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DISPOSABLE FILTER BAGS FOR VACUUM CLEANERS

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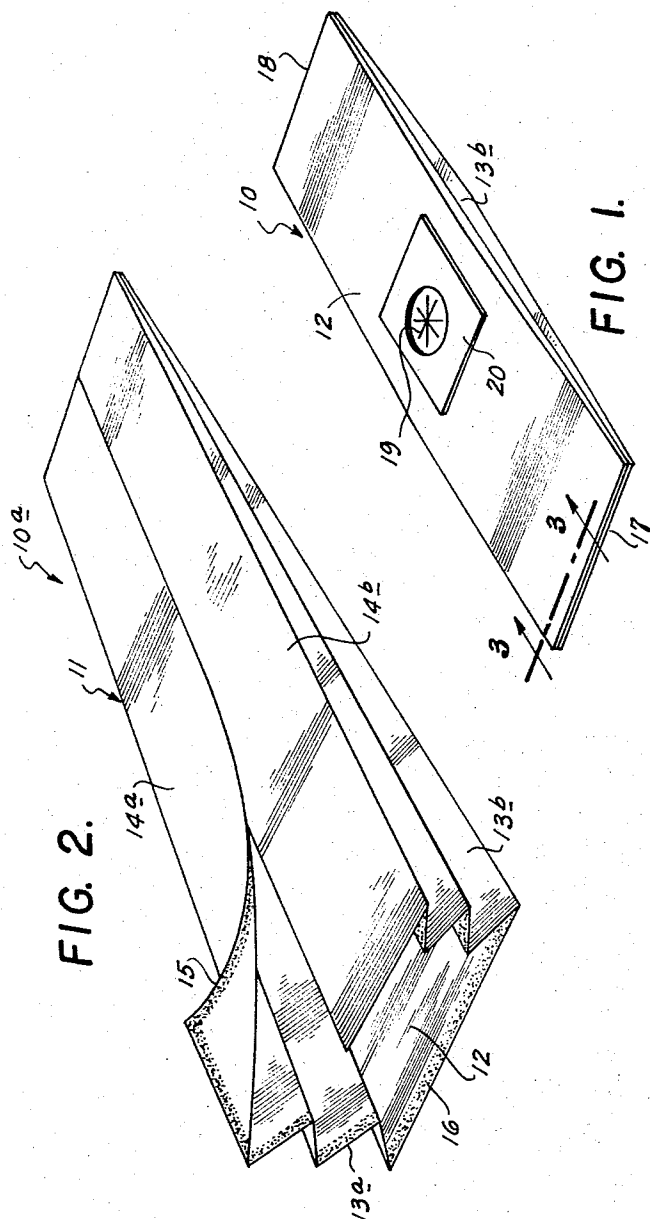


FIG. 1.

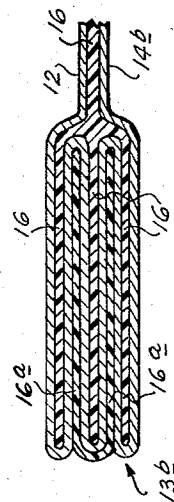


FIG. 4.

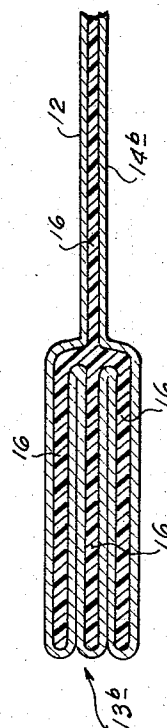


FIG. 3.

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DISPOSABLE FILTER BAGS FOR VACUUM CLEANERS

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Original application Dec. 20, 1965, Ser. No. 515,094, now Patent No. 3,333,523, dated Aug. 1, 1967. Divided and this application June 6, 1967, Ser. No. 643,969
4 Claims. (Cl. 229—53)

ABSTRACT OF THE DISCLOSURE

A disposable filter bag for vacuum cleaners comprises a sheet of flexible fibrous material folded upon itself and having its longitudinal edges adhesively secured together in overlapping relation to form a tube having opposed panels connected, at their sides, by a plurality of pleats extending along the tube, such sheet having a stripe of preferably thermoplastic adhesive extending completely across an end thereof on the face of the sheet which is at the inside of the tube to adhesively secure together the pleats as well as the panels at an end of the tube and thereby form a closed bag end. Adhesive may also be interposed between, and secure together the confronting outer faces of the pleats at each closed bag end.

