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(54) **GREASE-RESISTANT BAG HAVING ADHESIVE CLOSURE, ADHESIVE CLOSURE FOR BAG, AND RELATED METHODS**

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(52) **U.S. Cl.** **383/106**; 383/109; 383/113; 383/121; 383/123

(57) **ABSTRACT**

An embodiment of a bag includes a bag body having opposing bag ends and an inner face of an outer ply abuttingly adhered to an outer face of an inner ply with an adhesive. The bag can also include the outer ply having an inner face of a grease-resistant film abuttingly adhered to an outer face of a paper layer with an adhesive. The bag can further include the inner ply having a film of one or more layers having a grease-resistant material adapted to advantageously closingly seal at least one of the bag ends. An adhesive advantageously adheres a portion of a bag end to another portion of the same bag end to closingly seal the bag end. Embodiments of other bags, bag closures, and methods of assembly, positioning, using, and constructing a bag are also provided.

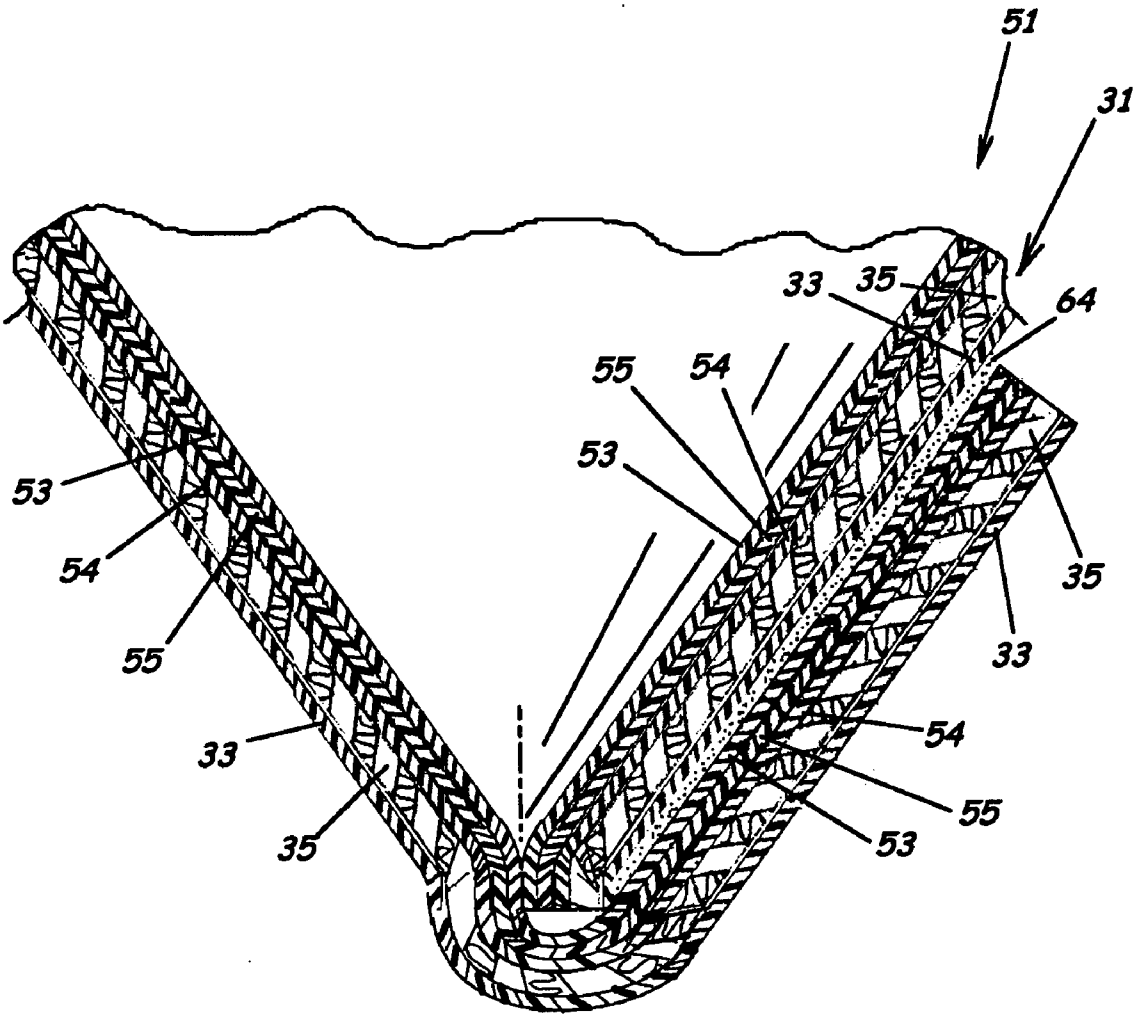
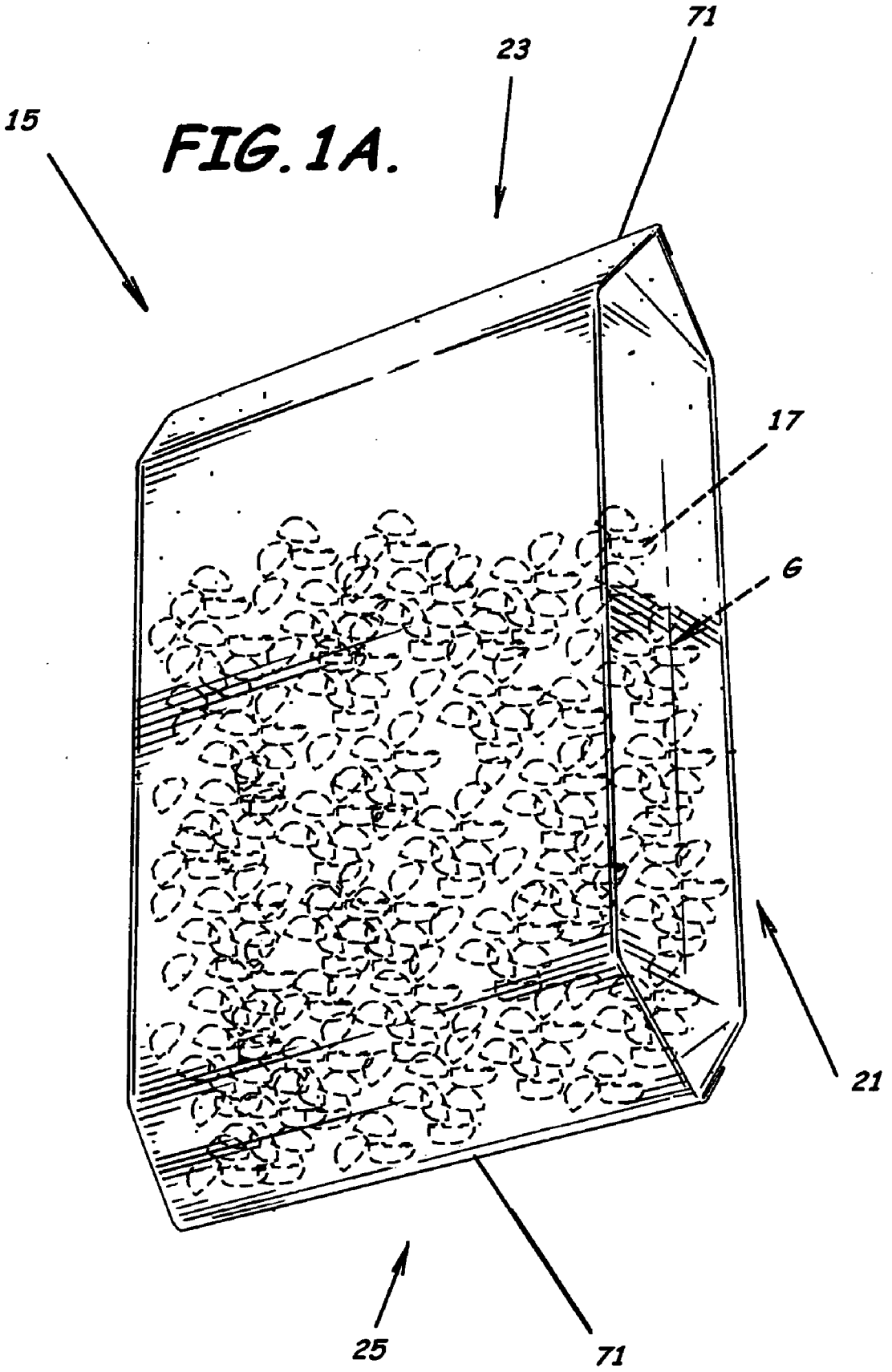


FIG. 1A.



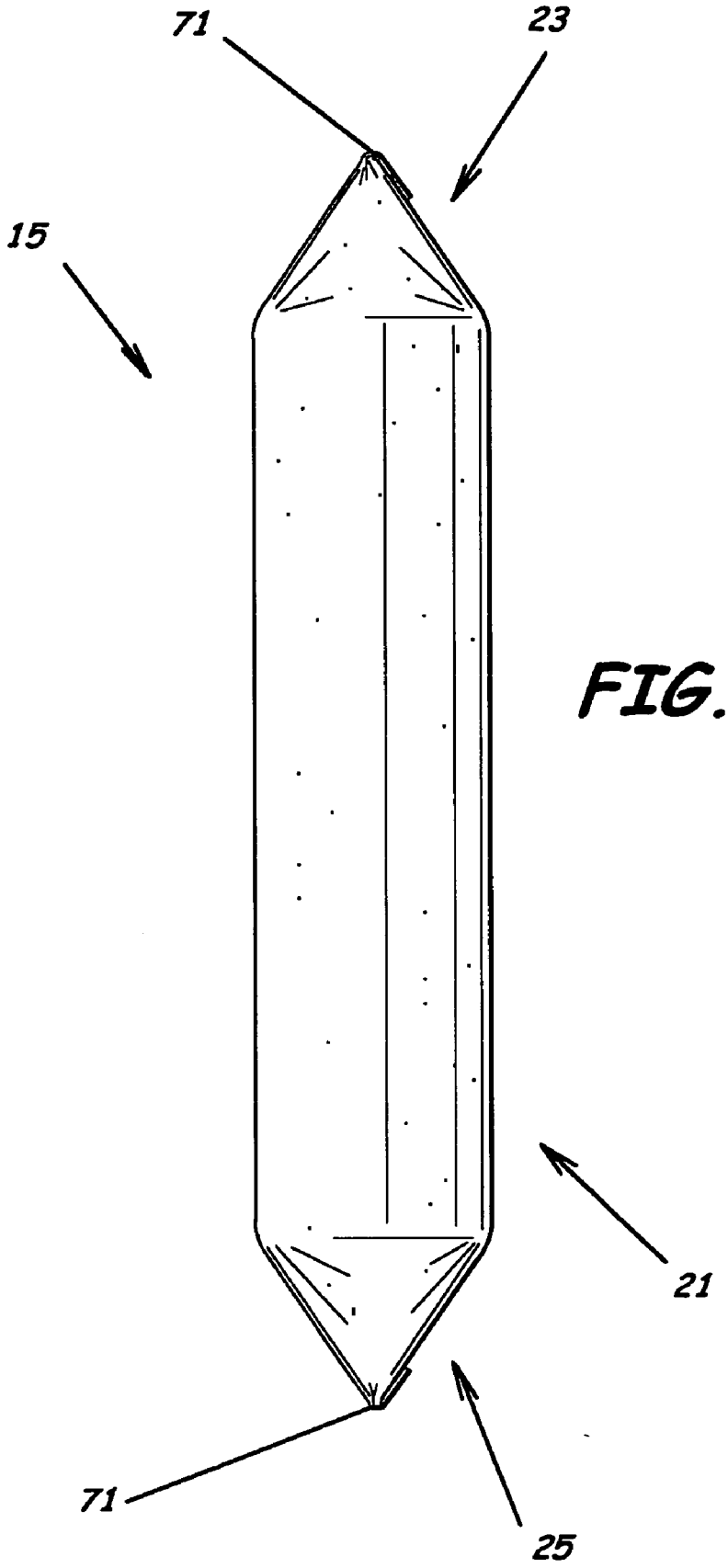


FIG. 1B.

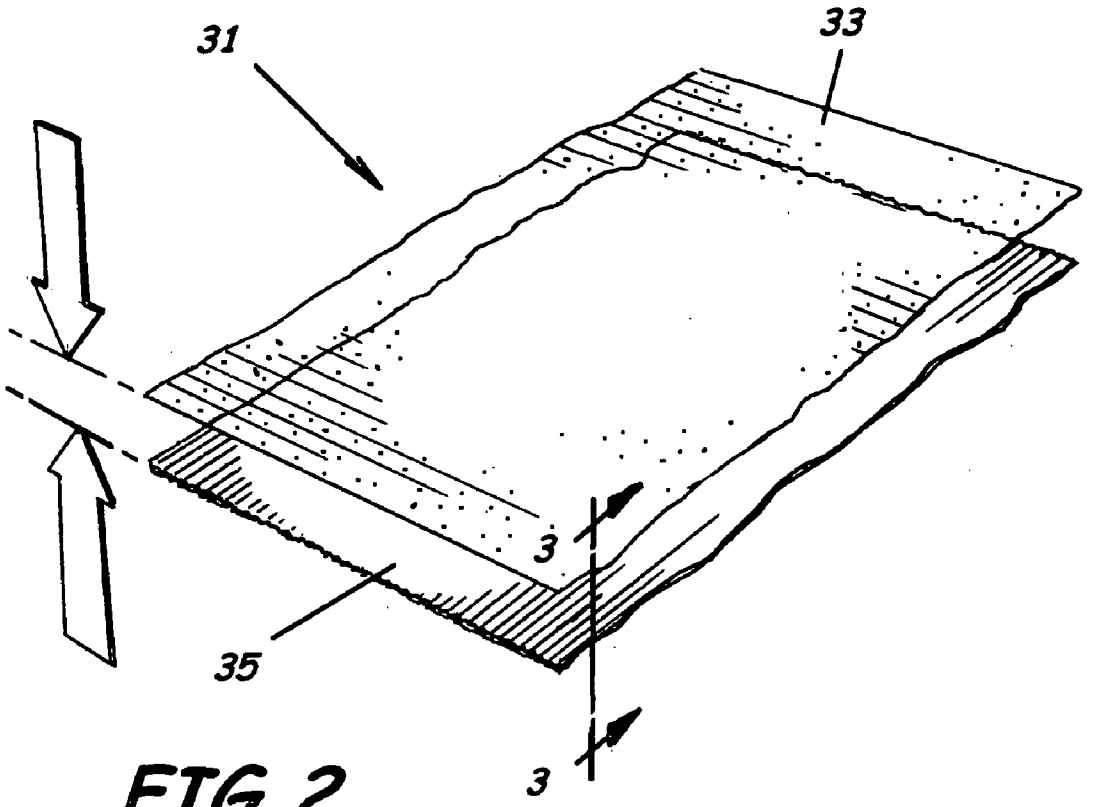


FIG. 2.

