

July 6, 1926.

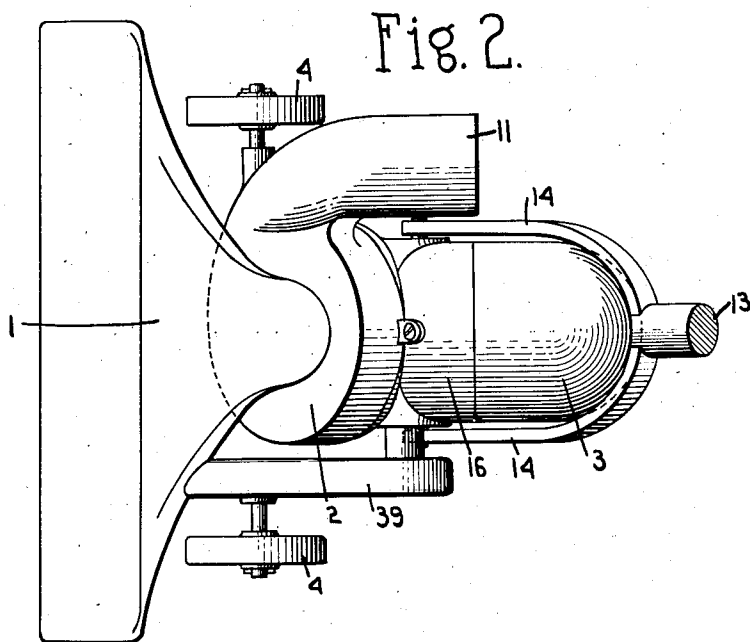
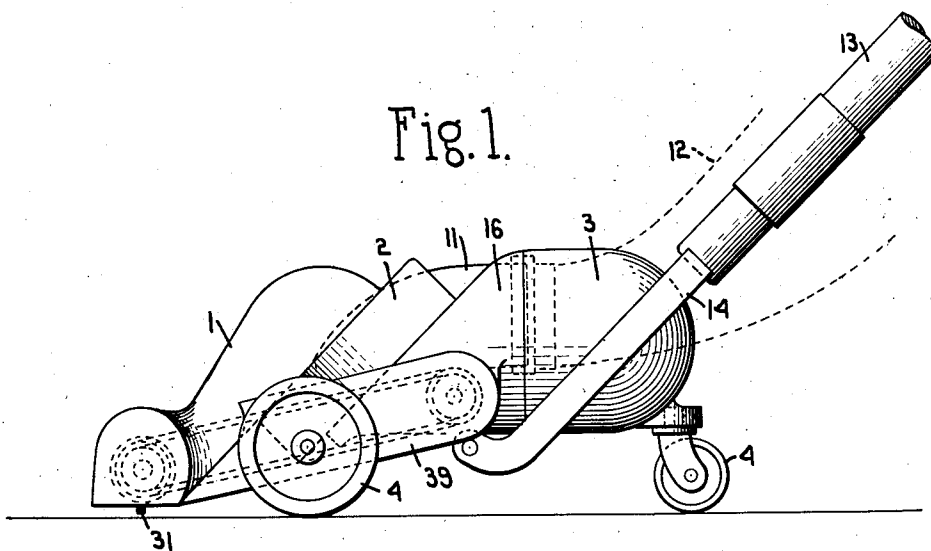
1,591,325

J. B. KIRBY

SUCTION CLEANER

Filed Feb. 18, 1922

3 Sheets-Sheet 1



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INVENTOR.

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Fig. 3.

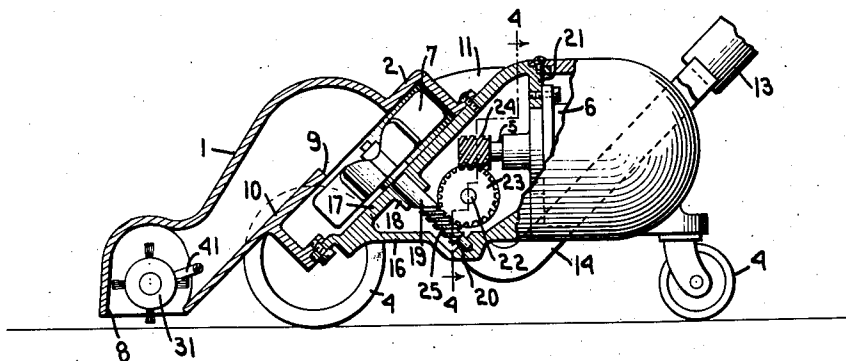
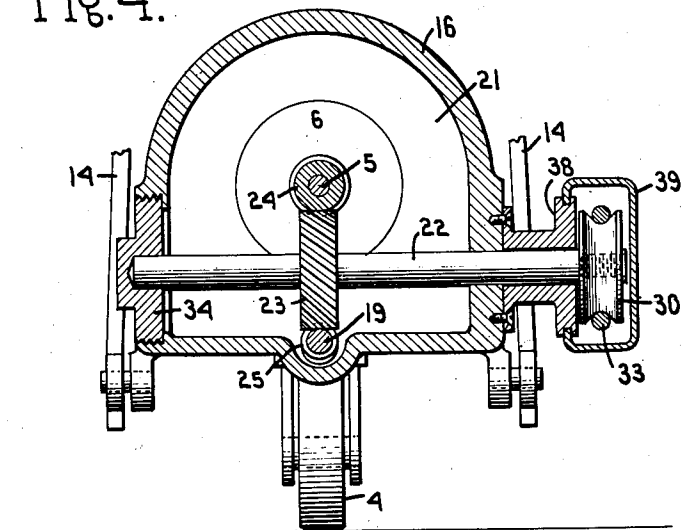


