July 1, 1952 W. A. HUMPHREY 2,601,698

SUCTION CLEANER WITH AGITATOR DISCONNECT

Filed May 17, 1949 3 Sheets-Sheet 1

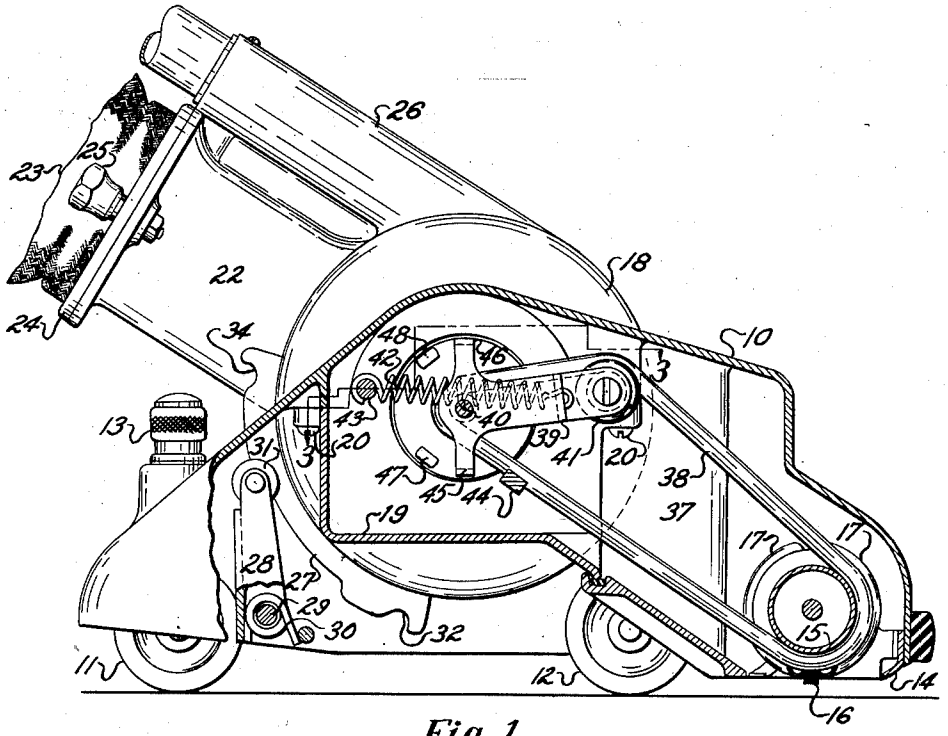


Fig. 1

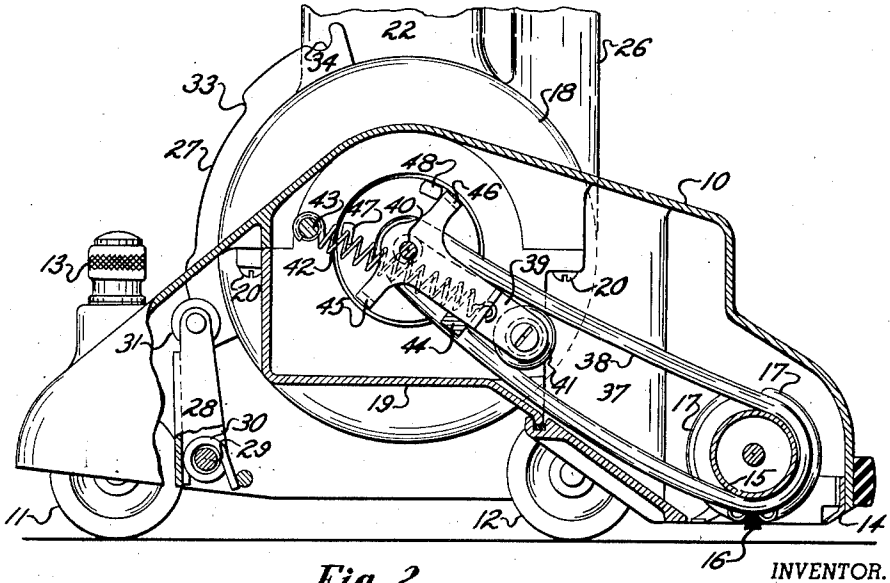


Fig. 2

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July 1, 1952 W. A. HUMPHREY 2,601,698