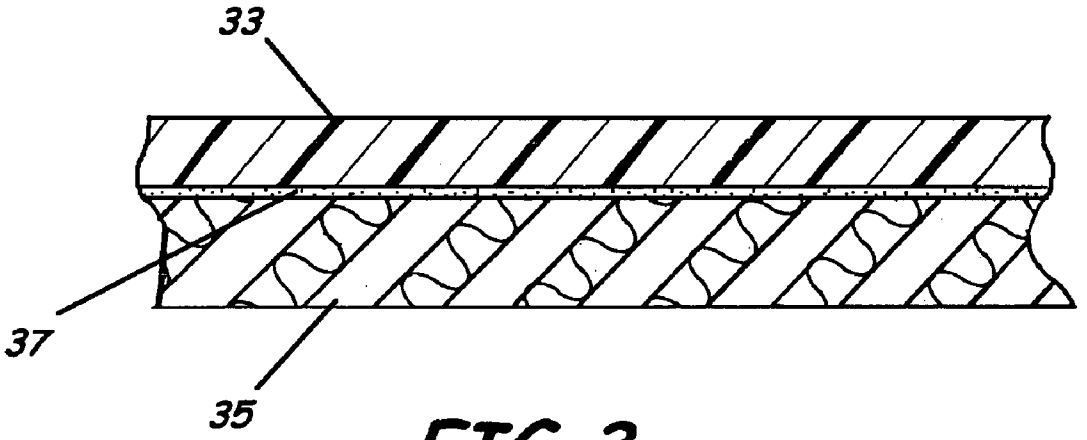


FIG. 3.

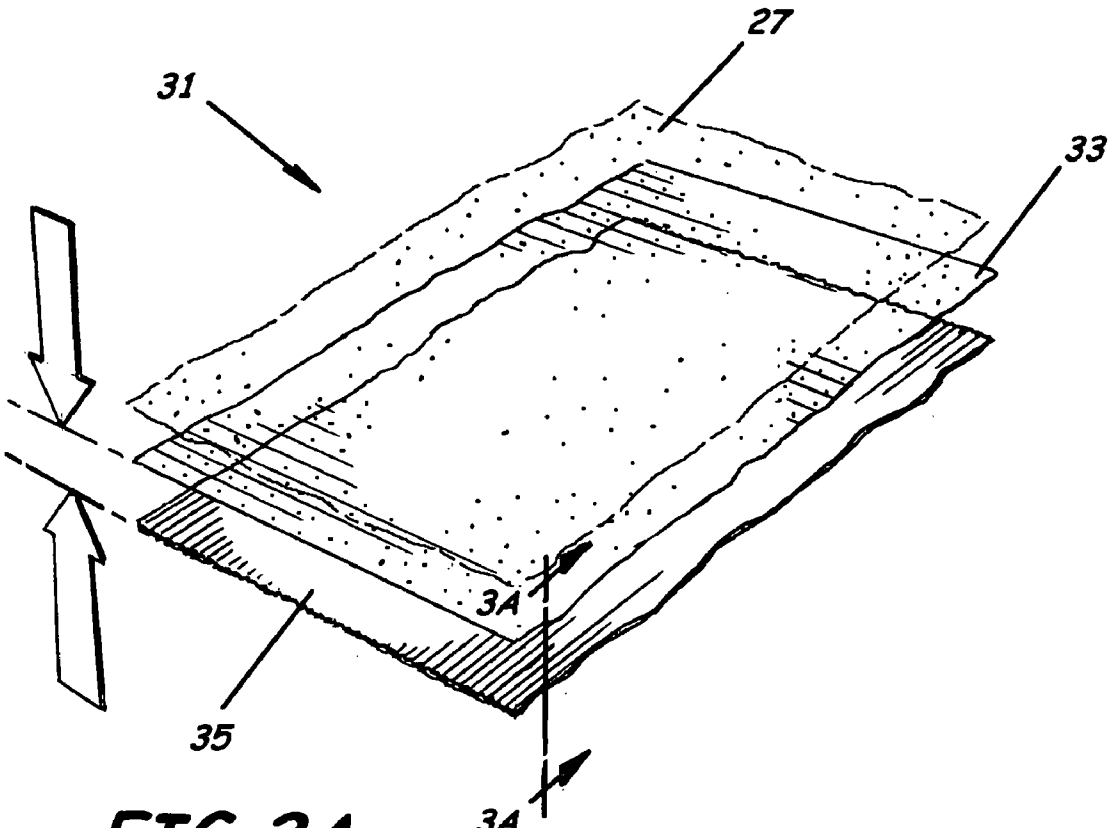


FIG. 2A.

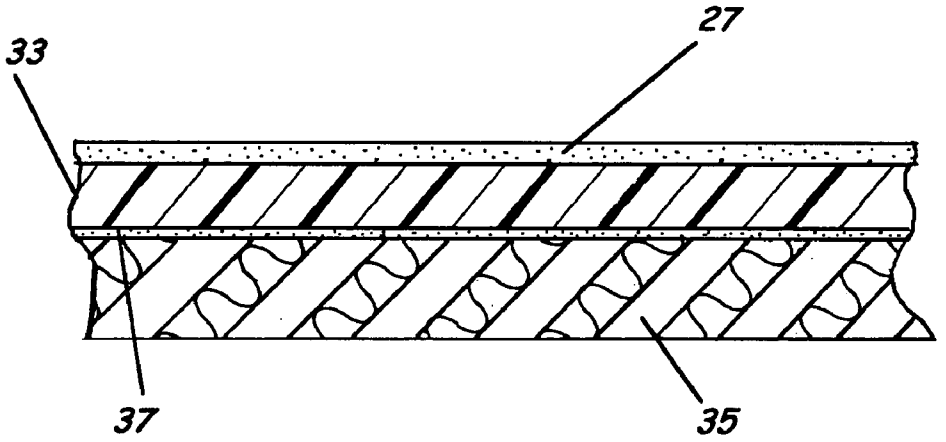


FIG. 3A.

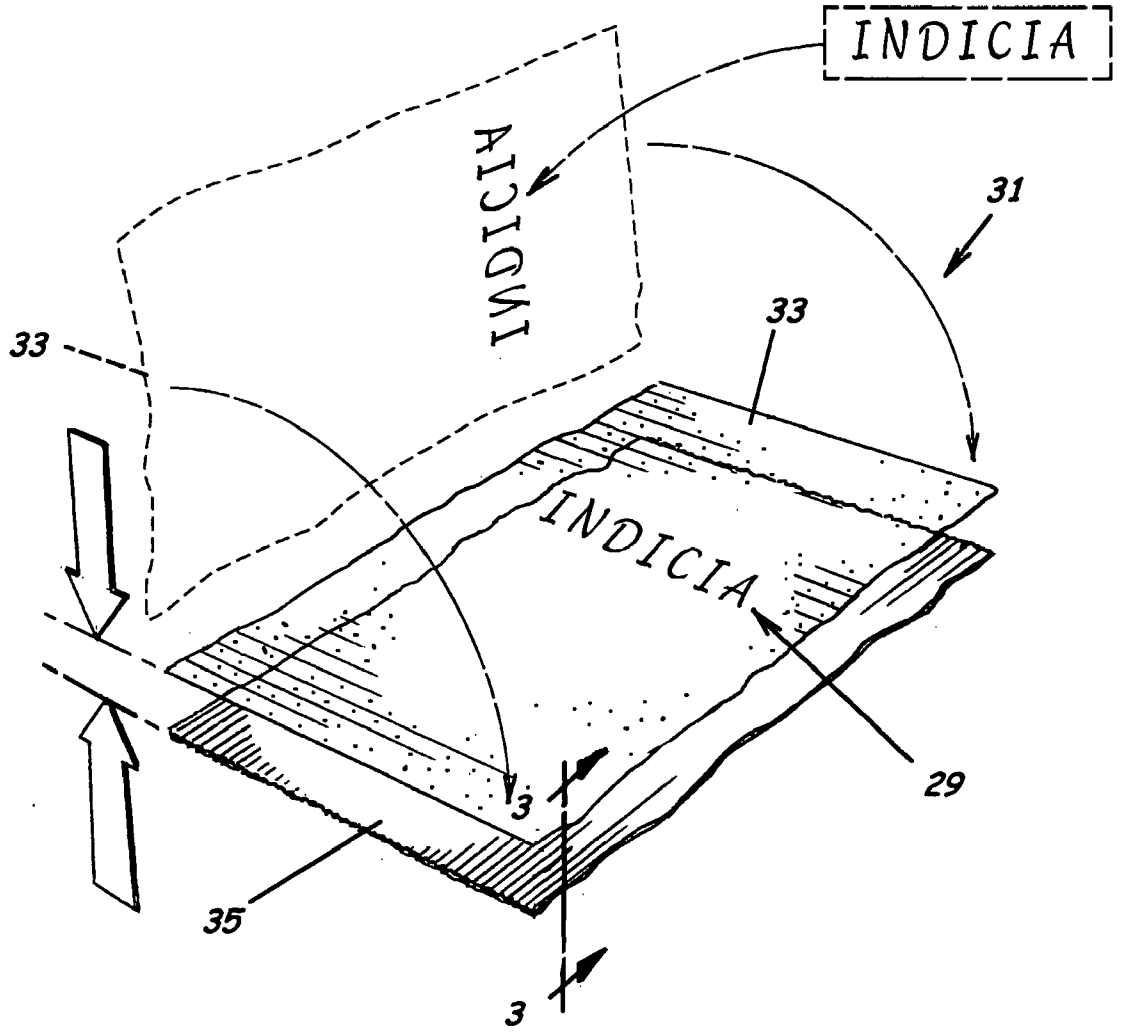


FIG. 2B.

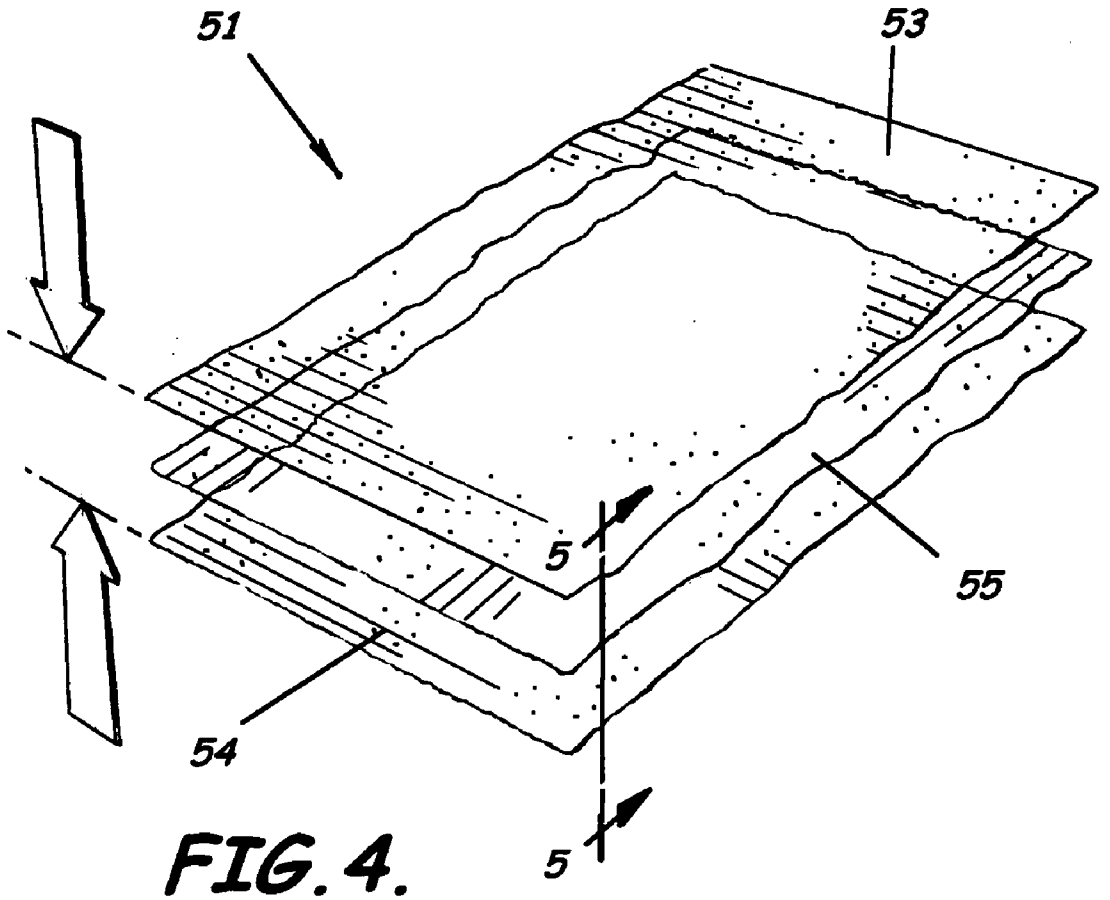


FIG. 4.

