Dec. 20, 1932. D. G. SMELLIE 1,891,504

SUCTION CLEANER

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Fig. 1.

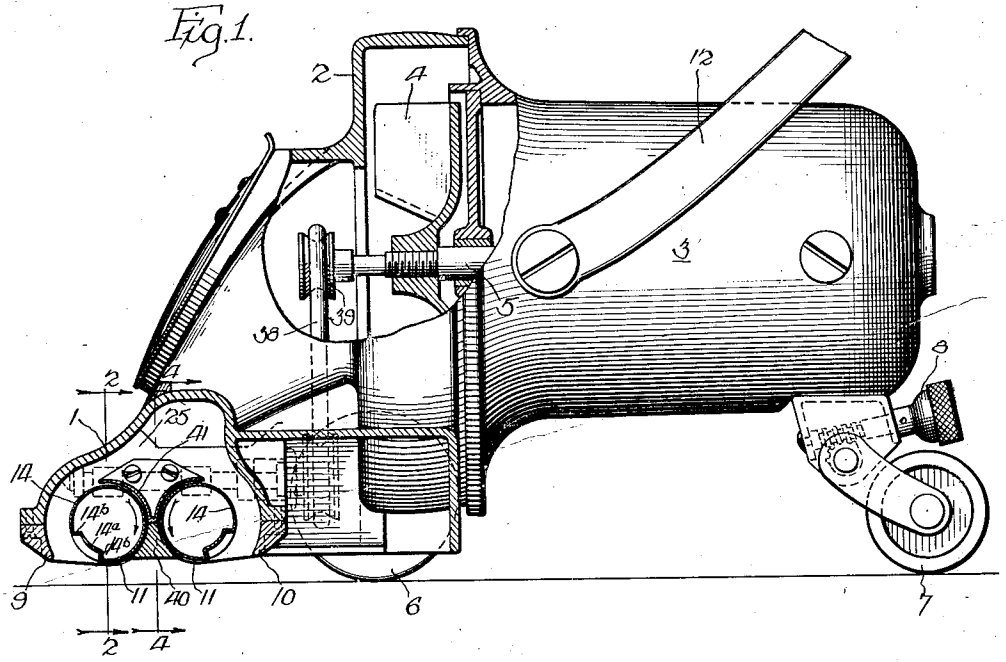
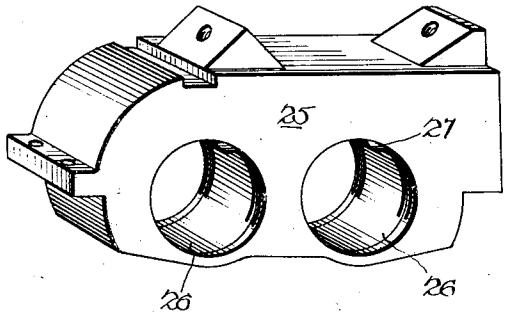


Fig. 3.



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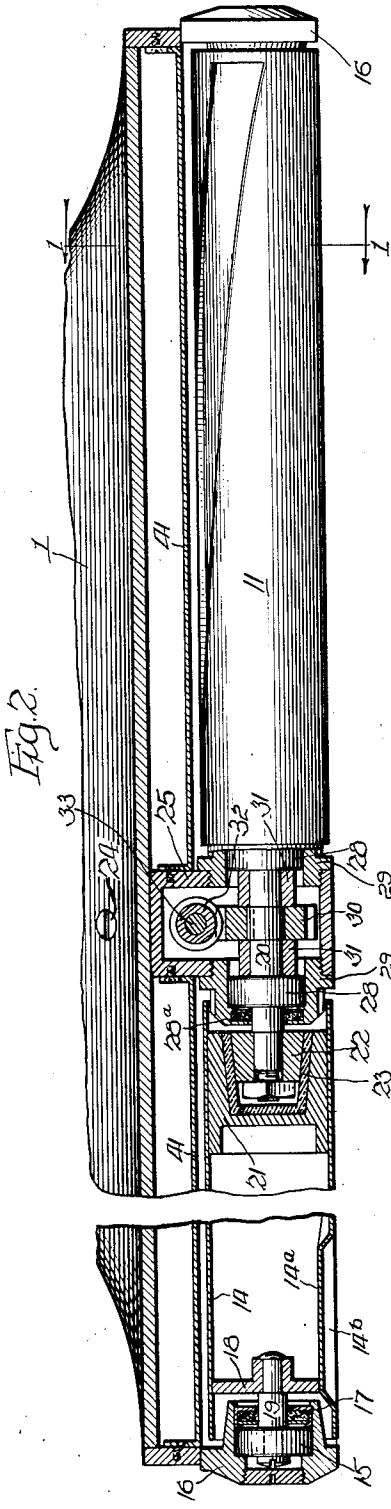


