Oct. 17, 1950 D. H. REEVES 2,526,419

BRUSH ADJUSTING SYSTEM

Filed June 16, 1945 3 Sheets-Sheet 1

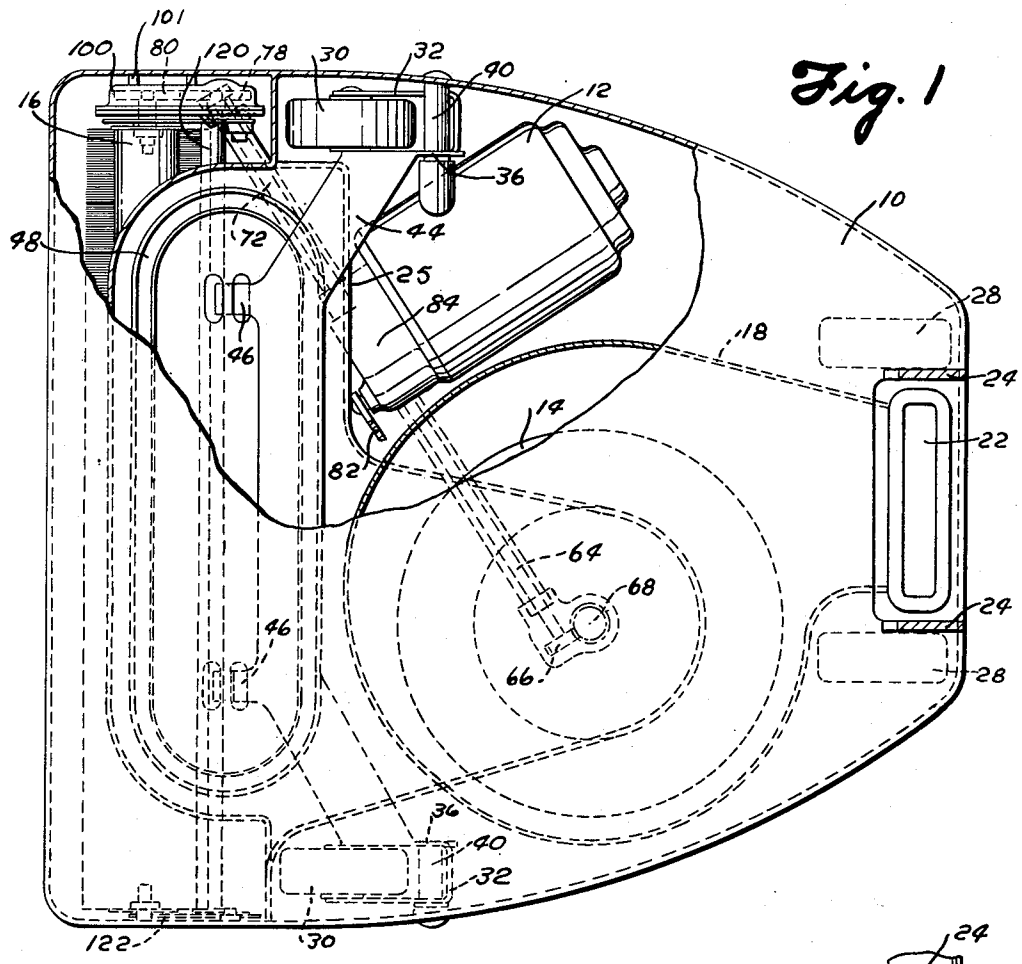

Fig. 1

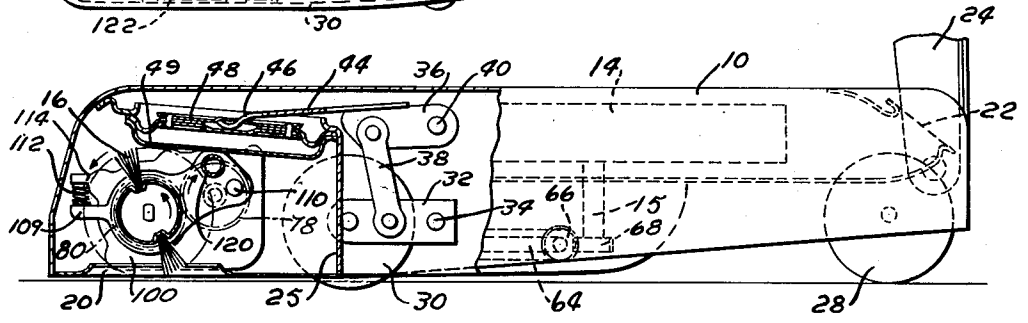

Fig. 2

Donald H. Reeves, INVENTOR.