This invention relates generally to bags, such as, for example, disposable filter bags for vacuum cleaners. The present application is a division of my copending application Ser. No. 515,094, filed Dec. 20, 1965, now Patent No. 3,333,523.

Disposable filter bags for vacuum cleaners are generally formed of paper or other fibrous flexible material which is porous. Such bags usually are closed at one or both ends and have opposing panels which are connected at the sides of the bag by a plurality of pleats or gussets to permit expansion of the bag. Further, an aperture is provided either at an end of the bag or in one of the panels thereof for cooperation with the air inlet opening of the vacuum cleaner casing. Since bags of the described character are intended to be disposable, great emphasis is placed on the low cost production thereof. Low cost production of the bags obviously requires economical utilization of the fibrous flexible material forming the bags, high speed operation of any machines that may be employed for the bag production, and minimization of any manual labor.

In the production of bags of the described character, the fibrous flexible material is usually supplied in the form of a continuous web, for example, unwound from a roll thereof, and is moved continuously along a predetermined path. During such movement of the web, adhesive is applied along a longitudinal edge of the web and thereafter the web is folded longitudinally upon itself so as to overlap and secure together the longitudinal edge portions of the web by means of the previously applied adhesive, thereby to form a tube. The folding operations further provide the tube with opposed panels connected, at the sides, by a plurality of pleats extending longitudinally along the tube. The pleated tube formed in the foregoing manner is transversely cut at locations spaced therealong to provide separate tube sections intended to form respective bags.

In forming a bag from each tube section, it is necessary to close at least one of the ends of the tube section. One existing method of closing an end of the tube section involves applying a stripe of adhesive across an end portion of the tube section which is thereafter folded over. In order to ensure that both panels of the folded over end portion of the tube section will be adhesively secured, this method of closing a bag end requires that the opposed panels of the pleated tube be cut along offset lines when

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dividing the tube into the tube sections. Although devices exist for effecting such cutting of the pleated tube during its continuous movement in the longitudinal direction, such cutting devices have a limited practical operating speed, as do the devices provided for folding over an end portion of each tube section after adhesive has been applied thereto, so that the rate at which the described bags can be produced is accordingly restricted. Further, a closed bag end of the described character is not wholly satisfactory in that the end portions of the pleats in the folded over end portion of the bag are not adhesively secured to each other and thus permit the collected dust to seep therebetween.

In order to provide improved sealing of the bags at the closed ends thereof, it has been proposed to provide one or both of the ends of each pleated tube section with two or more transverse folds that are adhesively secured. However, where two or more folds are to be provided at each end of a tube section, such folds cannot be conveniently formed during the continuous movement of the tube sections in the longitudinal direction. Thus, it becomes necessary to change the orientation of the tube sections with respect to their direction of movement, and this inherently limits the rate of production and increases the cost thereof, particularly when the closed bag ends are formed on a machine separate from the machine forming the pleated tube sections.

Further, the material required for the fold or folds at one or both ends of the bag may represent as much as one-third of the total material required to produce the bag.

In another form of disposable filter bags for vacuum cleaners, one or both ends of the pleated tube sections are closed by stitching the same transversely thereacross and then further sealing each closed bag end by means of a strip of gummed tape which is folded over and covers the stitching. Although this form of filter bag avoids the waste of material required for the folded bag ends, there is no overall economy, as the transverse stitching of the bag ends and the application of the gummed tape thereover cannot be conveniently effected while the tube sections continue to move at high speed in the longitudinal direction. Thus, the production of the last described type of filter bag also involves either changing the orientation of the pleated tube sections with respect to their direction of movement or the transfer of the pleated tube sections to a separate machine for forming the closed bag ends, with inherent limitations on the rate of production and increases in the cost thereof, as previously mentioned.

