Sept. 28, 1937. H. B. WHITE 2,094,138

SUCTION CLEANER

Filed March 12, 1936 2 Sheets-Sheet 1

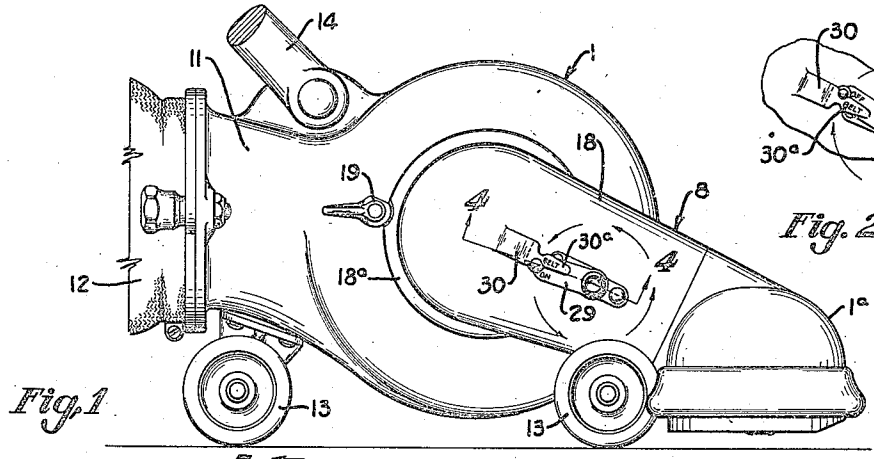


Fig. 1

Fig. 2

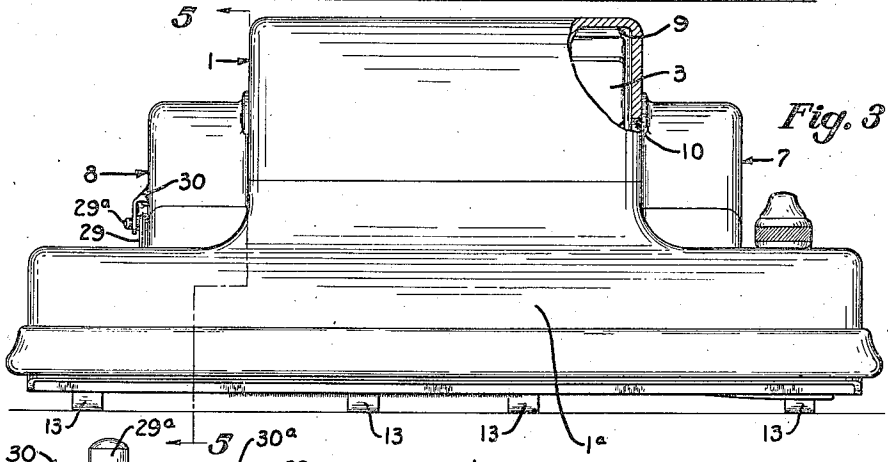


Fig. 3

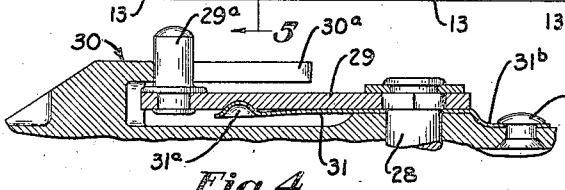


Fig. 4

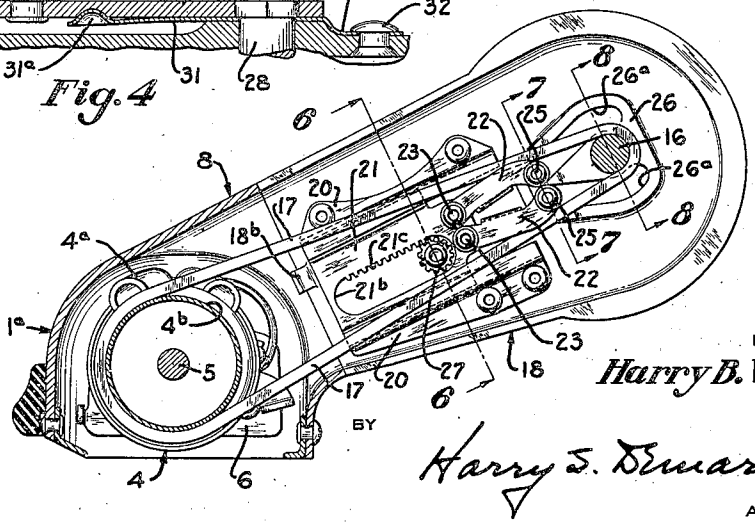


Fig. 5

INVENTOR

Harry B. White

BY

Harry S. Duncan

ATTORNEY

Sept. 28, 1937. H. B. WHITE 2,094,138

SUCTION CLEANER