BY Spencer, Hardman & Fehr,
His Attorneys

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BRUSH ADJUSTING SYSTEM

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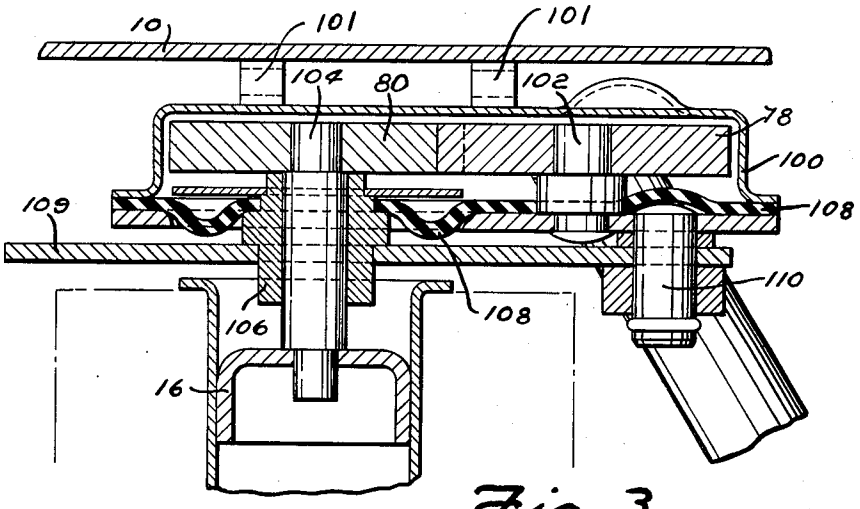

Fig. 3

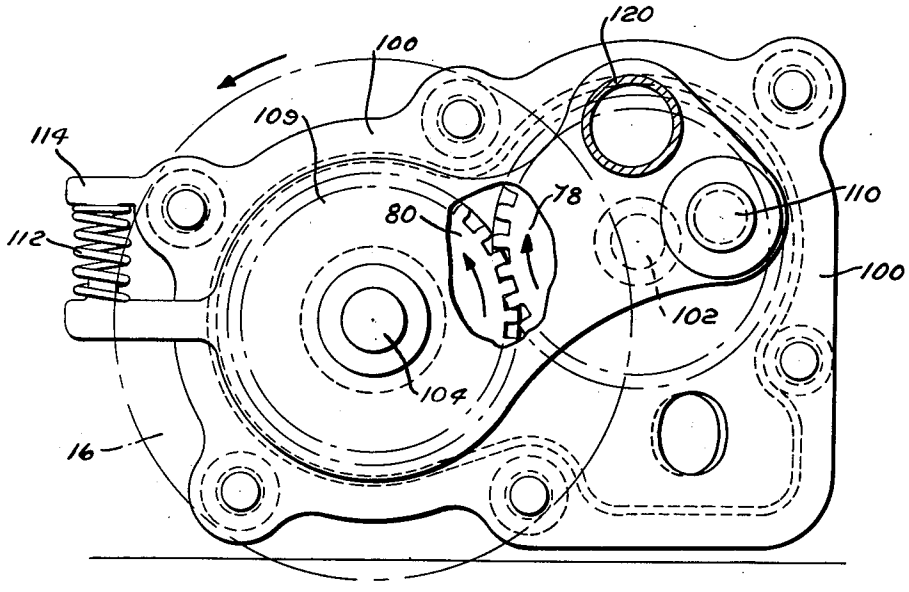

Fig. 4

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BRUSH ADJUSTING SYSTEM

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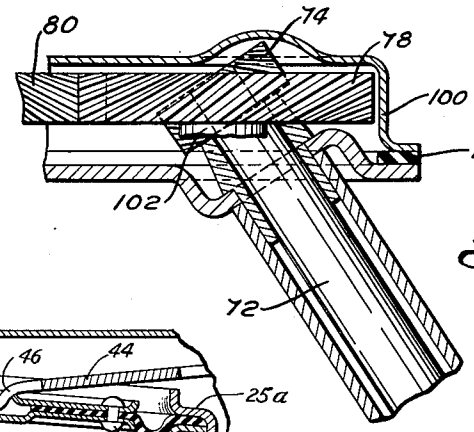

