June 7, 1938. E. F. MARTINET 2,120,011

SUCTION CLEANER

Filed April 11, 1936 3 Sheets-Sheet 1

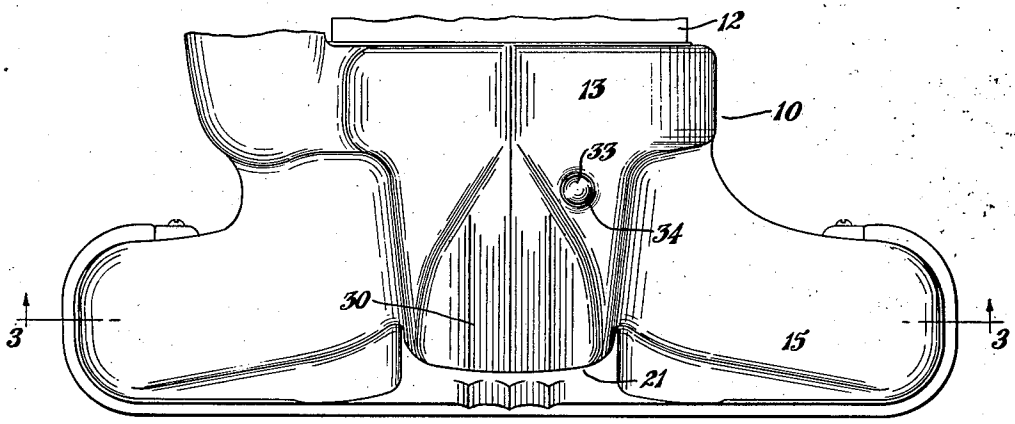


Fig. 2

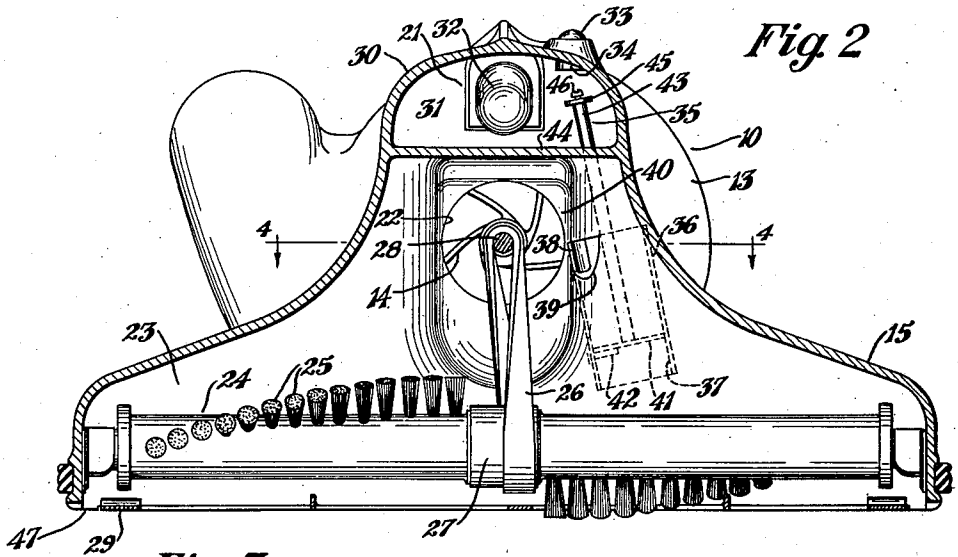


Fig. 3

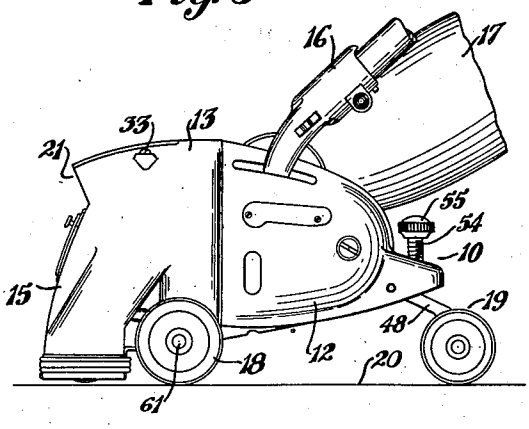