Filed March 12, 1936 2 Sheets-Sheet 2

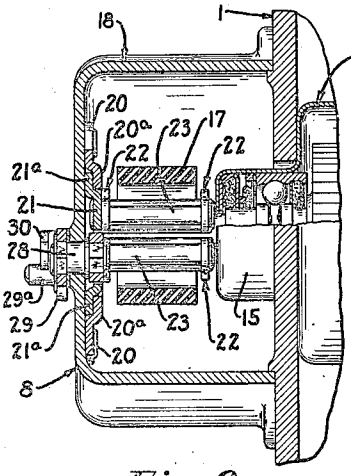


Fig. 6

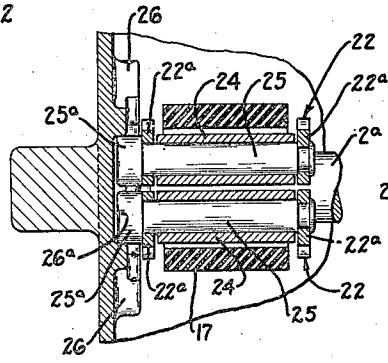


Fig. 7

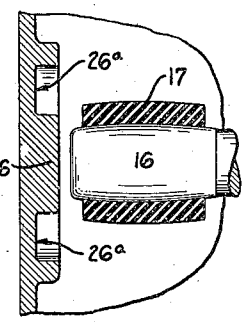


Fig. 8

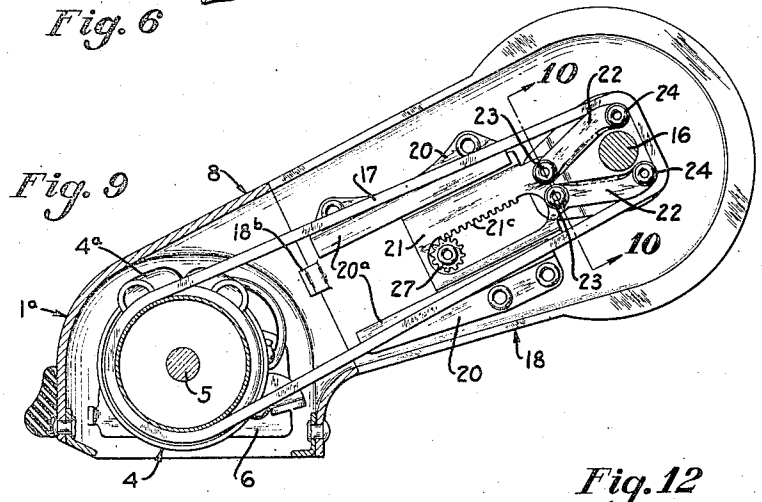


Fig. 9

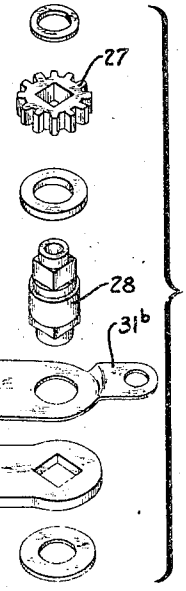


Fig. 12

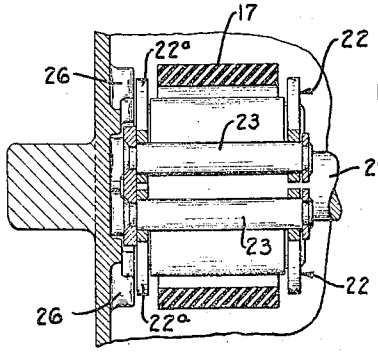


Fig. 10

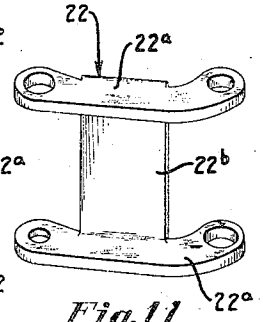


Fig. 11

INVENTOR

Harry B. White.