Fig. 2.

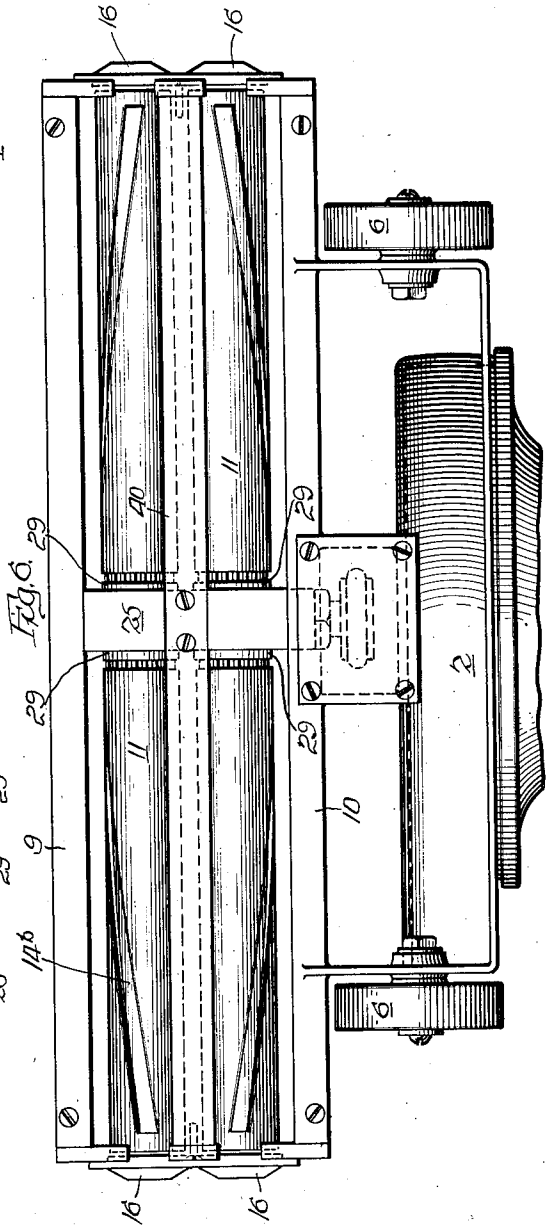


Fig. 6.

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SUCTION CLEANER

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Fig. 4.

