

- [54] **SELF-SEALING END CLOSURE FOR DISPOSABLE DUST BAG**
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- [22] Filed: **Nov. 6, 1969**
- [21] Appl. No.: **871,639**

**Related U.S. Application Data**

- [63] Continuation of Ser. No. 690,490, Dec. 14, 1967, abandoned.

**Foreign Application Priority Data**

- Dec. 26, 1966 Sweden .....1730/66
- [52] U.S. Cl. ....55/367, 16/74, 16/150, 49/386, 55/377, 55/378, 55/507, 137/525.3, 137/527, 220/24 R, 220/35, 229/62.5, 251/303, 285/7
- [51] Int. Cl. ....B01d 46/02
- [58] Field of Search .....55/507; 137/527; 16/74, 150; 49/386; 251/303

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**[57] ABSTRACT**

A self-sealing end closure for a disposable paper dust bag having superimposed outer and inner cardboard sheets, the inner sheet having an opening and tongues cut therefrom for holding one or more elongated rubber strips which are substantially in the plane of the inner sheet, and the outer sheet having a plurality of triangular-shaped flaps cut therefrom which overlie the inner sheet at the opening therein with their apices located approximately at the center of such opening. The flaps are forcibly swung about several fold lines in the outer sheet through the opening in the inner sheet by a tubular member through which dust-laden air is conducted into the paper dust bag, the flaps moving inward to provide a hole in the end closure, the material of the end closure defining the hole receiving the tubular member. The one or more elongated rubber strips resist inward movement of the flaps and resiliently hold the flaps against the tubular member to provide a substantially air-tight seal between these parts with first flap portions substantially in their entirety bearing against the outer surface of the tubular member and with second flap portions, which extend radially outward from the first flap portions, inclined to the plane of the plate by the action of a sealing gasket on the tubular member. When the tubular member is withdrawn from the end closure, the elongated rubber strips, which overlie the inner faces of the flaps, urge the flaps into the plane of the outer sheet to close the hole and effect self-sealing of the end closure.