Fig. 5

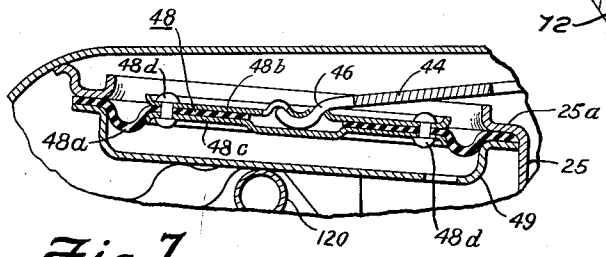

Fig. 7

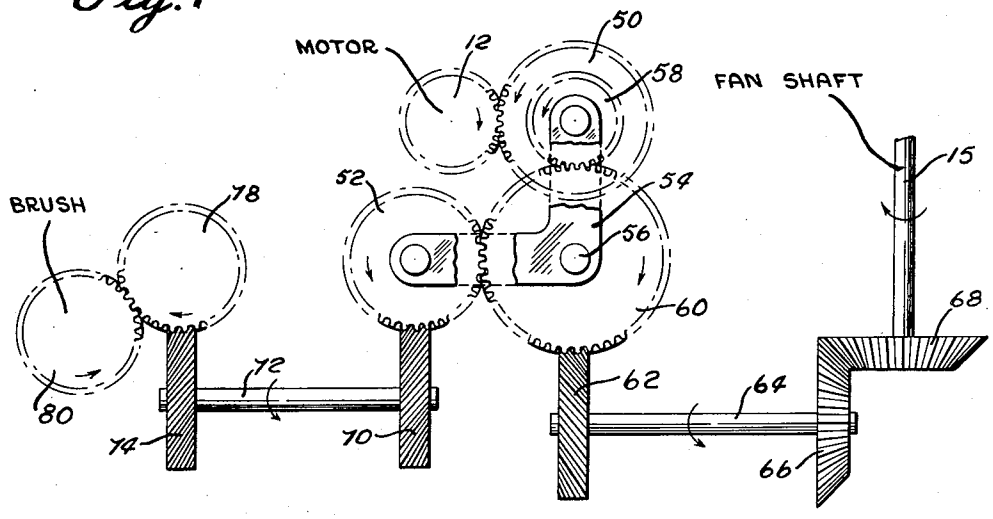

Fig. 6

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Patented Oct. 17, 1950 2,526,419

UNITED STATES PATENT OFFICE

2,526,419

BRUSH ADJUSTING SYSTEM

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Application June 16, 1945, Serial No. 599,926

3 Claims. (Cl. 15—372)

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This invention relates to an improved vacuum cleaner.

This application is related to my copending application S. N. 564,305, filed November 20, 1944, disclosing and claiming a suction cleaner with a different form of drive wherein the disconnection of the agitator causes operation of the fan at a higher rate of speed. This application is also related to my copending application S. N. 564,306, filed November 20, 1944, now Patent No. 2,513,587, issued July 4, 1950, in which there is disclosed and claimed a suction cleaner wherein the agitator is automatically adjusted for height by a different system.

One object of this invention is to provide an improved drive mechanism for transmitting power from the motor to the fan and the brush of a vacuum cleaner.

Another object of this invention is to provide an improved arrangement for automatically adjusting the height of the brush.

Still another object of this invention is to provide an improved arrangement which automatically maintains the proper relationship between the floor nozzle, the surface to be cleaned, and the brush.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view, with parts broken away, showing the arrangement of the parts within the vacuum cleaner housing;

Fig. 2 is a side elevational view, with parts broken away, showing the arrangement of the nozzle height adjusting mechanism;

Fig. 3 is a fragmentary sectional view showing a portion of the brush driving mechanism;

Fig. 4 shows a portion of the brush driving mechanism;

Fig. 5 is a fragmentary sectional view showing the relationship of the brush operating gears;

Fig. 6 is a diagrammatic view showing the arrangement of the gears which are used for driving the brush and the fan; and

Figure 7 is a fragmentary sectional view showing the diaphragm construction on an enlarged scale.

Referring now to the drawings wherein I have shown a preferred form of a vacuum cleaner utilizing my improved mechanism, reference numeral 10 designates the main housing within which there is mounted a motor 12 which is used

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for operating the suction creating fan 14 and the brush 16. The fan 14 is mounted within a conventional shroud 18 which has its inlet connected to the suction nozzle 20 and its outlet 22 arranged to discharge the dust laden air into a conventional vacuum cleaner bag (not shown) carried by the handle 24 in accordance with standard practice. The motor 12 is protected from the dust laden air by the wall 25 which cooperates with the casing 10 to connect the nozzle to the suction inlet of the fan.

