Nov. 26, 1957 M. H. RIPPLE 2,814,063

SELF PROPELLED SUCTION CLEANER

Filed Aug. 31, 1954 5 Sheets-Sheet 1

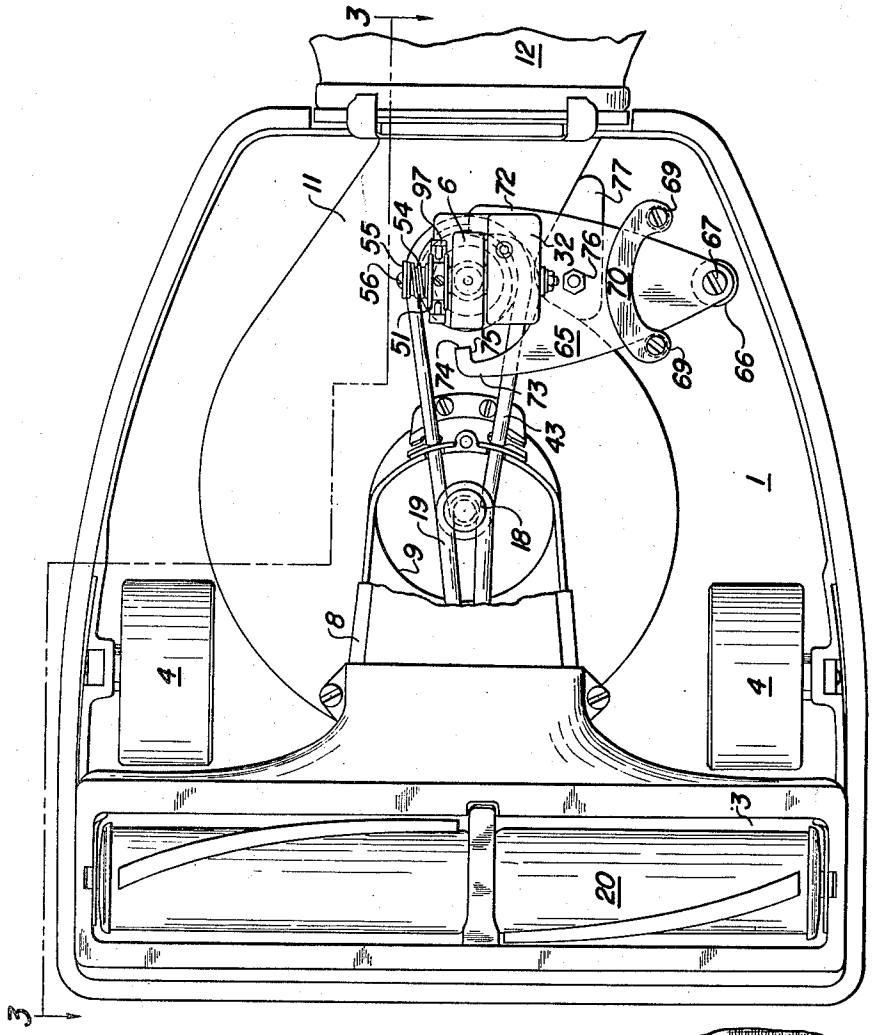


Fig. 2

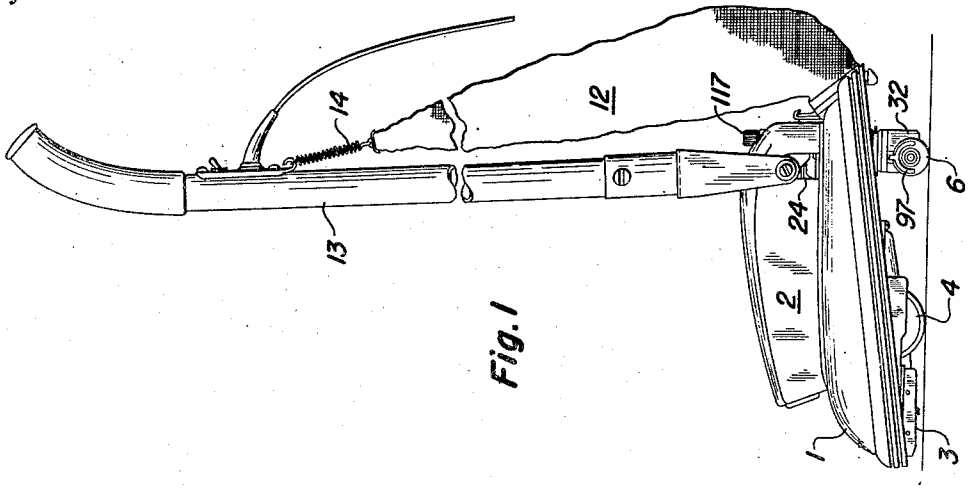


Fig. 1

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SELF PROPELLED SUCTION CLEANER