BY

Harry S. Duarte

ATTORNEY

Patented Sept. 28, 1937 2,094,138

UNITED STATES PATENT OFFICE

2,094,138

SUCTION CLEANER

Harry B. White, Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application March 12, 1936, Serial No. 68,375

5 Claims. (Cl. 74—242.5)

This invention relates to improvements in suction cleaners and more particularly to a device for disengaging the belt driven brush or beater roll of a suction cleaner from the driving motor by shifting the belt from contact with its driving pulley.

As well known in the suction cleaning art, some types of cleaners are equipped with rotary brushes or beaters mounted in the nozzle for promoting greater cleaning effectiveness, these rolls being belt driven from a driving pulley on the same shaft that carries the suction fan. Now, for ordinary cleaning operations in which the cleaner is maneuvered over the floor covering to be cleaned, there is no occasion for rendering the roll inoperative, but where the cleaner is designed to function with dusting tools, it is desirable if not necessary to provide for the temporary disengagement of this rotary carpet contacting member and for the obvious reason that, having converted the cleaner from so-called "on-the-floor" to "off-the-floor" operation through the agency of the dusting tools, undue carpet wear will result if the cleaner is allowed to operate for any length of time in one position. Moreover, the driving of the roll under these conditions involves a needless consumption of power.

It has been the practice heretofore, to cover the space occupied by the driving belt with a removable bottom plate, which permitted access to the belt for its temporary disengagement from its pulley by hand, at the same time replacing the bottom plate with a special fitting or attachment for the hose to be used with the dusting tools, said fitting or converter member, usually fitting over the inlet opening to the fan chamber and at the same time closing off all other passages thereto.

Thus, with the foregoing introduction to the problem of suction cleaner operation with which the present invention is particularly concerned, it may be stated that its principal object is to provide means whereby the belt driving the rotary brush or beater roll may be disengaged or shifted from driving contact with its pulley, without removing any part of the cleaner casing or manipulating the belt by hand and, without having to stop the driving motor if it is not desired to do so.

Essentially, the invention embodies a novel belt shifting mechanism consisting primarily of a pair of fingers or arms which are shiftable lengthwise between the two leads of the belt, said fingers carrying rollers at their outer ends which separate as they approach the pulley thus shifting the belt therefrom.

A preferred embodiment of the belt shifting device is disclosed in the accompanying drawings in which:

Figure 1 is a general view in side elevation of a suction cleaner showing the operating members for shifting the driving belt into and out of driving connection with its pulley;

Figure 2 is a fragmentary view showing the external operating handle shifted from "on" position shown in Figure 1 to the "off" position with arrows indicating the direction in which the handle is to be turned to restore the belt to its driving position;

Figure 3 is a view in front elevation of the cleaner showing the location of the belt shifting device with relation to the nozzle, fan chamber and other essential parts of the cleaner;

Figure 4 is an enlarged detail view in section taken on line 4—4 of Figure 1 showing the external operating handle for the belt shifting device;

Figure 5 is a detailed view slightly enlarged showing the belt and belt shifter housing in longitudinal section as taken on line 5—5 of Figure 3;

Figures 6, 7, and 8 are enlarged detailed views in cross section through the belt shifting mechanism as taken on lines 6—6, 7—7, and 8—8 respectively, of Figure 5;

Figure 9 is a view duplicating the showing of Figure 5, but with the belt in its shifted position and disengaged from its driving pulley;

Figure 10 is an enlarged detailed view in cross section as taken on line 10—10 of Figure 9 and corresponds to the showing of Figure 7, but with the parts in belt shifted position;

Figure 11 is a perspective view of one of the belt shifting element fingers with the roller removed and

Figure 12 is a perspective view of the various parts of the operating pinion and handle in position for assembly.

