June 3, 1941. C. G. TROXLER 2,244,130

BAG PRESSURE INDICATOR FOR SUCTION CLEANERS

Filed May 18, 1939

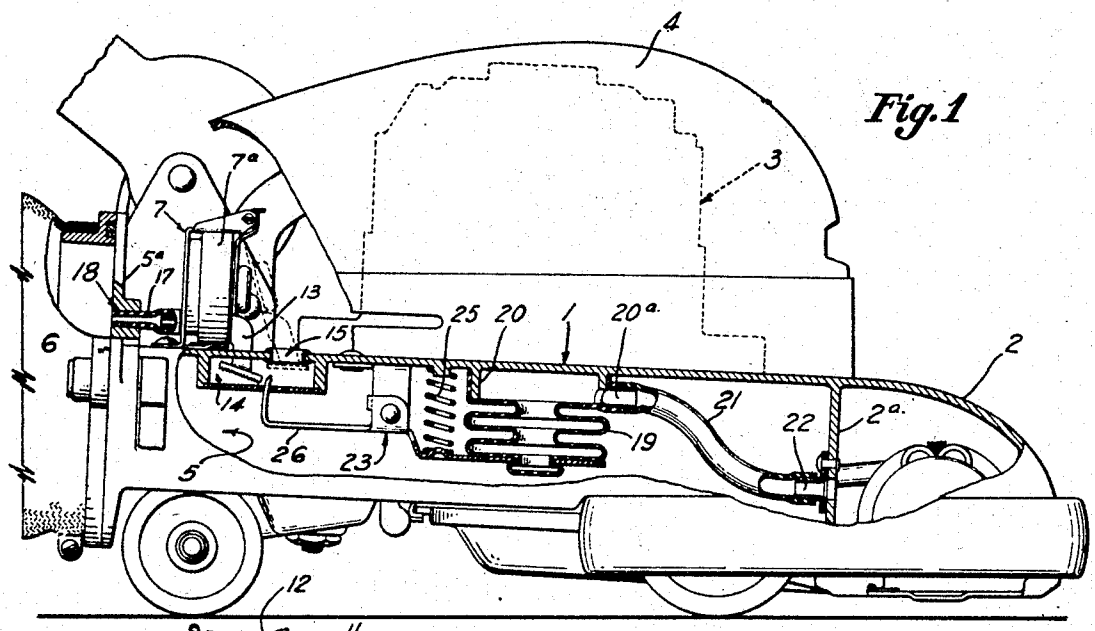

Fig.1

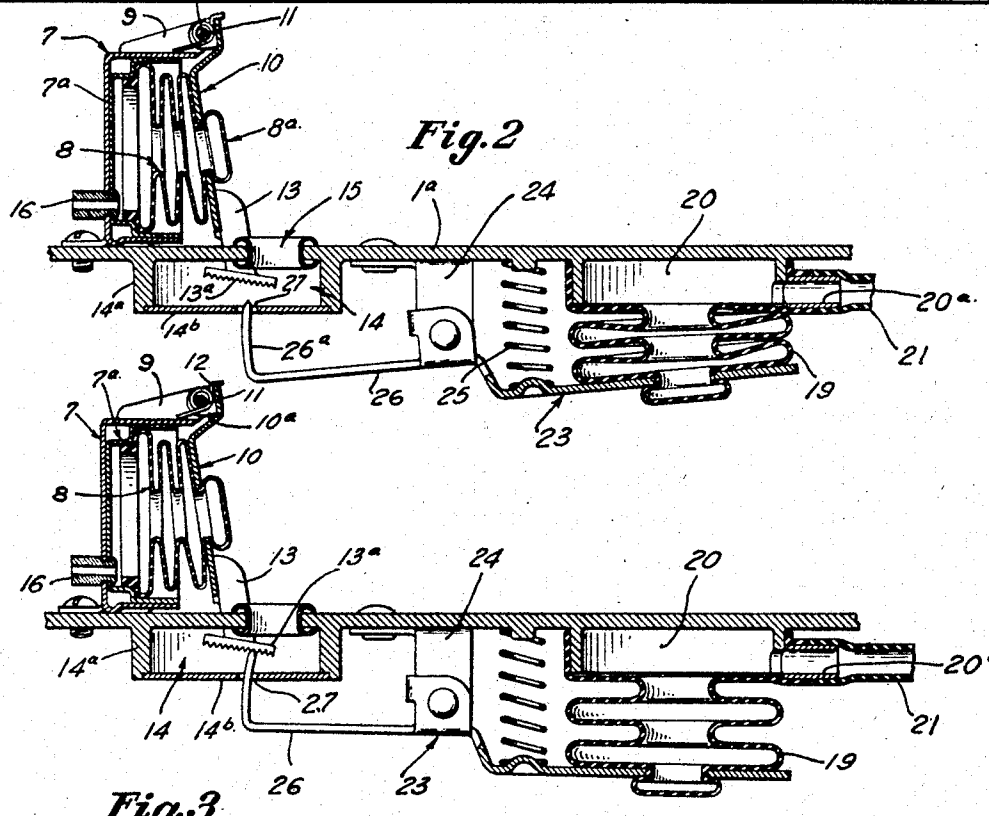

Fig.2

Fig.3

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Patented June 3, 1941 2,244,130

UNITED STATES PATENT OFFICE

2,244,130

BAG PRESSURE INDICATOR FOR SUCTION CLEANERS

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Application May 18, 1939, Serial No. 274,368

4 Claims. (Cl. 116—65)

This invention relates to improvements in bag pressure indicators for suction cleaners and more particularly to an auxiliary suction-actuated device for rendering a bag pressure indicator inoperative except under conditions for which the bag is directly responsible.

The necessity for an auxiliary locking device associated with a bag pressure indicator is due to the fact that under certain operating conditions of a suction cleaner, the indicator is likely to display a false signal thereby indicating to the operator that the dirt bag should be emptied, whereas the dirt bag may be quite free of dirt. For example, if a cleaner equipped with an indicator responsive to the pressure at the inlet end of the dirt bag is being operated on a carpet of average quality and texture and is then wheeled onto a bare floor or a floor covering that is quite thin and porous, the indicator is likely to display the bag emptying signal regardless of the condition of the bag. And the reason for this is that when the nozzle leaves the carpet, the seal is broken and the increased air-flow causes a drop in the suction at the nozzle, accompanied by a corresponding increase in the pressure at the exhaust outlet because the bag is not capable of disposing of the increased volume of air discharged by the fan and this increase in pressure is sufficient to cause the bag pressure indicator to function as it would if the increased pressure were due to a clogged condition of the bag.

Therefore, the object of the present invention is to provide a locking device which will prevent the indicating device from functioning from causes other than the dirty condition of the bag.