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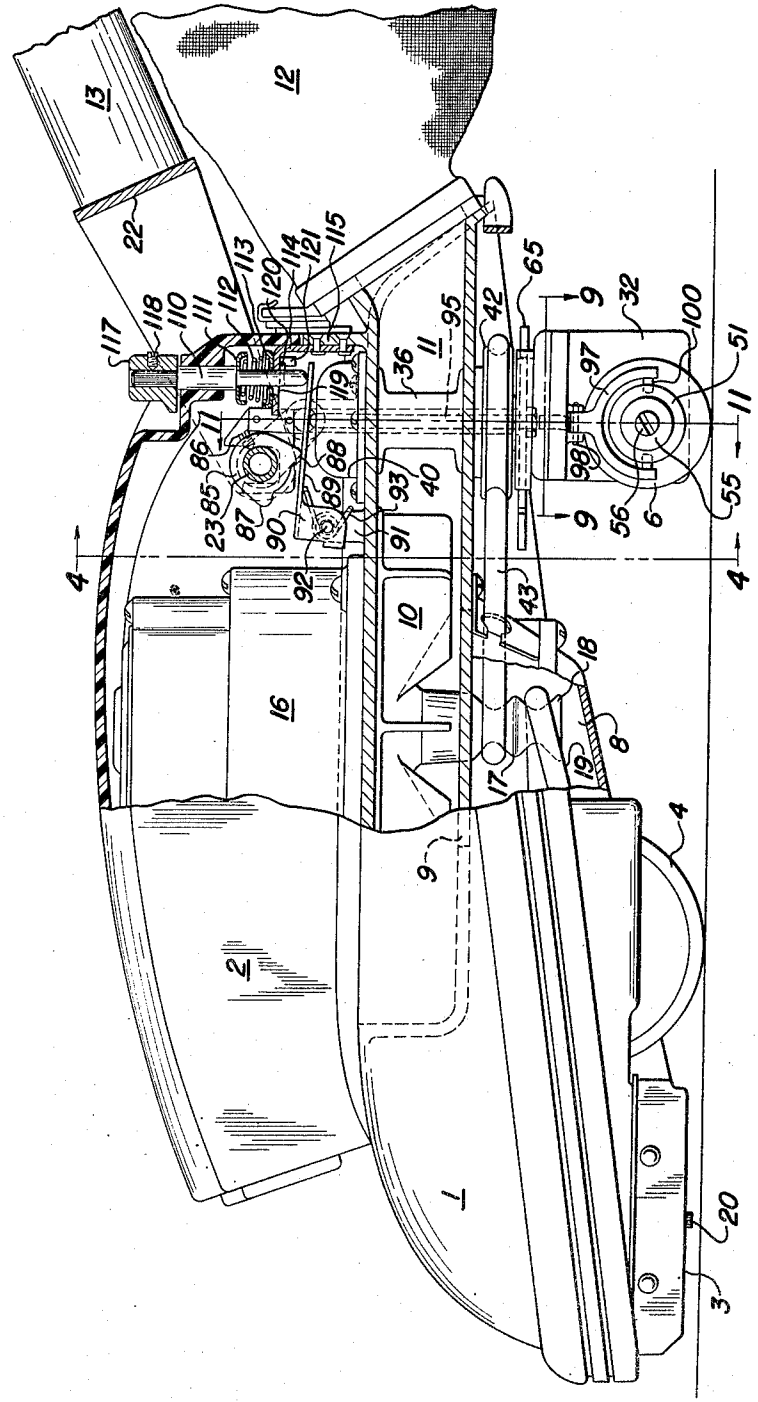


Fig. 3

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SELF PROPELLED SUCTION CLEANER

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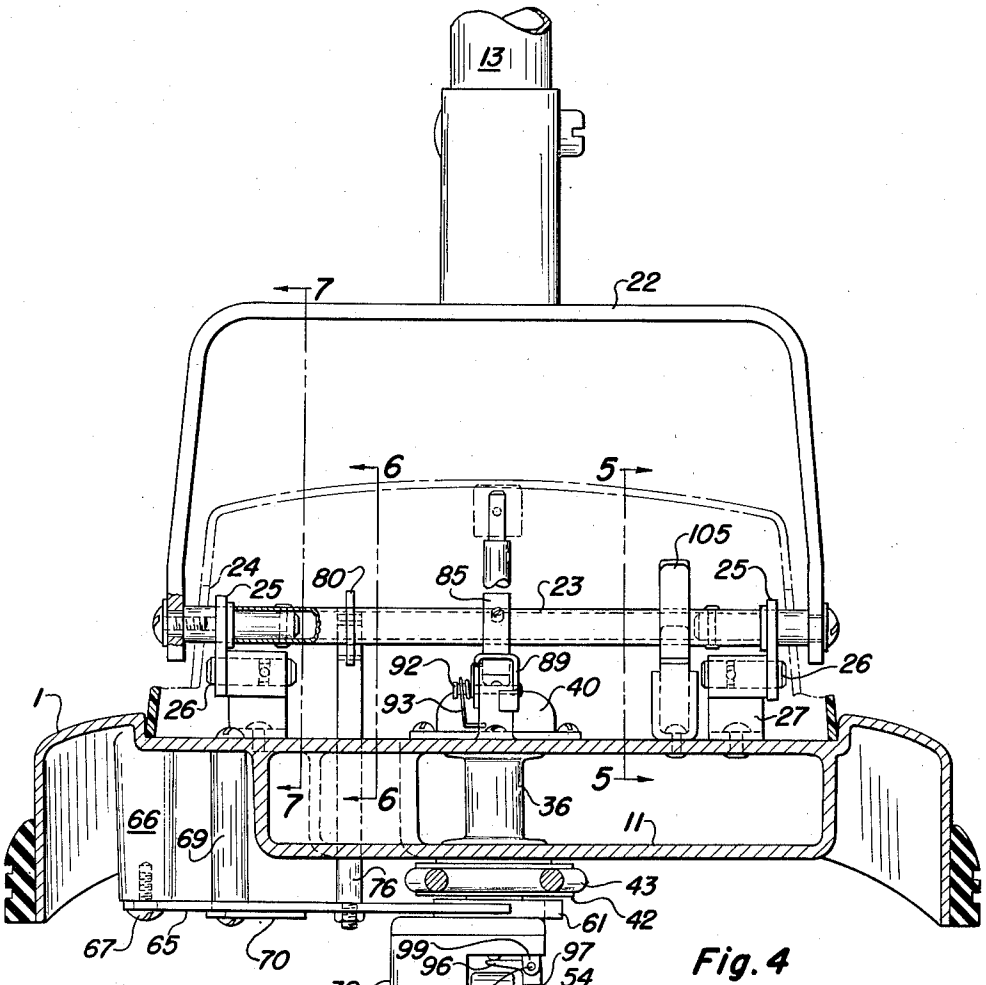