**5 Claims, 8 Drawing Figures**

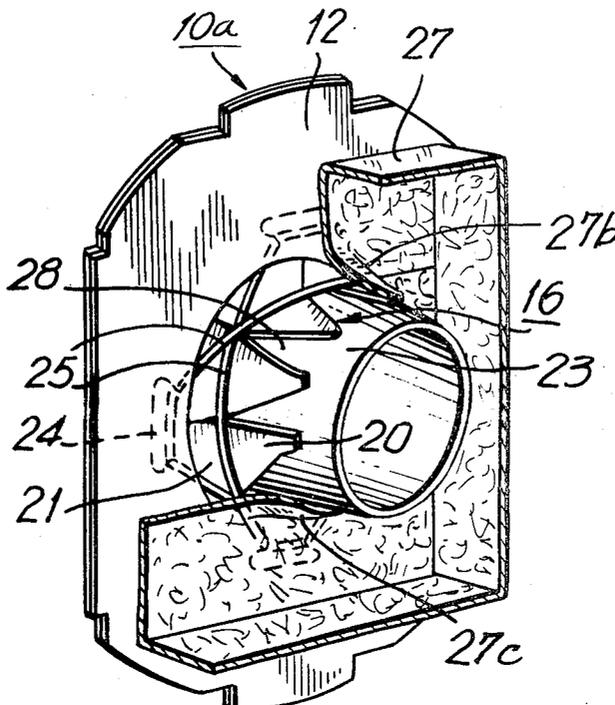


FIG. 1

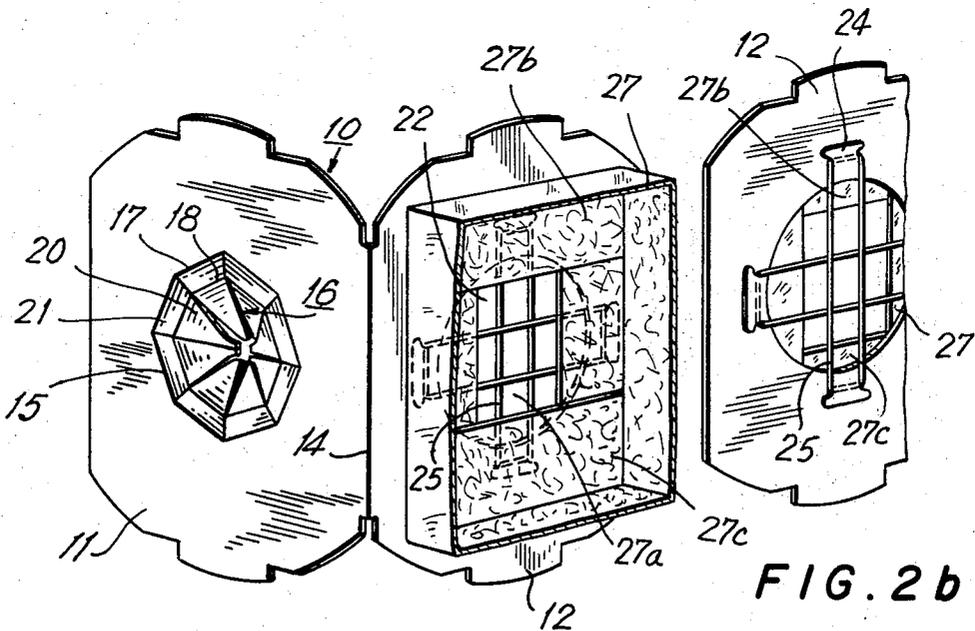
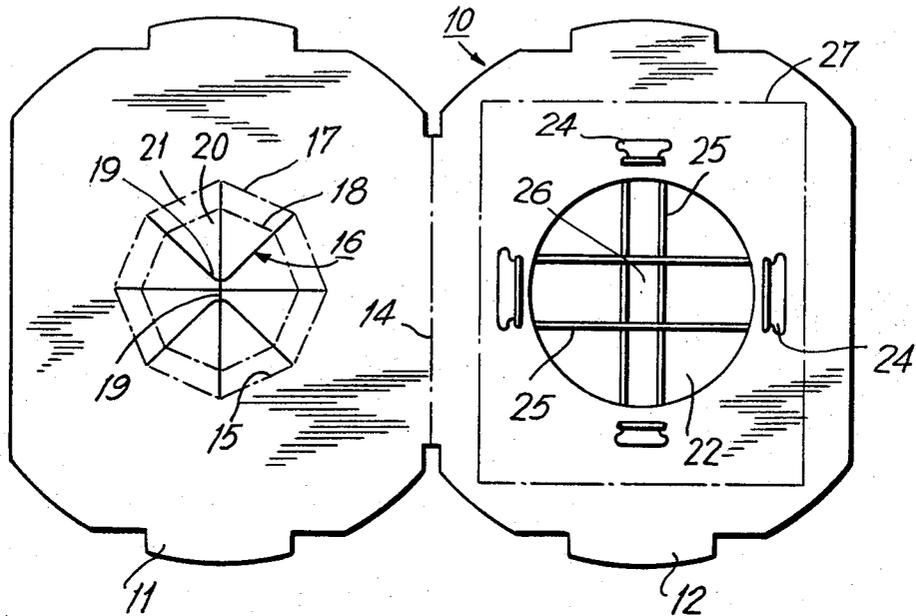