The particular type of indicator employed is not particularly important, although for convenience one disclosed in an application for a United States Letters Patent, bearing Serial No. 102,897, filed September 28, 1936, has been reproduced herein. Thus, the cleaner and the indicator per se will require only a brief description. In the accompanying drawing:

Figure 1 is a general view in side elevation of a suction cleaner equipped with a pressure-responsive bag pressure indicator and an auxiliary suction-responsive locking device associated therewith;

Figure 2 is an enlarged detail view in vertical section through the bag pressure indicator and associated locking device, showing the latter in its inoperative position; and

Figure 3 is a view similar to Figure 2, but showing the locking device in locking engagement with the signal member of the bag pressure indicator.

Referring first to the general structure and arrangement of the cleaner, the same comprises a main casing 1, having a nozzle portion 2 extending transversely across its forward end and supporting a centrally disposed motor 3 enclosed within a dome-shaped cover 4 and having direct driving connection with a fan located within a fan chamber forming an integral part of the casing 1 immediately below the motor. The fan chamber has a rearwardly directed exhaust passage 5 terminating in a flanged outlet connection 5a to which a dirt bag 6 is removably attached.

The nozzle portion 2 includes a nozzle chamber defined in part by a vertical rear wall 2a and having the usual downwardly opening suction mouth communicating with the fan chamber through an inlet passage. Under normal operating conditions a substantially uniform suction is maintained within the nozzle chamber and a substantially uniform pressure within the discharge outlet passages, although as the bag gradually becomes filled with dirt, a back pressure is built up which results in a drop in the nozzle suction and a reduction in the cleaning effectiveness of the cleaner unless the bag is emptied.

Therefore, it is the increased back pressure due to a dirty condition of the bag that the indicator is intended to register by displaying a visual signal which can be seen by the operator.

The indicator is preferably located adjacent the rear end of the casing 1 and is supported upon the top wall 1a thereof between the motor 3 and the outlet passage 5 and concealed beneath the rear end portion of the cover 4.