Fig. 4

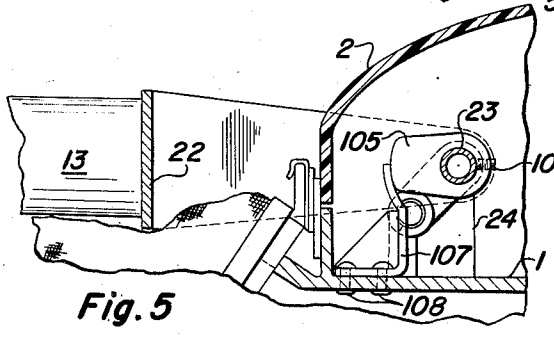


Fig. 5

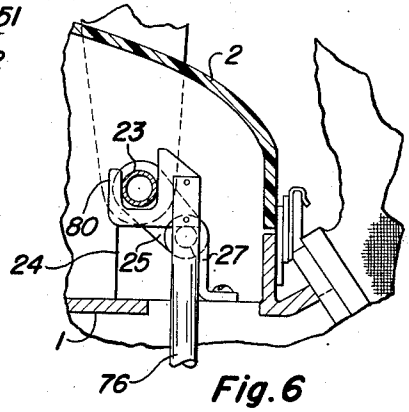


Fig. 6

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SELF PROPELLED SUCTION CLEANER

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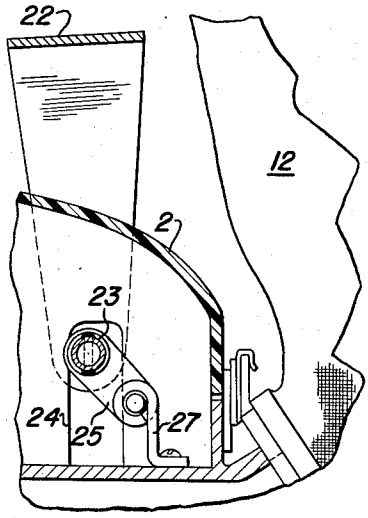


Fig. 7

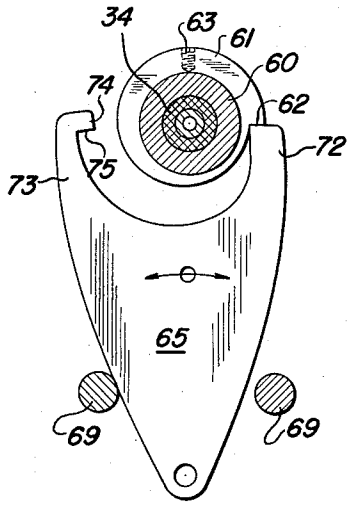


Fig. 8

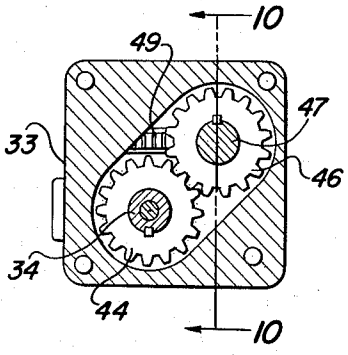


Fig. 9

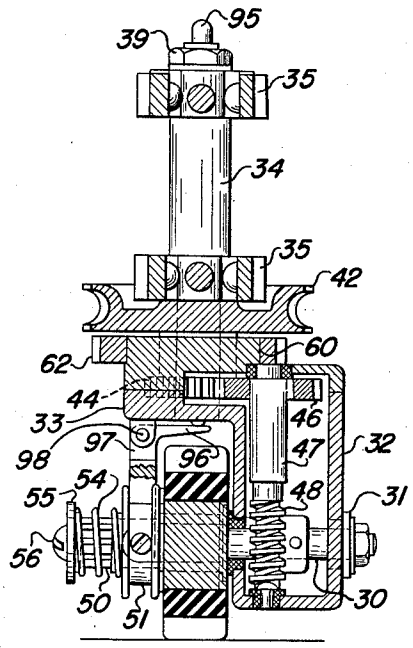


Fig. 10

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SELF PROPELLED SUCTION CLEANER

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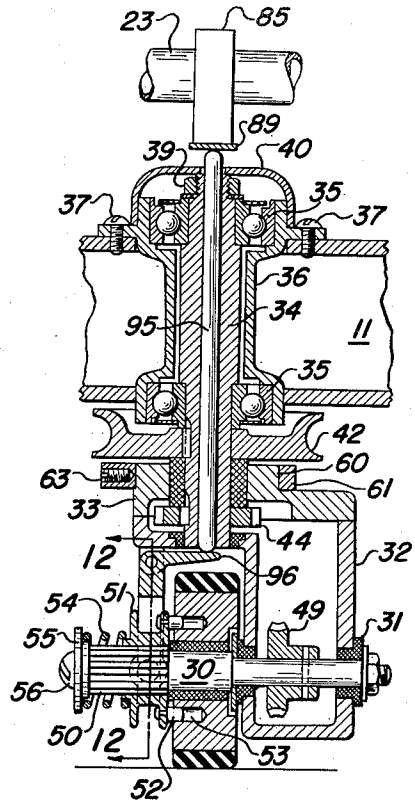


Fig. 11

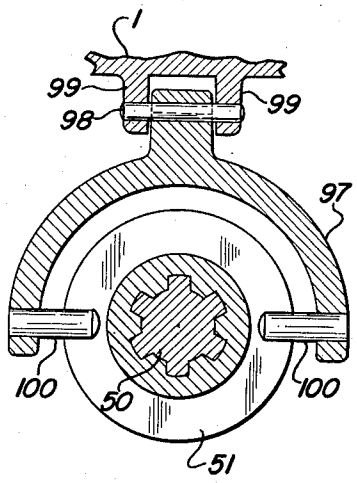


Fig. 12

United States Patent Office 2,814,063 Patented Nov. 26, 1957

2,814,063

SELF PROPELLED SUCTION CLEANER

Melvin H. Ripple, North Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application August 31, 1954, Serial No. 453,326

11 Claims. (Cl. 15—319)

The present invention relates to surface treating devices generally and, in particular, to a novel suction cleaner construction provided with a propelling mechanism so actuated that substantially unconscious reactions on the part of the operator applied to the handle will cause the propelling mechanism to reverse direction at the end of a stroke forwardly or rearwardly of the operator without requiring a conscious action on the part of the operator to operate the reversing mechanism.

It is a particular object of the present invention to provide a self propelled suction cleaner provided with a drive mechanism characterized by the provision of a traction wheel device so driven and mounted that a torque reaction is present in the traction wheel drive tending to spin the drive wheel about a vertical axis which is normal to the axis of rotation of the drive mechanism and to provide a stop mechanism which will selectively overcome the aforementioned torque reaction in one of two positions of the traction wheel drive mechanism in order to propel the cleaner forwardly or backwardly.

It is a further object of the invention to provide a self propelled cleaner having a disengaging clutch for the drive mechanism which is operative either by a separate manual control or automatically by placing the handle in a predetermined position.

It is a further object of the present invention to provide a self propelled suction cleaner having a manipulating handle mounted to move relative to the cleaner in response to the application of a forwardly or rearwardly directed force of very small magnitude on the handle to cause the same to shift relative to the cleaner body and thus govern the operation of the propelling mechanism.

Other objects and advantages of the invention will become apparent as the description proceeds when taken in connection with the accompanying drawing, wherein:

Figure 1 is a small-scale, side elevational view of a suction cleaning apparatus embodying my invention;

Figure 2 is an enlarged scale, bottom plan view of the apparatus of Figure 1 with certain parts broken away to illustrate a belt drive to the cleaner propelling mechanism;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2 and looking in the direction of the arrows;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3 and looking in the direction of the arrows;

Figure 5 is a partial sectional view taken on the line 5—5 of Figure 4 looking in the direction of the arrows;

Figure 6 is a partial sectional view taken along the line 6—6 of Figure 4 and looking in the direction of the arrows;

Figure 7 is a sectional view taken on the line 7—7 of Figure 4 looking in the direction of the arrows;

Figure 8 is a bottom plan view of a stop cam and directional control mechanism;

Figure 9 is a sectional view taken along the line 9—9 of Figure 3 and looking in the direction of the arrows;

Figure 10 is a sectional view taken on the line 10—10 of Figure 9 and looking in the direction of the arrows;

Figure 11 is a sectional view taken along the line 11—11 of Figure 3 looking in the direction of the arrows; and

Figure 12 is an enlarged sectional view taken on the line 12—12 of Figure 11 and looking in the direction of the arrows.

Referring now to the drawing in detail, and first to Figure 1 thereof, the suction cleaner embodying my invention comprises generally a main casting 1 which carries a decorative hood 2 enclosing certain drive mechanisms and is provided with a suction nozzle 3 extending across the front thereof. At its forward end, the cleaner body 1 is supported upon supporting wheels 4 positioned directly behind the nozzle 3 and carried on suitable stub shafts secured to the main casting or frame 1. The rear portion of the cleaner is supported by a traction wheel indicated by the reference character 6 which is controlled and driven in a manner to be described hereinafter.

As shown most clearly in Figures 2 and 3, the main frame 1 is provided with a central, rearwardly-extending duct 8 which communicates the suction nozzle 3 to the inlet eye 9 of a suction-creating fan 10 which discharges dirt-laden air through a rearwardly-directed exhaust duct 11 where it connects to a suitable filter 12 having the upper end thereof supported from a manipulating handle 13 by means of a tension spring 14. The fan 10 is driven by a suitable electrical motor 16 housed within the casing 2 and having its shaft projecting below the fan 10 and through the fan eye 9 into the duct 8 where it carries a pair of pulleys 17 and 18. The lower pulley 18 is connected by means of a belt 19 to a rotary agitator 20 rotatably mounted within the nozzle 3 in position to agitate and clean a surface covering drawn up against the nozzle by the suction effect.