The invention is incorporated in a suction cleaner of the portable, hand-maneuvered type consisting generally of a casing supported upon wheels and provided with a nozzle portion communicating with a fan chamber in which a motor driven fan is mounted and leading to a dust bag or receptacle through an exhaust outlet. In the present disclosure, the cleaner is more particularly characterized by the fact that the axis of rotation of the motor and fan is horizontal and parallel with the axis of a combined brush and

beater roll which hereafter will be referred to as an agitator. Thus, referring to Figures 1 and 2, the main casing 1, of the cleaner, comprises a horizontally arranged cylindrical housing 1, in which is enclosed the driving motor 2 (Figure 6) directly connected with the fan 3, (a portion of which is shown at the right hand of the housing 1 in Figure 3), this fan being mounted upon an extension of a motor shaft 2a. Immediately in front of the cylindric housing 1 and extending transversely across the front of the cleaner is the nozzle 1a, having a downwardly facing suction mouth or opening and having the form of an arched chamber in which is located the agitator 4 consisting primarily of a cylindric metal shell with helically arranged beater elements 4a projecting from its surface, as well as suitably arranged brush elements (not shown). The cylindric shell of the agitator is journaled on a shaft 5 which in turn is supported in a bearing 6 mounted at each end of the nozzle chamber.

As clearly shown in Figure 3 there is provided at either end of the cylindric housing 1 of the casing a pair of symmetrically arranged passageways or conduits 7 and 8, extending forwardly and downwardly from each end of the cylindric housing 1 and opening at their lower ends into the nozzle chamber at points disposed inwardly from the outer ends thereof. The passageway 7 on the right hand side of the cleaner forms the air passage from the nozzle chamber to the fan chamber 9, the same being that portion of the cylindric housing 1 enclosing the fan and communicating with the upper end of the passage 7 through an inlet opening or eye 10 formed in the end wall of the housing separating the fan chamber from the air inlet passage 7 and concentric with the axis of the fan. The fan chamber 9 has direct communication with an exhaust passage 11 extending rearwardly from the housing 1, and thence with a dust bag 12, removably attached at its inlet end to the flanged end of the exhaust outlet 11. And finally, to complete the general assembly of the cleaner, wheels 13—13 are mounted at the forward and rear ends of the cleaner casing, whereby the cleaner is maneuvered over the carpet, being guided and manually propelled through a handle 14, the lower end portion of which is shown pivotally connected to the casing, immediately above and to the rear of the cylindric housing 1 thereof.

Referring now to the inclined passage 8 on the left hand side of the cylindric housing 1, the same is substantially a counterpart of the air inlet passage 7 at the opposite end of the housing and while it also communicates at its lower end with the nozzle chamber, it is closed off from the housing 1 at its upper end except for an opening in the end wall of the housing for the motor shaft bearing 15 (Figure 6) and the extension of the shaft forming the driving pulley 16. This pulley is located in the upper end of the passage and carries a driving belt 17 having driving connection in an annular groove 4b on the agitator 4.

Before considering the belt shifting device, it may be observed that access to the interior of the passageway 8 is made possible by constructing the entire upper end portion thereof in the form of a removable cover plate 18, having a substantially semi-circular flanged upper end portion 18a bearing flatwise against the end wall of the housing 1 and suitably fastened in place by means of a manually operative latch member 19 engaging the flanged edge of the removable cover, coupled with a locking finger 18b at the lower inside edge of the cover. Also, it is to be observed that the removable cover section 18 of the belt passageway 8 forms the supporting member for the belt shifting device and when the cover section is removed, the shifting device is removed with it. Needless to say, it is first necessary to retract the belt shifting device into its non-operating position before the cover section can be removed.

Referring now to Figures 5 and 6 it will be noted that a pair of spaced guide members 20—20 are riveted or otherwise secured to the inner face of the removable cover section 18, the same being disposed in parallel relation to the direction of the belt and are provided along the opposed inner edges with offset flanged portions 20a—20a forming parallel guide-ways for a sliding plate 21, having offset marginal tracks 21a engaging said guide-ways. Extending lengthwise of the sliding plate 21 is a slot 21b, having semi-circular ends and a series of rack teeth 21c cut along its upper edge. Pivotally mounted at the upper end of the sliding plate 21, that is, the end adjacent the driving pulley 16, are pivotally mounted a pair of arms 22—22, each consisting of a frame slightly wider than the belt and made up of a pair of side frame members 22a, integrally connected by a transverse member 22b (see Figure 11).