Fig. 1

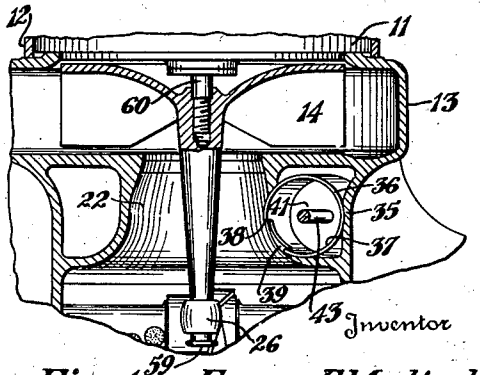


Fig. 4

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SUCTION CLEANER

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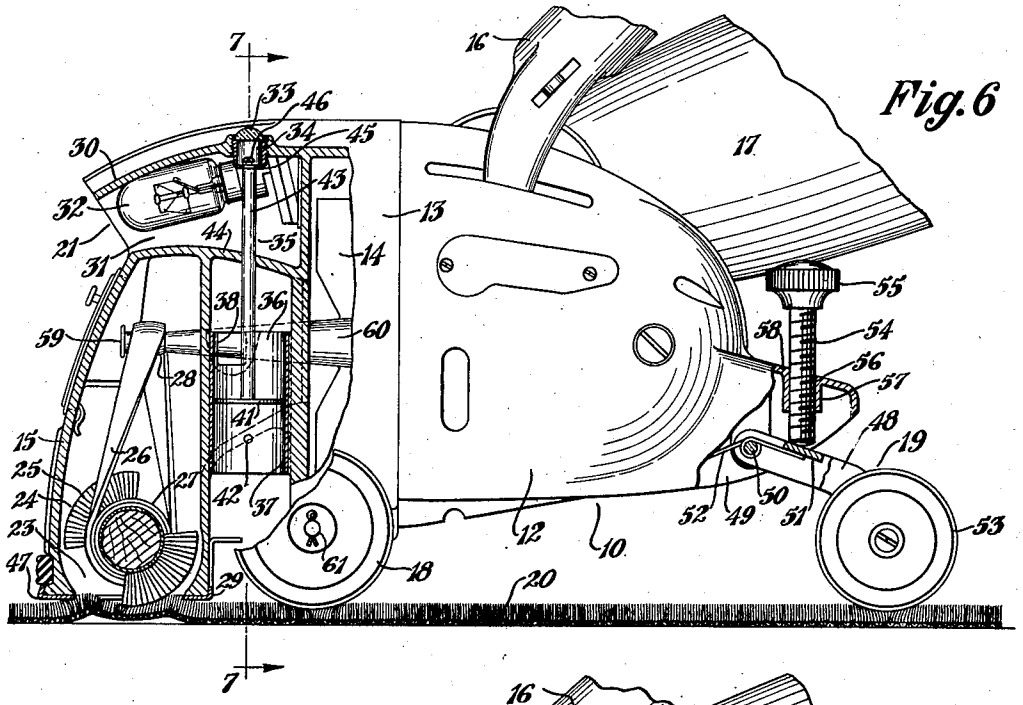