The housing 10 is adapted to be supported on a pair of rear wheels 28 and a pair of front wheels 30. Each of the front wheels 30 is carried by a pivoted lever 32 (see Fig. 2) which is adapted to oscillate about a stationary pivot pin 34 carried by the side wall of the casing 10. The lever 32 is connected to a suction pressure operated lever arm 36 by means of a connecting link 38 which is arranged as shown. The lever arm 36 is pivoted on a pin 40 also carried by the side wall of the casing 10. By virtue of the above described arrangement of levers, it is apparent that the oscillation of the lever arm 36 about the pin 40 will cause oscillation of the lever 32 about the pin 34 and that such oscillation is instrumental in raising and lowering the nozzle end of the cleaner relative to the surface to be cleaned. A separate lever arm 36 is provided for each front wheel and the two lever arms 36 are connected together so as to operate in unison by means of the cross bar 44 (see Fig. 1) which is provided with a pair of forwardly extending arms 46 which are connected to a pressure operated diaphragm arrangement 48 so as to cause the height of the nozzle to be adjusted in response to pressure changes operating on the diaphragm 48. The bottom side of the diaphragm 48 is subjected to a pressure corresponding to the pressure maintained within the suction nozzle whereas the upper side of the diaphragm 48 is subjected to a pressure corresponding to atmospheric pressure. The lower side of the diaphragm 48 is protected by a perforated, pan-shaped guard element 49. As shown in Figure 7 of the drawing, the diaphragm 48 comprises a flexible membrane 48*a* which has its outer edge clamped between the flange 25*a* of the wall 25 and the upper flange of the pan-shaped guard element 49. The central portion of the flexible membrane 48*a* has its central portion clamped between a pair of metal plates 48*b* and 48*c* which are riveted together by means of rivets 48*d* as shown. The handle 24 is preferably pivoted to the casing 10 at

a point very close to or coinciding with the axis of the rear wheels so as not to interfere with the free operation of the nozzle height adjusting means. By virtue of the above described arrangement, it is obvious that if the suction inlet 20 is too close to the surface to be cleaned a high suction will be produced on the lower side of the diaphragm 48 and this suction will operate through the members 44, 36, 38 and 32 to raise the nozzle away from the surface to be cleaned. The arrangement is such that the nozzle will be maintained at a height so as to maintain substantially uniform suction pressure at all times irrespective of the depth of the nap on the carpet being cleaned and irrespective of the amount of wear on the nap.

It has long been recognized that for most efficient use of the power available in the motor it is desirable to operate the suction creating fan at a much higher speed for off the floor cleaning than for on the floor cleaning and it is the purpose of my invention to provide an improved driving arrangement for producing the desired change in speed of the vacuum cleaner fan. The arrangement used automatically disengages the brush from the motor when the cleaner is arranged for off the floor cleaning and since a considerable amount of power is required for operating the brush it is desirable to discontinue operation of the brush in this manner.

Referring now to Fig. 6 wherein I have diagrammatically shown the mechanism for transmitting power from the motor to the brush 16 and the fan shaft 15, reference numerals 50 and 52 designate a pair of gears that are rotatably supported on the ends of the bell crank 54. The bell crank 54 is adapted to pivot about the stationary pivot pin 56 for a purpose to be described more fully hereinafter. The gear 50 has secured thereto a smaller gear 58 which meshes with a larger gear 60 which in turn drives the gear 62. The gear 62 is supported on the shaft 64 which, for purposes of illustration, has been shown as carrying a beveled gear 66 arranged in driving engagement with a corresponding beveled gear 68 mounted on the fan shaft 15. Helical gears are preferred in actual practice for quiet operation but other types may be used if desired.

The gear 60 is arranged in driving engagement with the gear 52 at all times and the gear 52 is arranged to be moved in and out of driving engagement with the gear 70 merely by oscillating the bell crank 54 about the stationary pin 56. The gear 70 is mounted on one end of the shaft 72 which has a gear 74 mounted on its other end. The gear 74 drives the gear 78 which in turn is arranged in driving engagement with the brush operating gear 80. The bell crank 54 is arranged as shown when it is desired to operate both the fan and the brush. The number of teeth provided in the various gears is preferably such that in this position of the bell crank 54 the fan will operate a speed of approximately 5000 R. P. M. The motor 12 is a small high-speed series wound motor which is designed to operate at a speed of about 12,000 R. P. M. when the brush and fan are both in operation. The brush is arranged to be operated at a speed of approximately 1800 R. P. M. when it is in operation. In order to declutch the brush for off the floor cleaning purposes and at the same time increase the speed of the fan to a speed of approximately 8500 R. P. M., the bell crank 54 is oscillated so as to move the gear 52 out of driving engagement with the gear 70 and into driving engagement with the

gear 12 at the same time disengaging gear 50 from gear 12. This changing of the gears changes the gear ratio between the motor 12 and the fan. The bell crank 54 may be operated by any convenient handle such as the handle 82. The gears 50, 52, 60, 62 and 70 are all mounted within the gear housing 84 located at the end of the motor 12 (see Fig. 1). A bell crank operating lever 82 projects to the outside of the gear housing 84 for shifting the bell crank 54. It is apparent that in the above described arrangement, operation of the lever 82 serves the dual purpose of varying the speed of the fan at the same time disengaging the brush from the motor when the fan is operated at the high speed suitable for off the floor cleaning.