The indicator consists primarily of a frame 7 having a vertically arranged cylindrically cup-shaped body portion 7a opening forwardly. Partially enclosed by this cup-shaped body portion is a bellows member 8 consisting also of a cup-shaped member of some flexible material such as rubber and having a series of corrugations throughout its length. The open end of the bellows member is fitted around a shoulder at the base of the body portion of the frame and at its free end is formed a button-like projection 8a.

Having hinged connection along its upper edge with the forward ends of a pair of brackets 9 mounted on top of the frame 7 is a signal member 10 secured to the outer end of the bellows member by the insertion of the button 8a through an opening therein, said signal member having the form of a plate with a pair of rearwardly bent ears 10a along its upper edge which are supported upon a horizontal hinge pin 11 extending between the brackets 9. A torsion spring 12

is coiled around the hinge pin 11, with one end bearing against the top edge of the hinged signal member 10 and the other against the top of frame 7, thereby exerting a tension in a direction to swing the signal member in a clockwise direction and against the pressure exerted thereon through the bellows member 8.

Projecting downwardly from the plate-like portion of the signal member 10 is a signal arm 13 which passes through a slot in the top wall 1a of the casing 1 and terminating just below the underside thereof in a transversely arranged target 13a having its upper face preferably coated with red paint or enamel. The target 13a is housed in a separate chamber 14 formed by a shallow web 14a depending from the underside of the top wall 1a of the casing and closed by a bottom plate 14b. An aperture 15 is formed in the top wall 1a of the casing in a position to register with the target 13a in its signalling position, and therefore located slightly forward of the target in its normal position, as shown in Figure 1.

To complete the indicator assembly, a nipple 16 communicating with the space enclosed by the bellows 8 and the cup-shaped portion 7a of the frame 7 supports one end of a short tube 17 which is inserted into a cored passage 18 through the flanged outlet connection 5a and opening toward the mouth of the bag 6. In this way, the bellows member responds to variations in pressure at the bag mouth, expanding axially as the pressure increases beyond a predetermined maximum established by the tension exerted upon the signal member by the torsion spring 12. Thus, when the pressure within the bag reaches a certain maximum, the signal member is displaced by the bellows to bring the target 13a into position beneath the aperture, thereby warning the user that the bag should be emptied.

Now, the device which acts automatically to prevent the functioning of the indicator except under conditions of increased pressure due to a dirty or clogged dirt bag, is practically a duplication of the elements constituting the indicator itself, except that it responds to nozzle suction and operates a locking finger or detent instead of a signal member. Thus, there is supported on the under side of the top wall 1a of the casing 1 and at a point forwardly of the indicator mounting, a bellows member 19 similar in all respects to the bellows member 8 of the pressure indicator with its open end fitting around an annular web 20 depending from the under side of the top wall 1a. A tube 21 connects the interior of the bellows 19 with the nozzle chamber, one end of the tube being fitted onto a nipple 20a extending forwardly from the annular web 20 and the other end of the tube being fitted onto another nipple 22 fastened to the vertical rear wall 2a of the nozzle chamber.

A horizontal lever 23 has pivotal connection with a bracket 24 secured to and depending from the underside of the casing wall 1a intermediate the pressure indicator mounting and the bellows 19. One end of the lever is connected with the lower end of the bellows 19 by the same type of button and aperture connection used in the indicator. Between the bellows and the bracket 24 is a compression spring 25 held in vertical position between the lever and the bottom wall 1a. This spring acting to oppose continually the collapse of the bellows member 19 under the suction produced in the nozzle chamber.

And finally, extending rearwardly from the pivotal mounting of the lever 23 is an arm 26 having an upturned finger or detent 26a which registers with a slot 27 in the bottom wall of the chamber 14 housing the target 13a. This finger has a pointed end normally positioned below the path of the target 13a, preferably provided on its under face with a series of teeth or serrations, as clearly shown in Figures 2 and 3.

The operation of the suction-responsive locking device will be clearly understood from the following discussion: Referring first to Figure 2, the suction-actuated bellows member 19 assumes a contracted position when a normal suction is being maintained in the nozzle chamber, as would be the case when the cleaner is operating upon a carpet of average thickness. Under these conditions, the spring 25 is not strong enough to overcome the suction and the lever 23 is depressed with the detent 26a below the path of the target 13a, where it can offer no obstruction to the movement of the signal arm.