FIG. 2a

FIG. 2b

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FIG. 3

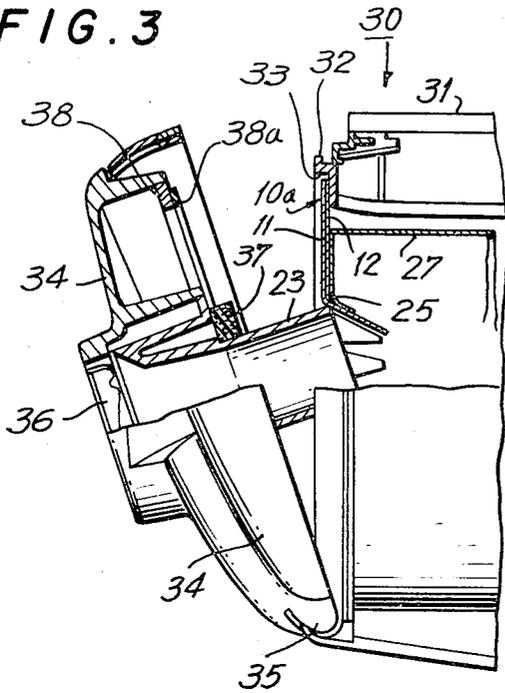


FIG. 3a

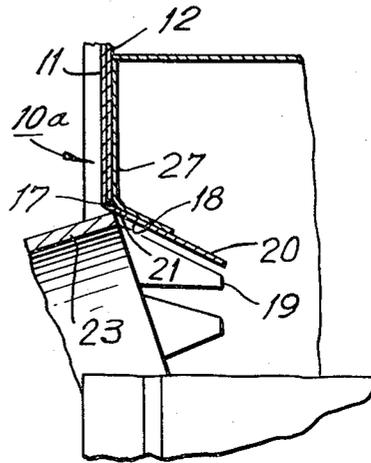


FIG. 4

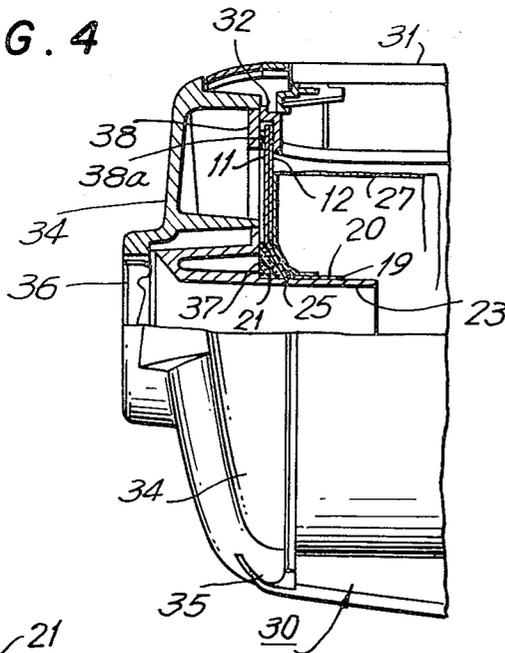


FIG. 5

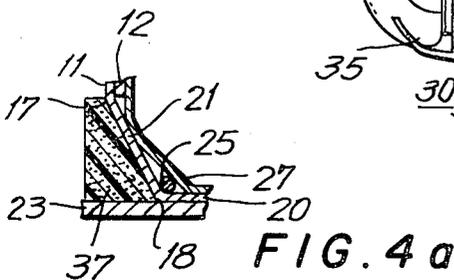
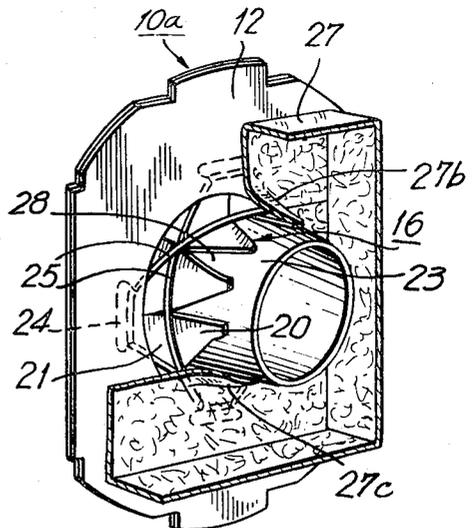


FIG. 4a

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## SELF-SEALING END CLOSURE FOR DISPOSABLE DUST BAG

This application is a continuation of application Ser. No. 690,490, filed Dec. 14, 1967, now abandoned.

### BRIEF SUMMARY OF THE INVENTION

My invention relates to disposable dust bags for vacuum cleaners and more particularly to an end closure for such a dust bag which is substantially self-sealing.

Disposable dust bags are well known and usually comprise a paper bag which is permeable to air and has its open end fixed to an end closure which may be formed of material like cardboard, for example. The end closure has a hole into which a tubular member of the vacuum cleaner can be introduced for flowing dust-laden air into the paper bag. When the tubular member is withdrawn from the end closure, the latter usually is constructed so that it will be self-sealing and retain the dust and dirt collected in the paper bag. In addition, the end closure of the self-sealing dust bag should provide a substantially air-tight seal about the tubular member when the latter extends through the hole in the end closure.