Fig. 6

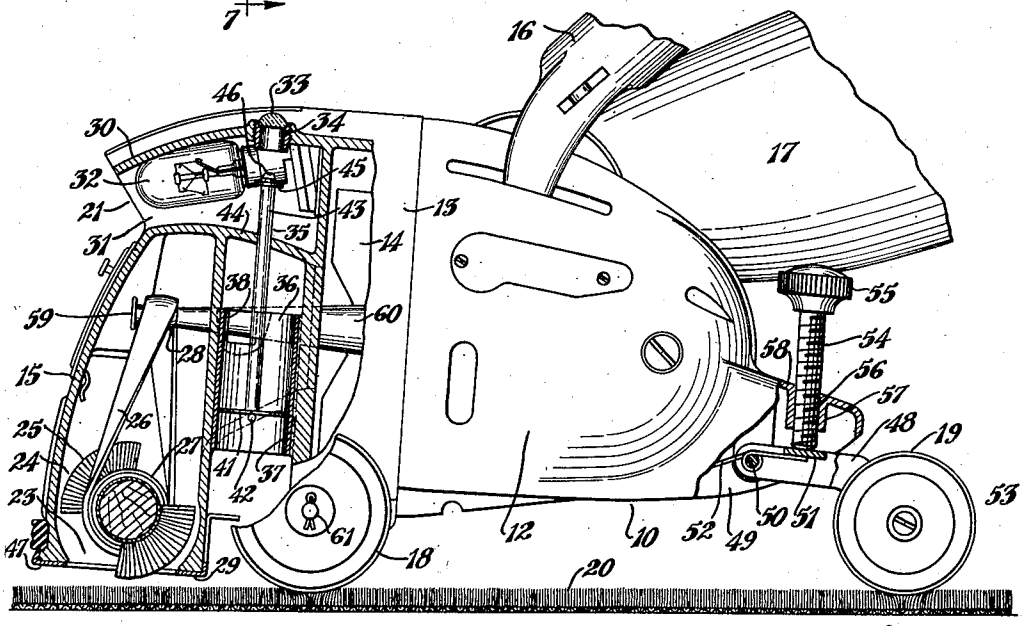


Fig. 5

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SUCTION CLEANER

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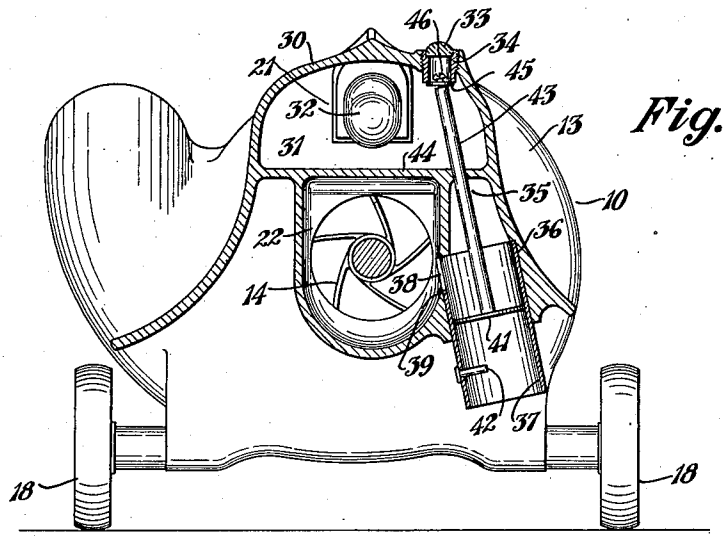


Fig. 7

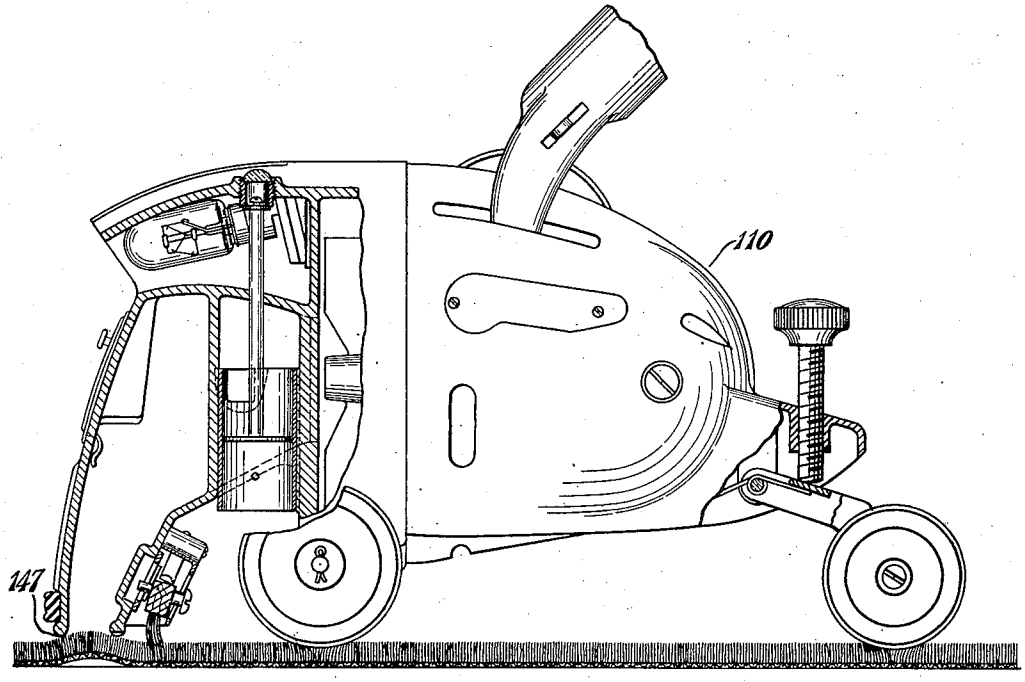


Fig. 8

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UNITED STATES PATENT OFFICE

2,120,011

SUCTION CLEANER

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Application April 11, 1936, Serial No. 73,868

10 Claims. (Cl. 15—8)

The invention relates to portable suction cleaners including a suction nozzle and associated means which are adjustable to vary the relative location of the nozzle mouth with respect to the particular surface being cleaned.

