April 3, 1934. W. H. KITTO 1,953,616

SUCTION CLEANER

Filed May 28, 1930 3 Sheets-Sheet 1

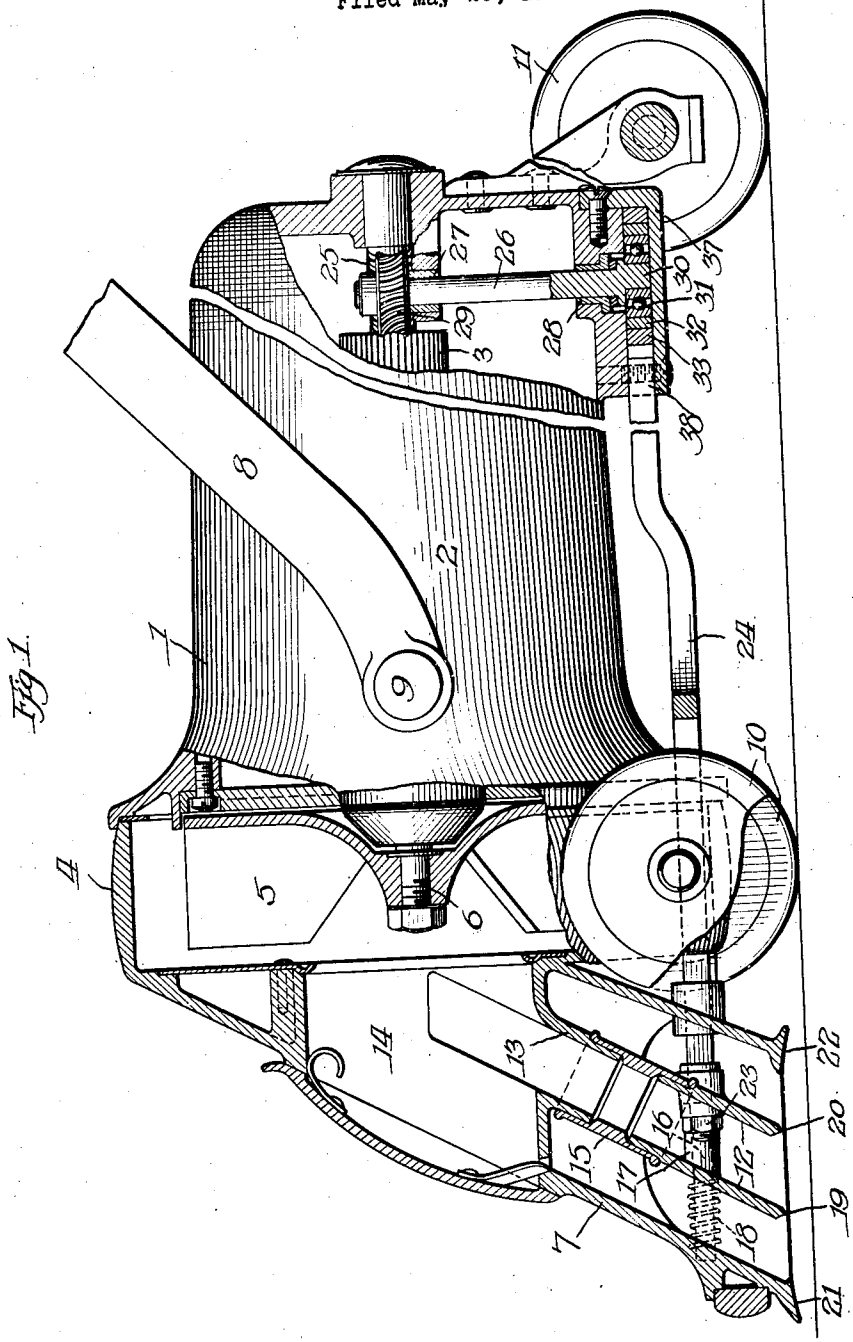


Fig 1.