However, with the bellows 19 expanded as it would be in case of decreased suction within the nozzle chamber, as for instance, when the cleaner is wheeled onto a bare floor, the compression spring 25 is now able to overcome the force of the reduced suction with the result that the detent 26a is raised either in front of the target 13a, as shown in Figure 1, or into contact with its serrated under-surface, as shown in Figure 3. In the first instance, the dirt bag is comparatively clean and therefore the indicator bellows will be almost entirely collapsed, so that the target 13a would be well beyond the locking detent. However, it is quite possible that the pressure conditions in the bag would be such that the indicator bellows is partially extended, thus carrying the target 13a forwardly (as in Figure 2) but not into final signalling position. In this second situation, the locking detent would then be directly below the target and should the locking device function, the end of the detent would engage the serrated under-surface of the target and the locking action would be just as effective.

It is important to note in this connection that the indicator will eventually respond to the same change in operating conditions that causes the suction-responsive locking mechanism to operate, and therefore it is essential that the latter should be designed so as to act promptly in order to move the locking detent into obstructing position before the signal arm has an opportunity to function. For this reason, the suction-responsive bellows 19 is purposely made larger than the bellows 8 of the indicator, thus making it relatively more responsive to pressure changes and thus insuring its locking action in advance of the false action of the indicator.

And in conclusion, it may be added that the same result could be obtained by incorporating into the indicator a suction-responsive bellows acting directly upon the signal member to compensate for the increasing pressures due to other than dirt bag conditions. However, an indicator of the so-called compensating type is the subject matter of a co-pending application for Letters Patent, bearing Serial No. 283,327 filed July 8, 1939. Therefore, it will be understood that the present disclosure is directed to the combination with a pressure-responsive indicator of a separate suction-responsive locking or signal-obstructing device, and having the advantage of being attachable to cleaners already equipped with a standard type of pressure-responsive in-

dicator or where the use of the locking device may be optional or not entirely necessary.

Having set forth a preferred embodiment of the invention, with the understanding that it is not limited to the specific arrangement or combination of parts herein disclosed,

I claim:

1. The combination with a suction cleaner equipped with an indicator having a signal member responsive to variations in pressure at one point in the suction-creating system of the cleaner, of an auxiliary locking device adapted to prevent the functioning of said indicator except under predetermined pressure changes and comprising a locking member adapted to be shifted into and out of a position to obstruct the movement of the signal member of said indicator toward signalling position, and a pressure-responsive element operatively connected with said shiftable locking member and responsive to pressure variations at another point in said suction-creating system.

2. The combination with a pressure indicator for suction cleaners comprising a shiftable signal member and a pressure-responsive element operatively connected to said signal member, of an auxiliary locking device adapted to prevent the functioning of said indicator under predetermined changes in pressure conditions within the suction-creating system of the cleaner and comprising a locking member adapted to be shifted into and out of the path of the signal member in its movement into signalling position, and a pressure-responsive element operatively connected with said shiftable locking member and responsive to the suction changes in said system.

3. The combination with a bag-pressure indicator for a suction cleaner adapted to display a signal when a predetermined increase in pressure occurs due to a dirty condition of the dirt bag and including a pivoted signal member and pressure-responsive bellows member, of an auxiliary locking device comprising a lever adapted to be shifted into and out of the path of movement of said signal member toward its signalling position, a bellows member operatively connected with said lever arm, the same being relatively larger than the bellows member of said indicator and correspondingly more responsive to variations in suction at the nozzle of said cleaner, and a spring acting on said lever in a direction to shift the same into obstructing position, the tension of the spring being adapted to overcome the force exerted through said bellows member upon a predetermined drop in suction at said nozzle to actuate said lever arm in advance of any response of said indicator to a corresponding increase in pressure.

4. The combination with a bag pressure indicator for suction cleaners, comprising a shiftable signal member and a pressure responsive element, said signal member being adapted to display a visual signal when a predetermined increase in pressure occurs within said bag, of an auxiliary locking device for said signal member comprising a lever having a finger adapted to be shifted into and out of the path of movement of said signal member toward its signaling position, a bellows member operatively connected with said lever, and a spring acting on said lever in a direction to shift the same into the path of movement of said signal member, the tension of the spring being such as to overcome the force exerted on said bellows member upon a predetermined drop in suction at said nozzle and thereby actuate said lever in advance of any response of said indicator to a corresponding increase in bag pressure in said bag.

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