These arms 22 are pivotally connected at their inner end to the plate 21 by means of pivot pins 23, disposed diametrically on either side of an imaginary line passing through the axis of the agitator and pulley 16 and defining the path of endwise sliding movement of the plate 21. From their point of pivotal connection with the sliding plate 21, these arms extend forwardly and approximately parallel with each other, but owing to a slight curvature at their outer ends they normally assume the slight convexed relationship shown in Figure 5. Carried at the outer ends of the arms 22—22, are rollers 24 journaled on bearing pins 25 supported in holes formed in the slightly curved outer ends of the side frame members 22a—22a, as clearly shown in Figures 7 and 11.

Leaving the arms 22—22, for the moment, attention is directed to a boss 26, formed on the inside face of the removable housing section 18 immediately adjacent the end of the driving pulley 16 (see Figures 5, 7, and 8). This boss 26, which in reality is but a portion of the outer wall of the housing section 18 of increased thickness, is generally heart shaped and disposed symmetrically with respect to the imaginary center line of the belt, the upper and larger end portion of the boss extending a short distance beyond the pulley 16 and converging to a blunt point below and on the opposite side of the pulley and a short distance from the ends of tracks 20—20 supporting the plate 21. Formed in the face of the boss 26 is a pair of complementary cam grooves 26a—26a, arranged in V-shaped conformation disposed and symmetrically with respect to the pulley 16, that is, with the angle included between the two grooves being bisected by the imaginary center line of the belt. Again referring to Figure 5, it will be noted that the two cam grooves 26a—26a diverge from the base of the boss 26 and, upon approaching the pulley 16 assume a curvilinear path around the pulley finally terminating a short distance therebeyond. Now, coacting with the cam grooves 26a—26a, are cam followers 25a—25a at the outer end of the arms 22—22, the same having the form of enlarged heads or blocks at the end of each of the roller supporting pins 25—25, as shown in

Figure 7. These cam followers lie outside of the adjacent side frame members 22a and engage the cam grooves 26a—26a in the boss 26.

Thus with the outer or free ends of the arms following the line defined by the two V-shaped cam grooves 26a—26a, it follows that if the belt shifting device be normally positioned as shown in Figure 5, that is, with the plate 21 shifted to the left into its extreme retracted position, the arms are drawn closely together and disposed at a distance from the pulley 16 with the belt engaging rollers 24 at their outer ends in contact with each other and out of contact with the belt. Hence, in the normal operation of the cleaner, the belt shifter is inoperative and the agitator 4 is driven in the usual manner. However, if the plate 21 is shifted endwise and towards the driving pulley 16 to the position shown in Figure 9, the arms 22—22 manifestly follow the cam 26a—26a, first approaching the pulley along divergent paths. In the meantime, the rollers 24—24 contact the inner faces of both leads of the belt and as the arms continue to spread apart they eventually embrace the pulley and in so doing lift the belt entirely out of contact therewith and transfer it on to the rollers 24—24. In the event that the belt shifting device is operated while the cleaner is in operation, the belt merely sets the rollers 24 rotating as contact takes place therebetween, and continue to rotate until the belt is lifted from the driving pulley 16, whereupon the belt comes to rest although the driving pulley continues to rotate with the motor. It hardly need be added that while the belt is disconnected from the pulley, the agitator remains inoperative and that the belt is reconnected with the driving pulley by shifting the plate 21 in the opposite direction thus restoring the parts to the positions disclosed in Figure 5.

Referring now to the means for operating the belt shifting device, the same comprises a pinion 27 meshing with the rack 21c along the top edge of the longitudinal slot in the plate 21 and mounted at one end of a stub shaft 28 journalled in the outer wall of the housing section 18, said shaft carrying at its outer end a handle 29 by means of which the pinion is rotated, and belt shifting device operated by hand from the exterior of the belt housing.

The operating handle 29 and the pinion 27 are so arranged as to shift the plate 21 from one end to the other of its stroke with complete turn of the shaft 28. In other words, one revolution of the handle in one direction shifts the belt from its driving pulley and turning the handle in the opposite direction restores the belt to agitator driving condition.