In a suction cleaner, whether or not a power driven rotary brush or agitator is provided in its nozzle mouth, substantially no cleaning takes place unless the nozzle mouth is properly located with respect to the particular surface to be cleaned, so as to provide the proper nozzle adjustment between the surface being cleaned and the nozzle mouth, as the cleaner is moved across the surface being cleaned.

Rugs having different nap thicknesses, and floor surfaces, of wood, linoleum, tile, or the like, each require a different adjustment of the nozzle mouth with respect to the surface, to provide the proper nozzle adjustment for most effective cleaning.

Suction cleaners are usually provided with manually adjustable means for varying the location of the nozzle mouth with respect to the surface being cleaned, but prior to the present improvements, the only way the user had of determining whether or not a proper nozzle adjustment had been effected between the nozzle mouth and the surface to be cleaned was by changes in the sound of the motor, or by changes in the sound of a revolving element in the nozzle, or by the lifting of a portion of a carpet to the nozzle lips. However, it is difficult to detect such changes in the sound of the motor or of a revolving element, or to observe the slight lift of a carpet; and such methods of determining when a proper nozzle mouth adjustment has been made, are not dependable.

The need for automatic signal means which can be easily understood and utilized by the ordinary user of a suction cleaner to accurately and instantly determine whether or not the cleaner has a proper adjustment of its nozzle mouth with respect to any surface to be cleaned, has long been recognized.

In a suction cleaner, if the nozzle adjustment is too close to the surface being cleaned, the nozzle will tend to dig into the surface, and it will be difficult or hard to push the cleaner back and forth across the surface.

Accordingly, it is particularly important that the adjustment of a cleaner nozzle mouth with respect to the surface being cleaned shall not be any closer than is necessary to provide for the maximum amount of cleaning effect, with the least amount of effort on the part of the operator, and with a minimum of wear on the surface being cleaned.

The objects of the present invention include in general the provision of an improved suction cleaner having a nozzle and other parts mounted upon adjustable preferably caster or wheel means, and provided with signal means automatically indicating to the user whether or not proper adjustment of the nozzle mouth has been attained by any particular adjustment for any particular surface to be cleaned.

Broader objects of the present invention include the provision of an improved suction cleaner in which the variation in the suction or pressure of the air existing in the cleaner is utilized to actuate means such as signal means for automatically indicating to the user a desired particular condition of the suction air, such as when the suction or pressure in the cleaner passages is such as will provide a maximum amount of cleaning.

The foregoing and other objects are attained by the suction cleaner, apparatus, parts, improvements, methods, combinations, and sub-combinations, which comprise the present invention; and the nature of which is set forth in the following general statements; and preferred embodiments of which, together with their mode of use are set forth in the following description; and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the improvements of the present invention may be described in general terms as including in a portable suction cleaner having a nozzle mouth for the entrance of the suction air which passes through chambers or passageways of the cleaner by the action thereon of an electric motor driven fan located in one of the chambers of the cleaner, of operating means actuated by variations in the suction or pressure existing in one of the chambers or passageways of the cleaner, the operating means being utilized for example to operate other means such as signal means for indicating to the user of the cleaner a particular condition of the suction air, such as that condition of the suction air when a proper adjustment of the nozzle mouth with respect to the surface to be cleaned has been effected for providing for a maximum cleaning action of the cleaner.

