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BAG PRESSURE INDICATING DEVICE FOR SUCTION CLEANERS

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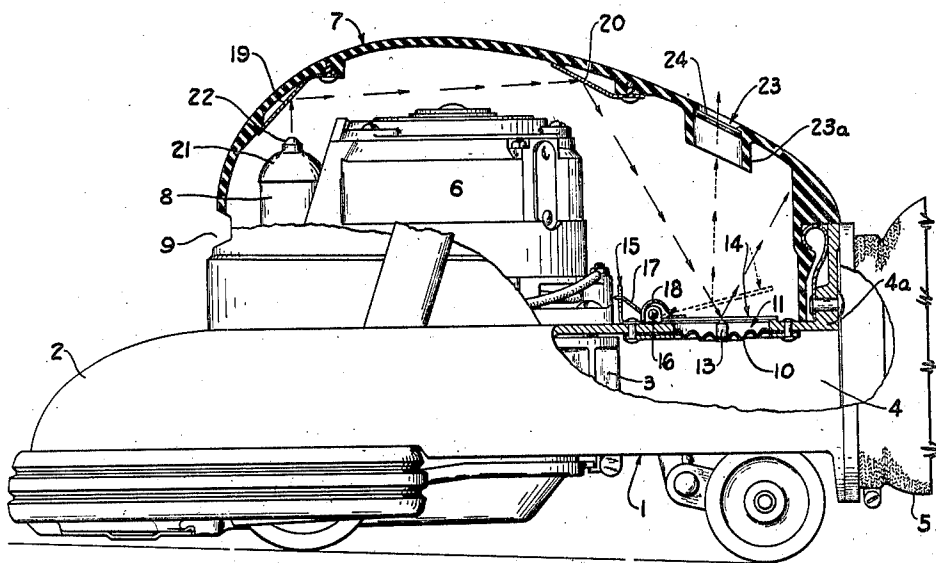


Fig. 1

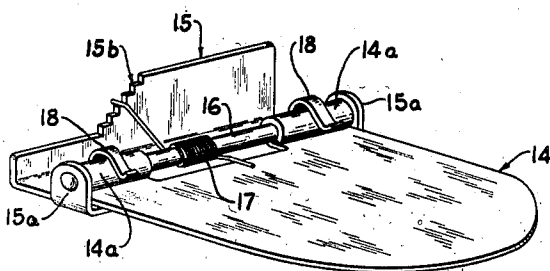


Fig. 2

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BAG PRESSURE INDICATING DEVICE FOR
SUCTION CLEANERSQuentin Berg, Akron, Ohio, assignor to The
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6 Claims. (Cl. 116—65)

This invention relates to improvements in bag pressure indicators for suction cleaners and more particularly to means for warning the operator that the dirt bag has been filled beyond its normal capacity and should be emptied.

In suction cleaners of the portable hand-manuevered type, the dirt-laden air is discharged into a porous fabric bag capable of retaining the dirt but allowing the air to pass therethrough with a minimum of resistance. In the course of normal cleaning operation, the dirt bag gradually becomes filled and the effective filtering area correspondingly reduced, with the result that if the bag is not emptied of its contents periodically, excessive back pressure is created which materially reduces the efficiency of the suction system as well as the cleaning effectiveness of the device.

Users of suction cleaners are prone to neglect the emptying of the dirt bag at regular intervals unless reminded of the necessity for so doing and therefore some manufacturers have equipped suction cleaners with automatic signalling devices which either visually indicate pressure conditions or display a warning signal. For the most part, these indicating or signalling devices are actuated by a pressure-responsive element located on the pressure side of the fan chamber and responding directly to the increased pressure resulting from over-capacity bag conditions.

The object of the present invention is to provide an improved indicating device, the novel features thereof residing more particularly in the character of the signal displayed, namely, the sudden appearance of a beam of light through a window in the upper wall of the cleaner casing and readily discernible by the operator from above.

A preferred embodiment of the invention is disclosed in the accompanying drawing, in which:

Figure 1 is a general view in side elevation of a suction cleaner equipped with one of the novel indicating devices and with the upper portion of the cleaner casing shown in section to show the source of the light and means for directing and controlling the same; and

Figure 2 is an enlarged detail view in perspective of the pressure regulated mirror that controls the light beam.

The suction cleaner disclosed in Figure 1 may be typical of any standard make or design, although to carry out the present improvement it must preferably be equipped with a headlight for illuminating the floor surface immediately ahead

of the cleaner and a dome-like cover or casing not only enclosing the motor and headlight but a space considerably greater than that occupied by both and extending lengthwise of the cleaner casing.

Thus, in Figure 1, the main body or casing 1 of the cleaner includes the nozzle chamber 2 located at its forward end, a fan chamber housing the suction fan 3 and a discharge outlet passage 4 terminating in a flanged connection 4a at the rear end of the casing. Detachably mounted to the flanged outlet connection 4a is a dirt bag 5 preferably of a porous woven fabric filtering material and into which the dirt laden air is discharged directly from the outlet passage 4 from the fan chamber.