Accordingly, it is an object of this invention to provide a bag having opposed panels connected at the sides of a plurality of pleats so as to be particularly suited for use as a filter bag in a vacuum cleaner, which bag has one or both of its ends securely and tightly sealed in a manner that permits the high speed and economical production thereof.

Another object is to provide a bag of the described character which permits the most economical utilization of the fibrous flexible material from which the same is formed.

In accordance with an aspect of this invention, a bag comprises a sheet of flexible fibrous material folded upon itself and having its longitudinal edges secured together in overlapping relation to form a tube having opposed panels connected, at the sides, by a plurality of pleats extending along the tubes, such sheet having a stripe of adhesive, which is preferably thermoplastic, extending completely across the face of the sheet which is at the inside of the tube and being located adjacent an end of the tube to adhesively secure together the pleats as well as the panels at the end of the tube and thereby form a closed bag end.

In accordance with a further feature of the invention, the sheet of flexible fibrous material forming a bag has additional adhesive on the surface thereof which is at the outside of the bag, such additional adhesive being located to come between, and bond together the confronting outer faces of the pleats at each closed bag end.

The above, and other objects, features and advantages of this invention, will be apparent in the following detailed description of an illustrative embodiment which is to be read in connection with the accompanying drawing, wherein:

FIG. 1 is a perspective view of a bag embodying this invention;

FIG. 2 is an enlarged perspective view of a pleated tube from which the bag of FIG. 1 is formed;

FIG. 3 is a fragmentary enlarged sectional view taken along the line 3—3 on FIG. 1; and

FIG. 4 is a sectional view similar to that of FIG. 3, but showing a bag in accordance with another embodiment of the invention.

Referring to the drawing in detail, it will be seen that a bag 10 (FIG. 1) in accordance with this invention is formed of a sheet of flexible material, such as, paper or other fibrous material which is preferably porous when the bag 10 is to be employed as a disposable filter bag for vacuum cleaners. The sheet 11 (FIG. 2) is folded about longitudinal fold lines, so that its central portion forms a panel 12 connected, at its opposite sides, by a plurality of pleats 13a and 13b with longitudinal edge portions 14a and 14b, respectively. The longitudinal edge portions 14a and 14b extend inwardly towards each other so as to overlap at their edges, and a stripe 15 of adhesive extends along one of the overlapping longitudinal edges for securing together the latter. It will be seen that the folded sheet 11 having its longitudinal edges secured together by the adhesive stripe 15 forms a tube 10a (FIG. 2) having opposed panels 12 and 14a, 14b connected, at the sides of the tube, by a plurality of pleats 13a and 13b extending along the tube. A bag is formed from tube 11 merely by closing at least one end thereof.

In accordance with this invention, closing of an end of tube 10a is effected by providing the sheet 11, while in its flat form, with an uninterrupted stripe 16 of adhesive extending completely across the face of the sheet 11 which is at the inside of the tube 10a upon folding of the sheet and which is located adjacent the end of the tube 10a intended to form a closed bag end. Thus, when sheet 11 is folded to form the tube 10a, as shown on FIG. 2, the adhesive of stripe 16 will appear at the confronting surfaces of panel 12 and panels 14a, 14b, and also at the confronting inner surfaces of pleats 13a and 13b for adhesively securing together both the panels and pleats at the related end of the tube.

The bag shown on FIG. 1 is a disposable filter bag for vacuum cleaners of the type having both of its ends 17 and 18 closed in the manner indicated above, and an aperture 19 cut in the panel 12 and surrounded by the usual reinforcing collar 20 of cardboard or other substantially rigid material to cooperate with a vacuum cleaner inlet.

Since the adhesive of each stripe 16 applied to sheet 11 before the folding thereof appears between the confronting surfaces of the panels and between the confronting inner surfaces of the pleats, there is adhesive-to-adhesive contact between the panels and pleats, as shown on FIG. 3, for tightly sealing each closed bag end. Thus, seepage of dust from the closed ends of filter bag 10 is prevented without resorting to multiple folds at the ends of the bag. Such multiple folds, as previously employed for closing the ends of filter bags, require a sheet of flexible material having a length up to one-third greater than the length of the finished bag, whereas the sheet 11 for forming the bag in accordance with this invention has a length equal to that of the finished bag and therefore effects the most economic utilization of the sheet material.

Since each transverse stripe 16 of adhesive is applied

to the sheet 11 prior to the folding of the latter, it is desirable that the adhesive of each stripe 16 be in a dry and non-tacky condition during the folding operations to avoid smearing of the adhesive or interference with the folding. Thus, in accordance with this invention, each transverse stripe 16 is of a thermoplastic adhesive, that is, an adhesive that is rendered plastic or adherent by heat applied thereto after the folding of the sheet 11. By way of example, the adhesive of each transverse stripe 16 may be a hot melt or other thermoplastic. The hot melt is heated so as to be in a liquid condition when applied to the sheet 11 and, upon cooling, becomes solid and substantially non-tacky so as to permit the folding of the sheet into the tube 10a. After such folding heat and pressure are applied at each end of the tube to be closed so as to again melt the plastic or hot melt for bonding together the confronting inner surfaces of the panels and pleats.

Alternatively, the adhesive of each transverse stripe 16 may be of a rubber latex applied in liquid form and drying to a non-tacky, solid consistency before the folding of the sheet. Thereafter, when heat and pressure are applied to the end of the tube to be closed, the rubber becomes plastic and is vulcanized for securely bonding together the confronting inner surfaces of the panels and pleats.

Since the adhesive, in each of the foregoing examples, is applied to the sheet 11 while in a melted or liquid state and thereafter is dried or solidified on the sheet prior to the folding thereof and the application of heat and pressure for closing the bag end, such adhesive enters into the porous structure of the sheet material for forming a secure bond therewith.

In accordance with this invention, additional thermoplastic adhesive in liquid form may also be applied to the face of sheet 11 which is at the outside of tube 10a, that is, the face of sheet 11 which is opposed to that receiving the stripe 16. Such additional adhesive is applied as stripes or spots located along sheet 11 so as to register with each stripe 16 on the opposite face and further being located and dimensioned transversely of the sheet so as to come between the confronting outer faces of the pleats, as shown at 16a on FIG. 4. Thus, when the tube end is subjected to heat and pressure, the additional adhesive 16a is effective to securely bond together the confronting outer faces of pleats 13a and 13b at the closed bag end.

The bags embodying this invention, as described above, can be conveniently produced at high speed by the apparatus and method disclosed in detail in the application Ser. No. 515,094 which is identified more fully above. The possibility of such high speed production results from the fact that an effective, dust tight seal is achieved at each closed bag end without requiring the folding over of the bag end.

Although illustrative embodiments of the invention have been described in detail herein with reference to the accompanying drawings, it is to be noted that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. A bag comprising a sheet of flexible fibrous material folded upon itself and having its longitudinal edges secured together in overlapping relation to form a tube having opposed panels connected, at the sides of the tube by a plurality of pleats extending along the tube, the end edges of said panels and pleats being superposed at the ends of said tube, said sheet having an uninterrupted stripe of thermoplastic adhesive extending completely across the face of the sheet which is at the inside of the tube and being located adjacent an end of the tube, said stripe of thermoplastic adhesive securing together said panels and the confronting inner faces of said pleats at said end of the tube and thereby forming a closed bag end.

2. A bag according to claim 1; wherein said sheet has

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another stripe of thermoplastic adhesive similarly extending thereacross adjacent the other end of the tube so that both ends of the bag are closed.

3. A bag according to claim 2; wherein one of said panels has an aperture therein to cooperate with a vacuum cleaner inlet. 5

4. A bag according to claim 1; wherein said sheet further has thermoplastic adhesive on the face thereof which is at the outside of the tube, the last mentioned adhesive being located along the tube so as to register with 10

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said stripe of adhesive and further being located transversely of the sheet to come between the confronting outer faces of the pleats and bond together said outer faces.

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