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SUCTION CLEANER

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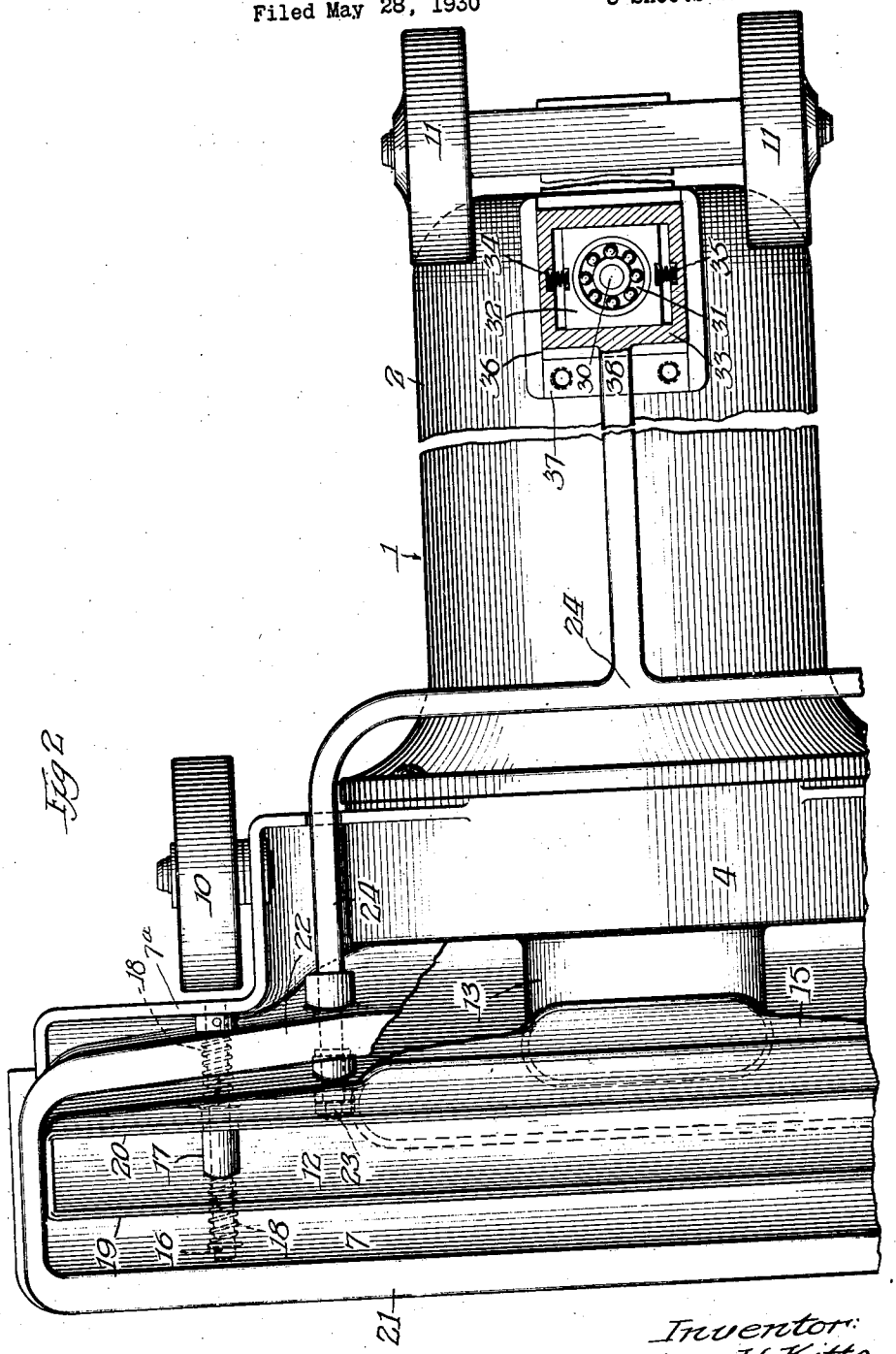