Supported upon the casing 1 and having direct driving connection with the suction fan 3 is an electric motor 6 located substantially centrally of the top wall of the casing 1, which forms the support for the base of the motor. A dome-like hood or cover 7 is removably supported upon the casing 1 and, as clearly shown in Figure 1, extends from a point well forwardly of the motor upwardly and thence rearwardly to the outlet connection 4a at the rear of the cleaner casing. The walls of the cover 7 are spaced from the motor 6 on all sides, thus leaving the chambers or compartments in front of and at the rear of the motor as well as an open space above.

Located in the space or chamber immediately in front of the motor is an upstanding lamp 8 mounted in a socket supported on the base of the motor, this lamp being positioned directly behind an opening or window 9 in the front wall of the cover 7 and so arranged as to direct the light rays forwardly and downwardly upon the floor surface just ahead of the nozzle. For the purpose of this disclosure, it may be assumed that the lamp 8, receiving its current from the same source as does the motor, is lighted while the cleaner is being operated.

Referring now to the indicating device, the pressure-responsive element thereof consists of a circular diaphragm 10 extending over an opening 11 formed in that portion of the top wall of the casing 1 which forms the exhaust passage 4 from the fan chamber. This diaphragm may be a metal disc corrugated concentrically to give it flexibility or may be constructed of any other suitable resilient material; in either case, its distortion in response to variations in pressure within the discharge passage being translated into a vertical endwise movement of a cylindric stud 13 mounted at the center of the diaphragm with its

pointed tip portion projecting a short distance above the top wall of the casing.

Mounted on the top of the casing 1 just forwardly of the aperture 11 is a flat plate 14 hinged along one edge to swing about a horizontal axis extending transversely of the cleaner body. This hinged plate extends rearwardly and over the aperture 11 with its underside contacting the stud 13 carried by the diaphragm 10. As will presently be pointed out, the upper surface of the plate 14 is polished to form a mirror-like surface, but for the present further details of its mounting will be considered: A bracket 15 of L-section is suitably anchored as by rivets to the top surface of the casing 1 and is provided with upturned ears 15a to support a bearing pin 16 for the plate 14, as clearly shown in Figure 2. The plate 14 has tubular portions 14a along its hinged edge surrounding the pin which has its central portion exposed to accommodate a coiled torsion spring 17 having one end bearing against the top face of the plate 14 and the other end extending rearwardly and upwardly to engage one of a series of stepped notches 15b cut in the edge of the upstanding portion of the L-shaped bracket 15. These notches correspond to varying angular positions of the adjustable end portion of the torsion spring 17 so that by shifting said end from one notch to another serves to vary the tension exerted by the torsion spring upon the plate 14. And finally, a pair of stop members 18, 18 mounted upon the bracket 15 extend upwardly and over the tubular bearing portions 14a of the plate 14 with their forward ends terminating a short distance above the normal horizontal plane of the plate 14. As clearly shown in Figure 1, these stop members serve to limit the swinging movement of the plate 14 in an upward direction from its normal horizontal position, it being apparent that the extreme angle of displacement of the plate 14 is limited to the somewhat limited displacement of the diaphragm 10.

Now, bearing in mind that the upper surface of the plate 14 is a light-reflecting surface, it will next be observed that immediately above the lamp 8 and supported against the inner surface of the dome-like cover 7 is a stationary reflector 19 inclined at an angle of approximately 45°. Directly to the rear of the reflector 19 and located just above the rear portion of the motor 6 is a second stationary reflector 20 mounted on the underside of the top wall of the cover 7, this second reflector being inclined at an angle such that the light reflected from the first stationary reflector 19 is directed in a downward and rearward direction upon the hinged mirror or reflecting plate 14. In other words, the light emanating from the lamp 8 is reflected rearwardly and downwardly upon the mirror surface of the plate 14, as indicated by the direction arrows.

As a practical matter, it may be desirable to concentrate the light from the lamp 8 into a beam in order to intensify the ultimate signal made visible to the operator and for this purpose, a semi-spherical reflector or shield 21 is preferably fitted over the tip end of lamp 8, the central portion of this shield having the form of a tubular extension in which a small lens 22 is fitted. In this way the light from the lamp is transmitted from one reflector to the other as a beam of appreciable intensity.

And finally, located above and in vertical alignment with the central portion of the reflecting plate 14 is a window or aperture 23

formed in the top wall of the cover 7, said window being preferably closed by a suitable translucent panel 24 and preferably surrounded by a depending annular skirt or wall section 23a in order to narrow the field visible through the window.

The operation of the signal device is quite obvious from the foregoing description, it being apparent first of all, that the beam of light reflected rearwardly and downwardly from the headlight strikes the mirrored surface of the plate 14 which is angularly adjustable through a relatively small angle by the displacement of the diaphragm. Thus, assuming that the pressure within the outlet passage is normal therefore insufficient to distort the diaphragm 10, the hinged reflector plate remains in a horizontal position, as shown in full lines in Figure 1 and as a consequence, the beam of light striking its surface is reflected therefrom, but since the angle of reflection is equal to the angle of incident, the reflected beam strikes the inner surface of the cover 7 somewhere rearwardly of the window 23, as shown by the full line arrows.