To limit the turning of the handle 29 and to define the position of the belt shifting device, a stop 30 formed integral with the wall of the housing section 18 has a pointed finger 30a arranged radially with respect to the axis of the shaft 28 and overlying the path traversed by the outer end of the handle 29 which has an upstanding knob 29a. Immediately beneath the handle and in radial alignment with the stop finger 30 is a flat leaf spring 31 serving to yieldingly hold the handle 29 in its extreme positions by means of a pair of projections 31a—31a engaging a corresponding recess 29b in the underside of the handle 29. The handle position retaining spring 31 is partially held in place by the stub shaft 28 passing through its fixed end and also by a radially projecting ear 31b which is riveted to the housing wall at 32 (Figure 4). As clearly shown in Figure 1, the handle 29 contacts with the stop 30 with the knob 29a engaging a recess on the lower edge of the finger 30a. This is the "On" position of the handle wherein the belt 17 has its normal driving connection with the pulley 16. For convenience the word "belt" is indicated on the face of the finger 30a and the word "On" is stamped on the handle 29, the words "belt on" indicating to the operator that the belt is on its pulley and in readiness to drive the agitator. Now, by rotating the handle 29 in a counterclockwise direction to the position shown in Figure 2, the device is actuated to shift the belt from the driving pulley 16 and the handle 29 bears against the upper edge of the stop finger 30a and held by the locking spring 31 as before. The word "Off" is also stamped on the face of the handle immediately opposite the word "On", one or the other being concealed beneath the finger, depending on the position of the belt shifting device. For a complete disclosure of the pinion and handle assembly attention is directed to Figure 12, showing the various parts of the assembly in their relative positions, all of which is common practice in the art including the square end shaft 28 for mounting the pinion and handle, the utilization of washers and screws engaging threaded sockets in the ends of the shaft for assembling the parts together.

Enumerating the advantages of the herein disclosed type of belt shifter as applied to a suction cleaner, there may be mentioned the increased ease of changing over or converting the cleaner to and from "off-the-floor" cleaning by avoiding the necessity of touching the belt, lifting the cleaner or removing any part thereof, in order to disengage and engage the agitator. A feature also, of the device is the facility with which the belt may be shifted to and from the driving pulley while the cleaner is in operation.

Having thus disclosed a preferred embodiment of the invention:

I claim:—

1. In a belt shifting device, the combination of a driving pulley, a driven pulley and a belt connecting said pulleys, of a supporting member mounted in the plane of said belt and shiftable toward and from one of said pulleys, a pair of arms carried by said supporting member and provided at their free ends with belt engaging rollers, and means for spreading said arms apart in the movement of said supporting member toward said pulley to shift said belt therefrom and onto said rollers.

2. In a belt shifting device, the combination of a driving pulley, a driven member and a belt connecting said driving pulley with said driven member, of a pair of spreader arms provided at their free ends with belt engaging rollers located in the plane of said belt and shiftable toward and from said driving pulley and means acting to spread said arms during the movement of said rollers toward said pulley and into position to shift said belt onto said rollers.

3. In a belt shifting device, the combination of a driving pulley, a driven member and a belt connecting said driven member with said driving pulley, of a pair of spreader arms shiftable toward and from said pulley in substantial alignment with the leads of said belt and provided at their outer ends with belt engaging rollers and means for spreading said arms apart during their their movement toward said pulley to bring said rollers into contact with opposite leads of said

belt and thence into positions to support said belt free of said pulley.

4. In a belt shifting device, the combination of a driving pulley, a driven member and belt connecting said driving pulley with said driven member, of a manually shiftable support movable toward and from said driving pulley in line with said belt, a pair of spreader arms pivotally mounted on said support and provided at their outer ends with belt engaging rollers and co-acting cam members operating to spread said arms apart to bring said rollers into contact with said belt on opposite sides of said pulley and thence into positions to transfer said belt onto said rollers.

5. In a belt shifting device, the combination with a driving pulley, a driven member, a belt connecting said driving pulley with said driven member and a housing enclosing said belt, of a supporting member slidably mounted on said housing and shiftable toward and from said driving pulley substantially in the plane of said belt, a pair of spreader arms pivotally mounted on said support and provided with belt engaging rollers engaging grooves formed in the adjacent face of said housing, whereby said arms are successively spread apart as they approach said pulley to engage said belt and remove said belt from said pulley.

HARRY B. WHITE.