Fig 2

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SUCTION CLEANER

Filed May 28, 1930 3 Sheets-Sheet 3

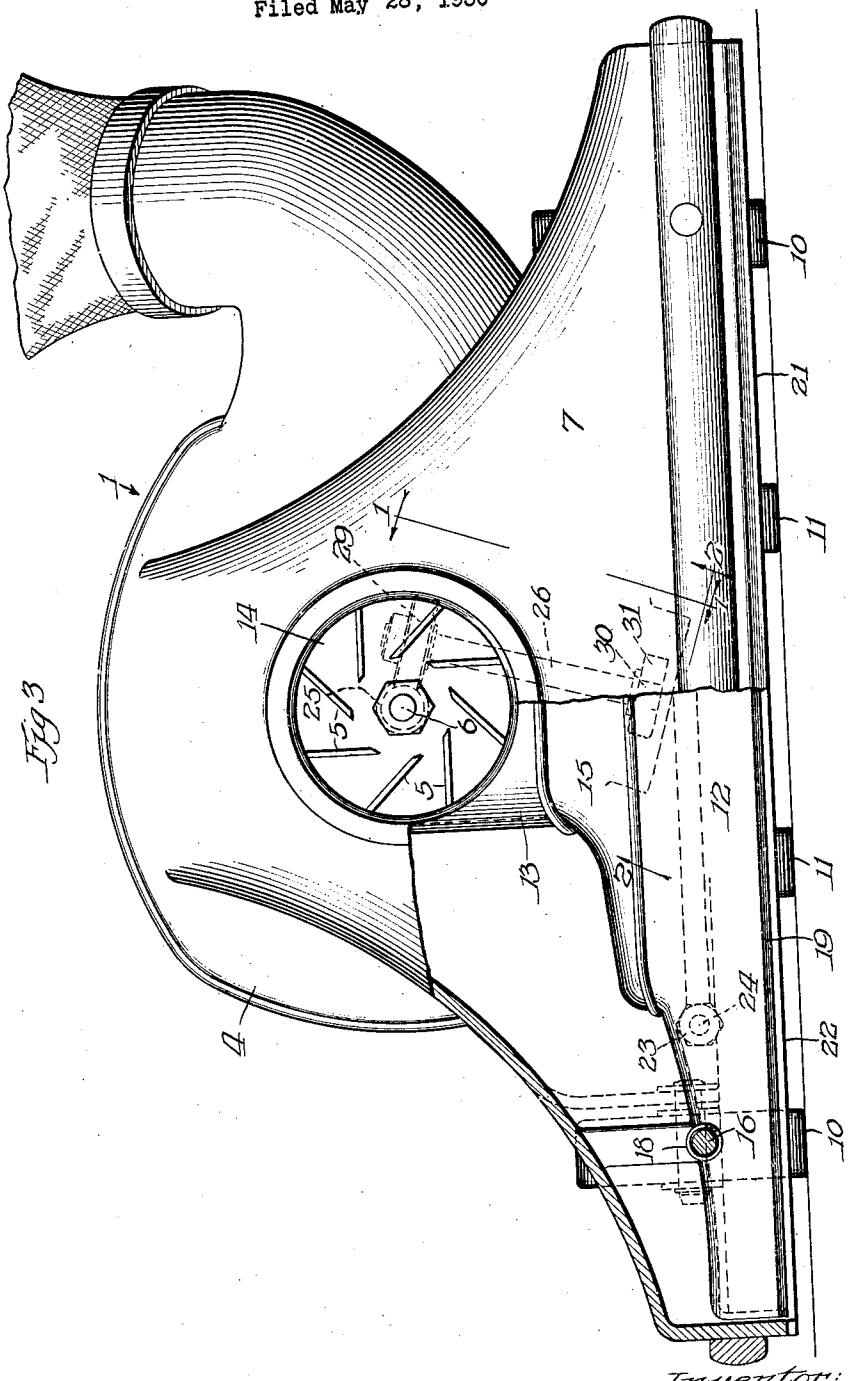


Fig 3

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UNITED STATES PATENT OFFICE

1,953,616

SUCTION CLEANER

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13 Claims. (Cl. 15—13)

The present invention relates to improvements in suction cleaner construction. It is the primary object of the present invention to provide a new and novel suction cleaner construction in which the agitation of the surface covering undergoing cleaning is accomplished by new and novel means. It is a further object of the present invention to provide a suction cleaner in which a secondary suction nozzle is provided within the main nozzle. It is a still further object of the present invention to provide a suction cleaner in which a secondary nozzle, positioned within the main nozzle, is actuated relative to said main nozzle. Other and more specific objects will appear upon reading the following specification and considering the drawings annexed thereto.