Since disposable dust bags are only used once and are discarded when filled with dust and dirt, it is desirable to provide dust bags of this kind that are inexpensive to manufacture. Since the end closure forms an important component of a disposable dust bag, it is desirable to provide this component at minimum cost in order to reduce the overall cost of making the dust bag.

It is an object of my invention to provide an end closure for a disposable self-sealing dust bag which is inexpensive to fabricate and will provide a substantially airtight seal when the tubular member for introducing dust-laden air into the dust bag extends through a hole in the end closure and also effectively seals the dust bag when the tubular member is withdrawn from the end closure. I accomplish this by providing an end closure which constitutes a mounting plate having outer and inner faces and is formed with a hole through which is adapted to extend the tubular member for introducing dust-laden air into a dust bag secured to the mounting plate. The mounting plate has a plurality of flaps cut therefrom which, when acted upon by the tubular member, can be forcibly swung about fold lines out of the plane of the plate at its inner face to form the hole. I also provide elongated resilient means which at least partly overlies the flaps at the inner face of the plate and functions to urge the flaps into the plane of the plate to close the hole and also resist movement of the flaps when they are forcibly swung inward from the plane of the plate by the tubular member to provide a substantially air-tight seal between the flaps and the tubular member with first flap portions substantially in their entirety bearing against the outer surface of the tubular member and with second flap portions, which extend radially outward from the first flap portions, inclined to the plane of the plate by the action of a sealing gasket on the tubular member.

The above and other objects and advantages of the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

In the drawing,

FIG. 1 illustrates a substantially self-sealing dust bag end closure embodying my invention in which two superimposed sheets thereof are unfolded;

FIG. 2a is a perspective view of the end closure shown in FIG. 1 in which the two sheets thereof are between their folded and unfolded positions and a paper dust bag, only a part of which is shown, is fixed to one of the sheets;

FIG. 2b is a perspective view of the rear face of the right-hand sheet of the end closure illustrated in FIG. 1 and to which the paper dust bag is adapted to be fixed, as shown in FIG. 2a;

FIG. 3 is a fragmentary axial sectional view of a vacuum cleaner in which is positioned a dust bag having an end closure like that illustrated in FIGS. 1, 2a and 2b, the hinged end cover of the cleaner being shown between its fully open and closed positions;

FIG. 3a is an enlarged fragmentary sectional view of parts shown in FIG. 3 to illustrate details more clearly;

FIG. 4 is a sectional view similar to FIG. 3 with the hinged cover of the cleaner in its closed position and the air inlet tube of the end cover extending through the end closure into the dust bag;

FIG. 4a is an enlarged fragmentary sectional view of parts shown in FIG. 4; and

FIG. 5 is a perspective view, partly in section, of the paper dust bag shown in FIG. 4, the sheets of the end closure being folded and contacting one another.

### DETAILED DESCRIPTION

In accordance with my invention, the end closure 10a illustrated in FIGS. 3 and 3a is fabricated from a blank 10 which is formed from suitable sheet-like material like cardboard, for example, which is generally stiff and yet is flexible to some extent. As seen in FIGS. 1 and 2a, the blank 10 is divided into two integral sheets 11 and 12 by a scored line 14. When the two sheets 11 and 12 are folded on the scored line 14, these sheets form plies which are superimposed and form the end closure 10a. It will be understood that the end closure embodying my invention may, if desired, be formed from a single sheet of material. In the embodiment of FIGS. 1 to 5 being described, the sheets 11 and 12 form the outer and inner faces of the end closure 10a which serves as a mounting plate for a dust bag.

The outer sheet 11 is formed with an opening 15 closed by a plurality of triangular-shaped flaps 16 which are cut from the sheet and at their bases are integrally joined to the sheet at the edge of the opening 15 at fold lines 17 formed by scoring the sheet. While the triangular-shaped flaps 16 can be formed to swing about single fold lines 17, in the preferred embodiment being described I provide second fold lines 18 for the flaps 16 which are radially removed and nearer to the apices 19 of the flaps 16 than the fold lines 17.

