth which increased the load on the motor only 10%, but produced an increase of 7% in the cleaning effectiveness of the cleaner, would not be considered excessive.

Considering now the reasons for and advantages of the particular shape or contour of the suction mouth, characterized chiefly by the widening of the end portions, it may be assumed at the outset that the suction produced by the fan is uniform throughout the length of the nozzle. Hence, the direct result of widening the ends of the suction mouth is to increase the suction areas at each end of the nozzle and thereby produce a corresponding increase in the suction or lifting force exerted upon the carpet, lying beyond the ends of the nozzle. In other words, the suction acting throughout a greater area exerts a greater lifting force on the carpet, thus promoting a firmer contact at the ends of the nozzle which counteracts the usual tendency of the carpet to pull away from the nozzle with the attendant leakage of air and loss of cleaning effectiveness.

To complete the nozzle construction, it is usually desirable to provide a guard 20 extending transversely of the suction mouth at the center thereof and in alignment with the belt pulley groove 10a. The purpose of this guard is to prevent the fringes of rugs and the like from being caught between the belt and the agitator. The guard herein disclosed is preferably made from a piece of heavy steel wire shaped to provide a pair of parallel arms terminating in a loop at its outer or free end and a pair of laterally projecting arms at its inner end, whereby the guard is pivotally anchored to the nozzle section just above the central portion of the lip forming member 16, so that it can be swung outwardly in order to permit the agitator 10 to be removed. Otherwise it simply straddles the nozzle mouth to prevent the fouling of the driving belt.

Moreover, as a means for affording protection both to floor surfaces and to the cleaner, it is desirable to provide at the extreme ends of the nozzle, a pair of ribs or fins 21, preferably formed by depressing a short mid-section of the outer edges of the end lips 15, 15. These ribs or fins may not project more than a small fraction of an inch below or beyond the plane of the nozzle mouth as shown in Figures 1 and 3, but this is quite sufficient so long as the same project below the beater bars 13 of the agitator.

The operation of the cleaner herein disclosed is the same as performed by any cleaner of the same general type, namely, by maneuvering the same over the floor covering to be cleaned by means of a long operating handle pivotally attached to the cleaner through a bail 25, the fan at the same time creating the necessary suction within the nozzle to draw the dust laden air into the fan chamber and thence rearwardly through an exhaust outlet 26 to a dust collecting bag 27, removably attached thereto.

Certain details of construction disclosed in connection with the suction cleaner embodying the present improvement have not been described in detail inasmuch as they have no particular rela-

tionship to the invention, aside from being already well known in the art.

Having set forth a preferred embodiment of our invention, we claim:

5 1. In a suction cleaner, the combination of a nozzle and suction creating means communicating with said nozzle, the latter having a downwardly opening mouth gradually increasing in width from its central portion outwardly toward  
10 its ends to form widened end portions of uniform width.

2. In a suction cleaner, the combination of a nozzle having a suction mouth defined by longitudinal lips and transverse end lips said longitudinal lips having their inner edges spaced apart to form a relatively narrow central portion, and 5 gradually diverging to form relatively wide end portions of uniform width.

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