In the drawings in which like reference characters refer to like parts thruout:

Figure 1 is a side view, with certain parts broken away and showing certain parts upon the line 1—1 of Figure 3, of the suction cleaner constructed in accordance with the present invention.

Figure 2 is a bottom view of the suction cleaner disclosed in Figure 1, showing the operating mechanism upon the line 2—2 of Figure 1, with the bottom plate removed.

Figure 3 is a front view of the present invention with certain parts broken away.

The present invention provides a new and novel suction cleaner construction in which a plurality of nozzles are provided in one construction. The usual or main nozzle is so constructed that it performs the function of providing a seal with the surface covering undergoing cleaning at the expenditure of a relatively small suction. The main nozzle lips are spaced at a relatively great distance apart so that, in the operation of the machine, the covering is bowed within said nozzle between said lips. In the bowed section of the covering the nap or pile thereof is necessarily spread or opened at its top and an open pathway to the base thereof is presented to the cleaning air thereby permitting the removal of the deeply embedded foreign particles. Positioned within the main nozzle is a secondary nozzle provided with penetrating lips, that is, lips whose width are of such a magnitude that they will penetrate between adjacent rows of pile or adjacent tufts of a single row of pile of a surface covering. The secondary nozzle is connected directly to the eye of the fan chamber and is movably mounted within the main nozzle. A driving motor is operatively connected to the secondary nozzle and imparts thereto, in the operation of the cleaner, a horizontally reciprocating motion.

In the operation of the cleaner as the surface covering is drawn against the broad sealing lips of the main nozzle and is lifted and bowed between said lips the penetrating lips of the secondary nozzle contact this bowed-up portion and extend thereinto. The reciprocating motion imparted to the secondary nozzle results in the nozzle lips agitating and flexing the pile of the bowed section of the covering thereby dislodging the embedded foreign particles therein and making possible their removal by the cleaning air which passes under said lips in gaining entrance into said secondary nozzle as it passes to the fan chamber.

Referring now to the drawings the reference character 1 indicates a suction cleaner constructed in accordance with the present invention. The suction cleaner comprises the motor casing 2 enclosing the motor 3; the fan chamber 4 enclosing the fan 5 which is carried by the motor shaft 6; and the main nozzle 7 carried by the fan casing 4. Handle bail 8 is pivotally mounted upon the motor casing 2 at the pivot 9 and front supporting wheels 10, 10 and the rear supporting wheels 11, 11 support the cleaner in operative relation above the surface covering undergoing cleaning.

Positioned within the main nozzle 7 is the secondary nozzle 12, which exhausts directly into the eye of the fan chamber 4, it being movably and flexibly connected to the downwardly projecting mouth 13 of the substantially cylindrical housing 14 by means of a flexible coupling 15. Housing 14 entirely encloses the fan eye and prevents the entrance of air into the fan chamber except through mouth 13 in the operation of the machine as a cleaning unit. Secondary nozzle 12 is supported within the main nozzle 7 upon the supporting rods 16, 16 which extend through its wall at the bearings 17, 17 which are slidably mounted on said supporting rods. The rods 16, 16 extend across the width of the nozzle mouth being suitably mounted at their forward ends in the forward main nozzle wall and at their rear ends in the front wheel supporting walls 7a, 7a which extend substantially parallel to the rear wall of the main nozzle at that point. Springs 18, 18 which are positioned upon the rods 16, 16 at the sides of the secondary nozzle 12 tend to resiliently maintain said nozzle in its position and prevent unnecessary play.

The lower edges of the walls of the secondary nozzle 12 are adapted to contact the surface cov-

ering and are tapered and narrowed to such magnitude that in the operation of the machine they penetrate between adjacent rows of pile or adjacent tufts of an individual row. These lips so narrowed are known as pile penetrating lips and are indicated by the reference characters 19 and 20. Positioned upon the lower edges of the walls of the main nozzle 7 and extending slightly below the plane of the penetrating lips 19 and 20 are the relatively broad sealing lips 21 and 22 against which the surface covering is sealed in the operation of the cleaner.