But now assuming that the dirt bag becomes filled with dirt to such an extent that the increasing bag pressure causes the diaphragm to respond, the accompanying distortion is followed by the vertical displacement of the stud 13 and the angular displacement of the hinged reflector plate 14. And finally, when the bag pressure has increased to a point such that the emptying of the bag is necessary, the reflector plate assumes its maximum position of angularity and in this position the reflected beam from the headlight is reflected in a direct vertical line through the window 23 and becomes visible to the operator, who recognizing the meaning of the signal, will then know that the bag should be emptied without further delay.

Thus it follows that the reflected beam is only visible under conditions that require immediate attention to the bag; under other and normal operating conditions no signal being visible.

Having set forth a preferred embodiment of the improved bag pressure indicating device,

I claim:

1. An operating condition indicator for a suction cleaner, comprising a pressure-responsive element subject to pressure changes in the suction-creating system of said cleaner, a reflector mounted for angular adjustment on the body of the cleaner and having operative connection with said pressure-responsive element, an enclosure for said reflector having an aperture through which light reflected from said reflector may be visible from above, and a source of light within said enclosure and adapted to have the light therefrom projected upon said reflector and thence through said aperture for certain angular positions of said reflector under predetermined pressure conditions in said suction system to indicate one condition of said cleaner, the arrangement of said aperture and the adjustability of said reflector being such that another condition of said cleaner is indicated when light reflected from said reflector fails to pass through said aperture.

2. An operating condition indicator for a suction cleaner, comprising a pressure-responsive element mounted for exposure to pressure variations in the suction system of said cleaner, a signal member pivotally mounted on the body of said cleaner in operative connection with said pressure-responsive element and having a light-reflecting surface an enclosure for said signal

member, a source of light within said enclosure, and means for directing the light from said source onto the reflecting surface of said signal member, said enclosure having an aperture with which the beam of light from said reflecting surface registers when said signal member is angularly displaced under predetermined pressure conditions in said suction system to indicate one condition of said cleaner, the arrangement of said aperture and the displaceability of said signal member being such that another condition of said cleaner is indicated when light reflected from said reflector fails to register with said aperture.

3. An operating condition indicator for a suction cleaner, comprising a pressure-responsive element subject to pressure variations in the suction-creating system of the cleaner, a reflector mounted on the body of the cleaner for angular displacement and operatively connected with said pressure-responsive element, a cover extending over said reflector and having a relatively small aperture therein, a lamp mounted beneath said cover, and means for directing the rays of light from said lamp onto said reflector to be reflected therefrom at an angle to pass through said aperture for certain angular positions of said reflector under predetermined pressure conditions in said suction-creating system to indicate one condition of said cleaner, another condition of said cleaner being indicated when the angular adjustment of said reflector is such that light fails to pass through said aperture.

4. An operating condition indicator for suction cleaners, comprising a pressure-responsive element subject to pressure variations in the suction-creating system of the cleaner, a reflector operatively connected with said pressure-responsive element and mounted on the cleaner body for angular adjustment, a hood extending over said reflector and having an aperture substantially above said reflector, a lamp mounted beneath said hood, and means for directing a beam of light from said lamp onto said reflector and thence to be reflected upwardly therefrom at an angle to register with said aperture for certain angular positions of said reflector under predetermined pressure conditions in the suction-creating system to indicate one condition of said cleaner, the arrangement of said aperture and the adjustability of said reflector being such that another condition of said cleaner is indicated when

light reflected from said reflector fails to register with said aperture.

5. An operating condition indicator for a suction cleaner, comprising a diaphragm mounted on the cleaner body and responsive to pressure variations in the suction-creating system thereof, a reflector operatively connected with said diaphragm and pivotally mounted on the cleaner body for a limited angular displacement, a hood extending over the top of said cleaner body and enclosing said reflector, said hood having an aperture in its wall positioned substantially above said reflector, a lamp enclosed within said hood, and reflecting elements within said hood for directing a beam of light from said lamp onto said reflector at a relatively acute angle of incidence, whereby the reflected beam of light from said reflector is brought into register with said aperture in angular positions of said reflector corresponding to predetermined pressure conditions within said suction-creating system to indicate one condition of said cleaner, the arrangement of said aperture and the displaceability of said reflector being such that another condition of said cleaner is indicated when light reflected from said reflector fails to register with said aperture.

6. An operating condition indicator for a suction cleaner, comprising a pressure-responsive diaphragm extending over an aperture in the top wall of the exhaust passage of the cleaner, a reflector mounted to rest upon said diaphragm and hinged along one edge of said aperture for a limited angular displacement by said diaphragm, a hood extending over said reflector and having a window in its top wall and above said reflector, a lamp enclosed within said hood remote from said reflector, said hood being provided with reflecting surfaces for directing a beam of light from said lamp to said reflector at a relatively acute angle of incidence, whereby a beam of reflected light registers with said aperture in the angular position of said reflector corresponding to a predetermined increased pressure within said exhaust passage to indicate one condition of said cleaner, the arrangement of said aperture and the displaceability of said reflector being such that another condition of said cleaner is indicated when light reflected from said reflector fails to register with said aperture.

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