Referring to Figs. 3 and 4, reference numeral 100 designates a stationary gear casing within which the gears 78 and 80 are supported. The gear casing 100 is secured to the main cleaner casing 10 by means of one or more mounting lugs 101. The gear 78 is supported on a stationary pin 102 whereas the gear 80 is supported on a movable pin 104 which is drivingly connected to the brush 16. The movable pin 104 is journalled in a bearing element 106 carried by the flexible diaphragm element 108 and the pivoted lever 109 whereby it is possible for the pin 104 to oscillate about the stationary pin 110 as a center so as to adjust the vertical height of the brush 16. The diaphragm element 103 also serves to prevent the escape of lubricant from the gear casing 100. As shown in Fig. 4, the lever 109 is biased downwardly by means of a spring 112 which has its upper end arranged in engagement with the lug 114 provided on the gear casing 100. While the center of rotation of the lever 109 does not exactly coincide with the stationary pivot pin 102, the difference is not enough to materially interfere with the proper engagement between the gears 78 and 80 as the lever 109 pivots about the point 110. The spring 112, together with the weight of the brush and associated parts, biases the brush downwardly into brushing engagement with the surface to be cleaned but, when the friction between the brush 16 and the surface to be cleaned becomes too great there will be a tendency for the gear 80 and the brush 16 to discontinue rotating about the pin 104. However, since the gear 78 continues to rotate, the gear 80 and its associated parts are bodily lifted by the gear 78 until the resistance to the rotation has been reduced enough to allow the brush to operate at its normal speed. Thus the arrangement provides a convenient arrangement for maintaining the brush at the right height despite wear on the brush and regardless of any adjustment in the height of the nozzle occasioned by the nozzle height adjusting means. A cross bar 120 connects the lever 109 at the one end of the brush with the corresponding brush supporting lever 122 located at the opposite end of the brush so as to cause both ends of the brush to be raised and lowered in unison.

In order to simplify this disclosure, the means for attaching a hose to the cleaner for off the floor cleaning has not been shown. Such a hose attachment may be connected directly to the nozzle opening 20 or may be connected directly to the fan inlet in accordance with standard practice in many of the present day cleaners.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other

forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a suction cleaner, a casing provided with a suction opening, a rotatable agitating means located in said suction opening, a pivoted bearing support means for said agitating means having its pivoting axis located laterally with respect to the agitating means to allow the agitating means to rise and fall within the suction opening, a driving gear having its axis parallel to and adjacent to said pivoting axis, a driven gear upon said agitating means in meshing engagement with said driving gear, means for rotating said driving gear in the same direction of rotation as the pivoted bearing support means moves about its axis to lift the agitating means relative to the suction opening, and a spring means acting upon said bearing support means to oppose the lifting of said agitating means by the torque reaction of the driving gear upon the driven gear.

2. In a suction cleaner, a casing provided with a suction opening, a rotatable agitating means located in said suction opening, a pivoted bearing support means for said agitating means having its pivoting axis located laterally with respect to the agitating means to allow the agitating means to rise and fall within the suction opening, a driving gear having its axis parallel to and adjacent to said pivoting axis, a driven gear upon said agitating means in meshing engagement with said driving gear, means for rotating said driving gear in the same direction of rotation as the pivoted bearing support means moves about its axis to lift the agitating means relative to the suction opening, and a spring means acting upon said bearing support means to oppose the lifting of said agitating means by the torque reaction of the

driving gear upon the driven gear, a lubricant housing for said driving and driven gear including a rigid portion fixed to said casing and a flexible portion sealed to said rigid portion and having a sealed connection with a bearing support portion of said pivoted bearing support means.

3. In a suction cleaner, a casing provided with a suction opening, a rotatable agitating means located in said suction opening, a movable bearing means for movably supporting said agitating means for movement up and down within said suction opening, a gear train for driving said agitating means, a lubricant housing for said gear train including a rigid portion fixed to said casing and a flexible portion sealed to said rigid portion and having a sealed connection with the adjacent movable bearing means.

DONALD H. REEVES.

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