Fig. 4.



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Fig. 5.

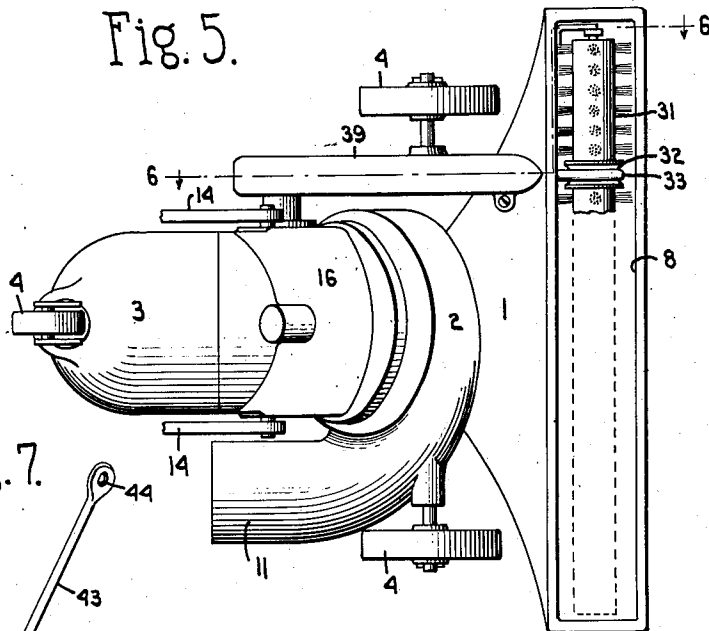


Fig. 7.

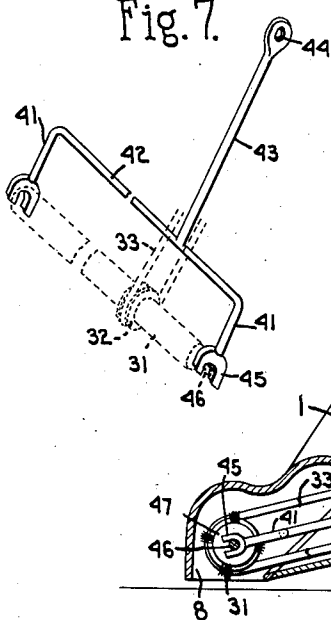
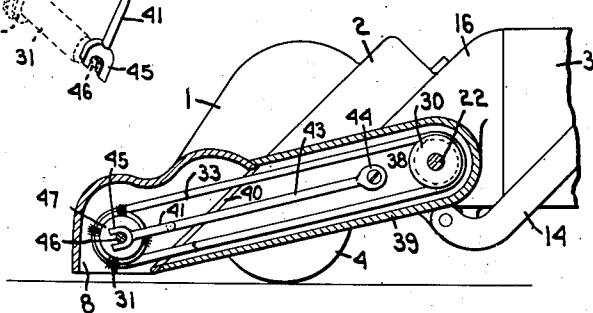


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES B. KIRBY, OF WEST RICHFIELD, OHIO.

SUCTION CLEANER.

Application filed February 18, 1922. Serial No. 537,384.