SUCTION CLEANER WITH AGITATOR DISCONNECT

Filed May 17, 1949 3 Sheets-Sheet 2

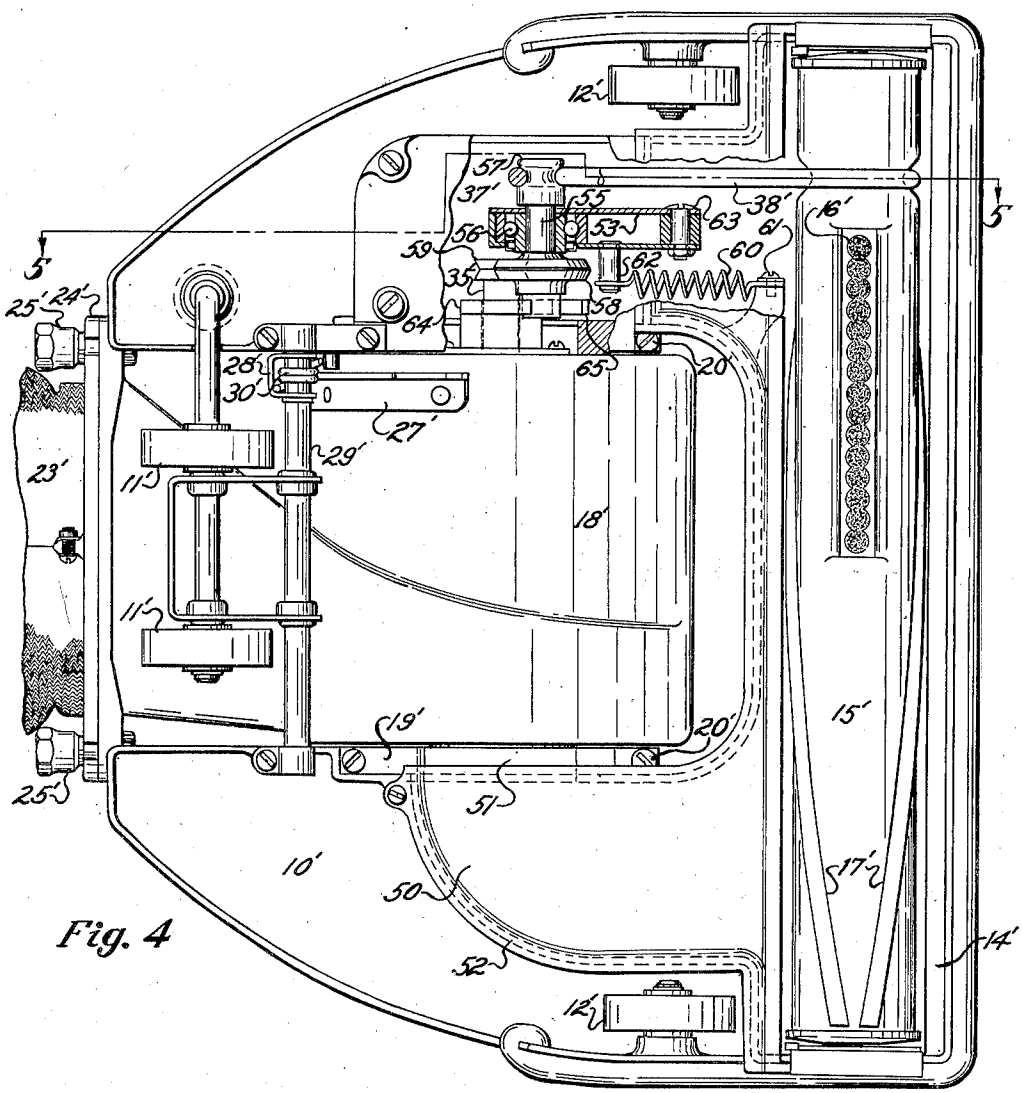


Fig. 4

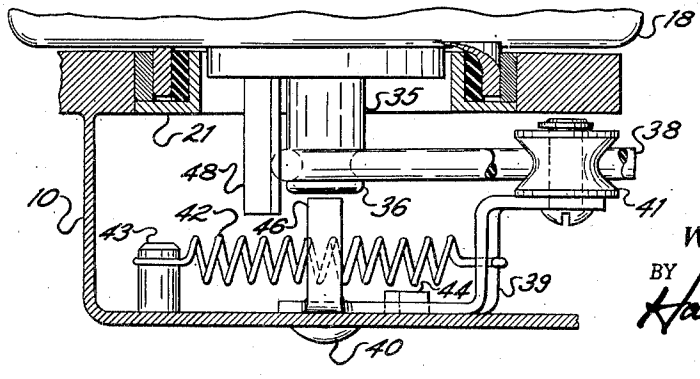


Fig. 3

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July 1, 1952 W. A. HUMPHREY 2,601,698