It will now be understood that each flap 16 includes the portions 20 and 21 which are movable about the fold lines 18 and 17, respectively. If desired, the apices of the triangular-shaped flaps may be located at substantially the same point and coincide with one another

at the center of the opening in the mounting plate. In such case there is the possibility that the apices of the triangular-shaped flaps may be torn, thereby preventing the flaps from completely sealing and closing the opening. This is avoided in the embodiment shown in FIGS. 1 to 5 and being described by providing the flaps 16 which are cut from the outer sheet 11 in such manner that the apices 19 of the different flaps are removed from one another and located at different regions when they are coplanar with the sheet, as shown in FIG. 1.

The inner sheet 12 is formed with an opening 22 which registers with the opening 15 formed in the outer sheet 11 when the flaps 16 are moved from the plane of the outer sheet, the registered openings 15 and 22 together defining a hole in the end closure 10a, as seen in FIGS. 3 and 3a. The openings 15 and 22 may be of generally circular form or any other suitable shape, such as elliptical in form, for example. Openings 15 and 22 of generally elliptical form are especially suitable when the tubular member 23 like that shown in FIGS. 3 and 3a is angularly moved through an arc toward the end closure 10a so that it will project through the hole formed therein by the registered openings 15 and 22.

The inner sheet 12 is formed with two pairs of tongues 24, the tongues of each pair being diametrically opposite one another about the opening 22. The tongues 24, which are cut out from the inner sheet 11 and are integral therewith, serve as regions at which elongated resilient means can be fixed to the inner sheet. The elongated resilient means is formed from elastomeric material which may comprise any suitable resilient substance such as natural or synthetic rubber or other rubber-like plastics. Thus, the term "rubber" as hereinafter used in the specification is intended to include other rubber-like plastics. As shown in FIGS. 1, 2a and 2b, the elongated resilient means comprises endless rubber bands 25, the sides of which form elongated rubber strips which intersect one another and are fastened to the tongues 24. The straight sides or strips of the intersecting rubber bands 25 define a rectangular-shaped zone 26 at the center of the openings 15 and 22.

When the end closure 10a is being fabricated the tongues 24 can be formed and struck out from the plane of the blank 10 when it is made. After the rubber bands 25 are fastened to the tongues 24, the latter can be pressed into the plane of that part of the blank 10 forming the inner sheet 12. Thereafter, the outer and inner sheets 11 and 12 may be folded together about the scored line 14 and secured together in any suitable manner, as by a suitable adhesive, for example.

As shown in FIG. 2a, the open end 27a of a paper dust bag 27 may be fixed in any suitable manner, as by an adhesive, for example, to that side of the inner sheet 12 which defines the inner face of the end closure or mounting plate 10a. The bag 27 desirably is fixed to the inner sheet 12 so that the bag parts 27b and 27c at the open end 27a partly or entirely cover the opening 22 and the flaps 16. Dust may tend to collect at the gaps 28 between the flaps 16 when the dust bag is being used. The collecting of dust in gaps 28 between the flaps 16, which in and of itself is not too serious, can be prevented by providing a dust bag 27 of the kind just described and shown in FIGS. 2a and 2b.

The manner in which the end closure 10a for the dust bag 27 operates in a vacuum cleaner 30 is shown in FIGS. 3, 3a, 4, 4a and 5. The vacuum cleaner 30 includes a casing 31 having a collar or ring 32 at the open end thereof formed to provide a seat 33 in which the end closure 10a is positioned with the dust bag 27 extending within the casing 31. The open end of the casing is adapted to be closed by an end cover 34 which is hinged at 35 to the casing 31 in any suitable manner (not shown) and movable from a fully open position (not shown) to a partly open position shown in FIG. 3 and from such partly open position to a closed position shown in FIG. 4.