As shown in Figures 3, 4 and 7, the lower end of the handle 13 connects to a handle bail 22 which straddles the decorative casing 2. The opposite legs of the handle bail 22 are rigidly and non-rotatably connected to a transverse shaft 23 which enters the casing 2 through elongated slots 24 on opposite sides thereof. The shaft 23 is rotatably received in short crank arms 25 within the casing 2 adjacent the opposite side walls thereof. The cranks 25 are pivotally mounted on short stub shafts 26 which are carried by support bracket 27 secured to the casing 1 just above the exhaust duct 11. It is apparent from the foregoing that a forwardly-directed or rearwardly-directed force applied to the hand grip portion of handle 13 while the same is in its angular operating range which lies between the handle positions of Figures 1 and 3 will cause the handle to rock on the cranks 25 about the stub shafts 26, thus in effect causing the shaft 23 to rock about the axis of the shafts 26 and thus partake of a substantial arc of movement having a significant horizontal component directed fore and aft of the main frame of the cleaner 1. The handle may be pivoted with shaft 23 independently of bodily movement thereof relative to the frame 1 on the cranks 25. The extent of the bodily movement of shaft 23 is limited by the edges of the slots 24 but other stop means may be provided if desired.

The traction wheel 6 at the rear portion of the cleaner is journaled on a drive shaft 30 rotatably mounted in bearings 31 formed in the opposite side walls of a gear housing 32 extending downwardly along one side of the wheel 6. The gear housing 32 has an upper offset portion 33 extending across the top portion of the drive wheel 6. The portion 33 of the gear housing 32 is journaled on a vertical shaft 34 which extends upwardly into the body of the cleaner proper and is mounted on anti-friction bearings 35 which are in turn supported in the end portions of a tubular housing 36 extending through the air duct 11. The housing 36 is secured to the top wall of

the duct 11 by means of anchoring studs 37. As best shown in Figure 11, the central portion of the shaft 34 between the anti-friction bearings 35 is enlarged to provide anchoring shoulders bearing against the facing ends of the two anti-friction bearings to prevent vertical motion of the shaft 34 with respect to the bearing structure. The upper end of the shaft 34 carries an anchoring nut and washer 39 bearing on the end of the shaft and the upper end of the upper bearing. A dust cap 40 is carried over the upper end of the shaft 34 and upper bearing 35 to protect these parts from dirt.

A driving pulley 42 is mounted on the shaft 34 below the lower bearing 35 and just above the offset portion 33 of the gear housing. The pulley 42 is non-rotatably mounted on the shaft 34 in any suitable manner. A drive belt 43 extends between the upper pulley 17 on the motor shaft and the pulley 42 to transmit driving power from the cleaner motor to the traction wheel 6 in a manner to be described hereinafter. The shaft 34 extends into the interior of the offset portion 33 of the gear housing where it non-rotatably carries a spur gear 44 which meshes with a gear 46 mounted on a shaft 47 journaled in the upper and lower walls of the gear housing 32. The lower end of the shaft 47 is formed with a worm 48 which is meshed with a worm gear 49 mounted within the gear housing 32 upon the shaft 30.

The shaft 30 extends entirely through the traction wheel 6 and has a splined portion 50 projecting therebeyond. A clutch spool 51 is slidably and non-rotatably mounted on the splined portion 50 of shaft 30 and is provided with axially-projecting pins 52 which are adapted to engage in complemental bores 53 formed in the side face of traction wheel 6, wherefore, a driving connection is established between shaft 30 and wheel 6 when the parts are in the position illustrated in Figures 10 and 11. The clutch member 51 is biased into engaged position of Figure 11 by means of a compression spring 54 surrounding the splined shaft 50 and bearing against a stop washer 55 held on the end of the shaft 30 by means of a stud 56.

From the foregoing it is believed clear that energization of the cleaner motor rotates the shaft 34 through the belt 43 and thus rotates the gears 44, 46, 48 and 49 to tend to rotate shaft 30 which would tend to drive the wheels. However, such propulsion force applied through the gears 44 and 46 produces a torque reaction which tends to rotate the gear housing 32 about the axis of the shaft 34. This is most plainly apparent from a perusal of Figures 9, 10 and 11 from which it is clear that the gear housing 32 is free to pivot about the shaft 34 because of its journal mount thereon and that a rotational force applied through the gear 44 to the gear 47 tends to rotate the housing 32 rather than to rotate the shaft 47 axis because of the resistance to rotation of shaft 47 accumulated through the drive from shaft 47 to the traction wheel 6. Hence, driving force applied as above described will not rotate the traction wheel 6 but will spin the entire structure associated with the gear housing 32 about the vertical shaft 34. This tendency of the drive mechanism to rotate about the vertical axis is utilized to effect reversing control of the power drive mechanism in a manner now to be described.

The offset portion 33 of gear housing 32 is provided with an upwardly-projecting circular collar section 60 which is concentric with the axis of the shaft 34. The collar 60 carries, as shown in Figure 8, a stop member 61 having its outer surface in the form of a spiral extending through an arc of 360° to form a radially-directed stop shoulder 62. The stop member 61 is non-rotatably mounted to the collar 60 by means of a flush type set screw 63. The member 61 is utilized to stop rotation of the gear casing 32 about the shaft 34 under which circumstances the gear 44 then rotates gear 46 and imparts driving motion to the traction wheel 6 if the clutch pins 52 are engaged with the wheel. In the position of the parts shown in Figures 2 and 8, the stop member 61 is arrested in the position it assumes for driving the cleaner forwardly; that is, away from the operator. Under these circumstances the main portion of gear housing 32 is positioned to the right of the traction wheel 6 with reference to an operator holding the manipulating handle.

The position of the stop member 61 is governed by control member 65 which is pivoted on a stud 67 threaded into a post 66 depending from the underside of the casing 1 in offset relation to the air duct 11. The member 65 is allowed limited arcuate movement on the pivot 67 by means of spaced stop pillars 69 depending from the underside of casing 1 in offset relation to the air duct 11. A supporting plate 70 secured to the lower ends of the spaced pillars 69 underlies the control member 65 and provides a support therefor removed from the pivot 67. The member 65 has its end portion bifurcated. The leg 72 of the member 65 is, as shown in Figures 2 and 8, engaged at its end with the stop member 62 to arrest the member 61 in a position of the parts producing a forward drive of the cleaner mechanism; that is, the member 65 absorbs the rotating torque applied to the gear casing 32 and thus, a driving force is then transmitted to the traction wheel 6 in a direction to drive the cleaner forwardly. The other leg 73 of the member 65 is provided with an inturned portion 74 having a stop surface 75 facing in a direction opposite to the stop surface on the end of arm 72 and is adapted to engage the surface 62 when the same is rotated approximately 180° from the position thereof shown in Figures 2 and 8. Under these conditions, of course, the gear casing 32 has also rotated 180° and the direction of rotation of traction wheel 6 will be such as to drive the cleaner rearwardly; that is, away from the nozzle 3.

The stop member 65 is actuated by means of a post 76 bolted thereto and extending upwardly through an opening 77 formed in casing 1. The upper end of the post 76 carries a yoke 80 engaged around the shaft 23 and having a depth such that it remains engaged with the shaft 23 through the full extent of the arcuate movement thereof about the shafts 26. A forward thrust applied to the handle 13 when the same is in angular position imparts a forward motion to the yoke 80 and post 76 which rocks the stop 65 in a counterclockwise direction, as viewed in Figures 2 and 8, to move the surface of the end of the arm 72 into the path of the stop 62. As explained heretofore, this is the position of the part in which the cleaner will drive in a forward direction. A rearwardly-directed force applied to the handle 13 will rock the same rearwardly with respect to the casing on the shafts 26 shifting post 76 rearwardly which imparts a clockwise rotation to member 65 disengaging the end of arm 72 from the stop 62 and shifting the surface 75 into the path of movement of the surface 62. As soon as the surface 62 and member 72 are disengaged, the rotating torque always applied to the gear casing 32 rotates the same about the shaft 34 until surface 62 engages surface 75 after which the rotation of gear box 32 is arrested and a driving torque is then transmitted to the traction wheel 6 which now rotates in a direction which pulls the cleaner rearwardly with respect to the nozzle.

It is believed apparent from the foregoing that a slight, substantially unconscious forward thrust which the operator automatically applies to a manipulating handle of a suction cleaner as the same approaches the end of a rearwardly-directed stroke; that is, the cleaner approaches the operator, rocks the handle support in a direction to disengage surfaces 75 and 62 whereupon the drive mechanism immediately spins to cause the wheel to rotate in a direction tending to drive the cleaner forwardly away from the operator due to the engagement between the surface 62 and the member 72. As the cleaner reaches the end of a forward stroke the operator automatically applies a slight rearward force to the handle to cause the same to

rotate or slide rearwardly with respect to the main body, again shifting the parts to the position thereof illustrated in Figures 2 and 8 to produce a rearwardly-directed drive through the traction wheel **6**.

As pointed out heretofore, the shaft **23** rotates with the handle assembly as the same moves arcuately during use or as it is placed in the upright storage position illustrated in Figure 1. The rotation of the shaft **23** is utilized to control the clutch **51** in a manner now to be described. The shaft **23** is provided with a cam **85** which is secured to the shaft **23** by means of a set screw **86**. The cam **85** is provided with a pair of angularly-spaced, projecting noses **87** and **88** which are adapted to bear upon a spring steel plate **89** formed at its forward end with downwardly-projecting legs **90** which straddle an upstanding pillar **91** on the casting **1**. A hinge pintle **92** pivotally mounts the legs **90** on the post **91**. A torsion spring **93** wrapped around the pintle **92** biases the plate **89** upwardly or in a counterclockwise direction, as viewed in Figure 3, in order to urge the same into engagement with the cam **85**. The plate **89** projects rearwardly from its pivotal mounting, passing directly over the shaft **34**.

The shaft **34** is hollow and provides a slidable bearing for a push rod **95**, the upper end of which engages the underside of the spring plate **89** and the lower end of which engages a horizontal arm **96** formed on a clutch shifting yoke **97** which is pivoted on a pintle **98** mounted in a downwardly-projecting, supporting ears **99** formed on the portion **33** of the gear housing. The arms of the yoke **97** are larger than the external diameter of the clutch spool **51** and are provided with inwardly-directed pins **100** which engage between the flanges of the clutch spool **51** in order to provide a driving engagement between the clutch and yoke. The spring **54** normally biases the clutch spool **51** into the clutch engaged position which action tends to rock the arm **96** in a counterclockwise direction about the pintle **98**, as viewed in Figure 11, and thus maintains the push rod **95** in raised position. It is apparent from the foregoing that a downward thrust applied to the rod **89** from the position thereof, illustrated in Figure 11, will rock the yoke structure in a clockwise direction as viewed in Figure 11 to disengage the clutch **51** from the traction wheel **6** and thus allow that wheel to rotate freely upon its journal independently of the power drive mechanism.

The cam **85** is so positioned on the shaft **23** that the nose **87** thereof engages the plate **89** when the handle is in the upright storage position illustrated in Figure 1. Under these conditions the pressure between the nose **87** and plate **89** is such that the rod **95** is forced downwardly to its lowermost position to disengage the clutch and the reaction between the plate **89** and nose **87** resiliently holds the handle in the upright storage position. As long as the handle is in the normal operating range of movement, the cam noses **87** and **88** are disengaged from the plate **89**. The arcuate movement imparted to the handle structure and hence to the cam **85** as the cleaner is moved forwardly and backwardly, may cause the cam to contact the plate **89** on the forward stroke. This, however, does not actuate the declutching pin **95** for the reason that the spring **93** is sufficiently strong to withstand such forces as the plate **89** receives during such operations and the clutch **51** remains engaged. When the handle is dropped to the inclined rest position illustrated in Figure 3, the nose **88** of the cam **85** engages the plate **89** and depresses the pin **95** to disengage the clutch, thus throwing the apparatus into the neutral position. The spring plate **89** will retain the handle in the inclined rest position against its own weight, however, a downward force applied to the handle will cause the cam nose **88** to move forwardly along the surface of the plate **89** flexing the same slightly to permit the handle to be dropped to the horizontal position illustrated in Figure 5. In all angular positions of the handle, from that illustrated in Figure 3 to the lowermost horizontal position thereof, the cam nose **88** engages plate **89** and maintains the clutch disengaged. This is desirable in order to insure that the operator may operate the cleaner manually under very low furniture and the like at which point a positive power propelled drive might be undesirable.

In order to prevent rocking of the handle when the same is in the horizontal position, an additional lock device is provided which is best shown in Figure 5. As there shown, a rectangular type cam **105** is secured to shaft **23** by means of a set screw **106** and is adapted to bear upon a leaf spring member **107** made in the form of a bracket and secured to frame **1** by means of rivets **108**. The members **105** and **107** are shaped to engage each other as the handle approaches the horizontal position and to lock the handle pivoting shaft **23** in its forwardmost position against the edges of the slot **24** in the cover shell **2**. Thus, under these conditions, the members **105** and **107** prevent pivotal movement of the handle mounting structure and the cam **85** maintains the clutch **51** in disengaged position, wherefore the power drive mechanism is inoperative though the stop member **65** is locked in the forward drive position and the traction wheel **6** is freely journaled and can rotate on shaft **30** as the operator manipulates the cleaner under low-lying furniture and the like.

The foregoing construction for locking the power propelling wheel in the declutched or freely rotating condition when the cleaner handle is horizontal is preferred but may be eliminated if desired, in which event a sharpening of the nose **88** on the cam **89** would permit the cam nose **88** to disengage from plate **89** and the power drive to operate as before when the handle is in the horizontal position.

Additional means, shown particularly in Figure 3, are provided for manually locking the clutch **51** in the disengaged or neutral position. This means comprises a pressure pin **110** slidably mounted in the cover shell **2** and carrying a spring retaining cup **111** bearing against a shoulder formed on the pin **110**. A compression spring **112** surrounds the lower portion of the pin **110** and bears between cup **111** and a lower spring retaining cup **113**, the upper edge of which rests upon the horizontal portion of an L-shaped bracket **114** which is riveted or otherwise secured to an upstanding flange **115** formed on the main casting or frame **1**. As is apparent from Figure 3, the spring **112** biases the pin **110** upwardly. The upper end of the pin **112** carries a suitable pressing and rotating knob **117** secured to the pin **110** by set screw **118**. The portion of the bracket **114** upon which the spring retainer **113** rests is provided with the opening **119** shaped to receive the pin **110** and having a forwardly-directed, elongated slot-like extension through which a pin **120** attached to pin **110** may pass when properly aligned. The purpose of the above described mechanism is to secure the clutch **51** in disengaged position. In the position of the parts as shown in Figure 3, the pin **110** has been depressed against spring **112**. Pin **120** has passed through opening **119** and has then been rotated out of alignment with the slot portion of opening **119** into engagement with a stop pin **121** in order to secure the pin **110** in depressed position. In this depressed position the lower end of pin **110** has depressed plate **89** and the thrust pin **95** sufficiently to disengage the clutch. This device is particularly useful to facilitate movement of the cleaner when it is not energized as it allows the traction wheel to rotate freely on its axis. When it is desired to restore the apparatus to power drive the knob **117** is rotated until the pin **120** passes through the opening **119** under the bias of spring **112** which will then disengage pin **110** from plate **89**.

The foregoing specification describes a preferred embodiment of a power propelling mechanism particularly applicable to suction cleaners but also applicable to other types of surface treating devices such as polishers, scrubbers and the like. The foregoing device is particularly characterized by the provision of a traction wheel drive wherein the drive as such is unidirectional but is so designed as to provide a built-in torque which tends to

rotate the same so as to cause the traction wheel to rotate in opposite direction with respect to the main body of the propelled device. The propulsion mechanism is also characterized by the provision of a reversing control mechanism which is operated by bodily movement of the handle responding to a minor force applied to the handle substantially unconsciously by the operator in the use of the cleaner so that the operator is required only to exert a small force on the handle at the beginning and end of each stroke of the cleaner over the surface being treated. In addition, the power propulsion device insures that the cleaner will be moved over the carpet or other surface being cleaned at an optimum and uniform rate in order to secure uniform cleaning under the most effective condition.