SUCTION CLEANER WITH AGITATOR DISCONNECT

Filed May 17, 1949 3 Sheets-Sheet 3

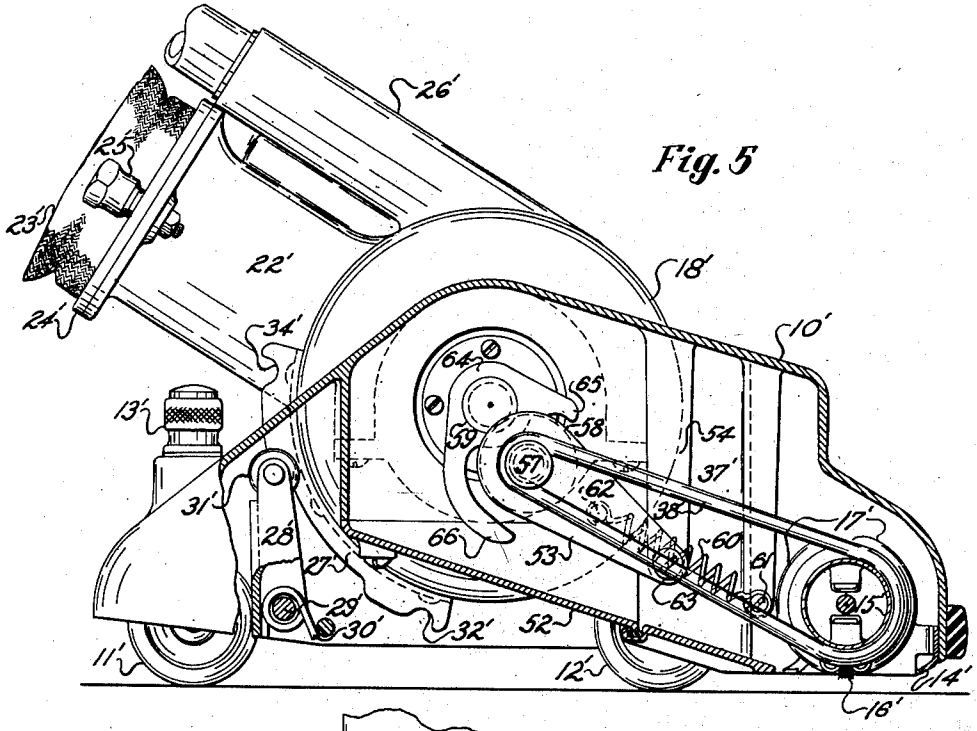


Fig. 5

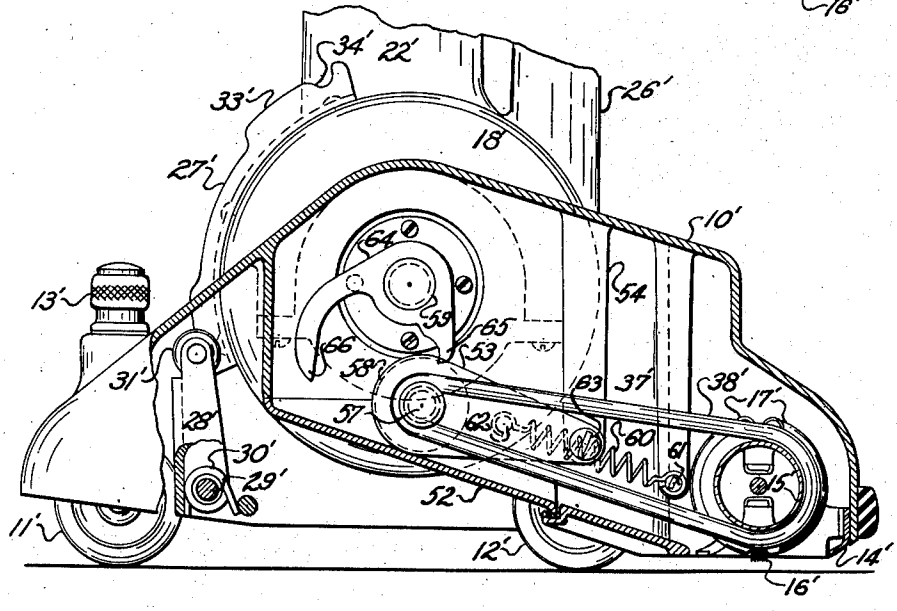


Fig. 6

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# UNITED STATES PATENT OFFICE

2,601,698

## SUCTION CLEANER WITH AGITATOR DISCONNECT

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10 Claims. (Cl. 15—390)

1

This invention relates to suction cleaners and more particularly to simple but highly effective means for discontinuing the operation of the agitator without interfering with the operation of the motor-fan unit.

There are certain instances when it is disadvantageous to drive the agitator as, for example, while moving furniture to clean the underlying carpeting or while using dusting tools. At such times the cleaner remains stationary on the carpet with the possibility that the rotating agitator may unnecessarily wear the carpet or the brush bristles. Previous attempts to overcome these and other disadvantages have not been satisfactory because the structures relied upon were complex, cumbersome, unreliable in operation, added unnecessarily to the cleaner weight or had other undesirable characteristics.

A major objective achieved by the present invention is the provision of a simple, inexpensive, highly efficient and automatic device for disconnecting an agitator drive in a suction cleaner.

Another objective is the provision of an agitator disconnect in which tension on the driving belt is relaxed when the agitator is disengaged thereby greatly prolonging the life of the belt and reducing the load on the motor bearings.