The end cover 34 is formed with an air inlet opening 36 to which a flexible hose (not shown) is adapted to be connected for flowing dust-laden air into the vacuum cleaner 30. The dust-laden air flows from the air inlet opening 36 through the tubular member 23 projecting inward from the end cover 34. The end cover 34 is provided with a collar or ring 37 which functions as a sealing gasket and is disposed about the tubular member 23 and bears against the outer sheet 11 of the end closure 10a when the end cover 34 is in its closed position, as shown in FIGS. 4 and 4a. The ring 37 may be formed of a material like foamed plastic, for example, to provide an air-tight seal at the end closure 10a about the tubular member 23.

Since the tubular member 23 is moved angularly and in an arc about the hinge at 35, it is desirable to provide openings 15 and 22 in the outer and inner sheets 11 and 12, respectively, which are of elliptical shape.

When the end cover 34 is being moved from its open position to its closed position, the inner free end of the tubular member 23 will initially engage the portions 21 of the flaps 16. In order for the flap portions 21 to resist the force applied thereto by the tubular member 23, the bases of the flap portions 21, which are at the fold lines 17, are formed so that they will be comparatively wide. As seen in FIG. 3, the flap portions 20 and 21 of the flaps 16 are initially bent as an entire unit. When the flaps 16 are forcibly swung about the fold lines 17 in the manner just described, the parts 27a and 27b of the dust bag 27, which overlie the opening 22 in the inner sheet 12, will also be forcibly swung into the interior of the bag 27 and overlie the flaps 16, as best seen in FIG. 5.

In FIGS. 4 and 4a it will be seen that the flap portions 21 are inclined to the vertical and forcibly swing inward from the end cover 34, thus causing the fold lines 18 of the flaps to bear against the tubular member 23. The flap portions 21 assume this inclined position responsive to the action of the sealing gasket 37. By providing two fold lines 17 and 18 for the flaps 16, the flap portions 20 in their entirety will bear against the outer surface of the tubular member 23 to provide a good air-tight seal between the flap portions 20 and the tubular member 23.

If the triangular-shaped flaps 16 were only provided with single fold lines 17 and the fold lines 18 were omitted, it would be necessary for the fold lines 17 to bear against the outer surface of the tubular member 23 to provide a good air-tight seal between the flaps and the tubular member. But due to the fact that the free inner end of the tubular member 23 moves through an arc as the end cover 34 is being angularly moved to

its closed position, this end result cannot be realized and an end closure having only the single fold lines 17 cannot be used.

FIG. 5 illustrates the manner in which the end closure 10a functions when viewed from within the dust bag 27. In FIG. 5 it will be clearly evident how the flap portions 20 and 21 and the portions 27b and 27c of the dust bag 27 are disposed about and envelop the tubular member 23. In FIG. 5 it will also be seen how the rubber strips 25 overlies and embrace the flaps 16 when the dust bag 27 is being used in a vacuum cleaner.

As seen in FIG. 4, the end cover 34 may be provided with a ring-shaped rim 38 to which a sealing gasket 38a may be fixed in any suitable manner. The sealing gasket 38a is adapted to bear against the outer peripheral edge of the end closure 10a to provide an air-tight seal between these parts when the end cover 34 is in its closed position, as shown in FIG. 4.

What is claimed is:

1. An end closure for a dust bag comprising
  - a. a mounting plate having outer and inner faces and formed with a hole therein through which a tubular member is adapted to extend, the tubular member having an encircling sealing gasket of annular form adapted to bear against the outer face of the plate,
  - b. said plate having a plurality of flaps cut therefrom which are forcibly swung about fold lines by the tubular member out of the plane of said plate at the inner face thereof to form said hole,
  - c. said flaps being provided with at least two fold lines at different radial distances from the center of said hole to form first flap portions extending radially toward the center of said hole and second flap portions extending radially outward from said first flap portions, and
  - d. elongated resilient means which is fixed to said end closure and at least partly overlies said flaps at the inner face of said plate and functions to urge said flaps into the plane of said plate to close said hole,
  - e. said elongated resilient means also functioning to resist movement of said flaps when forcibly swung inward from the plane of said plate by the tubular member to form a substantially air-tight seal with said first flap portions substantially in their entirety bearing against the outer surface of the tubular member and with the second flap portions inclined to the plane of said plate by the action of the sealing gasket on the tubular member.
2. An end closure for a dust bag as set forth in claim 1 in which said elongated resilient means comprises at least two pairs of intersecting strips of elastomeric material, the region of the inner faces of said first flap portions within the area defined by the intersecting strips being at the vicinity of the center of said hole.
3. An end closure for a dust bag comprising
  - a. a mounting plate having outer and inner faces and formed with a hole therein through which a tubular member is adapted to extend,
  - b. said plate having a plurality of flaps cut therefrom which are adapted to be forcibly swung about fold lines by the tubular member out of the plane of said plate at the inner face thereof to form said hole,