This invention relates to suction cleaners and has for its object the provision of a device of this character which shall combine the advantages of small height, high suction, low motor-speed, high fan-speed, and, when a brush is used, a low brush-speed, all coupled with a simple, reliable and inexpensive structure. Cleaning efficiency can be secured either by a large fan at low speed or a small fan at high speed. If a large, low-speed fan is used the motor must be large, heavy and expensive, and the machine will be large and unwieldy; if a small, high-speed fan is used the motor, if directly connected thereto in the usual manner, offers commutator troubles, and no gearing arrangement has heretofore been found which would operate properly at such speeds. Besides if a power-driven brush be used it ought to run slowly, since otherwise its driving means will fail frequently, the power consumption is unduly great, and its destructive effect upon floor coverings is excessive: yet if belted directly to the suction-fan the brush must either be driven too fast or the fan too slow, and no ordinary gearing arrangement will serve, owing to the high fan speed required. One object of my invention is the satisfaction of all these mutually antagonistic requirements by means of a simple, inexpensive, and practical domestic structure and other objects and advantages of the invention will become apparent as the description proceeds, some features of the same being practically useful in the absence of other features herein shown as will be apparent by those skilled in the art.

One of the many physical forms in which my inventive idea can be embodied is shown in the drawings accompanying and forming a part of this application, although such drawing is merely illustrative and not limiting upon me. Fig. 1 represents a side elevation, Fig. 2 a top plan view, and Fig. 3 a central, longitudinal section of a cleaner embodying my improvements; Fig. 4 is a cross-section taken on the broken line 4—4 of Fig. 3 and looking in the direction of the arrows; Fig. 5 is a bottom plan view of the cleaner; Fig. 6 is a detail view taken on the line 6—6 of Fig. 5, and Fig. 7 is a perspective view of one of the brush mountings.

The cleaner casing is preferably made as a rigid, compact, device having a collecting nozzle 1 in front, a fan chamber 2 immediately at the rear thereof, and a motor hous-

ing 3 at the rear, all supported on suitable floor-rollers or casters 4 so as to maintain the shaft 5 of the motor 6, substantially horizontal and the fan chamber tipped rearwardly with the axis of its fan 7 downwardly and rearwardly inclined. The nozzle is provided with a narrow elongated inlet mouth 8 transversely arranged and supported parallel to and slightly above the floor, while the body of the nozzle overlaps the upper forward face of the fan chamber which is provided with an inlet opening 9. The top of the fan chamber preferably merges directly with the bottom wall of the nozzle as shown at 10 in Fig. 3, the slope being so chosen that litter will easily ride up the incline without making the casing unduly long. The periphery of the fan chamber is provided with a rearwardly turned outlet neck 11 to which is attached one end of a dust bag 12, the other end of which (not shown) is suspended from the operating handle 13, pivoted to the casing by suitable forks 14.

Between the fan chamber 2 and motor housing 3 is located the triangular gear box 16. The slanting top 17 of this box preferably constitutes the bottom of the fan chamber, being formed with a bearing 18 for the fan-shaft 19, the lower end of which is stepped in a thrust-bearing 20 at the bottom of the box. The vertical rear wall 21 of this box constitutes a support for the motor 6; and journaled transversely of this box, below the motor shaft and above the fan shaft is a horizontal jack-shaft 22 carrying a spiral gear 23 which meshes with a smaller gear 24 carried by the motor shaft and a yet smaller gear 25 carried by the fan-shaft. The gear 25 is preferably cut directly on the fan-shaft so as to permit the latter to be dropped directly in place from the top and the direction of rotation of the jack shaft is such as to tend to pull the fan shaft down.

The gear 23 is an idler so far as the fan-drive is concerned, but is utilized for driving the brush. To this end the jack shaft 22 projects through the wall of the gear box at one side and is there provided with a belt pulley 30, and the nozzle is provided with a rotatable brush 31 journaled parallel to the jack-shaft just inside the inlet mouth and having a pulley 32 connected to the first pulley by an elastic belt 33. To enable the necessary access to the gear box one side is provided with a removable section 34.

The brush may be journaled in numerous ways, but my preference is to support it so that it will be free to yield in case it meets with an obstruction. The belt is housed by a casing comprising a rigid side 38, fixedly secured to the casing and having grooves in its sides, and an endwise sliding portion 39 having lips which fit the grooves, this casing being arranged longitudinally of the cleaner and communicating with the nozzle by way of the opening 40. The preferred brush support consists of a wire frame comprising a pair of spaced parallel ends 41 connected together by the longitudinal member 42 to which is rigidly attached the arm 43 having at its end the eye 44. The arm 43 projects from the member 42 at such a point as to extend into the belt casing where it is pivoted at a point near the pulley 30 and between the two runs of belt. The end members 41 of the frame are provided with bearings 45 adapted to receive the gudgeons 46 carried by the ends of the brush-body 31. I have shown these bearings as open forks in which the brush is held by the elasticity of the belt. The arm 43 is preferably spaced a substantial distance from each end of the member 42 and this mode of mounting assists the brush in following the contour of the floor and the unevenness caused by rugs, etc.

With this construction, the brush can rise and fall a considerable distance without materially changing the tension on the belt, thus riding over rugs and like obstructions without loss of sweeping effect. I have shown the brush as bearing on the floor merely by its own weight which is ordinarily about right, but this can be either increased or decreased by means well understood by those skilled in the art.

When a suction cleaner is used on a bare floor the surface which is cleaned is the same as that which is defined by the supporting wheels, but when such a device is used on a rug or carpet the surface being cleaned is displaced from that defined by the wheels either by the sinking of the wheels into the pile or by the lifting of the carpet owing to the suction or both. Any brush driven by the motor runs continuously and at very high speed. If mounted in a fixed position in the inlet mouth it overloads the motor or slows the fan below good operating speed and also injures the carpet whenever accidentally left too long in one place; unless indeed it is set so high as not to clean effectively. By the supporting expedient herein shown and claimed the brush is enabled to choose and assume a degree of elevation depending upon the speed of the brush and the pressure of the carpet thereagainst, never gouging into a soft or flexible rug nor passing over without touching a hard or stiff covering.

The slanting position of the fan chamber enables the construction of a cleaner of minimum height, and the gearing arrangement enables the driving motor to be made with a horizontal axis which is always the best position for a motor. The gearing also enables a moderate speed motor to drive the fan at high speed and the brush at low speed; and the direction of rotation which keeps the fan down also revolves the brush in the desired direction without twisting the belt. The gears are packed in grease and require no attention for months at a time.

When the motor is geared to the fan as here illustrated it is important that spiral gears be used. A worm drive will not do, neither will spur gears, bevel gears, nor miter gears. Not only are all of these other devices inconveniently noisy at high speed but they cannot be meshed with unequal sized gears in the angular relations here employed. It will be understood, however, that I do not limit myself to details of construction, design, arrangement, or otherwise, except as specifically recited in the annexed claims.

Having thus described my invention, what I claim is:

1. A suction cleaner casing having a fan and a motor, the fan having its axis downwardly and rearwardly inclined and the motor having its axis horizontal, and intermeshing spiral gears operatively connecting said fan and motor.

2. In a suction cleaner, in combination, a motor, a motor shaft, a jack shaft perpendicular thereto, intermeshing spiral gears carried by said shafts, a fan, and a fan shaft having a spiral gear meshing with the gear on said jack shaft.

3. In a suction cleaner, in combination, a nozzle, a motor, and a fan chamber located between them, a fan in said fan chamber, a brush in said nozzle, gears carried by said fan and motor, an idler-gear meshing with said first gears, and operative driving connections including a belt between said idler gear and brush.

4. In a suction cleaner, a rigid casing comprising a nozzle, a fan chamber, and a motor housing, floor engaging rollers adapted to support said casing with said fan chamber inclined, one side of said fan chamber having an inlet opening which communicates with said nozzle and the other side having a fan bearing therein, a motor in said housing and having a shaft located at the same side with said fan bearing but out of alignment therewith, a fan shaft journaled in said bearing, and gearing connecting said shafts.

5. In a self contained suction cleaner the combination of a fan casing, having its axis downwardly and rearwardly inclined and

- having an inlet opening in its upper face, a suction fan mounted within the casing, an electric driving motor mounted at the rear of the fan casing and having its axis substantially horizontal and out of alignment with the fan axis, a suction nozzle overlapping the front wall of the fan casing and having a horizontal bottom face with an elongated intake slot extending transversely of the motor axis, floor rollers for supporting said casing with the motor horizontal and said intake slot presented to the floor, and gearing connecting said fan and motor.
6. In a suction cleaner, a brush support comprising an elongated member having arms at its ends and a single arm projecting laterally intermediate its ends, and spaced from both ends, bearings carried by the first two arms, and a brush journaled in said bearings, the remaining arm being pivoted to a cleaner casing.
7. In a suction cleaner, in combination, a nozzle having an inlet mouth and a housing, a rotatable brush, and a brush support, said support comprising a member located in said nozzle, parallel to said brush and having at its ends a pair of parallel arms to which said brush is journaled, and another arm rigidly attached thereto intermediate its ends and pivoted inside said housing.
8. In a suction cleaner, in combination, a casing having a nozzle, a fan chamber, and a motor, said nozzle having an inlet mouth and an opening, a driving wheel in line with said opening and operatively connected to said motor, a rotatable brush in said nozzle, a brush support comprising a member in said nozzle having at its ends a pair of parallel arms to which said brush is journaled and having between its ends another arm projecting through said opening, a driving wheel carried by said brush in line with said opening, driving mechanism connecting said wheels, and means pivoting said last arm to said casing on an axis parallel to the brush axis.
- In testimony whereof, I hereunto affix my signature.

JAMES B. KIRBY.