Still another object of the invention is the provision of an agitator disconnect employing a snap-acting mechanism having two stable positions in one of which the drive is effective and in the other of which it is ineffective to drive the agitator.

A further object is the provision of a snap-acting agitator disconnect operable automatically when the cleaner handle is moved into or out of a non-propelling position. Thus, the agitator is driven so long as the cleaner handle is in a cleaner propelling position but is disconnected automatically and without the knowledge or intervention of the operator upon the handle being moved to a non-propelling position. Likewise, the agitator is automatically restored to operation as the handle is returned to its cleaner propelling range.

Other important objects and features of the invention will become apparent from the following detailed description of illustrative embodiments of the invention, in which:

Figure 1 is a side sectional view of a suction cleaner incorporating the invention with the parts in position to drive the agitator;

Figure 2 is a view similar to Figure 1 but with the agitator drive disconnected;

2

Figure 3 is a fragmentary sectional view on line 3—3 of Figure 1;

Figure 4 is a bottom plan view partly in section of a suction cleaner incorporating a modified embodiment of the invention;

Figure 5 is a vertical sectional view on line 5—5 of Figure 4 showing the agitator drive in operative position; and

Figure 6 is a view similar to Figure 5 but with the agitator drive disconnected.

While a suction cleaner embodying the present invention may be of either the horizontal or vertical motor type, greater efficiency and simplicity is achieved by incorporating the invention in the horizontal motor type. Accordingly, this type has been employed for the present disclosure.