- c. said flaps being provided with at least two fold lines at different radial distances from the center of said hole to form first flap portions extending radially toward the center of said hole and second flap portions extending radially outward from said first flap portions,
- d. elongated resilient means which is fixed to said end closure and at least partly overlies said flaps at the inner face of said plate and functions to urge said flaps into the plane of said plate to close said hole, and
- e. said elongated resilient means also functioning to resist movement of said flaps when adapted to be forcibly swung inward from the plane of said plate by the tubular member to enable said first flap portions in the open position of said flaps to assume a first angular position with respect to the plane of said mounting plate at one zone adjacent to the outer surface of the tubular member and to enable said second flap portions in the open position of said flaps to assume a second smaller angular position with respect to the plane of said mounting plate at another zone extending from the outer surface of the tubular member.
4. An end closure for a dust bag comprising
  - a. a mounting plate having outer and inner faces,
  - b. said mounting plate having a plurality of flaps which are cut therefrom and pivotally movable into an open position about fold lines out of the plane of said mounting plate at the inner face thereof,
  - c. said flaps in the plane of said mounting plate being in a closed position and in the open position forming a hole in said mounting plate,
  - d. said flaps being provided with at least two fold lines at different radial distances from the center of said hole to form first flap portions extending radially toward the center of said hole and second flap portions extending radially outward from said first flap portions,
  - e. elongated resilient means which is fixed to said end closure and at least partly overlies said flaps at the inner face of said mounting plate and functions to urge said flaps into the plane of said plate to close said hole, and
  - f. said elongated resilient means also functioning to resist movement of said flaps when pivotally moved into the open position out of the plane of said mounting plate at the inner face thereof to enable said first flap portions in the open position of said flaps to assume a first angular position with respect to the plane of said mounting plate and said second flap portions in the open position of said flaps to assume a second smaller angular position with respect to the plane of said mounting plate.
5. An end closure for a dust bag comprising
  - a. a mounting plate comprising superimposed outer and inner sheets, said outer sheet having a surface defining the outer face of said mounting plate and said inner sheet having a surface defining the inner face of said mounting plate,
  - b. said inner sheet having an opening,
  - c. said outer sheet having a plurality of flaps which are integral therewith and cut therefrom and

pivotally movable into an open position about fold lines out of the plane of said mounting plate at the inner face thereof,

- d. said flaps in a closed position in the plane of said outer sheet closing the opening in said inner sheet and in the open position forming a hole in said mounting plate defined by the opening in said inner sheet and said flaps in the open position, 5
- e. said flaps being provided with at least two fold lines at different radial distances from the center of said hole to form first flap portions extending radially toward the center of said hole and second flap portions extending radially outward from said first flap portions, 10
- f. an elongated endless band of elastomeric material, 15
- g. one of said sheets having a plurality of tongues which are cut therefrom and integral therewith,

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- h. said endless band being looped over said tongues of said one sheet to fix said band thereto and at least partly overlying said flaps at the inner surface of said outer sheet and functioning to urge said flaps into the closed position, and
- i. said endless band also functioning to resist movement of said flaps when pivotally moved into the open position out of the plane of said mounting plate at the inner face thereof to enable said first flap portions in the open position of said flaps to assume a first angular position with respect to the plane of said mounting plate and said second flap portions in the open position of said flaps to assume a second smaller angular position with respect to the plane of said mounting plate.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,724,179 Dated April 3, 1969

Inventor(s) Karl Eric Leinfelt

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet item [30], before "Sweden",  
"December 26, 1966" should be -- December 16, 1966--;  
and after "Sweden" "1730/66" should be -- 17301/66 --.

Signed and sealed this 26th day of March 1974.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents