SELF-CLOSING DUST VALVE FOR A DISPOSABLE VACUUM CLEANER BAG

Filed Mar. 16, 1967, Ser. No. 623,738
11 Claims. (Cl. 229—62.5)

ABSTRACT OF THE DISCLOSURE

A rigid end plate structure for a disposable paper vacuum cleaner dust bag having a self closing dust valve. The end plate includes two sheets of thin flexible and resilient plastic coated paperboard and heat sealed together around their edges. Each sheet is provided with a number of equally spaced apart slits extending radially outwardly from a common center an equal distance to provide a number of flexible and resilient triangular closure flaps encircling the center. The slits in one sheet are located half-way between the slits in the other sheet so that the closure flaps of one sheet are positioned half-way between the closure flaps of the other sheet in dust sealing relationship.

BACKGROUND OF THE INVENTION

1. Field of the invention

The invention is in the general field of automatically operable closing devices, such as, for example, of the type employed to close cans, cartons and bags. Such automatic closing devices are particularly useful when employed on containers for refuse such as garbage since they automatically seal off the contents which may be objectionably odorous. They also exclude houseflies and other insects from access to the contents which slits in preventing the spread of diseases.

The invention has specific application as a self sealing closure or valve for preventing the leakage of dust from the new disposable vacuum cleaner dust bags that are now so popular and widely used.

2. Description of the prior art

With the advent of the new disposable type of paper vacuum cleaner bags it was quickly recognized that an inexpensive and practical valve means was necessary to prevent dust from leaking from the bag through the dust entrance opening while the filled bag was being carried to the garbage can by the housewife.

Although prior patents disclose various ways of providing a dust valve, such valves have not been entirely satisfactory for one reason or another. Some are too expensive, others are not dust proof, and still others do not operate reliably.

One prior art device employs a rubber diaphragm having a slit in the center. The vacuum cleaner discharge nozzle passes through the slit in the diaphragm by stretching the rubber around the slit until the nozzle is accepted. When the bag is full it is pulled from the nozzle and the slit in the diaphragm returns to its normal small size due to the elasticity of the rubber. The slit is tight enough so that very little dirt can leak from the bag.

Another device employs a disc made of relatively thick foam rubber. The disc is provided with central slits that cross at their mid points. The slits are at right angles to each other so as to provide four triangular flaps. When the vacuum cleaner discharge nozzle is thrust through the slits the triangular flaps flex and ride over the nozzle. Upon removal of the filled bag the triangular flaps resiliently move back into the plane of the disc to their original positions. Since the slits between the flaps are thin line slits there is little space for the dust in the bag to sift through.

Although the just described prior art devices have some merit they are relatively expensive to manufacture in that they employ rubber in their construction which is a rather expensive material. Furthermore, rubber is difficult to handle during manufacturing operations which further adds to the cost of manufacture.

With such a disposable product the price to the consumer has to be attractive in order to achieve the high production volume necessary to warrant the purchase of high speed production machinery with its attendant further cost reducing potential. With cost and high volume production being so related it will be apparent that even very small savings per article become very important achievements often requiring a high degree of inventive skill to effect.

Since the valve construction of the present invention does not require the use of a highly elastic material such as rubber in its construction or an equivalently high priced material it is very inexpensive to manufacture and an advance in the art in this respect.

In order to achieve economy, the prior art proposed to construct a device as immediately above described but instead of using foam rubber for the disc in the crossed slits were made, paper or paperboard was instead employed. The crossed slits were similarly cut in the paper or paperboard to form the four triangularly shaped flaps. Although such a construction is indeed inexpensive, it failed to prevent the dust from easily seeping out through the slits due to the difficulty in getting the paper or paperboard flaps to reliably return to their original co-planar relationship after use in the vacuum cleaner. If the flaps are not in co-planar relationship, there will be relatively large spaces existing between the flaps through which dust will easily sift.

One prior art proposal to overcome the above difficulty employed two closely superposed layers of paper with each layer having a pair of crossed slits and being partly cut away so as to form closure flaps of generally trapezoidal configuration. The slits of the one layer were offset with respect to the slits of the other layer so as to form serpentine paths through which the dust could not easily sift.

This construction had two disadvantages that have been overcome in the present invention. One disadvantage was that when the bag was removed from the vacuum cleaner discharge nozzle, the closure flaps did not return to their previous initial positions but, instead, adjacent flaps became interlaced. During the interfacing operation the edges of the flaps were in sliding engagement and any roughness of the edges or out of tolerance condition in manufacture could result in one or more of the flaps being "hung-up" in an open position. Another fault found with this construction was that the tips of the flaps in contact with the discharge nozzle were relatively wide and inflexible, and; therefore, did not lie flat against the nozzle so as to effectively prevent air from entering the bag around the exterior of the nozzle when the vacuum cleaner was in operation and dust from leaving the bag around the exterior of the nozzle when the cleaner was turned off.