Referring to Figure 1, it will be noted that the main cleaner body comprises a main casting 10. This is supported upon the usual rear wheels 11 and front carrier wheels 12. The rear wheels may be adjustably supported in any well known manner as by vertically adjustable screw 13. Extending across the front of the main body is a downwardly opening suction nozzle 14. Rotatably mounted lengthwise of the nozzle is an agitator 15 which preferably carries one or more brushes 16. The agitator may also be provided with beater elements such as the helically mounted beater bars 17.

A unitary motor-fan unit is pivotally supported centrally of the main casing with its axis extending horizontally crosswise of the body. The motor-fan unit is here shown as assembled into the main casing from the bottom thereof and is held in place by a pair of bearing plates 19, 19 and retaining screws 20, 20. The bearings proper for the motor-fan unit may be formed of complementary bearing flanges formed upon the opposite ends of the motor-fan unit and in the adjacent portions of the main casting 10. Details of a suitable bearing are illustrated at 21 in Figure 3.

A tubular member 22 cast integrally with the motor-fan unit 18 extends rearwardly therefrom and communicates with the exhaust of the fan. A suitable filter bag 23 has its lower end attached to a detachable bag ring 24 which can be removably clamped to exhaust tube 22 by means of thumb screws 25. A cleaner propelling handle 26 overlies the exhaust passage 22 and filter 23 and is secured to the motor-fan unit so as to pivot therewith as the handle is raised and lowered in normal use. While handle 26 has not been shown in full, it will be understood to be of any well known type. Accordingly, it will be

understood that the pivot bearing for the handle comprises the same bearings as those for the motor-fan unit, namely bearings 21, 21.

The propelling handle and the motor-fan unit preferably are constrained for movement through a 90° arc under the restraint of a handle control sector 27 secured to the under side of the motor-fan unit and a roller detent member 28 pivoted to the under side of the main body by pin 29. The control sector may be shaped to provide a considerable degree of control over the rotation of the motor fan unit and of the handle. Detent lever 28 is spring biased clockwise by a torsion spring 30 to maintain detent roller 31 in firm contact with control sector 27 at all times. When the handle is raised to the vertical storage position, detent roller 31 will lie in notch 32 and will resistingly maintain the handle in the storage position. A stop 33 on the control sector is positioned to hold the handle in an inclined rest position at the lower end of the normal operating range of the handle. If the operator drops the handle while using the cleaner, the roller will come to bear against stop 33 and prevent the handle from falling to a horizontal position. However, if the operator desires to use the handle at a lower angle it is merely necessary to depress the handle so that the roller over-rides stop 33. The notch 34 at the extreme end of sector 27 serves to lock the handle in the horizontal position as a convenience in storing the cleaner vertically, as on a hook.

As will be observed from Figure 3, the motor shaft 35 projects from the right-hand end of the motor unit and carries the usual belt pulley 36 on its outer end. Pulley 36 is located at the upper end of a belt tunnel 37 formed in the right-hand side of main casing 10. Tunnel 37 extends between the belt pulley and the agitator 15 located in suction nozzle 14. A similar tunnel extends along the left-hand side of the main casing and provides a suction air passageway extending from the nozzle to the inlet of the fan which inlet passes through the left-hand main bearing 21. Agitator drive belt 38 surrounds the agitator and motor pulley 36.

Belt 38 may be either of the round or the flat type. Preferably, it is slightly elastic in character and of such a length that it is ineffective to drive the agitator unless one run is tensioned as by an idler roller. Accordingly it will be clear that when it is stretched as shown in Figure 1, it is effective to drive the agitator whereas it is ineffective to drive the agitator when the upper run is relaxed as shown in Figure 2.

The belt, together with a snap-acting toggle device and a means for controlling the position thereof, may be considered as a disconnectible power transmitting means for driving agitator 15. The toggle comprises an idler lever 39 pivoted to the main casing 10 by a pivot pin 40 positioned opposite the end of shaft 35. The outer end of lever 39 carries an idler roller 41 underlying the upper run of belt 38. One end of a tension spring 42 is attached to lever 39 while its opposite end is carried by a pin 43 secured to the main casing rearwardly of pivot pin 40. Pin 43 is so positioned that the center line of toggle spring 42 lies either above or below pivot pin 40. When the center line lies above the pivot pin, the spring holds the idler against the upper run of the belt so as to tension it firmly against pulley 36 and agitator 15, as shown in Figure 1. When the center line lies below pin 40, the idler will lie against stop 44 mounted on the cleaner casing



(as shown in Figure 2) in which position the idler is ineffective to tension either run of the belt. In these circumstances belt 38 will be relaxed so that it is ineffective to drive the agitator.

The means for shifting the idler and toggle from one position to the other will now be described. It will be noted that the pivoted end of lever 39 carries a pair of inwardly projecting tabs 45 and 46 spaced radially from pivot pin 40. Movement of idler lever 39 moves tabs 45 and 46 in the path of another pair of tabs 47 and 48 projecting outwardly from the motor-fan unit. Tabs 47 and 48 rotate with the motor as cleaner handle 26 is raised or lowered. If the handle is raised or lowered sufficiently then one or the other of tabs 47, 48 will contact tab 45 or 46 on the idler lever and shift it from one of its two stable positions to the other. Normally, however, the handle is free to be used throughout its normal operating range without contacting either tab 45 or 46. Hence, the position of the idler as shown in Figure 1 will not be interfered with during normal use of the cleaner. However, should the operator raise the handle above the normal operating range toward storage position, tab 48 will rotate clockwise and contact tab 46 on the idler lever and rotate it clockwise also. As soon as the center line of spring 42 passes pivot pin 40 the spring will snap the idler downwardly against stop 44.

If the handle is thereafter lowered from the vertical position, tab 47 will contact tab 45 and rotate the idler counterclockwise until its center line rises above pivot 40. At this moment spring 42 will snap the idler tightly against the upper run of the belt and maintain both runs of the belt taut.

From the foregoing, it will be clear that tabs 45, 46, 47 and 48 provide a lost-motion connection between the operating handle 26 and idler 39. This connection is operative to shift the idler to connect or disconnect the agitator drive whenever the handle is moved into or out of the non-propelling range of movement of the cleaner handle.

Referring to the second embodiment illustrated in Figures 4, 5 and 6, it will be noted that the same general type of cleaner is illustrated and that identical or similar parts to those of the first embodiment are designated by corresponding numerals primed. Figure 4, showing the cleaner from below, illustrates how the motor-fan unit 18' is pivotally supported on the under side of main body casting 10'. Figure 4 also clearly shows belt tunnel 37' extending along the right-hand side of the cleaner casing and a similar passage 50 on the left-hand side constituting a suction air passageway extending between nozzle 14' and through the left-hand main bearing into fan inlet 51. The lower side of both the belt tunnel and the suction air passageway is closed by a unitary, removable plate 52.

The disconnectible power transmitting means for the agitator of this embodiment includes a clutch one part of which is mounted upon a snap-acting toggle having two stable positions. When the toggle is in one stable position, the belt is tensioned and the clutch parts are engaged to drive the agitator. When the toggle is in the other of its stable positions the belt is relaxed and the clutch is disengaged to disconnect the agitator drive. The exceedingly simple structure for carrying out these functions will now be described.

A toggle lever 53 has its lower forward end

pivotally supported by a downwardly projecting post 54 on main casting 10'. The upper end of toggle lever 53 supports a short shaft 55 in any suitable bearing such as roller bearing 56. Belt pulley 57 on the outer end of shaft 55 supports the driven end of agitator belt 38'. The opposite end of shaft 55 carries an external V-grooved driven clutch wheel 58 which is engageable with a smaller diameter internally V-grooved driving clutch wheel 59 mounted on the projecting end of motor shaft 35'.

A tension toggle spring 60 has its lower end attached to the main casing 10' as at 61. The opposite end of toggle spring 60 is attached to a pin 62 carried on toggle lever 53.