While I have illustrated and described the invention in considerable detail, it is to be understood that various changes may be made in the arrangement, proportion and construction of parts without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a surface treating device having a main body portion, a surface treating means on the body portion, a drive motor and a manipulating handle for guiding the surface treating means, the combination of a drive mechanism mounted on the body portion for rotary movement about a vertical axis, a power take off from the motor to the drive mechanism, a surface engaging traction wheel mounted on the drive mechanism to be driven thereby, said drive mechanism including a power transmitting means producing a torque tending to rotate the drive mechanism about the said vertical axis, stop means operable to secure the drive mechanism against the said torque selectively in either of two angular positions about the said vertical axis in each of which the axis of the traction wheel is normal to the direction in which the surface treating device is moved over a supporting surface in use of the device whereby the traction wheel will propel the body portion forwardly or backwardly depending upon the arrested position of the drive mechanism, and manually actuated means for controlling the securing means to release the drive mechanism from either one of its angular positions for rotation about the vertical axis under the influence of said torque and securing the drive mechanism in the other of its angular positions.

2. Apparatus according to claim 1 wherein the surface treating means is driven by the drive motor.

3. Apparatus according to claim 1 wherein the drive mechanism includes a clutch interposed in the drive mechanism and means for disengaging the clutch whereby the traction wheel may rotate freely on its axis to allow the body portion to be propelled manually by the handle.

4. Apparatus according to claim 1 wherein the means controlling the securing means comprises a movable connection between the handle and the body portion and means responsive to a forwardly or rearwardly directed force applied to the handle for actuating the securing means to secure the drive mechanism to propel the body portion forwardly or rearwardly respectively.

5. Apparatus according to claim 4 wherein the drive mechanism includes a clutch operable when disengaged to free the wheel from driving power applied to the drive mechanism, the handle is also pivoted to move from an upright storage position through an operating range to an inclined rest position, and means operated by the handle for disengaging the clutch in the storage and rest positions thereof.

6. Apparatus according to claim 5 including means for securing the handle against movement other than pivotal movement thereof when lowered below the inclined rest position of the handle.

7. Apparatus according to claim 1 wherein the drive mechanism includes a clutch operable when disengaged to free the wheel from driving power applied to the drive mechanism, and manually actuated means for locking the clutch in disengaged position.

8. In a suction cleaner having a main body portion and a manipulating handle attached to the main body for guiding said body, the combination of a vertical shaft rotatably mounted on the main body and projecting therebelow, a gear casing rotatably mounted on the shaft, a gear fixed to the shaft in the gear casing, a vertical shaft mounted in the gear casing offset from the first mentioned shaft, a gear fixed on the second mentioned shaft and meshing with the first mentioned gear, a horizontal shaft in the gear housing projecting beyond one side thereof, means forming a driving connection from the second mentioned shaft to the horizontal shaft, a surface engaging traction wheel mounted on the projecting portion of the horizontal shaft and drivingly connected thereto, and stop means for selectively arresting rotation of the gear casing about the first mentioned vertical shaft in either of two angular positions in each of which the traction wheel propels the main body in a direction opposite to the direction of propulsion in the other of said positions, said stop means being releasable to permit rotation of the gear casing under the influence of the torque produced by said driving connection from either one of its angular positions to the other of its angular positions in which the stop means arrests rotation of the gear casing.

9. In a suction cleaner having a main body provided with a manipulating handle for guiding said body, the combination of a shaft rotatably mounted on the main body and projecting therebelow, a drive mechanism rotatably mounted on the shaft, a motor on the main body, a driving connection from the motor to the shaft, a surface engaging propelling wheel mounted on the drive mechanism for rotation on a horizontal axis, means forming a driving connection from the shaft to the propelling wheel of a type producing a torque tending to rotate the drive mechanism on the shaft, means for securing the drive mechanism against rotation about the shaft in either of two angular positions relative to the shaft in which the propelling wheel drives the main body in opposite directions, and means for controlling the securing means to release said securing means permitting rotation of the drive mechanism under the influence of said torque from either one of its angular positions to the other of its angular positions and securing the drive mechanism in the other of its angular positions.

10. Apparatus according to claim 9 wherein the driving connection to the wheel includes a clutch biased to the engaged position, means for disengaging the clutch including a thrust rod extending axially through the shaft and manually operated means for actuating the thrust rod to disengage the clutch.

11. Apparatus according to claim 9 wherein the handle is mounted on the main body for pivotal movement in a vertical plane and to move bodily with respect to the main body in response to forces having components directed forwardly or backwardly of the main body and means responsive to forward and backward movement of the handle relative to the main body for actuating the securing means to position the propelling wheel to drive the main body forwardly and backwardly, respectively.

References Cited in the file of this patent

UNITED STATES PATENTS

1,073,513	Parker	Sept. 16, 1913
1,465,285	Peterson	Aug. 21, 1923
1,571,236	Dieckmann	Feb. 2, 1926
1,737,568	Burris	Dec. 3, 1929
2,138,239	Irgens	Nov. 29, 1938
2,138,279	Kneisley	Nov. 29, 1938
2,148,656	Smellie	Feb. 28, 1939
2,619,209	Horn	Nov. 25, 1952

FOREIGN PATENTS

325,381	Great Britain	Feb. 20, 1930
188,645	Switzerland	July 1, 1937