Fixedly connected to the rear wall of secondary nozzle 12 by securing means 23 are the arms of the rod 24 which extend through a suitable opening in the rear wall of the main nozzle 7 and are movable therethrough. The arms of the rod 24 converge into a single arm in the rear of the fan chamber and, in the operation of the cleaner, are horizontally reciprocated by the driving motor 3 through a mechanism hereinafter described.

Carried by the motor shaft 6, at its rear end, is a spiral gear 25. Rotatably mounted adjacent the spiral gear 25 is the shaft 26 carried by the bearings 27 and 28 provided by the motor casing. Gear 29, carried by the shaft 26, coacts with the gear 25 and, in the operation of the suction cleaner, drives the shaft 26. Carried by the lower end of shaft 26 is an offset or eccentric stub shaft 30 mounted in the ball bearing 31. Bearing 31 is positioned within the sliding block 32 (see Figure 2) which, as the eccentric shaft 30 rotates with the shaft 26, receives a motion composed of components in the direction of the length and breadth of the cleaner. The sliding block 32 is slidingly positioned within the yoke 33 which is fixedly attached to the driving rod 24. Compression springs 34 and 35 are positioned between the sides of the block 32 and the yoke 33 and, while permitting sufficient movement of said sliding block to accommodate the sideward displacement of the block 32 resulting from the rotation of shaft 30 about the center of shaft prevent any looseness therein. Relative movement of the block 32 within the yoke 33 in the direction of the length of the cleaner is prevented through the sliding fit between the two members and the movement of block 32 in this direction as caused by the eccentricity of the shaft 30, is accommodated by the sliding of the yoke 33 within its channel 36 provided in the motor casing. Plate 37, secured to the motor casing by securing means 38, 38, provides the bottom plate for the yoke channel 36 and serves to protect the bearing 31 upon the eccentric shaft 30.

In the operation of the cleaner as the motor 3 revolves the shaft 26 is rotated by the intermeshing gears 25 and 29 and the eccentric stub shaft 30 is revolved. The movement of the shaft 30 imparts a reciprocating motion to the yoke 33 and accordingly to the driving rod 24 of which said yoke is a part. The high frequency reciprocation of the driving rod 24 is imparted to the secondary nozzle 12 within the main nozzle 7 resulting in the reciprocation of that member.

The surface covering undergoing cleaning is lifted, in the operation of the cleaner, against the broad sealing lips of the main nozzle as the air therein is exhausted thru the secondary nozzle. The sealing lips, because of their relatively great width, are unable to extend into the surface covering and, while providing excellent sealing means to insure the reduced pressure necessary for lifting the surface covering, offer minimum resistance to movement of the cleaner thereover. The area of the surface covering within the boundaries defined by the front and rear lips and the side walls of the main nozzle is lifted upward into contact therewith by the action of the reduced pressure in said nozzle resulting in the spreading apart of the upstanding pile of the covering. The penetrating lips upon the secondary nozzle positioned within the main nozzle extend into and between the individual tufts of the pile of the bowed surface covering and, being reciprocated at a high frequency, vibrate and bend these tufts resulting in the dislodgment of the foreign particles embedded therein and therebetween. The cleaning air which necessarily passes under the agitating penetrating lips removes, at the point of agitation, the foreign particles and results in maximum cleaning efficiency.

The cooperation of the main nozzle with its broad sealing lips and the positively actuated secondary nozzle with its penetrating lips makes possible high cleaning efficiency. The broad sealing lips insure the necessary seal for lifting the covering without undue resistance to movement and the penetrating lips insure the dislodgment of the particles within and between the individual tufts of pile.

From the foregoing it is clear that a new and novel suction cleaner construction has been provided, and having clearly illustrated and described the same, I claim:—

1. In a suction cleaner, suction-creating means, a suction nozzle connected to said suction-creating means and having front and rear lips, means supporting said nozzle with said lips above the normal plane of a surface covering undergoing cleaning, said lips being adapted to contact said surface covering as it is lifted by the reduced pressure in said nozzle created by said suction-creating means, and a second nozzle open to said suction-creating means thru said first-mentioned nozzle and having surface-contacting lips extending along and spaced from the lips of said first-mentioned nozzle.

2. A suction cleaner comprising a plurality of surface-contacting suction nozzles, one of said nozzles positioned within the other and having pile penetrating lips adapted to extend between adjacent rows of covering pile or between adjacent tufts thereof, and suction-producing means producing a minimum pressure in said inner nozzle causing air to flow under said penetrating lips.

3. A suction cleaner comprising an inner suction nozzle, pile penetrating lips adapted to extend between adjacent rows of covering pile or between adjacent tufts thereof on said inner nozzle, an outer suction nozzle and broad sealing lips on said outer nozzle, and suction-producing means producing a minimum pressure in said inner nozzle causing air to flow under said pile penetrating lips.

4. A suction cleaner comprising a movably mounted inner suction nozzle having surface contacting lips, an outer suction nozzle having surface-contacting lips extending along and spaced from said first-mentioned lips, and means to actuate said inner nozzle within said outer nozzle.

5. A suction cleaner comprising a movably mounted inner nozzle having a pile penetrating

lip, an outer nozzle, and means to actuate said pile penetrating lip.

6. A suction cleaner comprising a movably mounted inner nozzle having a pile penetrating lip, an outer nozzle, broad sealing lips carried by said outer nozzle and means to actuate said pile penetrating lip.

7. In a suction cleaner, suction-creating means, a main nozzle having surface-contacting lips, means supporting said nozzle with said lips above the normal plane of a surface covering undergoing cleaning, movably mounted spaced agitating means in said nozzle through which air cannot pass extended substantially into the plane of the said lips, means to actuate said agitating means, and means directing the draft of said suction-creating means to said nozzle to a point between said agitating means so that the cleaning air will pass thereunder.

8. In a suction cleaner a driving motor, a main nozzle having surface-contacting lips, a secondary nozzle having surface-contacting lips movably mounted within said main nozzle, a shaft fixedly connected to said secondary nozzle, a yoke carried by said shaft, a shaft driven by the driving motor and an eccentric pin carried by said driven shaft operatively connected to said yoke to impart a horizontally reciprocating motion thereto in the operation of the cleaner.

9. In a suction cleaner adapted to lift the surface covering undergoing cleaning a main nozzle, broad sealing lips on said main nozzle to which the surface covering is sealed, means supporting said main nozzle with said lips spaced above the normal plane of the covering, and a secondary nozzle positioned within said main nozzle having agitating means adapted to agitate the lifted surface covering within the main nozzle, and means to create a reduced pressure in said secondary nozzle.

10. In a suction cleaner, suction-creating means, a nozzle including front and rear surface-contacting lips connected to said suction-creating means, and a surface-contacting lip spaced from one of said nozzle lips and extending therealong, means forming a sealed chamber open only along its bottom between said spaced lip and the adjacent nozzle lip so that air drawn under said nozzle lip by said suction-creating means will pass between said spaced lip and the surface covering undergoing cleaning and through said sealed chamber, and means supporting said lips above the normal plane of a surface covering undergoing cleaning, the relationship between said spaced lip and the adjacent nozzle lip being such that the surface covering undergoing cleaning is lifted by the reduced pressure in said chamber and nozzle from said spaced lip to the far side of said nozzle.

11. The construction defined by the preceding claim characterized by the fact that the nozzle lip adjacent said spaced lip is of the pile penetrating type being adapted to extend between adjacent rows of pile and between adjacent tufts of pile of a surface covering undergoing cleaning.

12. The construction defined by the second preceding claim characterized by the fact that said spaced lip is of the broad sealing type and by the further fact that the adjacent nozzle lip is of the pile penetrating type.

13. The construction defined by the third preceding claim characterized by the fact that the nozzle lip adjacent said spaced lip is movably mounted and by the further fact that means are provided to actuate said lip to agitate the contacted surface covering.

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