As will be observed from a study of Figures 5 and 6, toggle lever 53 has two stable positions, one being that shown in Figure 5 and the other that shown in Figure 6. In Figure 5 the center line of spring 60 lies above pivot pin 63. When in this position the spring urges lever 53 upwardly so that friction wheel 58 is held firmly seated in the groove of the driven friction wheel 59. If lever 53 is rotated downwardly counterclockwise, the center line of spring 60 will fall below pin 63 and the toggle lever will be swung counterclockwise until wheel 58 strikes the upper side of closure plate 52. In this position, the center of shaft 55 will be closer to the center of agitator 15' with the result that the tension on the belt 38' is reduced so as to relax the belt. However, when the toggle lever is swung upwardly to engage the clutch wheel, pulley 57 will be moved away from the agitator thereby increasing the tension on the runs of belt 38'.

The means for engaging or disengaging the clutch includes a plate 64. This plate is pierced by motor shaft 35' and is rigidly mounted upon the motor unit so as to pivot therewith as the operating handle 26' is raised or lowered. Extending arcuately from plate 64 is a short arm 65 and a longer arm 66. The inner end of shaft 55 extends into the plane of movement of arms 65 and 66. Due to the spacing of arms 65 and 66 on either side of shaft 55, as appears from Figure 5, it will be manifest that the cleaner handle can be moved freely through its normal operating range without disturbing the position of toggle lever 53 or the engagement of the clutch parts. However, should the cleaner handle 26' be raised to its storage position, arm 65 will pivot downwardly into engagement with the end of shaft 55 to pivot toggle lever 53 counterclockwise about pin 63. As the center line of the toggle spring passes below the pivot pin, the toggle lever will snap downwardly to positively disengage the clutch. The parts will then be in the position illustrated in Figure 6. Lowering of the handle from storage position will bring arm 66 into contact with shaft 55 and will move the toggle back to its operating position shown in Figure 5.

From the foregoing, it will be manifest that the present invention provides an exceedingly simple, rugged and highly effective means for disconnecting the agitator drive. So long as the cleaner propelling handle is positioned to propel the cleaner, the agitator drive is maintained in operation. However, should the handle be raised to a non-propelling position, the agitator drive is automatically disconnected and the belt tension is relaxed thereby greatly prolonging the life of the belt. The operator need follow no special routine nor perform any additional operation other than raising the handle. Of even greater importance is the fact that it is unnecessary to explain this safety feature to the operator as it is equally as efficacious in the hands of a child as when operated by a person having full knowledge of it.

Obviously various other arrangements and modifications may be resorted to without departing from the spirit of the invention. While the invention has been shown as applied to a horizontal axis motor, it will be readily understood that it can be applied to other motor arrangements. Although a rotatably mounted motor-fan unit has been described, it will be appreciated that a fixed motor unit may be used. In this event, the pivoted handle can be employed to shift the belt disconnect.

I claim:

1. The combination with a suction cleaner including a wheeled body, a motor-fan unit thereon, a propelling handle pivoted to said body, a suction nozzle in communication with the fan of said motor-fan unit, a rotatable agitator mounted lengthwise of and within said nozzle, of belt means for driving said agitator from said motor, said means including a snap-acting device supported upon said body and carrying a pulley for engagement with said belt, said device having two stable positions in one of which said belt is operative to transmit power from said motor to said agitator to drive it and in the other of which said belt is rendered ineffective to transmit motive power to said agitator, and means operatively interconnecting said handle and said snap-acting device for shifting said device between said two stable positions as said handle is pivoted toward or away from a predetermined position thereof for controlling the operation of said agitator.

2. A suction cleaner of the type having a main body, supporting wheels, a fan, a driving motor therefor, a propelling handle, a suction nozzle, and a rotatable agitator mounted therein, said cleaner being characterized by the provision of disconnectible power transmitting means between said motor and said agitator including a belt, a snap-acting device supported on said cleaner and having a movable portion operable to co-act with said belt in a manner to shift the position of at least one run thereof, said device having two normally stable positions and being operable in one but not the other of said stable positions to render said belt effective to transmit power from said motor to said agitator, and means operable by movement of said propelling handle to shift said snap-acting device from one stable position to the other to connect or disconnect said power transmitting means.

3. A suction cleaner as defined in claim 2 wherein said handle has a cleaner propelling range of movement and a second range of movement not normally used for cleaner propelling purposes, and wherein said means operable by movement of said propelling handle comprises a lost motion connection between said handle and said snap-acting device for shifting said device from either one of said stable positions to the other, said lost motion connection being effective upon said device only upon movement of said handle into or out of said second range of movement.

4. A suction cleaner of the type having a suction nozzle, a propelling handle pivotally supported on said cleaner, a fan having an inlet in communication with said nozzle, a motor coupled to said fan, a rotary agitator mounted lengthwise of said nozzle, disconnectible power

transmitting means between said motor and agitator to drive the agitator at the will of the operator, said power transmitting means including a flexible, elastic belt, a snap-acting mechanism supported on said cleaner and co-acting with said belt to render the belt effective or ineffective to drive said agitator, said mechanism having two stable positions in only one of which said belt is effective to drive said agitator, and means mounted on said cleaner including a lost motion connection between said handle and said snap-acting mechanism operative to shift said snap-acting mechanism from one stable position to the other to connect or disconnect said power transmitting means.

5. A suction cleaner comprising a body having a suction nozzle, a horizontal axis motor-fan unit mounted crosswise of said body, a propelling handle having a pivotal axis parallel to the axis of said motor-fan unit, an agitator in said nozzle, disconnectible power transmission means between said motor and said agitator including a belt and a two-position snap-acting device for varying the tension on said belt to render it effective or ineffective to drive the agitator, and a lost motion connection between said handle and said snap-acting device operable when said handle is moved through a portion of its operating range to shift said device from one position to another to connect or disconnect said power transmitting means for said agitator.

6. In combination, a suction cleaner having a main body, a motor-fan unit thereon, a nozzle in communication with said fan, an agitator in said nozzle, a belt connecting said agitator and motor and operable when tensioned to drive said agitator, means pivoted to said cleaner carrying an idler pulley operable to tension said belt, a toggle spring operable to hold said pivoted means in either of two positions, one of said positions being such as to tension said belt sufficiently for it to drive said agitator and the other position being such as to relax the tension on the belt so that it is ineffective to drive said agitator, a propelling handle pivoted to said cleaner having an operating range of movement and a non-operating position, and lost motion means inter-connecting said handle and said pivoted means operable to shift it from one of its two positions to the other when said handle is moved into or out of said non-operating position.

7. The combination with a suction cleaner including a wheeled body, a motor-fan unit thereon, a propelling handle pivoted to said body, a suction nozzle in communication with the fan of said motor-fan unit, a rotatable agitator



mounted lengthwise of and within said nozzle, of disconnectible power transmitting means including a belt for driving said agitator from said motor, said power transmitting means including a snap-acting device movably supported on said cleaner and carrying a pulley for engagement with said belt, spring means for holding said device in either one of two stable positions thereof in one of which said belt is operable to drive said agitator and in the other of which said belt is inoperable to drive said agitator, and means providing a lost motion connection between said propelling handle and said snap-acting device for moving the same between said two stable positions whereby said power transmitting means can be rendered effective or ineffective to drive said agitator depending upon the position to which said handle is moved.

8. The combination defined in claim 7 wherein said snap-acting device comprises lever means having one portion pivotally supported on said cleaner, said belt engaging pulley being rotatably carried by said lever means, and said spring means having one end connected to said cleaner and the other end connected to said lever means at a point between said lever pivot and said pulley and arranged to hold said device in either one of said two stable positions.

9. The combination defined in claim 8 wherein said lever pivot is in alignment with the axis of said motor-fan unit, means for pivotally supporting said motor-fan unit on said cleaner body, and means rigidly securing said propelling handle to said motor-fan unit for pivotal movement therewith.

10. The combination defined in claim 8 wherein said lever pivot is supported on said cleaner at a point offset from the axis of said motor-fan unit.

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