By way of example, several embodiments of the present improvements are illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a fragmentary side elevation of an electrically operated, portable suction cleaner having a power driven rotary brush, and including one embodiment of the present improvements in the form of visual signal means operated by variations in the suction or sub-atmospheric pressure existing in the nozzle of the cleaner;

Fig. 2, a fragmentary enlarged top plan view thereof;

Fig. 3, a transverse sectional view thereof as on line 3—3, Fig. 2;

Fig. 4, a fragmentary plan sectional view thereof as on line 4—4, Fig. 3;

Fig. 5, an enlarged view similar to Fig. 1, with portions broken away to illustrate the signal means and signal operating means of the present improvements, the nozzle mouth of the cleaner and other parts being shown in their relative positions when the nozzle mouth is not properly adjusted with respect for example to the surface of the nap rug to be cleaned shown in the figure, the signal means and signal operating means likewise being shown in their relative positions for indicating that the suction of the air passing through the cleaner is not that which is associated with proper adjustment of the nozzle mouth thereof;

Fig. 6, a view similar to Fig. 5, in which the nozzle mouth adjusting means of the cleaner have been properly adjusted so that a maximum cleaning action will occur by the nozzle mouth on the surface of the nap rug shown in the figure, and the signal means and signal operating means being shown in their relative positions which they attain instantly upon the effecting of the proper adjustment of the nozzle mouth;

Fig. 7, a transverse sectional view of the cleaner as on line 7—7, Fig. 6; and

Fig. 8, a view similar to Fig. 6 of another portable electrically operated cleaner of the type having a free air nozzle without a rotary brush or agitator, and provided with the present improvements.

Similar numerals refer to similar parts throughout the several figures of the drawings.

An electrically operated portable suction cleaner with a power driven rotary brush in the nozzle chamber thereof and with a headlight, and provided with one embodiment of the present improvements is shown in Figs. 1 to 7 inclusive and is indicated generally by 10.

The suction cleaner 10 includes a motor 11 in a motor housing 12, associated with a fan housing 13 having a fan 14 therein secured on the motor shaft, and a suction nozzle 15 adjacent to and communicating with the fan housing. An operating handle 16, and a dust bag 17 connected with the exhaust opening of the fan housing 13 also are provided for the cleaner; and the motor housing 12, the fan housing 13, and nozzle 15 are mounted on front casters 18 and preferably on adjustable double rear caster means 19 for ambulant motion over a surface to be cleaned, as shown a nap rug 20. The cleaner 10 also is provided with headlight means indicated generally by 21.

The nozzle 15 includes walls forming a tubular neck 22 leading to the fan chamber, and a transversely elongated brush housing suction mouth 23. A rotary brush indicated generally by 24 and provided with bristles 25 is detachably and adjustably rotatably mounted in the suction mouth 23, as by means such as set forth in detail in my copending application Serial No. 692,482.

The brush 24 is preferably motor driven, as shown in the drawings, and for this purpose an endless preferably flat band rubber belt 26 passes over the brush pulley surface 27 and the end 28 of the motor shaft.

As shown, the nozzle 15 is provided at the entrance to its mouth with a nozzle lip plate 29.

The headlight means indicated generally by 21, as shown include in the nozzle housing, an upper centrally located forwardly opening headlight shield 30 within the chamber 31 of which is operatively mounted an electric headlight 32 which is associated with the source of power for the motor, the headlight 32 being lighted when the motor and fan are in operation.

In the illustrated embodiment of the present improvements, the headlight 32 and its shield 30 comprise part of visual signal means which also include a light transmitting element or lens 33 which as shown is contained in the upper end of a mounting tube 34 which is screwed in a suitable aperture in the top of the headlight shield 30.

The present improvements also include means for automatically operating the signal means and actuated by variations in the suction or pressure existing in the cleaner air passages.

As shown, the signal operating means are indicated generally by 35 and include a cylinder tube 36 arranged in a suitable bore formed in some of the walls of the nozzle 15, the lower end of the bore 37 of the cylinder sleeve 36 opening to the atmosphere and the upper end of the cylinder sleeve 36 having a notch 38 therein which registers with an opening 39 in one of the walls of the nozzle and provides a communication between the upper end of the bore 37 of the cylinder sleeve with the upper portion 40 of the nozzle, as shown at the forward end of the tubular neck 22 of the nozzle which communicates with the fan chamber 13.

A piston disk 41 is arranged for reciprocation in the bore 37 of the cylinder sleeve 36 and means such as a stop pin 42 prevent the piston disk 41 from dropping out of the cylinder sleeve 36.

A signal operating piston rod 43 has its lower end connected to the piston disk 41 and extends upwardly through a suitable aperture formed in the bottom wall 44 of the headlight shield 30, said bottom wall 44 comprising a top wall of the nozzle 15.

Upon the upper end of the piston rod 43 is loosely mounted a shutter disk 45 as by a screw 46, the shank of which passes through an enlarged central opening in the shutter disk 45 and is screwed in a suitable threaded aperture in the upper end of the piston rod 43.

The lower transversely elongated extremity of the nozzle 15 may be termed the entrance mouth 47 of the nozzle, and the cleaner 10 is provided with the adjustable double rear caster means 19 for adjusting the relative location of the nozzle entrance mouth with respect to the surface being cleaned such as the nap rug 20; and as shown, the rear caster adjusting means includes arm members 48 pivotally secured at one end to rear end portions 49 of the motor housing 12, as by the transverse pin 50.

The arm members 48 also include a transverse bar 51 and as shown spring means 52 are wrapped around the pivot pin 50, and the ends of the spring means 52 cooperate respectively against portions of the motor housing 12 and against the transverse bar 51 for urging the arm members 48 upwardly.

The adjustable caster means 19 furthermore include casters 53 mounted upon suitable shaft

means at the outer end of the arm members 48, and an adjusting screw 54 is provided at its upper end with a knurled head 55 and is screwed into a suitably threaded aperture 56 formed in a boss 57 provided in an upper rear end wall 58 of the motor housing 12.

The lower end of the screw 54 abuts against the bar 51 of the arm members 48, and accordingly screwing the screw 54 downwardly serves to increase the angulation of the arm members 48 with respect to the axis 59 of the motor shaft 60 and thereby serves to lower the entrance mouth 47 of the nozzle towards the surface 20 to be cleaned, with the reverse action of the adjusting means when the screws 54 is screwed upwardly.

In the operation of the adjustable caster means 19 all the sweeper parts, with the exception of the front casters 18 and their axle 61, swing one way or the other on the axle 61.

The operation of the improved suction cleaner 10 may be described as follows:

The manufacturer of a cleaner, such as the cleaner 10, determines and establishes, in designing the same, that degree of suction or subatmospheric pressure, or in other words, the drop from atmospheric pressure of the air existing in the cleaner nozzle 15 or other passages on the low pressure side of the fan, which is coincident with the correct adjustment of the entrance mouth 47 of the nozzle with respect to the surface to be cleaned, which is in the drawings the nap rug 20; so that a maximum or predetermined cleaning action will occur in using such particular design of cleaner with its nozzle mouth correctly adjusted.

In Fig. 6 the relationship of the nap rug 20 when the nozzle entrance mouth 47 is properly adjusted, is shown, the adjusting means 19 having been manually manipulated to attain the correct position of the nozzle entrance mouth 47 as shown.

In Fig. 5 the adjusting means 19 are shown in a position in which there is no proper relationship of the nozzle entrance mouth 47 with the nap rug 20 to accomplish any effective cleaning.

The manufacturer, having determined that degree of suction coincident with the proper adjustment of the nozzle entrance mouth to effect a maximum predetermined cleaning action, then so designs the signal operating means that it will operate a signal the instant that the suction or pressure has been obtained in the cleaner passage with which the signal operating means communicates, to indicate when proper adjustment of the nozzle entrance mouth has been obtained.

Thus, in the embodiments shown in the drawings, the weight and area of the signal operating piston disk 41 fitting and reciprocating in the bore 37 of the cylinder sleeve 36 is so established or determined by the particular characteristics of the cleaner on which it is mounted, that when the proper adjustment of the nozzle entrance mouth 47 is effected with respect to any surface to be cleaned to obtain a maximum predetermined cleaning effect, the suction within the chamber of the nozzle will have been increased to such a degree that atmospheric pressure on the piston disk 41 will elevate the same and the piston rod 43 to their positions shown in Fig. 6.

As above stated the cleaner 10 is of the headlight type, and the headlight 32 is at all times illuminated when the cleaner is in operation. When there is no proper adjustment of the nozzle entrance mouth 47, the piston disk 41 and rod 43 are dropped in the positions shown in Fig. 5 in which case light from the headlights 32 is transmitted through the light transmitting signal lens 33 which appears illuminated to the user of the cleaner 10 at all times when there is no proper adjustment of the cleaner nozzle entrance mouth 47.

At the instant however that proper adjustment of the nozzle entrance mouth 47 is effected as shown in Fig. 6 the shutter disk 45 on the upper end of the piston rod 43 closes off the lower end of the lens mounting tube 34 and thus obstructs the passage of light through the lens 33.

In other words the light passing through the lens 33 is shut off at the instant of obtaining proper adjustment of the nozzle mouth 47.

The improved cleaner 10 operates automatically to provide instantaneous signaling of the attainment of a proper adjustment or location of the nozzle with relation to any surface to be cleaned to obtain the maximum predetermined cleaning effect.

When the user is adjusting the location of the nozzle mouth for any particular surface, the screw 54 is manipulated with one hand so as to swing the sweeper parts about the front caster axle 61 to a position of too great displacement of the nozzle entrance mouth 47 above the surface to be cleaned. (Fig. 5.)

The screw is then manipulated in the other direction to lower the nozzle entrance mouth 47, in order to effect a proper adjustment. (Fig. 6.)

The instant the light emitting from the signal lens 33 shuts off, the user knows that proper adjustment of the nozzle entrance mouth 47 has been effected.

In some cases, the signal operating piston rod 43 may be arranged to switch on and off a separate signal means, as by having the piston rod operate a switch in an electric circuit, controlling a light, a bell or like signal means.

Also the signal operating rod 43 may be arranged to actuate movable signal members, or the upper end of the rod 43 may in itself by its position be used as a signaling indicator.

A cleaner 110 is shown in Fig. 8 including the present improved automatic signaling apparatus, the cleaner 110 being of the free air nozzle type without a rotary brush or agitator, and the several parts of the cleaner and signaling apparatus are shown when proper adjustment of the nozzle entrance mouth 147 has been effected.

The present improvements as above described by way of example thus provide a suction cleaner in which the variation in the suction or pressure of the air existing in the cleaner passages is utilized to acuate means, such as signal means, for automatically indicating to the user a desired particular suction or pressure condition of the cleaning air, such as when the cleaning air has attained the proper cleaning suction by the proper adjustment of the nozzle mouth of the cleaner, to perform a maximum predetermined amount of cleaning.

In the particular embodiments of the improvements above set forth the attainment of the proper adjustment is effected through manipulation of the means for adjusting the location of the nozzle entrance mouth with respect to the surface being cleaned, and the signal operating means, actuated by the variation in the suction of the air existing in the nozzle, automatically indicate to the user the instant a proper adjustment or relation of the nozzle mouth with re-

spect to the surface being cleaned has been effected from a condition of too great a displacement of the nozzle entrance mouth from the surface being cleaned.

The scope of the invention is not limited to an adjustment of the nozzle by manipulating an adjustable caster, because the nozzle adjustment may be effected by any other suitable means or by hand. Thus, a suction cleaning operation is frequently performed by using a portable cleaner and by securing a converter attachment to the suction side of the fan from which flexible and/or rigid tubular members extend, on the end of which a cleaning tool nozzle of desired shape is mounted.

Such cleaning tool nozzles may then be used to clean underneath a bed or the like, and unless the cleaning tool nozzle is properly located with respect to the surface being cleaned, no effective cleaning takes place. The present improvements, however, through the signal means thereof, can be utilized to indicate to the user whether or not the cleaning tool associated with the portable cleaner is being held in the proper location with respect to the surface in order to perform a cleaning operation in a place where it is otherwise difficult to determine whether or not a proper cleaning has taken place.

Moreover, flexible and/or rigid tubular members to which cleaning tool nozzles are connected are frequently used which extend from outlets from a stationary cleaner; and the present improvements may be utilized to indicate to the user thereof whether or not the cleaning tool is being held in the proper location with respect to the surface being cleaned to insure a maximum predetermined cleaning action.

Accordingly the present improvements provide in a simple, compact, and automatically operating manner, a signal which indicates when the nozzle mouth of cleaning apparatus has been located or adjusted to a proper position with respect to the surface being cleaned, to provide for a maximum predetermined cleaning effect.

Having now described the features of the invention, the construction, adjustment, and use of preferred forms of the invention, and the advantages of the results obtained thereby; the new and useful parts, elements, devices, combinations and constructions, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. In suction cleaning apparatus, a fan housing, a fan in said housing, a nozzle mounted on the fan housing having lips forming an entrance mouth in which the suction becomes increased to a predetermined proper cleaning suction when the nozzle lips are located at a correct position with respect to the surface being cleaned, signal means, suction operated means operatively associated with the signal means, and means communicating with said suction operated means and with the suction side of the fan above said nozzle lips, said suction operated means and communicating means being so constructed and arranged that the signal means is operated by the suction operated means the instant that the predetermined proper cleaning suction exists in the nozzle.

