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R. S. WATERS

3,333,564

VACUUM BAG INDICATOR

Filed June 28, 1966

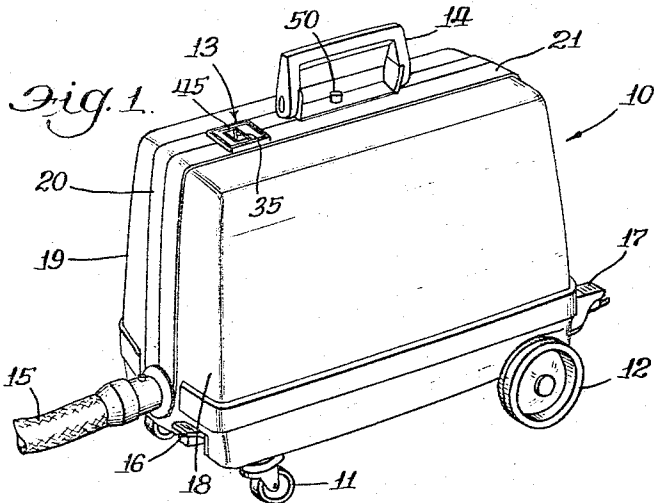


Fig. 2.

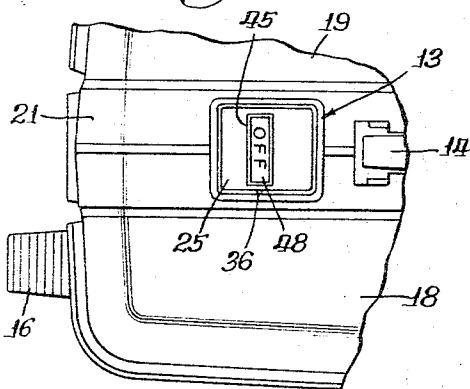


Fig. 3.

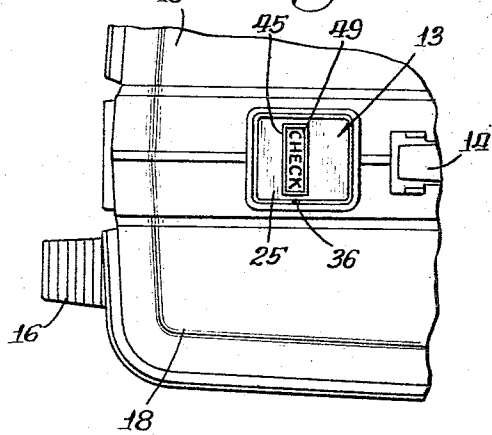


Fig. 4.

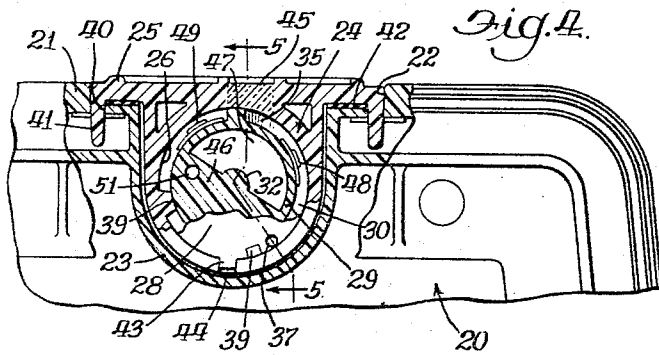


Fig. 5.

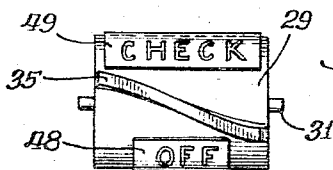
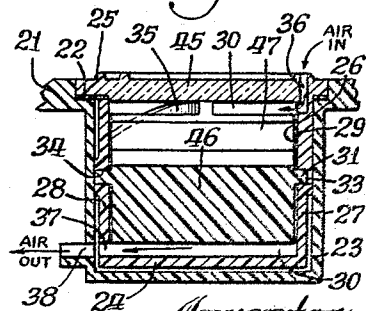


Fig. 6.

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VACUUM BAG INDICATOR

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ABSTRACT OF THE DISCLOSURE

The indicator comprises three plastic pieces. One piece is a drum chamber open at one end and integrally closed at the other. Another piece is a drum rotatably mounted in the drum chamber. The drum chamber and drum have integral vanes formed therein. The open end of the drum chamber is closed by the third piece which is removable. The drum is rotatably supported in the drum chamber by integral bearing portions formed at opposite ends of the drum and bearing apertures formed in the integrally closed end portion of the drum chamber and in the removable third piece.

This invention relates to a vacuum bag indicator, and more particularly, to an improved vacuum bag indicator for indicating the fill condition of a dust collecting bag for a vacuum cleaner.

It is an object of this invention to provide an improved vacuum bag indicator having a minimum number of parts which may be readily fabricated and assembled to provide a low cost vacuum bag indicator.

In the preferred form of the invention the vacuum bag indicator essentially comprises three single piece members constructed from a plastic molding material. One of the pieces comprises a housing having an integral mounting plate and drum chamber. One end of the drum chamber is integrally closed. Another piece comprises a rotatable indicator drum positioned inside the drum chamber. The third piece comprises an end closure disc for closing the open end of the drum chamber and providing a bearing support for the corresponding end of the rotatable drum. All the necessary detailed parts of the vacuum bag indicator such as the vanes for rotating the drum and the window for observing the position of the drum are integrally formed on these main three pieces.

The features of the invention which are believed to be novel are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying single sheet of drawing in which:

FIG. 1 is a perspective view of a portable vacuum cleaner employing the vacuum bag indicator of the invention;

FIG. 2 is a broken away top plan view of the left-hand corner portion of FIG. 1 showing the indicator in off position;

FIG. 3 is a view similar to that of FIG. 2 showing the check position of the indicator;

FIG. 4 is a broken away side elevation view of the vacuum bag indicator;

FIG. 5 is a sectional view taken along the section line 5—5 of FIG. 4; and

FIG. 6 is an elevation view of the indicator drum of the vacuum bag indicator.

Referring now to the drawings, and more particularly to FIG. 1, shown therein is a vacuum cleaner employing the invention. The details of the vacuum cleaner are fully described and claimed in pending Julius P. Wied patent application Serial No. 557,412 filed June 14, 1966, and assigned to the same assignee as the instant patent application. The vacuum cleaner comprises a housing 10 sup-

ported on a pair of front wheels 11 and rear wheels 12. The vacuum bag indicator which is referred to generally by reference numeral 13 is mounted on the top of the housing 10 adjacent to the front end thereof. The top of housing 10 has a carrying handle 14. A vacuum cleaner hose 15 is adapted to be connected to the suction side of the vacuum cleaner at the lower front end thereof. A foot operated control 16 for energizing and de-energizing the vacuum cleaner is mounted on the housing 10 adjacent to the connection of the hose 15 to the housing. At its rear end the housing 10 is provided with a foot operated cord release 17. The vacuum cleaner has a not shown cord reel mechanism inside the housing 10. The electric extension cord for the vacuum cleaner is stored on this cord reel mechanism and is intended to be withdrawn from inside housing 10 at the rear end thereof adjacent to foot operated control 17. The control 17 holds the electric extension cord in withdrawn position and also releases it for rewinding on the cord reel mechanism.

The housing 10 comprises a pair of metallic shells or pans 18 and 19, and an intermediate single piece plastic molding material centerframe 20. The centerframe 20 has a peripheral flange 21, see also FIGS. 4 and 5, which is positioned between the peripheral edges of the shells 18 and 19 to provide a continuous molding about the vacuum cleaner housing between the two shells, as is more particularly described in the mentioned pending Julius P. Wied patent application, the single piece plastic centerframe 20 mounts or supports essentially all the internal working parts of the vacuum cleaner inside the housing 10. The vacuum bag indicator 13 is also mounted in or supported on the centerframe 20, and more particularly, the vacuum bag indicator 13 is mounted in the flange portion 21 thereof. The flange 21 is provided with a shouldered opening 22. Positioned beneath the opening 22 and integrally formed with the centerframe flange 21 is a generally cylindrical closed recess or chamber 23. The vacuum bag indicator 13 is removably mounted or nested in the shouldered opening 22 and the recess 23.

The indicator comprises a housing 24 constructed from plastic molding material. It has a top mounting plate 25 and an underlying integrally formed cylindrical drum chamber 26. The axis of drum chamber 26 is parallel to the plate 25. One end of the drum chamber 26 is closed by an integral end wall 27. The other end of the drum chamber 26 is open and closed by a disc 28. A rotatable cylindrical indicator drum 29 is positioned in the drum chamber 26. It is circumferentially spaced from the interior of the drum chamber 26 by an annular space 30. The drum 29 is rotatably mounted in the central portions of the end wall 27 and the disc 28 by a pair of trunnions 31 formed on opposite ends of the drum 29. The trunnions 31 are integrally formed on a hub portion 32 of the drum. The trunnions 31 are received in apertures 33 and 34 formed respectively in the end wall 27 and the disc 28.

The drum 29 has an integrally formed vane 35 for rotating the drum by air flow. The vane 35 extends lengthwise of the drum with a slight helical or spiral curvature. The plate 25 has an air inlet opening 36, and the disc 28 is provided with an air outlet opening 37. The openings 36 and 37 are positioned on diametrically opposite sides of the drum. The vane 35 is positioned between the openings 36 and 37 on one side of the annular space 30. An air outlet opening 38 is also formed in one end of the recess 23. Opening 38 is in alignment with the opening 37. One or more fixed straight vanes 39 are formed integrally on the interior of the drum chamber 26. These vanes 39 extend lengthwise of the drum chamber 26 and are positioned between the air openings 36 and 37 on the side of annular space 30 diametrically opposite to the side thereof in which the movable vane 35 is positioned.

As will be obvious to those skilled in the art, the vacuum cleaner contains a not shown motor driven fan or blower for purposes of creating a vacuum or suction pressure. The recess 23 depends into the vacuum or suction chamber of the vacuum cleaner which contains the not shown air permeable dust collecting vacuum cleaner filter bag. The air outlet opening 38 exhausts into the vacuum bag compartment. Accordingly, when the blower or fan is operating atmospheric air will enter through the opening 36 into the drum chamber 26. The incoming air will not be able to escape through the annular space 30 and aligned air outlet openings 37 and 38 in a counterclockwise direction when viewing FIG. 4 by virtue of the fixed vanes 39. Instead the incoming air will have to move out of the drum chamber 26 in a clockwise direction past the movable spiral vane 35 on the drum 29. This movement of the air will cause vane 35 to move in a clockwise direction which results in rotation of the drum 29 also in a clockwise direction.

The vacuum bag indicator 13 is sealingly nested in the centerframe flange 21. The shouldered opening 22 has a pair of notches 40. These notches 40 are adapted to receive a pair of depending lugs 41 intergrally formed on the mounting plate 25. The peripheral portions of the mounting plate 25 overhang or overlie the peripheral portions of the shouldered opening 22. An air sealing ring or gasket 42 is disposed between the overlying edges of the plate 25 and opening 22 to air seal the recess 23 from the atmosphere. When the vacuum bag indicator is assembled into position the mounting plate 25 is nested in the shouldered opening 22 and the drum chamber 26 is nested in the recess 23.

The air outlet opening 37 is properly aligned with respect to the vane 35 and the air inlet opening 36 by a lug 43 formed on a peripheral portion of the disc 28 and a notch 44 formed in the peripheral portion of the drum chamber 26 at the open end thereof. The lug or tab 43 is receivable in the notch or groove 44 so that the air outlet opening 37 formed in the disc 28 can be positioned only in its single illustrated correct location. The air outlet opening 37 is formed in the peripheral portion of disc 28 in alignment with the annular air space 30. The air inlet opening 37 formed in the mounting plate 25 opens into the annular air space 30.

The mounting plate 25 has a window 45 formed therein for purposes of observing the position of the indicating drum 29 from about the vacuum cleaner. Preferably, the housing 24 is constructed from a transparent or clear plastic molding material so as to integrally provide the window 45 in the mounting plate 25. The part of mounting plate 25 aside from the window 45 may be suitably masked by a paint coating or the like. The indicating drum 29 is preferably provided with an integral counterweight. By viewing FIG. 4 it will be seen that the bottom half of the drum 29 comprises a solid portion 46, whereas the other half, thereof, 47 is hollow. The solid half 46 comprises an integral counterweight on the drum 29 for purposes of automatically returning it to the position it is supposed to assume when the suction fan or blower of the vacuum cleaner is de-energized. The counterweight 46 and the hub 32 are integral with each other and the trunnions 31 are formed at opposite ends of the hub 32. The means 31, 33, 34 for rotatably mounting the drum 29 in the drum chamber 26 are aligned with the lengthwise axis of the drum and the drum chamber 26.

It will be observed that the air which enters the drum chamber actually flows through the air opening or passageway 36 into the annular space 30 in a direction which is generally parallel to the axis of the drum. The movable vane 35 is curved clockwise of the drum starting from its left hand or exhaust side. Therefore, the incoming air is directed against the vane 35 to give it a thrust component to cause it to rotate clockwise. The two fixed vanes 39 are positioned on opposite sides and relative to the movable vane 35 to act as stops for the

drum to prevent its overtravel in either direction of rotation.

The drum 29 has two indicia or marks 48 and 49 formed thereon on opposite sides of the vane 35. The indicia 48 reads off and the indicia 49 reads check. When FIG. 4 is viewed the off mark 48 is positioned on the right-hand side of vane 35 whereas the check mark 49 is positioned on the left-hand side of vane 35. When the motor driven blower or fan of the vacuum cleaner is de-energized the counterweight 46 will cause the drum 29 to rotate in a counterclockwise direction to position the off mark 48 opposite to the window 45. When the vacuum cleaner is turned on, assuming that the vacuum bag thereof is empty or not overfilled, the air incoming into the drum chamber 26 through the air inlet opening 36 will be insufficient to rotate the drum 29 in a clockwise direction so as to position the check mark 49 opposite to the window 45. However, the incoming rush of air or resulting air pressure behind the vane 35 will be sufficient to cause the drum 29 to rotate slightly in a clockwise direction to remove the off mark 48 from opposite to the window opening 45. This position of the parts is illustrated in FIG. 4. In this position of the drum 29, neither of the indicia 48 or 49 is visible through the window 45. Disappearance of the off mark 48 from the window 45 tells the vacuum cleaner user that the vacuum bag indicator 13 is operative. Therefore, the vacuum bag indicator provides a means or mode of operation for checking its own operability. If the vacuum cleaner hose 15 becomes clogged or the vacuum cleaner bag becomes filled, the suction pressure inside the vacuum bag chamber surrounding the recess 23 is appreciably increased. This change in pressure differential between the inside of the vacuum cleaner and the atmosphere results in an increased rush of air into the drum chamber 26. This increased rush of air or increase in pressure differential results in the vane 35 rotating the drum 29 an additional amount in a clockwise direction to position the check mark 49 opposite the window 45. The location of the check mark 49 opposite to window 45 tells the vacuum cleaner user to check the vacuum cleaner for obstructions in the air flow path thereof including the fill condition of the vacuum bag. The vacuum cleaner housing 10 can be opened for this purpose by operating a latch button 50 positioned on the flange 21 beneath the handle 14. If the vacuum cleaner is free of obstructions except for a sudden impediment or obstruction in the hose 15, the indicator drum 29 will immediately rotate in a clockwise direction to position the check mark 49 opposite to the window 45. However, if the obstruction is due to a gradual filling or build up of dirt in the vacuum cleaner bag, the movement of the indicator drum 29 in a clockwise direction will be a gradual one. In other words, as the vacuum bag is being slowly filled or approaching its full condition the check mark will move opposite to the window slowly. Gradually appearance of the check mark 49 adjacent to the window 45 is an advance notice or warning that the vacuum cleaner bag will soon have to be replaced with a clean or empty one. Therefore, the vacuum bag indicator also serves as a means of informing the vacuum cleaner user the extent to which the vacuum cleaner bag may be approaching its full condition.

It will now be seen that the invention provides an improved and low-cost vacuum bag indicator since a minimum number of parts are utilized and the necessary minimal number of parts may be readily fabricated by plastic molding operations and then readily assembled together into an operative vacuum bag indicator mechanism. The mechanism is also easy to service and adjust. For example, it is readily removable and disassembled. The device is removable by withdrawing it from its nested position in the centerframe flange 21. It is disassembled by withdrawing the disc 28 from the open end of the drum chamber 26, after which the drum 29 itself may be with-

drawn from the drum chamber. The mechanism can be readily adjusted by virtue of the integral counterweight 46. The counterweight 46 is provided with one or more lengthwise extending holes or passageways 51. If the weight of the solid portion 46 needs to be reduced for proper adjustment of the device then additional openings 51 can be cut into the solid portion 46. If the weight needs to be increased, this can be accomplished by positioning some additional material such as slugs of lead in the passageway 51. Therefore, although the invention is advantageously suitable for use with the vacuum cleaner illustrated in FIG. 1 and more particularly described in the pending Julius P. Wied patent application it is not necessarily restricted thereto. The invention may also be used in vacuum cleaner constructions having different details and different horsepower ratings.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and that it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A three piece vacuum bag indicator, comprising a housing, a rotatable drum inside said housing, and a closure disc for one end of said housing and drum, said housing comprising a single piece plastic molding material member, said housing having a top horizontal mounting plate and an integral underlying cylindrical drum chamber, said drum chamber having its axis disposed parallel to said plate, one end of said drum chamber being closed by an end wall integral with said drum chamber, the other end of said drum chamber being open, said drum comprising a single piece plastic molding material member and being located in said drum chamber, said closure disc being positioned in the open end of said drum chamber and adjacent one end of said drum, bearing means formed at opposite ends of said drum and in said end wall and disc in alignment with the axis of said drum chamber for rotatably mounting said drum inside said drum chamber, a window formed in said mounting plate to make said drum visible from above said mounting plate, an air vane integrally formed on said drum for rotating the same by air flow, an air inlet opening to said drum chamber formed in said mounting plate, an air outlet opening for said drum chamber formed on said closure disc in a peripheral portion thereof, said openings being positioned along diametrically opposite sides of said drum, said drum being radially spaced inwardly from the interior of said drum chamber forming an annular space therebetween, said openings being in communication with said annular space by being aligned therewith, said vane being positioned in said annular space on one side thereof and circumferentially between said openings, and at least one fixed vane integrally formed on the interior of said drum chamber, said fixed vane being located in said annular space and circumferentially between said openings on the diametrically opposite side of said space.

2. In an indicator as in claim 1, said housing being constructed from transparent plastic molding material whereby said window is integrally formed in said mounting plate, said bearing means comprising bearing trunnions formed at opposite ends of said drum and trunnion receiving apertures formed in the central portions of said end wall and closure disc, and the peripheral portions of said closure disc and the open end of said drum chamber having a lug and notch formed therein which are adapted to be registered with respect to each other to properly position said air outlet opening with respect to said air inlet opening, and indicia formed on said drum which is visible through said window.

3. In an indicator as in claim 1, said indicator being mounted in a plastic centerframe member of a vacuum

cleaner casing comprising said centerframe and two metallic shells, said centerframe including an integral peripheral flange positioned between the peripheral portions of said shells, an opening formed in said flange, a closed cylindrical recess integrally formed on said centerframe beneath said flange opening, said indicator being positioned in said recess with the peripheral edges of said mounting plate overlying the peripheral edges of said flange opening, a sealing gasket positioned between said overlying peripheral edges, said recess depending from said flange into a vacuum bag compartment of said cleaner casing, and another air outlet opening, said another air outlet opening being formed in one end of said recess in alignment with the air outlet opening formed in said closure disc.

4. In an indicator as in claim 3, said flange opening being defined by a shoulder formed in said flange about said flange opening, a pair of notches formed in said shoulder on opposite sides of said flange opening, a pair of depending lugs integrally formed on opposite ends of said mounting plate, said mounting plate being received in said shoulder and said pair of lugs being received in said pair of notches to removably nest said indicator in said recess, and an integral counterweight formed on said drum, said drum being hollow in the half thereof adjacent to its vane and the other half thereof being solid, said solid half comprising said integral counterweight, said drum having a central hub, said hub being integrally formed on said solid half, and said trunnions being formed on opposite ends of said hub.

5. A three piece vacuum bag indicator, comprising a drum housing, a rotatable drum inside said housing, and a removable end closure wall for one end of said housing, said housing comprising a single piece plastic molding material member having a cylindrical drum chamber formed therein, one end of said drum chamber being closed by an integral end wall, the other end of said drum chamber being open, said drum comprising a single piece plastic molding material member and being located in said drum chamber, said removable end closure wall being positioned at the open end of said drum chamber, bearing means formed at opposite ends of said drum and in said end walls in alignment with the axis of said drum chamber for rotatably mounting said drum inside said drum chamber, an air vane integrally formed on said drum for rotating the same, air inlet and outlet openings to said drum chamber, said air openings being formed on generally diametrically opposite sides of said drum, said drum being radially spaced from the interior of said drum chamber by an annular space, said air openings being in communication with said annular space, said vane being positioned in said annular space on one side thereof circumferentially between said air openings, and at least one fixed vane integrally formed on the interior of said drum chamber, said fixed vane being located in said annular space circumferentially between said air openings and on the other side of said annular space.

6. In an indicator as in claim 5, an integral mounting portion formed on said housing, said air inlet opening being formed in said mounting portion, said air outlet opening being formed in one of said end walls, a window formed in said mounting portion, said window comprising an integral part of said mounting portion, and indicia formed on said drum visible through said window.

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LOUIS J. CAPOZI, *Primary Examiner.*