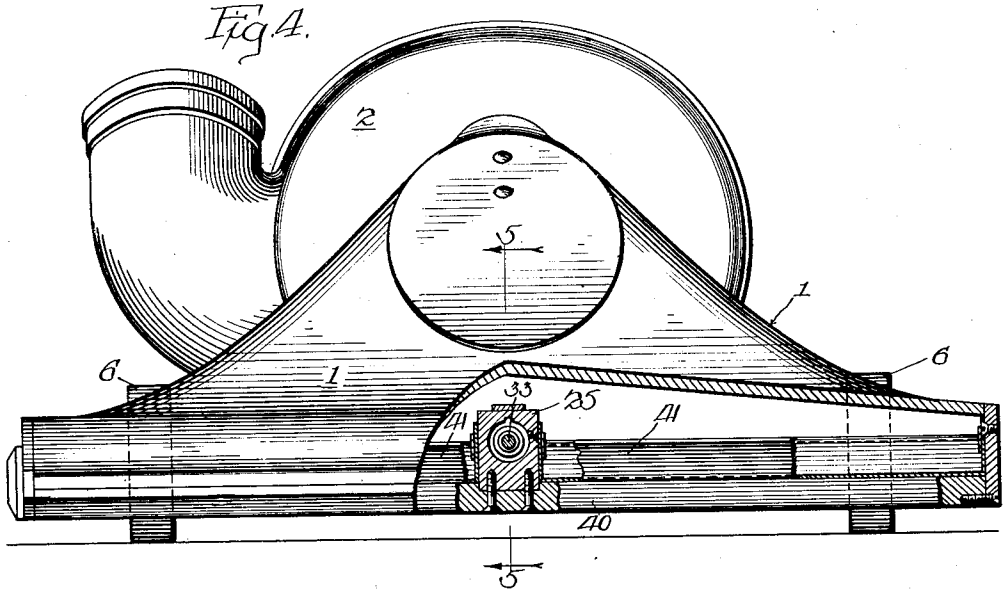
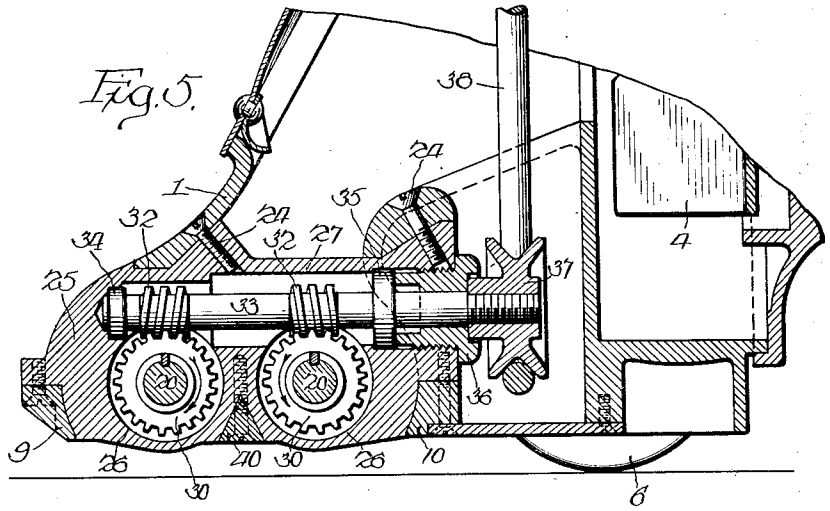


Fig. 5.



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1,891,504

UNITED STATES PATENT OFFICE

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SUCTION CLEANER

Application filed January 22, 1931. Serial No. 510,413.

The present invention relates to suction cleaners in general and particularly to a new and novel suction cleaner agitator. More specifically the present invention comprises a rotary suction cleaner agitator of the positive beating type in which the usual rigid beating elements which extend above the cylindrical surface of the agitator are absent and in their place are provided recessed beaters which function to positively vibrate and agitate the surface covering by permitting the suction which exists within the suction cleaner nozzle, to lift the surface covering into a position within the circumference of the agitator body and then, by physical contact, violently returning the covering to its initial position. An agitator constructed in accordance with the present invention is without projections above its body surface thereby making possible the use of a plurality of such agitators in close juxtaposition in a suction cleaner nozzle, with the attendant cleaning advantages, in a manner not possible where a separating space is required to accommodate projecting beater elements.

It is an object of the present invention to provide a new and improved suction cleaner agitator. It is another object to provide a suction cleaner agitator of the rotary type which is adapted to positively agitate the surface covering undergoing cleaning yet which is provided with rigid beating elements which do not extend above the surface of the agitator body. It is a further object of the present invention to provide a rotary suction cleaner agitator in which the positive beating elements are positioned within the periphery of the agitator body. Still another object is the provision of a rotary suction cleaner agitator having recessed beaters. A still further object is the provision, in a suction cleaner, of agitating means comprising parallel, rotary, recessed-beater agitators. These and more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the annexed drawings.

Referring now to the drawings in which a preferred embodiment of the present invention is disclosed:

Fig. 1 is a side view of a suction cleaner embodying the present invention, showing certain parts broken away and the nozzle in section upon the line 1—1 of Fig. 2;

Fig. 2 is a section thru the suction cleaner nozzle looking in the direction of the arrows upon the line 2—2 of Figure 1;

Fig. 3 is a view in perspective of the gear housing element;

Fig. 4 is a front view of a suction cleaner constructed in accordance with the present invention with the front wall of the nozzle partially broken away and the interior of the nozzle shown in section upon the line 4—4 of Figure 1;

Fig. 5 is a section upon the line 5—5 of Figure 4;

Fig. 6 is a partial bottom view of a suction cleaner constructed in accordance with the present invention.

A modern suction cleaner is shown in the drawings and comprises the nozzle 1 which is formed integrally in the same casting with the fan chamber 2 and is interiorly connected therewith. A motor casing 3 is positioned at the rear of the fan chamber 2 and houses a suitable driving motor, which is not shown, for the suction-creating fan 4 which is rotatably supported within the fan chamber 2 upon the extended motor shaft 5. The cleaner is movably supported by means of front supporting wheels 6, 6 and by means of a rear wheel 7, which is pivotally mounted at the rear of the motor casing, and is provided with an adjustment 8 by means of which the cleaner may be tilted about the front supporting wheels as an axis to vary the distance between the nozzle lips 9 and 10, which are carried by the nozzle 1 and form the surface-contacting portion thereof, and the surface covering undergoing cleaning. In the use of the cleaner upon various types of surface coverings the adjustment of the nozzle height becomes imperative in order that the surface covering may be lifted from the supporting surface and be sealed against the nozzle lips in each instance. This suspension of the covering is for the purpose of permitting the effective agitation of the covering by the rotary agitator or agitators,

which in the present construction are indicated by the reference characters 11, 11, and which extend parallel across the nozzle mouth. As in the usual suction cleaner a pivoted handle 12 is provided, which is shown broken away in the drawings but which is actually of sufficient length to extend from the cleaner to the hand of the operator, to make possible the propelling of the cleaner over the surface covering in the cleaning operation.

The rotary agitator constructed in accordance with the present invention, of which two are shown in the drawings, comprises a cylindrical smooth-surfaced hollow metallic cylinder 14 which is provided on its surface with a depressed sector, portion, groove, or recess which extends longitudinally and preferably helically. The helix is shown as reversing at the longitudinal center of the agitator. This recessed portion comprises a bottom surface 14*a*, curved on a radius having the same center as body 14, and side walls 14*b*, 14*b* which lie on radii of the cylinder and extend between the bottom surface and the normal surface of the agitator body and which merge from one to the other in smooth curves. It is not essential that the sector be exactly as described but may be, instead, of any desired cross-section, so long as the distance separating the side walls is sufficient that, when the agitator is being rotated at a high speed, sufficient time is allowed the surface covering undergoing cleaning to be lifted upwardly within the normal body periphery, at the point of the recess, so that the lagging wall of the recess can contact therewith to again displace it to its original position, the lifting effect being accomplished by the suction within the nozzle. It is clear that if the distance separating the walls 14*b*, 14*b* is too small that sufficient time will not have elapsed between the passing of the leading wall by the point of surface contact and the time at which the lagging wall arrives at that point to permit suction acting on the covering to overcome its inertia and also lift it against the action of gravity. A further requisite is that the depth of the recess or groove, which is known as a recessed beater, be sufficient that an appreciable displacement of the covering within the normal agitator body periphery is made possible, otherwise the agitation which is imparted to the covering by the agitator in returning it to its former position will be so slight as to be of no practical value.

Each agitator 11 extends between the end walls of the nozzle 1 being rotatably supported therein by bearings 15, 15 at each end which are suitably carried by seat-members 16, 16 carried by the removable nozzle end wall. Suitable seals 17 are also carried by the seat-members 16, 16 to afford protection to the bearings from the suspended dirt always present in the cleaner nozzle in the operation of the machine. The end plate 18 at each end of each agitator rigidly carries a suitable stub-shaft 19 which extends within a bearing 15 for the purpose of rotatably supporting that end of the agitator. Each agitator is also provided, at its approximate center, with suitable means to receive a rotating force which, instead of being a pulley to receive a driving belt from the rotating shaft of the driving motor, as in the usual cleaner construction, comprises means by which it can be rotatably driven thru gears from a transverse rotatable shaft which is itself driven by means of the belt from the shaft of the motor.

Each agitator body 14 comprise two longitudinally spaced half-sections which are non-rotatably connected by a shaft 20. This shaft extends within the adjacent ends of the agitator sections into suitable rigidly positioned cup members 21, 21 which define the inner ends of the sections and which are connected to and resiliently spaced from the shaft 20, which is itself provided with a head 22, by means of a rubber gasket 23. It is to be noted that the presence of the gaskets 23, 23, formed of resilient material, makes possible the correction for any disalinement between the opposite ends of the agitator and serves further to reduce to a minimum the vibration and noise which is transmitted from the body of the agitator to the driving mechanism which will be hereinafter described.

Positioned between the half-sections of the agitators 11, 11, and carried by the suction cleaner nozzle by suitable screws 24, 24, is a gear housing 25, which is perhaps best shown in Figure 3. Housing 25 is preferably formed of a single piece of metal which is adapted to be removably seated in suitable recesses formed in the front and rear walls of the nozzle 1 and extends therebetween as is clearly shown in Figure 5. Bores 26, 26 extend thru the gear chamber intercepting centrally at their tops a bore 27 which extends perpendicularly to them and which, at the rear of the chamber, opens into a suitable pocket or well formed in the nozzle behind the rear wall thereof. The connecting shafts 20, 20 extend thru the bores 26, 26 of the gear housing being rotatably supported by bearings 28, 28 which are themselves carried by the bearing seats 29, 29. A suitable seal 28*a* is provided for bearing protection in the seats which are themselves carried in screw threaded relationship in the ends of the bores 26, 26. Midway between the two supporting bearings 28, 28, of each shaft 20, is positioned a spiral gear 30 which is keyed to the shaft in non-rotatable relationship and which is further spaced between the bearings 28, 28 by suitable spacer members 31, 31. Each spiral gear 30 intermeshes with a worm gear 32 carried by the transversely extending

shaft 33 positioned within the upper bore 27, said shaft being rotatably supported by bearings 34 and 35, the latter being held in place by a suitable nut 36 thru which the shaft 33 extends. At its rear end and outside the housing 25 the shaft 33 carries a pulley 37 which is also connected, by means of the flexible driving belt 38, to the pulley 39 formed on the extended forward extremity of the motor shaft.

The adjacent and parallel agitators 11, 11 are spaced but a small distance apart in a relationship made possible by the use of recessed-type beaters in the body of the agitator itself rather than protruding-type agitating elements which extend above that body. Agitators 11, 11 extending closely adjacent one another contact the surface covering in that portion which is bowed between the front and rear nozzle lips 9 and 10 by the suction created within the nozzle 1 and are able to impart thereto an agitation considerably greater in degree than would be possible with a single agitator of the raised-beater type.

In the operation of the machine the agitators 11, 11 are preferably rotated in opposite directions, preferably that indicated by the arrows in Figure 1. Upon the rotation of the driving motor the shaft 5 rotates the suction-creating fan creating a reduced pressure within the nozzle 1 and lifting the surface covering below the nozzle lips 9 and 10 against the agitators. As the motor shaft revolves the pulley 39 rotates the shaft 33 thru being connected thereto by the driving belt 38 and the pulley 37 carried by shaft 33 itself. Upon the rotation of shaft 33 the intermeshing gears 32 and 30, connected between each agitator section-connecting shaft 20 and the perpendicularly extending shaft 33, are rotated, the respective gears 30, 30 being rotated in opposite directions. The shafts 20, 20 are rotated in opposite directions by the gears 30, 30, and of course, the remainder of the agitators rotate with them. As the agitators are rotated the surface covering is vibrated or agitated by the blows delivered thereto by the recessed beaters, in the manner previously described. The close adjacency of the two parallel agitators, each imparting to the covering an agitating effect to dislodge the embedded foreign matter, makes possible greater cleaning effectiveness than is possible with a single agitator or with a plurality of agitators spaced by a considerably greater distance.

To prevent the undue displacement of the surface covering between the closely adjacent agitators a carpet spacer 40 is provided which extends across the nozzle and closely adjacent and between the two agitators. Member 40 is secured to the end walls of the nozzle in any suitable manner, preferably by screws, and also between its ends, as it passes under the gear casing 25, to that member. Immediately above the carpet spacer member, and preferably formed of a sheet metal stamping, are shrouds 41, 41 which extend partially around and over the agitators and function to remove any foreign matter from the surface thereof which has adhered thereto in the cleaning operation. Shrouds 41, 41 are secured at their ends to the end walls of the nozzle and to the sides of the housing 25.

I claim:—

1. A rotary agitator for a suction cleaner comprising a smooth-surfaced elongated body, a narrow depressed portion in the surface of said body extending longitudinally thereof, and means to rotatably support said body.

2. A rotary agitator for a suction cleaner comprising a smooth-surfaced round elongated body, a depressed sector extending longitudinally of said body between its ends, and means to rotatably support said body.

3. A rotary agitator for a suction cleaner comprising a smooth-surfaced elongated round body, a depressed sector extending helically on the surface of said body, and means to rotatably support said body.

4. A rotary agitator for a suction cleaner comprising a smooth-surfaced elongated body, a sector of reduced height extending longitudinally of said body comprising a bottom surface lying within the normal body surface and side walls connecting said normal surface and said bottom surface, and means to rotatably support said body.

5. A rotary agitator for a suction cleaner comprising a smooth-surfaced body, a depressed sector extending longitudinally of said body comprising a bottom surface lying on a curvature of lesser radius than that of the normal surface of said body and side walls lying on radii of the curvatures of said surfaces extended therebetween, and means rotatably supporting said body.

6. A rotary agitator for a suction cleaner comprising a smooth-surfaced hollow body, a longitudinally extending narrow portion inset within the normal curved surface thereof including an inwardly extending wall defining one side of said portion, and means to rotatably support said body.

7. A rotary agitator for a suction cleaner comprising a cylindrical body the smooth surface of which is circumferentially interrupted across a definite sector one side of which is defined by an inwardly extending surface, and means to rotatably support said body.

8. In a suction cleaner having a suction opening, means to create a reduced pressure in said opening to lift the surface covering undergoing cleaning thereagainst, a rotary agitator positioned in said opening and arranged to contact the lifted covering, means to rotate said agitator, said agitator comprising a cylindrical body uninterrupted throughout the greater part of its circumfer-

ence and provided with a longitudinally extending sector of reduced radius for the purpose of permitting said covering to be lifted within the normal agitator periphery as it passes thereover in the rotation of the agitator, the lagging edge of said sector functioning as a beater upon contacting said covering to restore it to initial position.

9. In a suction cleaner, a suction nozzle having spaced lips defining a downwardly facing mouth, means supporting said nozzle with said mouth spaced above the normal plane of a surface covering undergoing cleaning, suction-creating means connected to said nozzle adapted to create a reduced pressure therein to lift a surface covering undergoing cleaning up into contact with said lips, said lips being sufficiently spaced to permit the covering to be lifted up into said mouth therebetween, a rotary agitator in said nozzle positioned between said lips and adapted to contact the lifted surface covering, said agitator including a cylindrical body the surface of which is interrupted across a sector in a transverse cross-sectional plane, the said interruption in the normal contour of the body extending longitudinally and being of such extent circumferentially that the surface covering in contact with said body is lifted within the normal body radius by the suction in said nozzle upon the registration of said interrupted section therewith in order that the agitator can impart a blow to the covering as the interrupted section is moved out of registration with the covering and the said covering is forced to a position outside the normal body radius.

10. In a suction cleaner having a suction opening, means to create a reduced pressure in said opening to lift the surface covering undergoing cleaning thereagainst, parallel rotary agitators juxtaposed in said opening and arranged to contact the lifted covering, said agitators comprising cylindrical bodies provided with beating elements, characterized by the fact that said beating elements are positioned within the normal periphery of said agitators.

Signed at North Canton, in the county of Stark, and State of Ohio, this 19th day of January A. D., 1931.

DONALD G. SMELLIE.