2. In a suction cleaner, a fan and an adjacent adjustable suction nozzle having an entrance mouth, the cleaner including a chamber between the mouth and fan through which cleaning air passes and in which the suction becomes increased to a predetermined proper cleaning suction when proper adjustment of the entrance mouth of the nozzle with respect to the surface being cleaned is effected, and signal means actuated by the varying suction in said chamber arranged so as to indicate when proper cleaning suction has been obtained in said chamber, the signal means including walls forming a piston bore having an opening communicating with said chamber and another opening communicating with the atmosphere, and a signal actuating piston arranged for reciprocation in the bore.

3. In a suction cleaner, a fan and an adjacent adjustable suction nozzle having an entrance mouth, the cleaner including a chamber between the mouth and fan through which cleaning air passes and in which the suction becomes increased to a predetermined proper cleaning suction when proper adjustment of the entrance mouth of the nozzle with respect to the surface being cleaned is effected, and signal means actuated by the varying suction in said chamber arranged so as to indicate when proper cleaning suction has been obtained in said chamber, the signal means including walls forming a piston bore having an opening communicating with said chamber and another opening communicating with the atmosphere, and a signal actuating piston arranged for reciprocation in the bore, the piston being associated with indicating means and being arranged to move and actuate the indicating means when proper cleaning suction has been obtained in said chamber.

4. In suction cleaning apparatus, a light transmitting signal element exposed to the user of the cleaner, a source of light, shutter means for movement to and withdrawal from light obstructing position between the source of light and the light transmitting element, and means operative by variations in the suction of the cleaner for actuating the shutter means.

5. In suction cleaning apparatus having a headlight and an air passage, a light transmitting signal element associated with the headlight, a shutter arranged for movement into and out of a position between the headlight and the light transmitting signal element, and pressure operated means communicating with the passage and operatively associated with the shutter.

6. In suction cleaning apparatus, a suction nozzle having lips forming an entrance mouth in which the suction becomes increased to a predetermined proper cleaning suction when the nozzle lips are located at a correct position with respect to the surface being cleaned, signal means exposed to the operator, and means communicating with the suction nozzle adjacent to the lips responsive to and operable by variations in the suction in the nozzle for operating the signal means the instant that the predetermined proper cleaning suction exists in the nozzle.

7. In suction cleaning apparatus, walls forming a movable suction nozzle having an entrance mouth in which the pressure becomes reduced to a predetermined proper value when the nozzle is so located with respect to the surface being cleaned as to obtain a maximum cleaning action with a minimum of effort in moving the nozzle over the surface, signal means, there being an opening formed in a nozzle wall, and means operatively connected with the signal means and communicating through said opening with the suction nozzle responsive to and operable by variations in the pressure in the nozzle for operating the signal means the instant that the predeter-

mined proper cleaning pressure exists in the nozzle.

8. In suction cleaning apparatus, a suction nozzle having an entrance mouth in which the suction becomes increased to a predetermined proper cleaning suction when the nozzle is located at a correct position with respect to the surface being cleaned, a fan for inducing the suction in the nozzle, signal means mounted on the nozzle exposed to the operator, and means operatively connected to the signal means intermediate the nozzle and fan communicating with the suction nozzle responsive to and operable by variations in the suction in the nozzle for operating the signal means the instant that the predetermined proper cleaning suction exists in the nozzle.

9. In suction cleaning apparatus, a headlight, a suction nozzle having an entrance mouth in which the suction becomes increased to a predetermined proper cleaning suction when the nozzle is located at a correct position with respect to the surface being cleaned, a light transmitting signal element associated with the headlight, and means communicating with the suction nozzle responsive to and operable by variations in the suction in the nozzle for controlling the light transmission from the headlight through the signal element the instant that the predetermined proper cleaning suction exists in the nozzle.

10. In suction cleaning apparatus, a headlight, a suction nozzle having an entrance mouth in which the suction becomes increased to a predetermined proper cleaning suction when the nozzle is located at a correct position with respect to the surface being cleaned, a light transmitting signal element associated with the headlight, and means communicating with the suction nozzle responsive to and operable by variations in the suction in the nozzle for illuminating the signal element from the headlight the instant that the predetermined proper cleaning suction ceases to exist in the nozzle.

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