The device of the invention in addition to being easy and inexpensive to manufacture, also eliminates both of the immediately discussed problems in that firstly, the closure flaps move smoothly with no possibility of interference between flap edges and with a minimum of friction existing between overlying flaps in contact with each other. Secondly, the flap tips are sharply pointed and the flaps are relatively slender near the tips making the tips
flexible so that they lie down on the discharge nozzle to seal off leakage around the exterior of the nozzle.

SUMMARY OF THE INVENTION

To overcome the problems encountered in the prior art devices, the invention broadly provides a self closing valve for a container comprising two layers of resiliently flexible non-elastomeric sheet material positioned closely face-to-face. From a center common to both sheets a plurality of radial slits is provided in each sheet with the slits encircling the center. The slits result in the formation of a plurality of triangular shaped closure flaps positioned about the center. The slits in one of the sheets are located between the slits of the other sheet so that each triangular flap of the said one sheet overlies and covers a portion of each of two adjacently disposed flaps in the other sheet.

The provision of the above described self closing valve represents the invention in its broadest form and is therefore the broad object of the invention.

A more specific object is to provide a valve structure for a container of the type just above described, the slits in each sheet being equal in length and equally angularly spaced about the center resulting in the triangular shaped flaps being equal in size.

A further object is to provide a valve structure for a container, in accordance with either of the above objects, in which the sheet material is paper or light paperboard.

A still further object is to provide a valve structure for a container of the type described in any of the above objects or combinations thereof further characterized in that the slits in one of the sheets are positioned approximately half-way between the slits in the other sheet.

An additional object is to provide a valve structure of the type described in any of the above objects or combinations thereof in which the container is a disposable dust bag for a vacuum cleaner and the valve provides an entrance opening for the admission of dust laden air.

Another object is to provide a vacuum cleaner dust bag as immediately above described in which the superposed sheet material forms a flat end plate portion of the dust bag.

Still another object is to provide a vacuum cleaner dust bag as immediately above set forth in which the end plate is provided with an externally disposed layer of reinforcing sheet material which is provided with a central opening to expose the valve.

Yet another object is to provide the slit sheets of material of the valve structure, particularly when they are made of paper or paperboard, with a coating of thin plastic film on the sides facing the exterior of the container with outer portions of the slit sheets being heat sealed together by melting the plastic film disposed between the sheets.

Other and more specific objects, advantages and uses of the invention will become apparent upon making reference to the drawings and following detailed description of a preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an end elevational view in a direction normal to the end plate of a disposable vacuum cleaner bag employing the self closing valve of the invention;

FIGURE 2 is a vertical sectional view of the end plate taken along line 2--2 of FIGURE 1; with the flaps of the valve in their closed position;

FIGURE 3 is a view similar to FIGURE 2, but with the flaps of the valve in their open position;

FIGURE 4 is a perspective view of the vacuum cleaner bag with portions being broken away and showing how the vacuum cleaner discharge nozzle fits through the valve;

FIGURE 5 is a vertical sectional view through the bag looking along the line 5--5 of FIGURE 3;

FIGURE 6 is an enlarged fragmentary sectional view through the end plate taken along line 6--6 of FIGURE 1.
bly 10 is shown fitted onto a discharge nozzle of a vacuum cleaner, it is possible to employ the bag assembly in vacuum cleaners of the type having no discharge nozzle. In such application of the invention as shown in FIGURE 3, the air stream, indicated by the arrows, exerts sufficient pressure on the flaps to cause them to flex to the open position illustrated.

In addition to acting as a heat sealing material to bind the three layers 13, 14 and 15 of the end plate 11 together, the plastic films 21 and 22 also serve other important functions. When the layers 14 and 15 are of paper or cardboard of a type not exhibiting the necessary resiliency, the plastic films provide increased resiliency to assist in causing the flaps 30 and 31 to return to the plane of the layers 14 and 15, respectively, upon removing the bag structure from the nozzle 24 of FIGURE 6 or stopping the air flow of the FIGURE 3 showing. The slipperiness of the films also assists in preventing the outwardly facing surfaces of the flaps from becoming laden with dust particles. The film 21 also reduces the friction factor between the surfaces of flaps 30 and 31 which contact each other. Furthermore, in order to reduce friction between the flaps and the vacuum cleaner discharge nozzle. This results in smoother action of the valve 32 and virtually eliminates the possibility of any of the flaps “hanging-up” in an open position when the bag structure is being disposed of after use.

As will be observed in FIGURE 4, the slender flaps 30 and 31 flex very easily into substantially parallel contact with the outer surface of the tube 24 with there being minimum sized spaces between the flaps and tube for the admission of air or the expulsion of air therethrough. Due to the slipperiness of the plastic films 21 and 22 contacting the tube 24 there is little danger of the flaps being bent out of shape by the tube 24 when the bag structure is removed therefrom.

When the valve 32 is in its closed position, as illustrated in FIGURES 1, 2 and 5, dust in the bag is substantially blocked from leaking out through the slits 26 and 27 because the slits are angularly offset so as to provide a serpentine path between the slits and adjacent flap surfaces through which dust will not easily pass.

It is preferred that the slits 27 be angularly positioned so as to lie half-way between the slits 26, as illustrated, for best results. In each case each of the flaps 30 in layer 14 will cover half of each of two adjacent disposed flaps 31 in layer 15 when the valve 32 is in closed position.

Variations from the preferred illustrated embodiment of the invention will occur to those skilled in the art which will nevertheless be within the spirit and scope of the invention.

An example of one such variation would be the elimination of the plate stiffening layer 13 in applications where the added strength and stiffness provided thereby are not necessary and where the opening 23 is not needed as a guide.

Although in the preferred embodiment, two layers having the valve forming slits are provided, in a further variation three such layers might be employed, with the slits in adjacent layers being out of register. This construction would be more silt proof but also more expensive.

Since the above and other variations will become apparent to those skilled in the art the scope of the invention is to be limited only as set forth in the following claims.

We claim:

1. An improved self-closing type valve structure for a container such as a disposable vacuum cleaner bag comprising: a first layer of thin resiliently flexible sheet material having a plurality of slits extending radially outwardly from and encircling a center; a plurality of resiliently flexible valve closure flaps of triangular shape defined by the said slits; a second layer of thin resiliently flexible sheet material closely overlying said first layer, said second layer being provided with a plurality of slits extending radially outwardly from the same center and spaced between the slits in the first layer; and, a plurality of triangular closure flaps defined by the slits in said second layer, said closure flaps in said second layer covering a portion of each of two adjacent disposed closure flaps in said first layer, said plurality of closure flaps in each of the said layers normally lying in the plane of their respective layers; and, after being deflected to valve open positions, return of their own accord to their normal positions.

2. A valve structure as set forth in claim 1 additionally characterized in that the said first and second layers and consequently the closure flaps by the slits in said layers are made of paper or cardboard.

3. A valve structure as set forth in claim 2 additionally characterized in that one of the said first and second layers has a plastic film covering on the side thereof facing the other of the said layers.

4. A valve structure as set forth in claim 3 additionally characterized in that portions of said first and second layers outwardly disposed from the closure flaps are heat sealed together with the plastic film being the sealing medium.

5. A valve structure as set forth in claim 4 further characterized in that a third stiffening layer of cardboard is provided closely overlying the said second layer; said third layer having a central opening therein to expose the triangular flaps in said second layer.

6. A valve structure as set forth in claim 5 further characterized in that one of said second or third layers has a plastic film covering on a side disposed between the said second and third layers.

7. A valve structure as set forth in claim 6 further characterized in that portions of said second and third layers outwardly disposed from the closure flaps are heat sealed together with the plastic film disposed between the second and third layers being the sealing medium.

8. A valve structure as set forth in claim 7 further characterized in that the plastic film coverings are provided on the said first and second layers.

9. A valve structure as set forth in claim 8 additionally characterized in that all of the said slits are of substantially the same length, and are equally angularly spaced about the center; the slits in the said second layer being spaced substantially half-way between the slits in the said first layer.

10. A valve structure as set forth in claim 9 further characterized in that there is an equal number of between 6 and 10 of the said slits provided in each of the said first and second layers so as to provide an equal number of between 6 and 10 of said closure flaps in each of said first and second layers.

11. A valve structure as set forth in claim 10 further characterized in that it is a dust valve for a disposable vacuum cleaner bag and said first, second and third layers having the valve therein define an end plate portion of the bag and the said central opening in the said third layer is of a size to fit over and guide the bag onto the discharge nozzle of a vacuum cleaner.

References Cited

UNITED STATES PATENTS

2,528,332 10/1950 Bergquist -------- 229—62.5 X
2,975,862 3/1961 Goldberg -------- 229—62.5 X

DONALD F. NORTON, Primary Examiner.