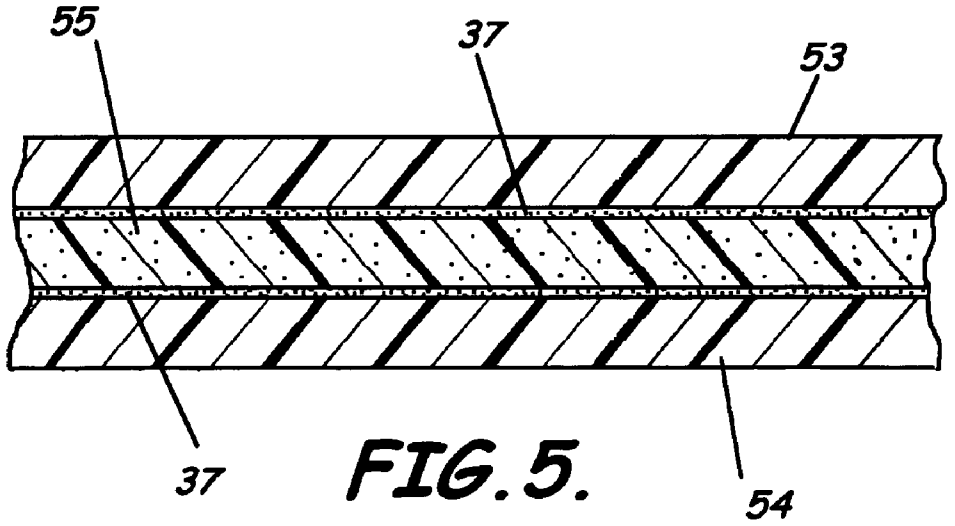


FIG. 5.

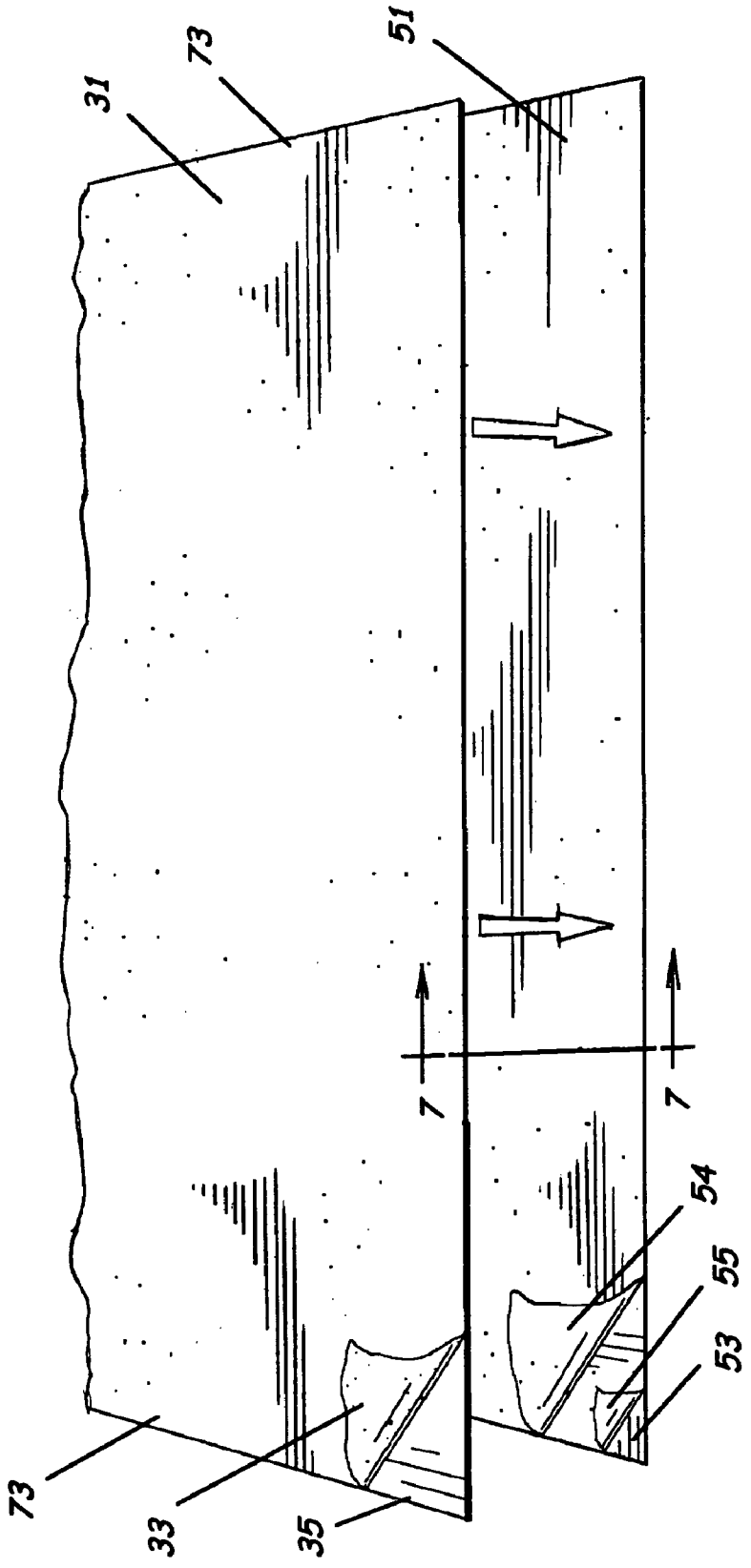


FIG. 6.

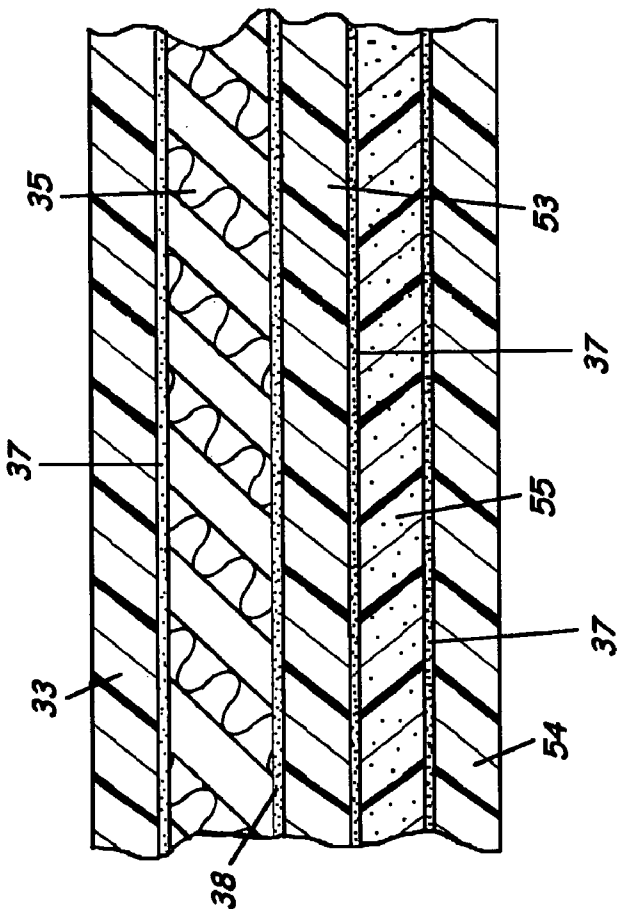


FIG. 7.

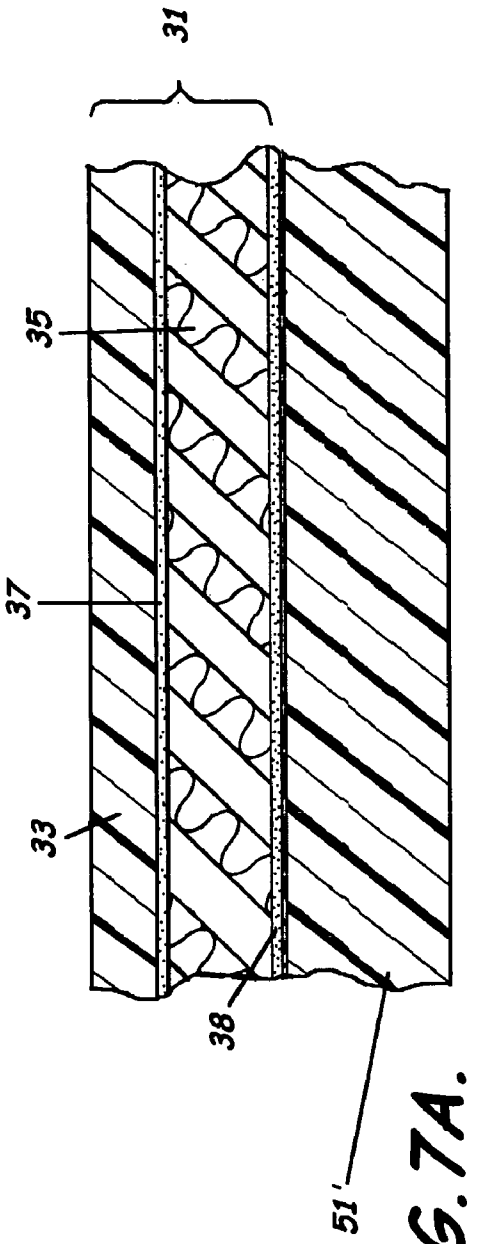


FIG. 7A.

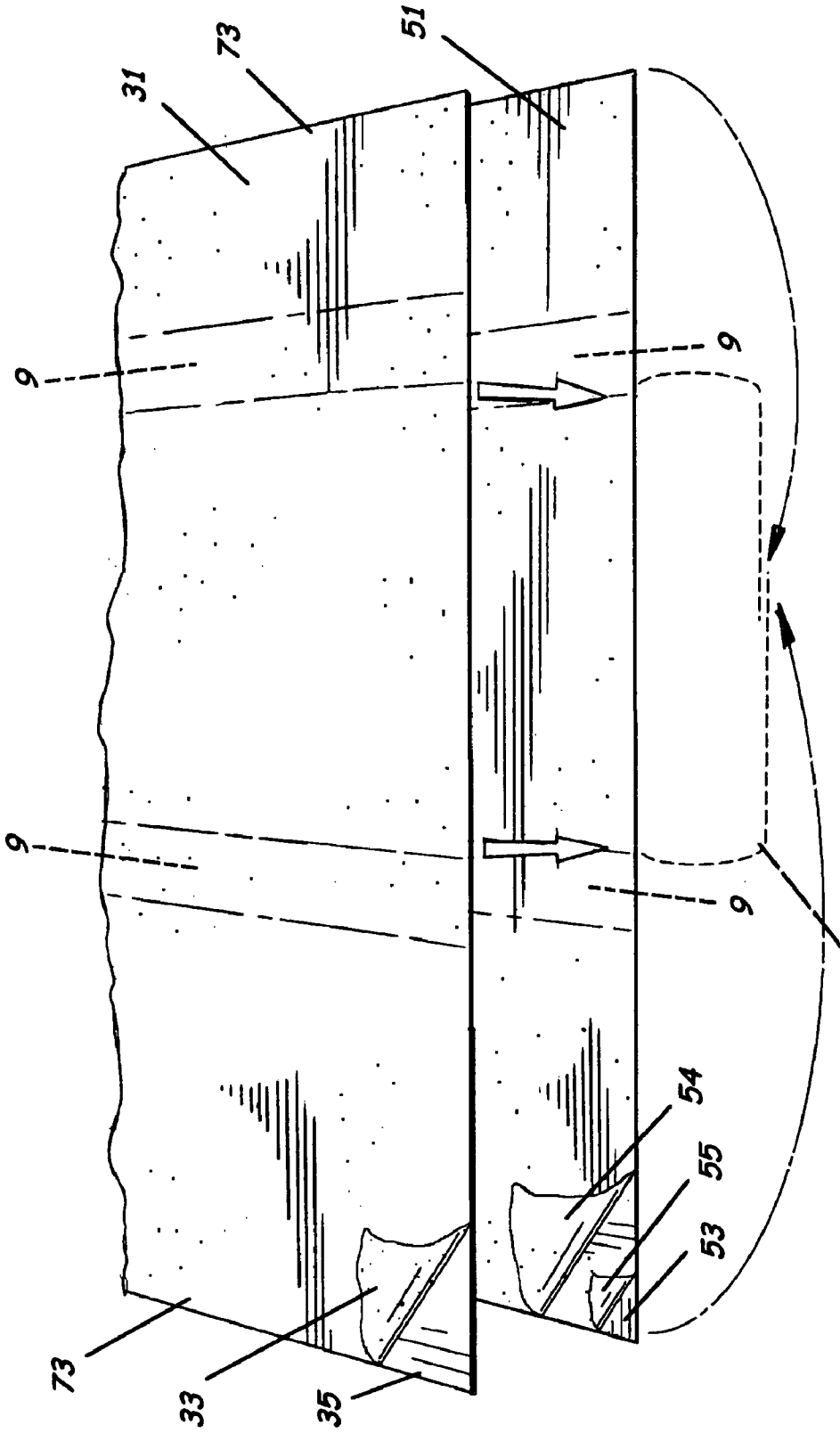


FIG. 8.

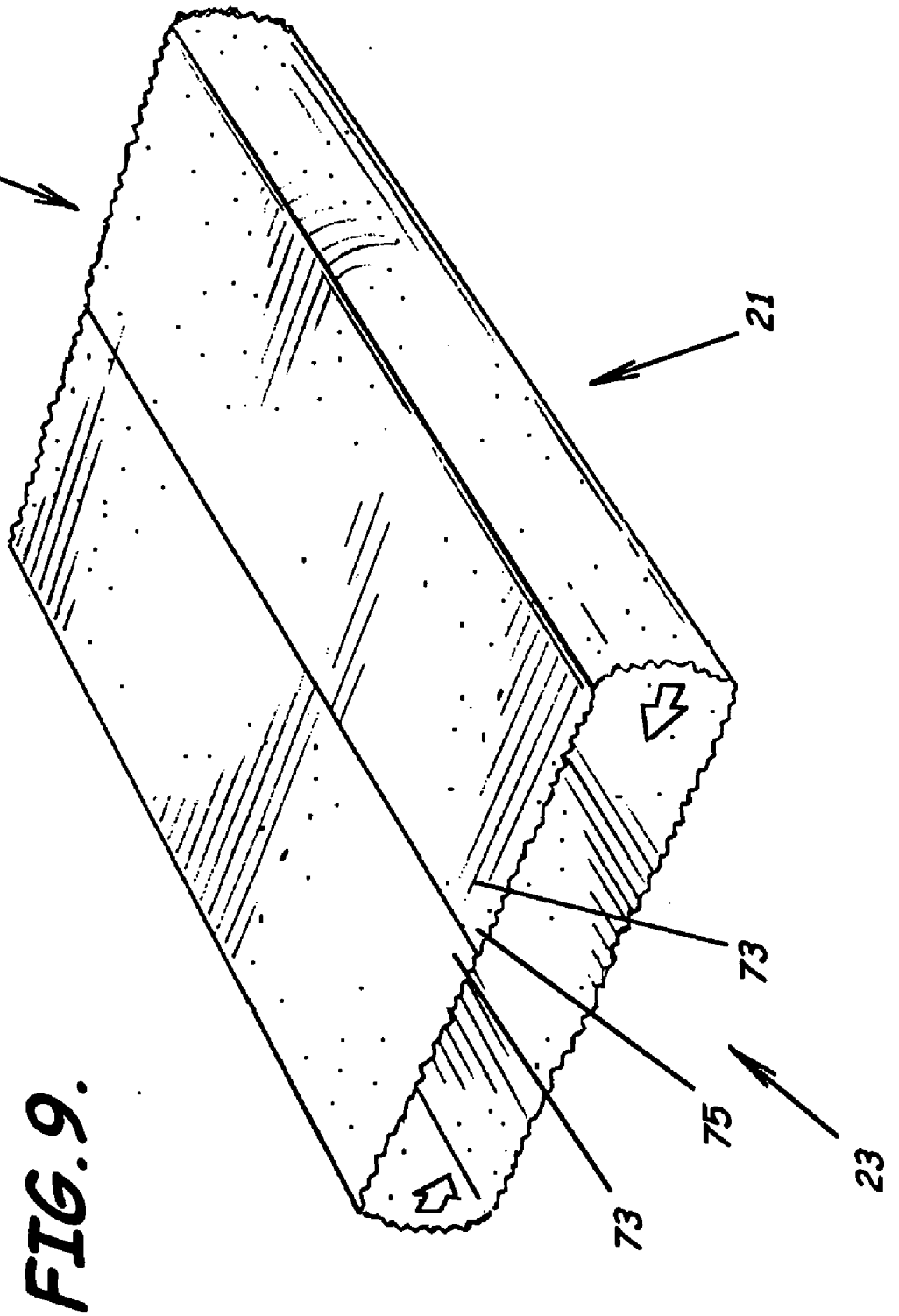


FIG. 9.

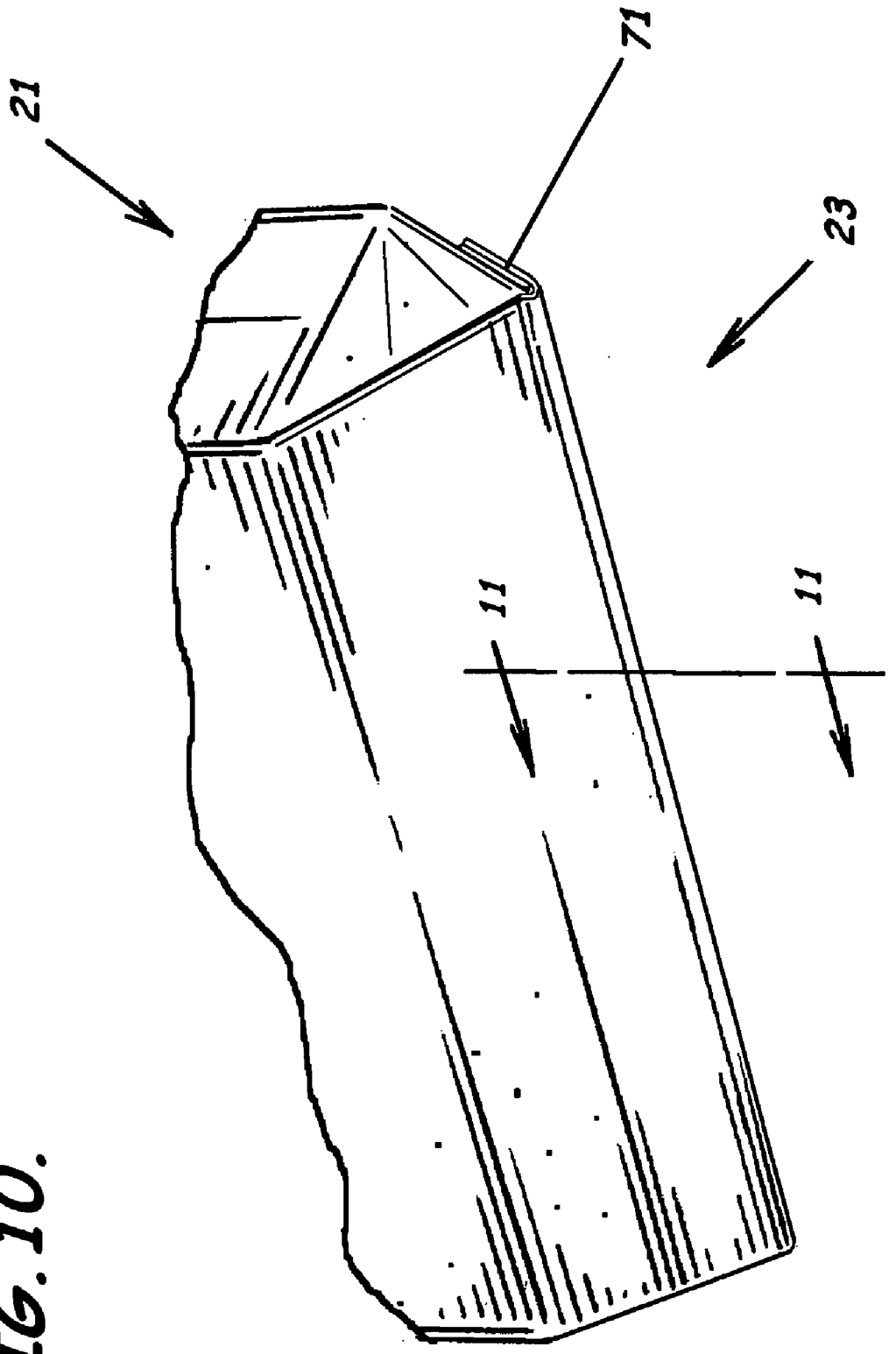


FIG. 10.

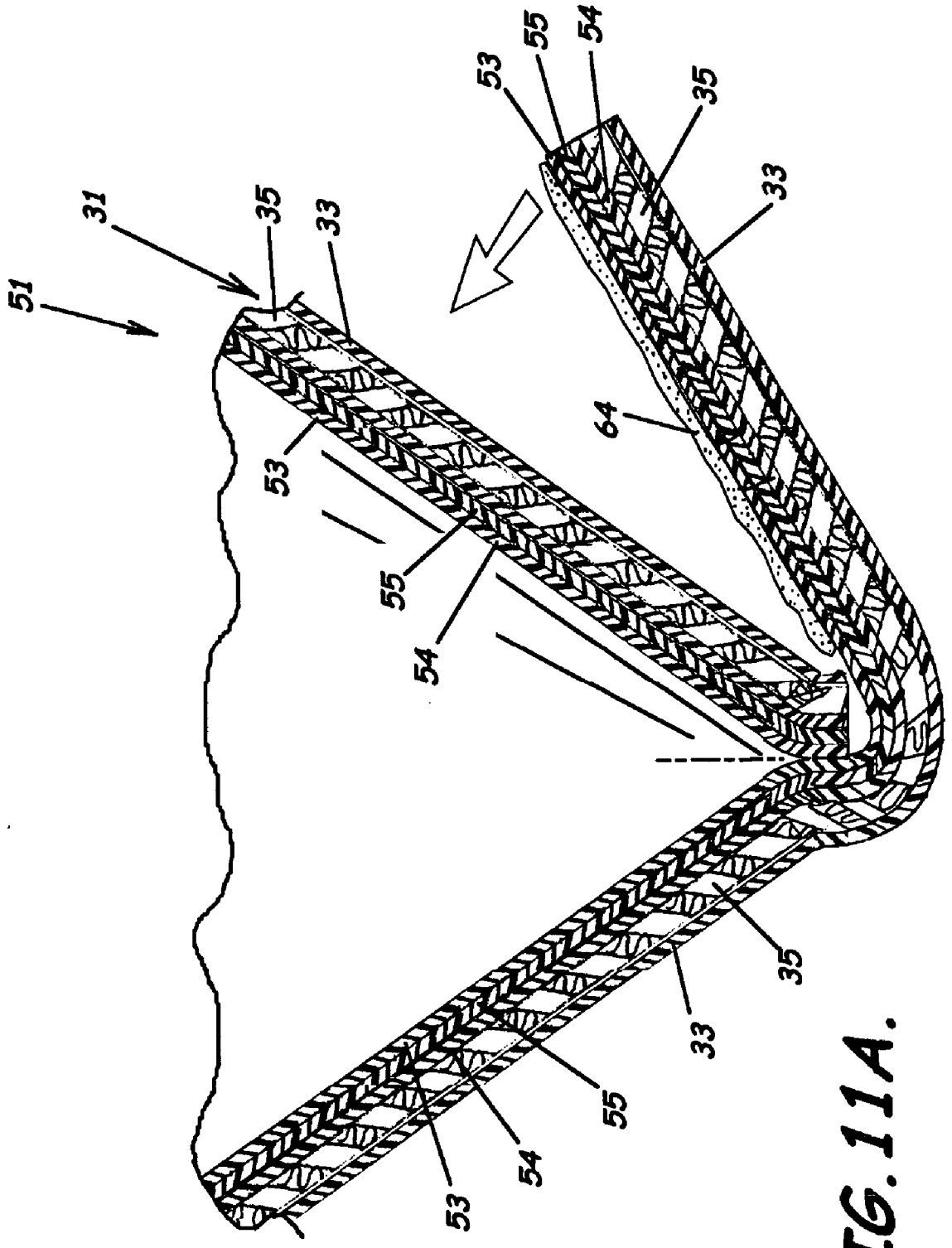


FIG. 11A.

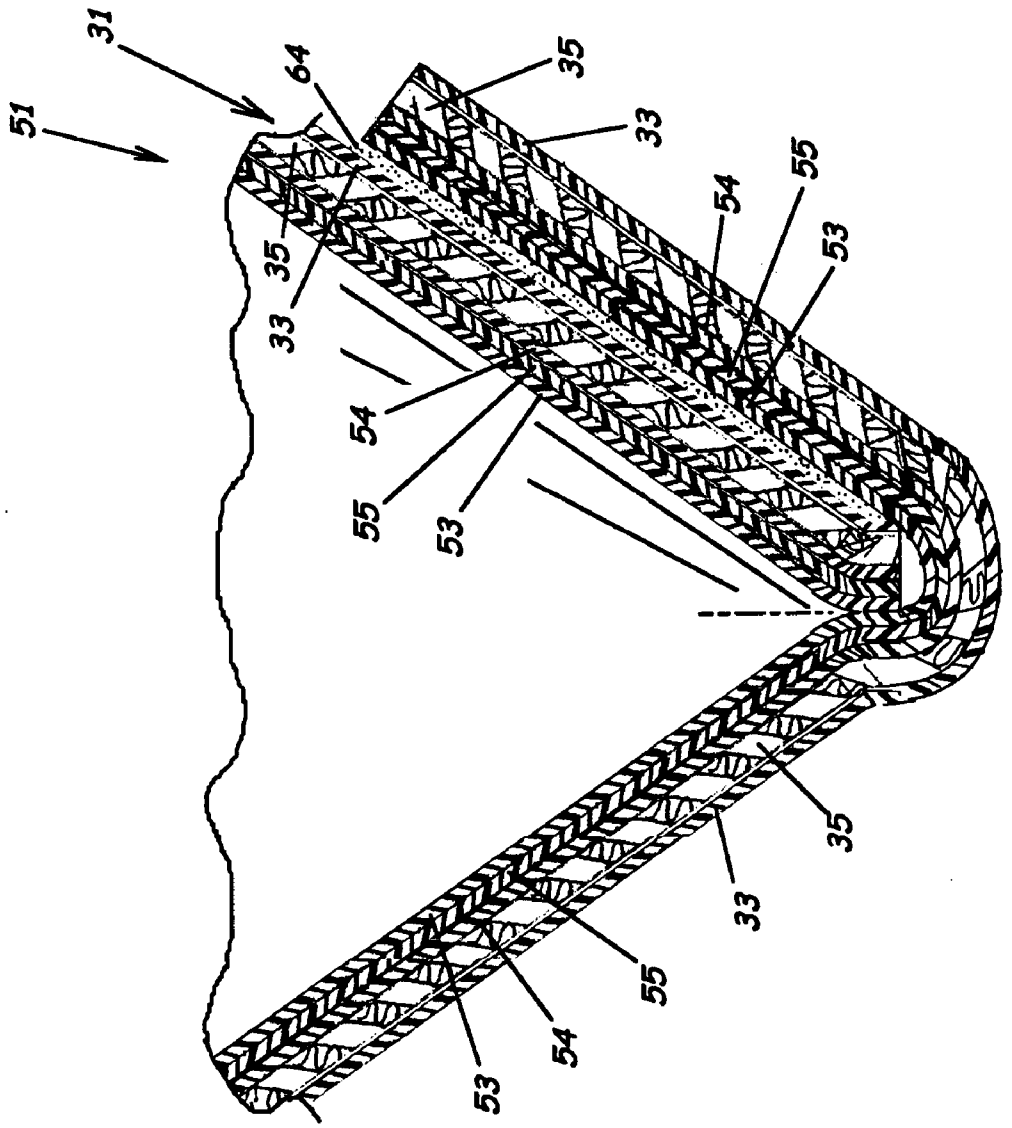


FIG. 11B.

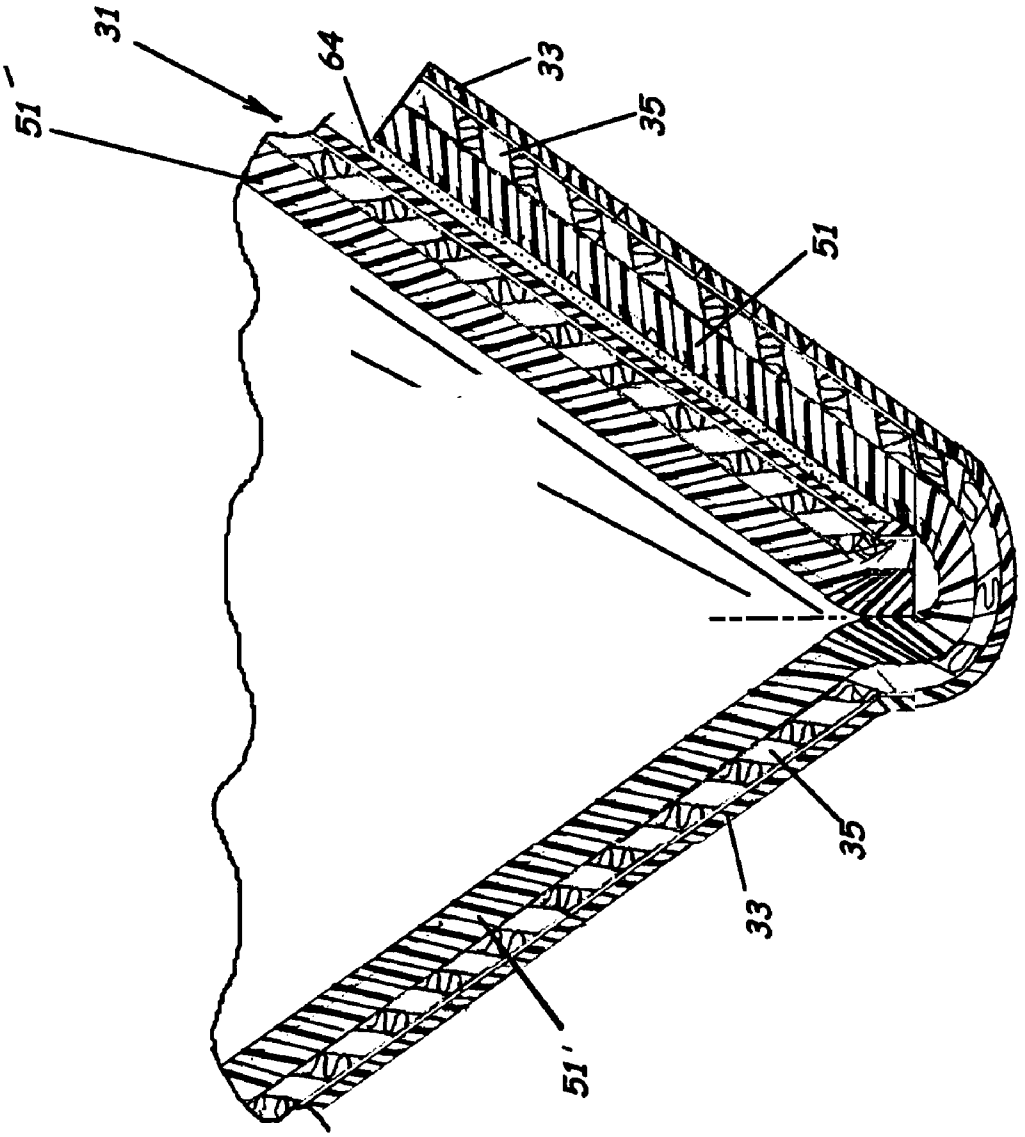


FIG. 11C.

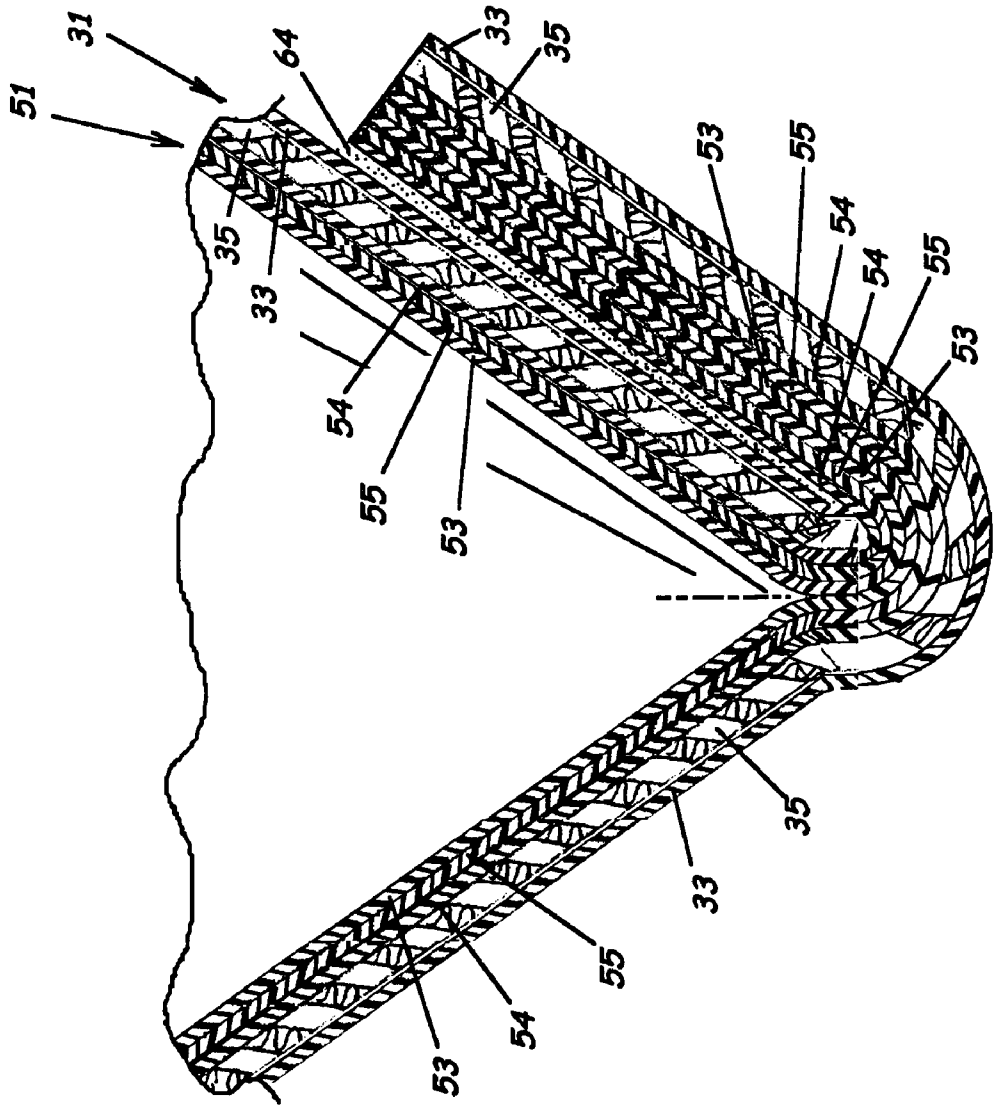


FIG. 11D.

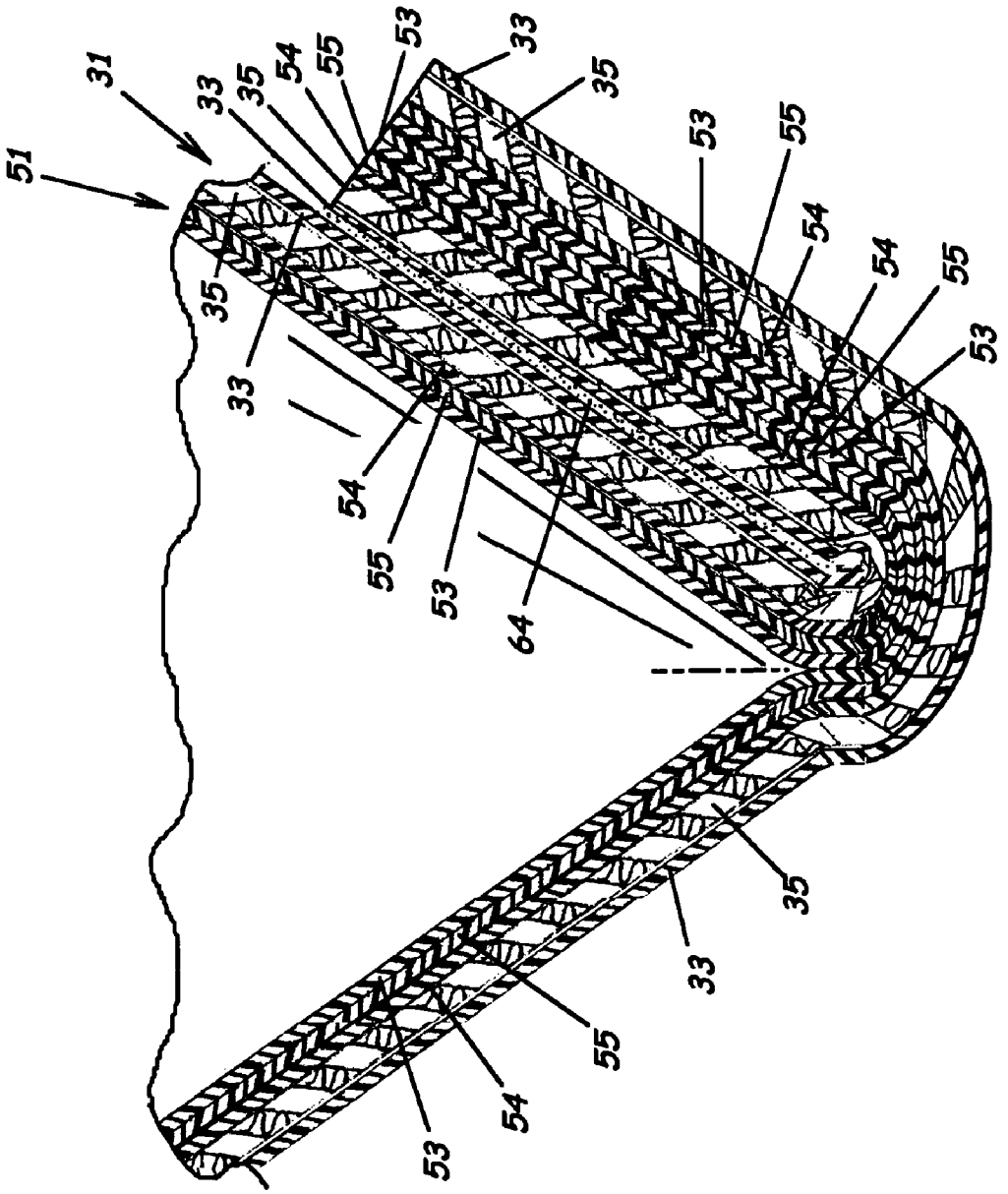


FIG. 11E.

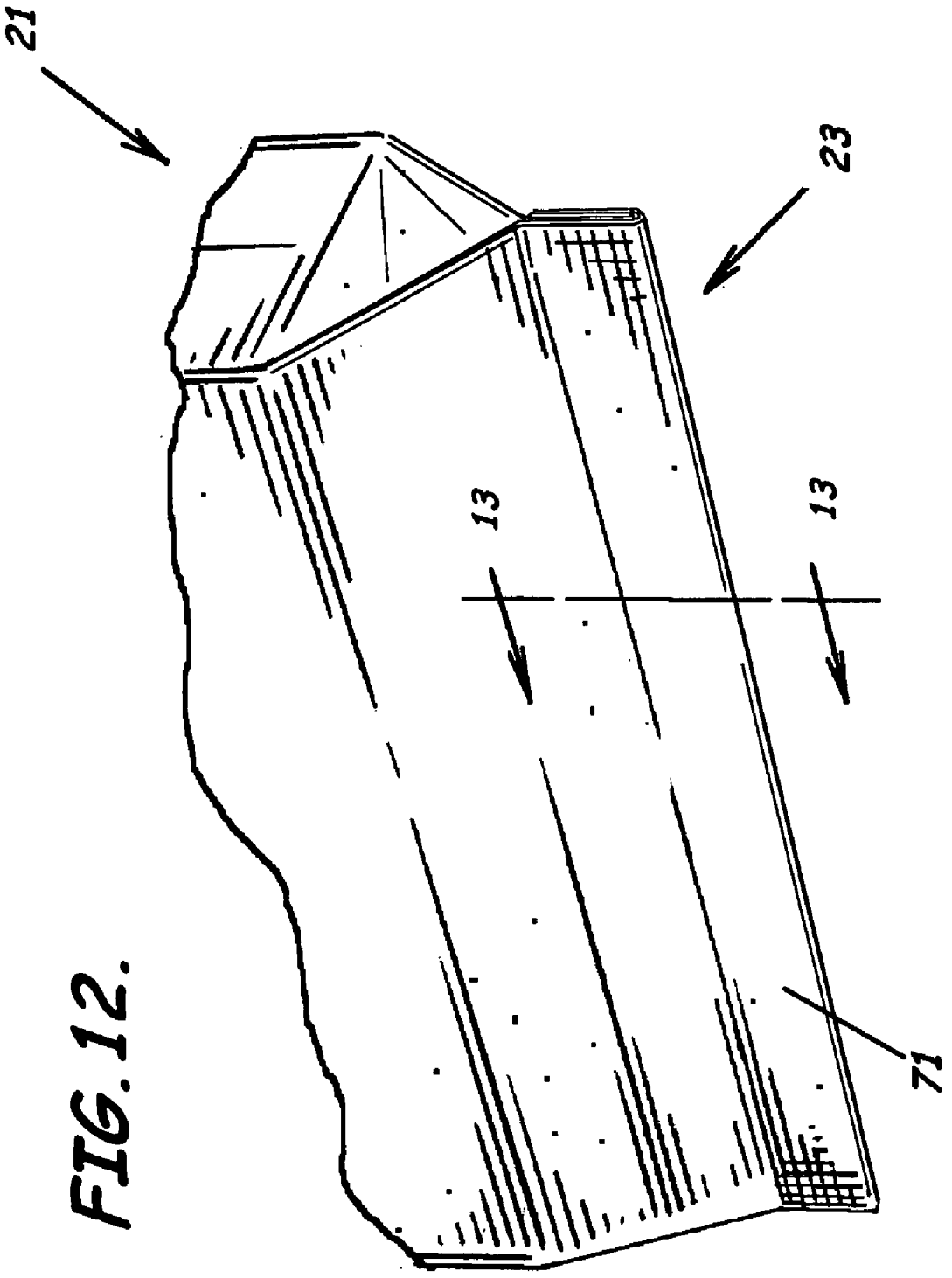


FIG. 12.

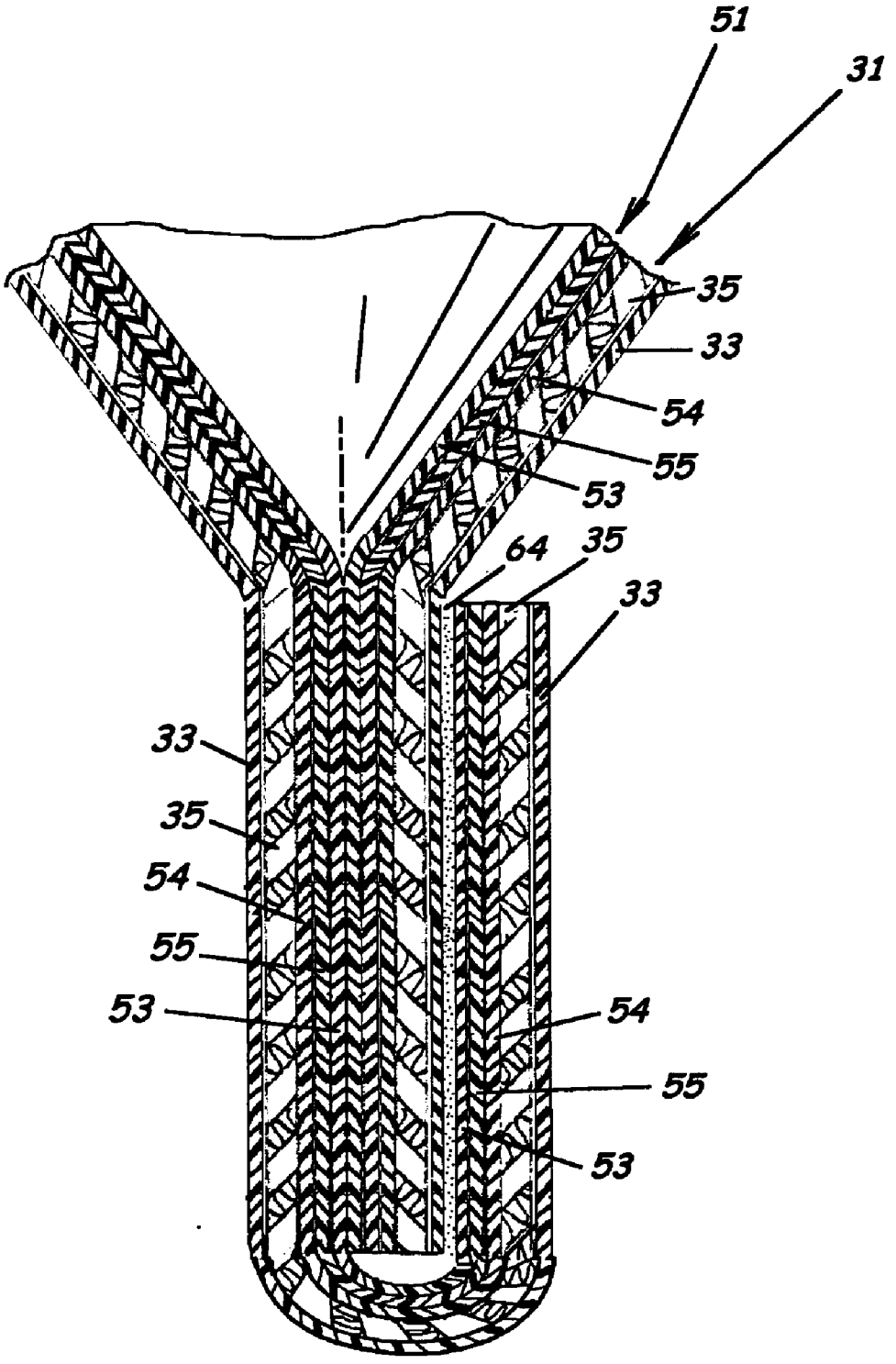


FIG. 13A.

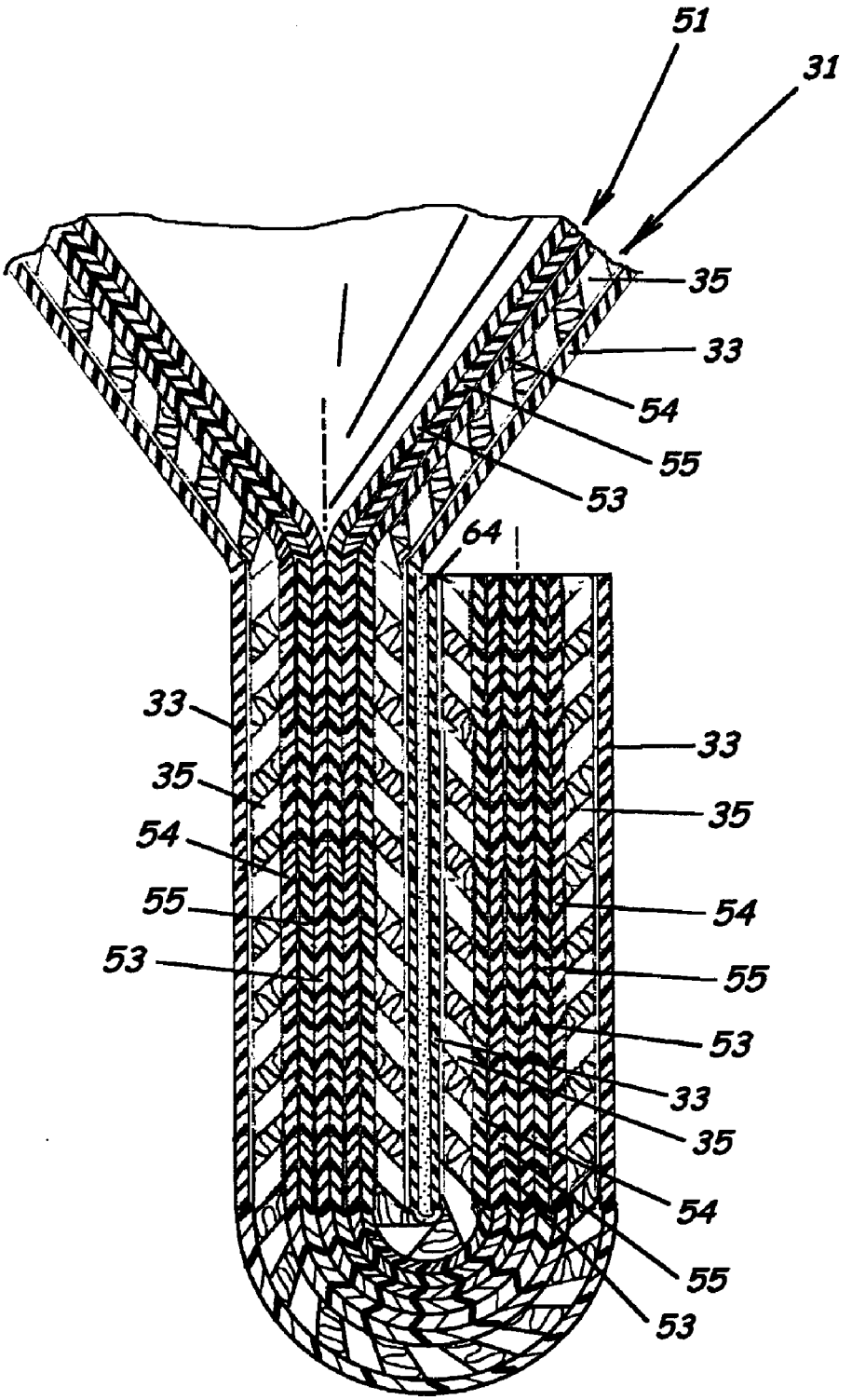


FIG. 13B.

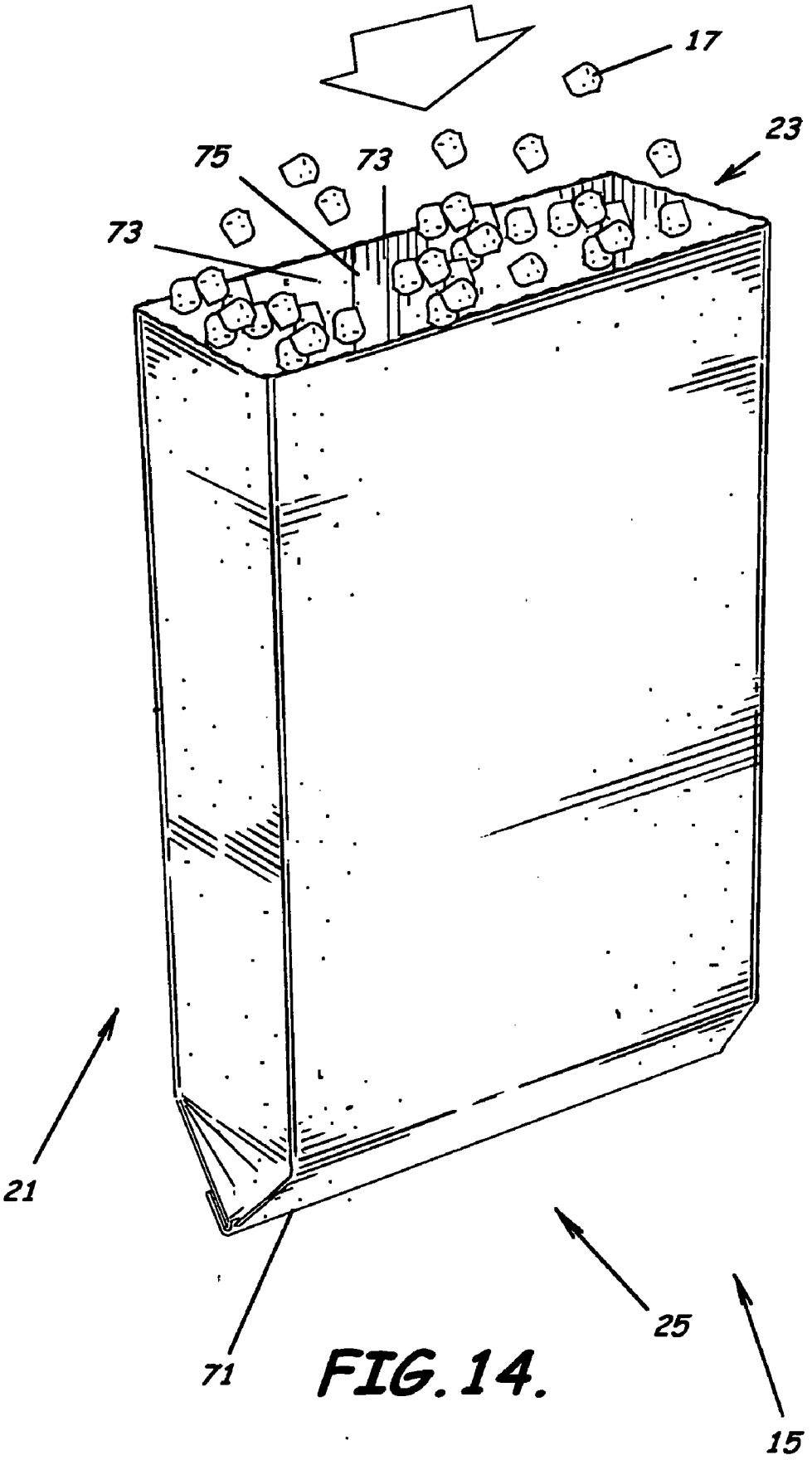


FIG. 14.

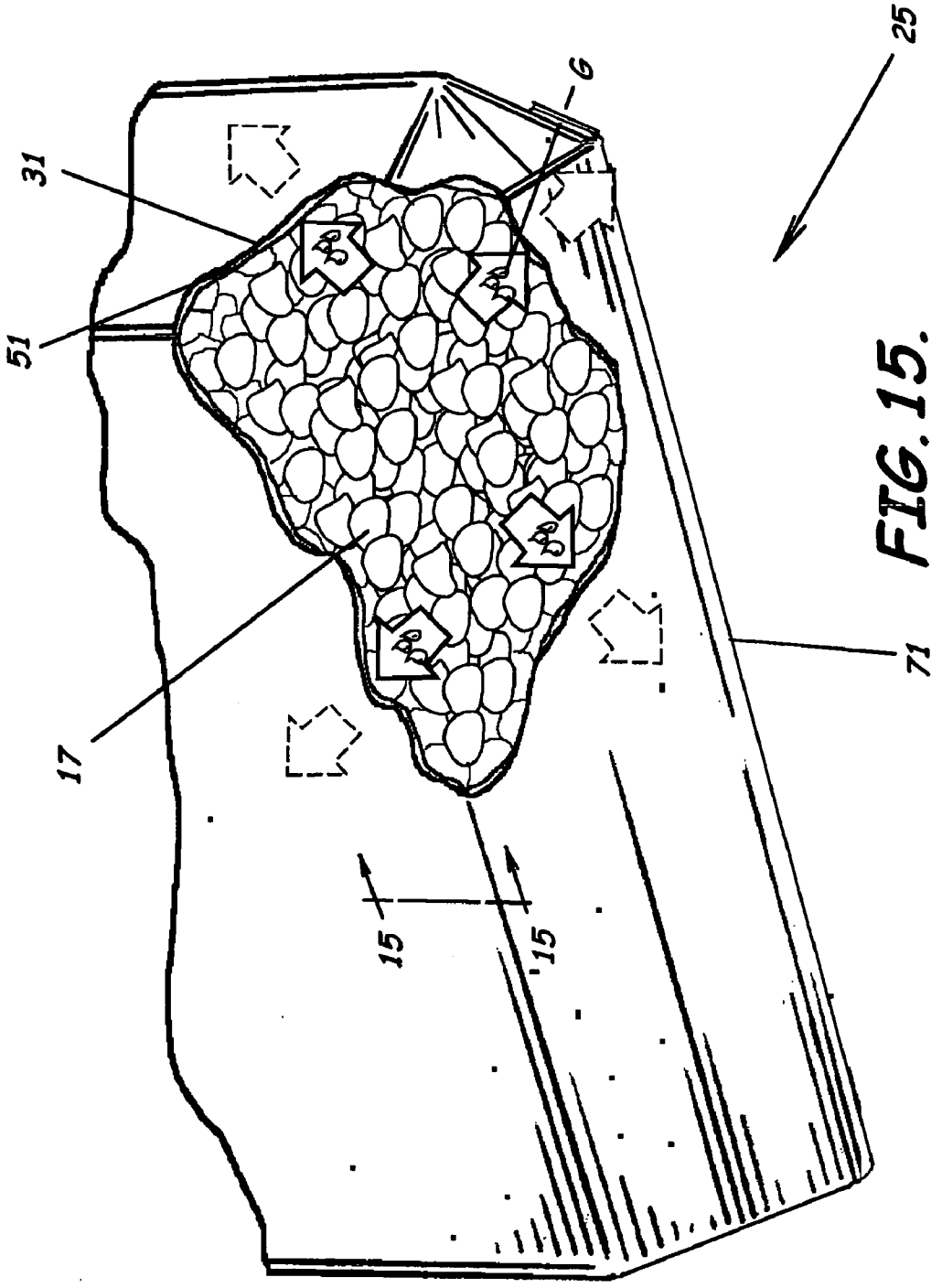


FIG. 15.

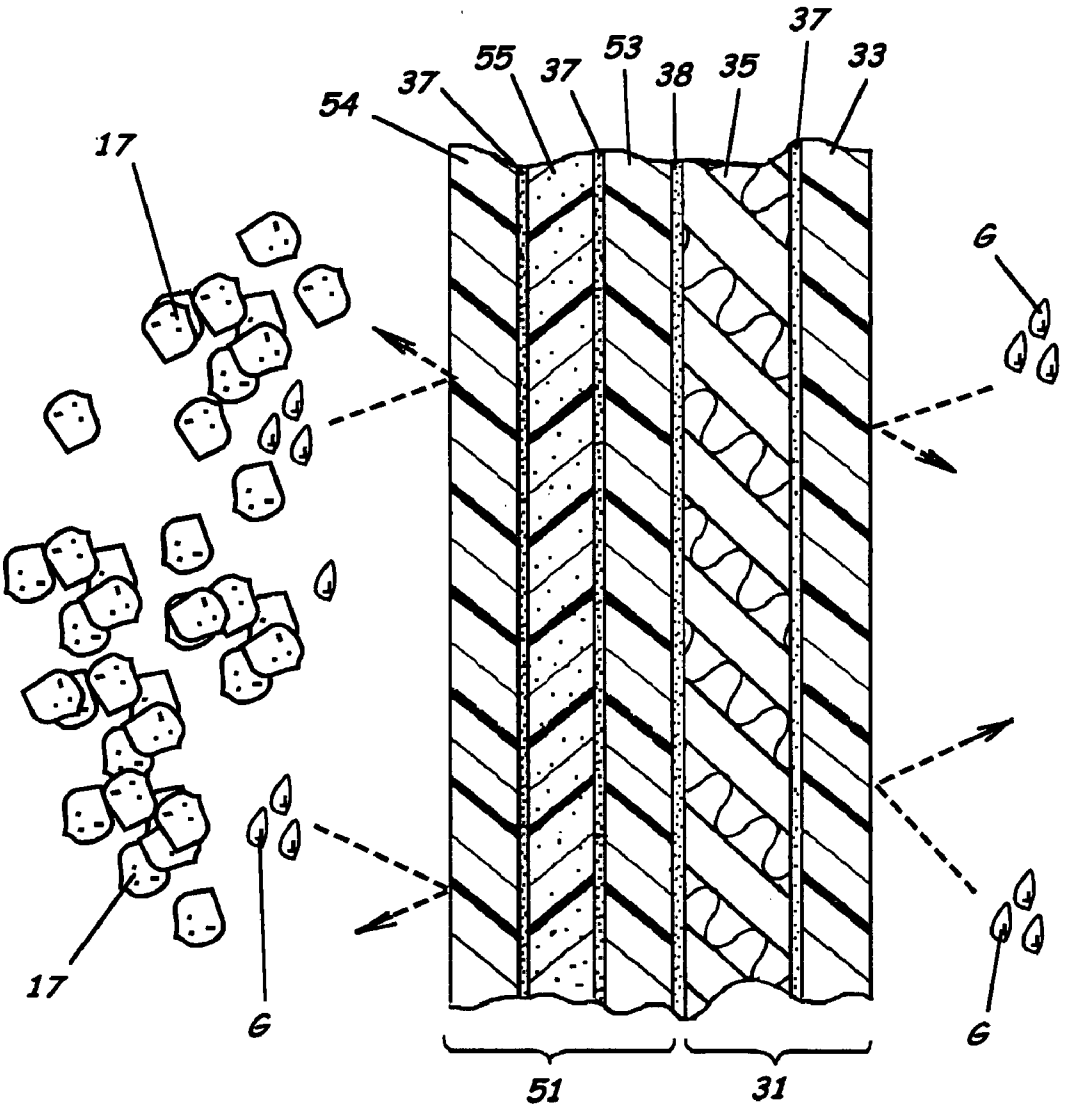


FIG. 16.

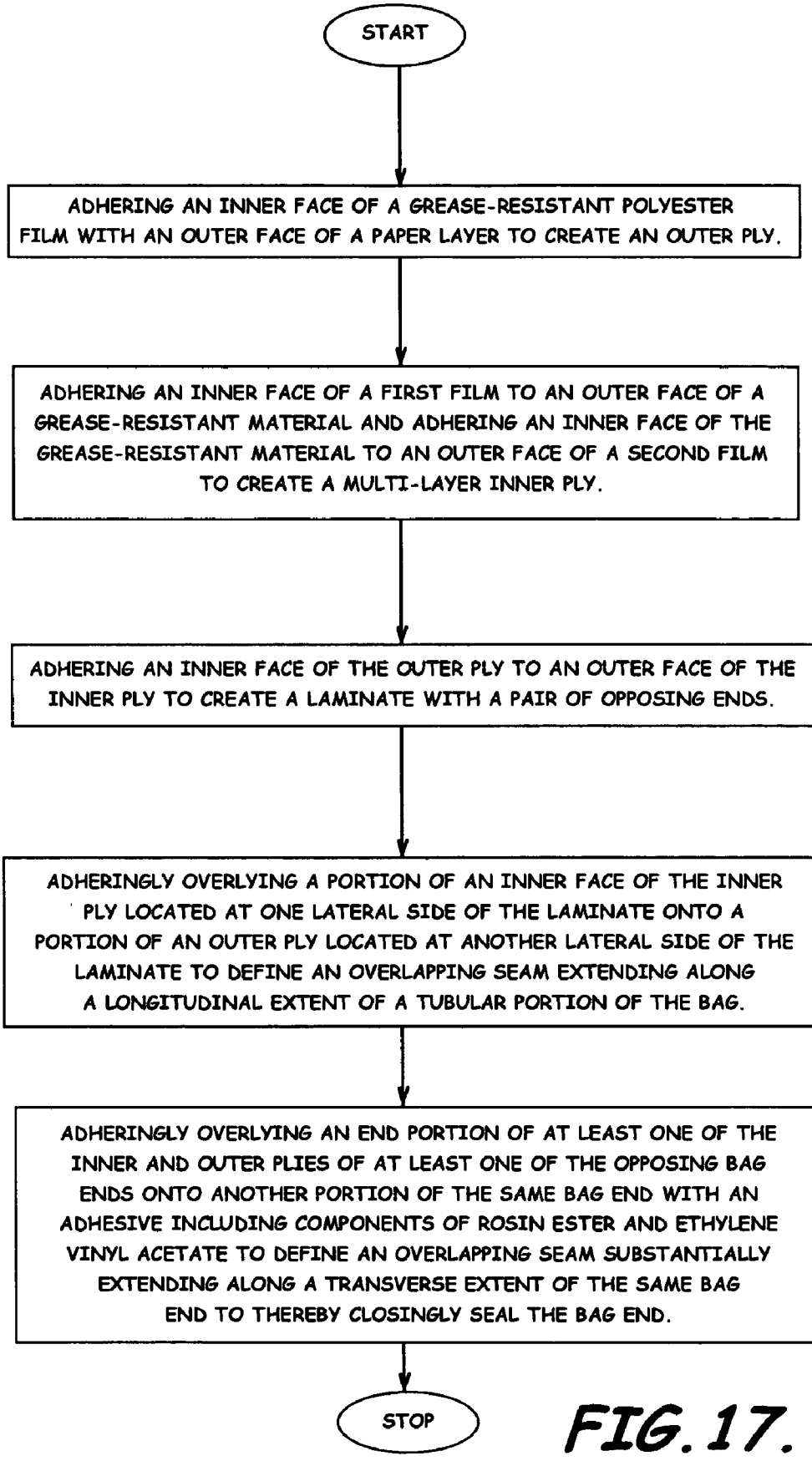

START
ADHERING AN INNER FACE OF A GREASE-RESISTANT POLYESTER FILM WITH AN OUTER FACE OF A PAPER LAYER TO CREATE AN OUTER PLY.
ADHERING AN INNER FACE OF A FIRST FILM TO AN OUTER FACE OF A GREASE-RESISTANT MATERIAL AND ADHERING AN INNER FACE OF THE GREASE-RESISTANT MATERIAL TO AN OUTER FACE OF A SECOND FILM TO CREATE A MULTI-LAYER INNER PLY.
ADHERING AN INNER FACE OF THE OUTER PLY TO AN OUTER FACE OF THE INNER PLY TO CREATE A LAMINATE WITH A PAIR OF OPPOSING ENDS.
ADHERINGLY OVERLYING A PORTION OF AN INNER FACE OF THE INNER PLY LOCATED AT ONE LATERAL SIDE OF THE LAMINATE ONTO A PORTION OF AN OUTER PLY LOCATED AT ANOTHER LATERAL SIDE OF THE LAMINATE TO DEFINE AN OVERLAPPING SEAM EXTENDING ALONG A LONGITUDINAL EXTENT OF A TUBULAR PORTION OF THE BAG.
ADHERINGLY OVERLYING AN END PORTION OF AT LEAST ONE OF THE INNER AND OUTER PLIES OF AT LEAST ONE OF THE OPPOSING BAG ENDS ONTO ANOTHER PORTION OF THE SAME BAG END WITH AN ADHESIVE INCLUDING COMPONENTS OF ROSIN ESTER AND ETHYLENE VINYL ACETATE TO DEFINE AN OVERLAPPING SEAM SUBSTANTIALLY EXTENDING ALONG A TRANSVERSE EXTENT OF THE SAME BAG END TO THEREBY CLOSINGLY SEAL THE BAG END.
STOP

FIG. 17.

TABLE 1

Construction	% Increase MD Tensile Stiffness	% Increase CD Tensile Stiffness
48 gauge PET, CSR4 Paper, and 2.5 mil. FT 2510 coextruded film v. PET	1066.9%	572.8%
48 gauge PET, CSR4 Paper, and 2.5 mil. FT 2510 coextruded film v. 2.5 mil. FT 2510 coextruded film	3369.5%	2004.3%
48 gauge PET, Advantage One Paper, and 2.5 mil. FT 2510 coextruded film v. PET	644.9%	769.3%
48 gauge PET, Advantage One Paper, and 2.5 mil. FT 2510 coextruded film v. 2.5 mil. FT 2510 coextruded film	2114.6%	2618.8%

FIG. 18

TABLE 2

Construction	% Increase Dull Puncture	% Increase Sharp Puncture
48 gauge PET v. Paper	98.3%	27.9%
48 gauge PET and 2.5 mil. FT 2510 coextruded film v. Paper	116.6%	166.0%

FIG. 19

TABLE 3

Construction	% Increase MD Tear Resistance	% Increase CD Tear Resistance	% Increase MD Tear Initiation	% Increase CD Tear Initiation
48 gauge PET v. Paper	24.8%	10.5%	76.2%	68.3%
48 gauge PET and 2.5 mil. FT 2510 coextruded film v. Paper	237.1%	174.1%	108.8%	60.2%

FIG. 20

TABLE 4

Construction	Dull Puncture Resistance, g	Sharp Puncture Resistance, g	MD Tear Resistance, g	CD Tear Resistance, g	MD Tear Initiation, g	CD Tear Initiation, g	MD Tensile, lbf/in	MD % Stretch	MD TEA, ft lb/ sq ft	MD Tensile Stiffness, lbf /in	CD Tensile, lb/in	CD % S	CD TEA, ft lb/sq ft	CD Tensile Stiffness, lb/in
CSR4	1403	276	41.8	58.1	556.5	631.3	26.5	2.1	3.9	1949	23	5.3	9.5	1171
MWK	1630	395	77.2	93.3	892.6	685.9	29.2	1.6	3.3	2431	15.5	3.3	4.4	1235
Trial, BL- Non CC	1572	255	31.7	41.4	1131.6	882.9	37.5	2.5	7	2660	15.5	3.7	4.9	1180
W-RPSE	3751	441	91.5	100.9	1050.7	946.5	32.9	5.4	13.3	1539	26	7.8	15.8	982
Ad One	6425	767	172.5	207.8	1627.6	1758.9	45.9	9.1	29.1	1292.1	33.5	5.2	14.8	2004
65# BL MWK	2230	378	98.5	101.9	1684.6	1685.5	40.6	1.9	5.6	3021	19.4	3.9	6.6	1502
48 ga PET	4713						15	92.1		199.5	14.9	69		215.8
2.5 mil FT 2510	2818						12.7	462.7		67.1	14.9	599.1		69
PET/CSR4	4143	285	70.3	55.8	1670.3	1692.1	35.2	2.2	5.6	2408	31.3	6.2	15.8	1396
PET/MWK	3721	427	85.6	102.6	1326.8	1088	37.2	1.8	4.6	2709	25.4	4.2	9.2	1654
PET/Trial BL	3164	349	46.3	51.5	1134.4	805.3	45.1	2.5	8.2	2896	23.6	4.4	9.3	1512
PET/Trial BL	3038	394	48.1	56.6	1379.5	779.2	45.2	2.6	8.5	2839	24.7	4.8	10.4	1497
PET/Ad One	8249	830	188.3	201.6	2968.2	3051.7	56.9	9.5	39.2	1548	45.4	6.6	24.7	2058
PET/W-RPSE	4764	643	103.4	122	2000.5	1886.4	43.4	5.9	19.8	1840	37.5	8.6	25.5	1307
PET/CSR4/2510 CTM	4317	1003	194.1	200.4	1558.9	1235.7	38.7	2.5	7	2328	36	7.1	20.7	1452
PET/Ad One/2510 CTM	8064	1293	362	422.5	2237.9	2192.9	62.3	10.3	46.6	1486	55.7	8.3	36.7	1876
PET/ 65# BL MWK	4673	625	100	116.9	2283.8	2011.4	49.6	2.3	7.8	3139	30.2	5.9	15.1	1799

FIG. 21

GREASE-RESISTANT BAG HAVING ADHESIVE CLOSURE, ADHESIVE CLOSURE FOR BAG, AND RELATED METHODS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to the bags or packaging industry, and more particularly, to grease-resistant bags having an adhesive closure and related methods.

[0003] 2. Description of the Related Art

[0004] Consumer packaging is important in today's marketplace. Not only do the products within the packaging have to be fresh, but the outside portions of the packaging must be aesthetically appealing. Traditionally, the focus has been to either sacrifice external appearance for internal protection, or sacrifice internal protection for external appearance, but seldom are the concerns with both external appearance and internal protection addressed with a single bag.

[0005] Furthermore, foods such as pet foods can exhibit an increased grease or fat component. The grease component of these foods in the past tended to penetrate the layers of the bag or gradually led to deterioration of the bag over time. The increasing grease content has created a desire in the art for a food bag with greater grease resistant properties and yet can be aesthetically appealing. Problems have also persisted regarding adequate sealing measures for the bag ends of the bags.

SUMMARY OF THE INVENTION

[0006] In view of the foregoing, embodiments of the present invention advantageously provide an enhanced bag that prevents grease from penetrating therethrough. Embodiments of the present invention also advantageously provide a method for constructing a bag that prevents grease from penetrating therethrough. Embodiments of the present invention further advantageously include a bag body and a pair of bag ends adapted to retain a food element, as well as any grease component associated with the food element, within the inner confines of the bag body. Embodiments of the invention allow the bag to carry over twenty-five pounds of a product, such as pet food, with relative ease.

[0007] For example, an embodiment of the present invention advantageously provides a bag to carry a food element having a grease component so that grease from the grease component is advantageously prevented from penetrating from within the bag to outside the bag. Additionally, for example, grease from other grease components not associated with the bag is advantageously prevented from penetrating from outside the bag to within the bag. An embodiment of the bag, for example, can include a tubular bag body having pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply. The outer ply includes an inner face of a grease-resistant polyester film abuttingly adhered to an outer face of a paper layer with a tie layer that can include a solventless adhesive. For example, the paper layer can advantageously have a greater bending stiffness than the polyester film. Also, for example, the paper layer can advantageously have a greater thickness than the polyester film. The bag can also include the inner face of the polyester film having printed indicia thereon to advantageously enhance visual appearance of the bag, and the polyester film can be adapted to allow an amount of light to advantageously transmit therethrough to thereby allow viewing of the printed indicia from outside of the bag.

[0008] An embodiment of the food bag, for example, can further include an inner ply having an inner face of a first film abuttingly adhered to an outer face of a grease-resistant material and an inner face of the grease-resistant material abuttingly adhered to an outer face of a second film. The embodiment can include a portion of the second film overlying a portion of the polyester film to define an overlapping seam of the tubular bag body extending along a longitudinal extent of the bag. The outer ply can have a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends, and the inner ply can have a substantially similar longitudinal length from the one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends. Also, for example, a portion of at least one of the inner and outer plies of at least one of the opposing bag ends can foldingly and adheringly overlie another portion of the one bag end to define an overlapping seam extending along substantially an entire transverse extent of the one bag end to thereby closingly seal the one bag end so that the food element when positioned therein is retained within inner confines of the bag between the opposing pair of bag ends.

[0009] A further embodiment of the bag, for example, can include a bag body having a pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply. For example, the outer ply can include an inner face of a grease-resistant polyester film abuttingly adhered to an outer face of a paper layer. Also, for example, the paper layer can have a greater bending stiffness than the polyester film. The inner ply can include a grease-resistant material. Also, for example, an end portion of at least one of the inner and outer plies of at least one of the opposing bag ends can adheringly overlie another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of the same bag end to thereby closingly seal the bag end.

[0010] A further embodiment of the bag, for example, can include a bag body having a pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply. For example, the outer ply can include a grease-resistant film, and the inner ply can include a grease-resistant material. Also, for example, an end portion of at least one of the inner and outer plies of at least one of the opposing bag ends can adheringly overlie another portion of the same bag end with an adhesive including components of rosin ester and ethylene vinyl acetate so that the grease resistant film of the outer ply contacts the adhesive and the grease resistant material of the inner ply contacts the adhesive to thereby define an overlapping seam substantially extending along a transverse extent of the same bag end.

[0011] Another embodiment of the bag, for example, can include a bag body having an inner face of an outer ply abuttingly adhering to an outer face of an inner ply. Also, for example, the outer ply can include a polyester material, and the inner ply can include a polymeric material. Also, for

example, a portion of at least one of the inner and outer plies can adheringly overlie another portion of the same bag end with an adhesive including components of rosin ester and ethylene vinyl acetate so that the polyester material of the outer ply contacts the adhesive and the polymeric material of the inner ply contacts the adhesive to thereby define a bag closure.

[0012] An embodiment of the bag, for example, can include a method of constructing a bag. For example, the method can include adhering an inner face of a grease-resistant polyester film with an outer face of a paper layer to create an outer ply. The method can also include, for example, adhering an inner face of a first film to an outer face of a grease-resistant material and adhering an inner face of the grease-resistant material to an outer face of a second film to create a multi-layer inner ply. The method can also include, for example, adhering an inner face of the outer ply to an outer face of the inner ply to create a laminate with a pair of opposing ends. The method can also include, for example, adheringly overlying a portion of an inner face of the inner ply located at one lateral side of the laminate onto a portion of an outer face of the outer ply located at another lateral side of the laminate to define an overlapping seam extending along a longitudinal extent of a tubular portion of the bag. The method can also include, for example, adheringly overlying an end portion of at least one of the inner and outer plies of at least one of the opposing bag ends onto another portion of the same bag end with an adhesive including components of rosin ester and ethylene vinyl acetate to define an overlapping seam substantially extending along a transverse extent of the same bag end to thereby closingly seal the bag end.

[0013] Embodiments of the present invention advantageously combine the use of polymeric structures and paper, thereby combining the advantages of the thickness and bending stiffness of paper with the puncture-resistant and grease-resistant properties of polyester. Embodiments of the present invention further advantageously combine the use of grease-resistant or polymeric structures in the form of a mono-layer or multi-layer coextruded film, thereby combining the advantages of the thickness and bending stiffness of paper with the puncture-resistant and grease-resistant properties of grease-resistant or polymeric materials. Embodiments of the present invention also provide increased barrier protections from grease, endurance, strength, physical integrity, thickness, stiffness, resistance to stretching from pressure from food elements within the bag, and heat-sealable characteristics not offered with other bags. The bag advantageously prevents problems customarily associated with greasy products such as pet food, for example, and eliminates the absorption and penetrable effect of the grease component included in such foods as pet food. Various bags are often used in other settings where greasy elements are contained within the bags, and the present invention advantageously contributes to solving such problematic concerns attributable to the grease. Other applications of the bag may include dry foods, beverages, feed, soil, lawn and garden, building materials, and other markets to advantageously prevent grease from penetrating from outside the bag to within the bag and to prevent grease from penetrating from within the bag to outside the bag.

[0014] Embodiments of the present invention offer the further advantages of the adhesive including components of rosin ester and ethylene vinyl acetate adhering a portion of at least one of the inner and outer plies of at least one of the opposing bag ends to another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends. For example, the adhesive can adhere a grease-resistant material to another grease-resistant material. Also, for example, the adhesive can adhere a polyester material with a type of polymeric material. Even further, for example, layers of materials, such as polyethylene or oriented polypropylene (OPP) can be heat-sealed in order to closingly seal the bag.

[0015] A further advantage of the present invention is the environmentally friendly composition of the structure of the present invention by producing bags **18** that are less toxic and increasingly biodegradable, while maintaining inexpensive costs relative to other types of potentially environmentally friendly bags **18**. Further, the bag **15** can advantageously be manufactured on existing equipment previously utilized for manufacturing bags **18**, so there is no necessity to invest in new and expensive bag **15** manufacturing equipment.

[0016] Embodiments of the invention can have many alternative bag styles in addition to the embodiments described, such as for example bag styles of a gusseted pinch-bottom bag, a pinch-bottom bag not gusseted, other various pinch-bottom styles of bags, heat-sealable bags of various constructs, and block-bottom bags of various constructs. Such features are interchangeable, as understood by those skilled in the art, and are determined by the requirements of the marketplace. Regardless of what type of bag is to be constructed, another advantage of embodiments of the present invention is that each can be run on conventional bag producing machines, as understood by those skilled in the art. Embodiments of the bags manufactured in this way using the described construction and materials also offers the advantage of allowing the bag to be made containing consumer features such as easy-carry handles, reclosable zippers, and easy-to-open features, and cost-effective measures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Some of the features, advantages, and benefits of the present invention having been stated, others will become apparent as the description proceeds when taken in conjunction with the accompanying drawings, in which:

[0018] FIG. **1**A is a perspective view of a bag according to an embodiment of the present invention having pet food therein;

[0019] FIG. **1**B is a side elevational view of a bag according to an embodiment of the present invention;

[0020] FIG. **2** is a perspective view of an outer ply of a bag having a grease-resistant film and a paper layer according to an embodiment of the present invention;

[0021] FIG. **2**A is a perspective view of an outer ply of a bag having a grease-resistant film, a paper layer, and an outer coating according to an embodiment of the present invention;

[0022] FIG. **2**B is a perspective view of an outer ply of a bag having a grease-resistant film with a printed indicia thereon and a paper layer according to an embodiment of the present invention;

[0023] FIG. **3** is a sectional view along line **3-3** of FIG. **2** of the outer ply of a bag according to an embodiment of the present invention;

[0024] FIG. **3**A is a sectional view along line **3**A-**3**A of FIG. **2**A of the outer ply of a bag having an outer coating according to an embodiment of the present invention;

[0025] FIG. **4** is a perspective view of an inner ply of a bag having a grease-resistant film adhered between a pair of heat-sealable films according to an embodiment of the present invention;

[0026] FIG. **5** is a sectional view along line **5-5** of FIG. **4** of the inner ply of a bag according to an embodiment of the present invention;

[0027] FIG. **6** is a perspective view of the outer ply of a bag adhering to the inner ply according to an embodiment of the present invention;

[0028] FIG. **7** is a sectional view along line **7-7** of FIG. **6** of the outer and inner plies of a bag according to an embodiment of the present invention;

[0029] FIG. **8** is a perspective view of the inner and outer plies of a bag illustrated to fold and overlap to create a tubular shape of the bag;

[0030] FIG. **9** is a perspective view of a tubular shape of a bag with two open bag ends and a longitudinal seam thereupon according to an embodiment of the present invention;

[0031] FIG. **10** is a perspective view of a bag with one of the bag ends sealed at the closed bag end according to an embodiment of the present invention;

[0032] FIG. **11**A is an enlarged sectional view along the line **11-11** of FIG. **10** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0033] FIG. **11**B is an enlarged sectional view along the line **11-11** of FIG. **10** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0034] FIG. **11**C is an enlarged sectional view along the line **11-11** of FIG. **10** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0035] FIG. **11**D is an enlarged sectional view along the line **11-11** of FIG. **10** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0036] FIG. **11**E is an enlarged sectional view along the line **11-11** of FIG. **10** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0037] FIG. **12** is a perspective view of a bag with one of the bag ends melted and closingly sealed to form a lip at the closed bag end according to an embodiment of the present invention;

[0038] FIG. **13**A is an enlarged sectional view along line **13-13** of FIG. **12** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0039] FIG. **13**B is an enlarged sectional view along line **13-13** of FIG. **12** illustrating the layers of a closed bag end according to an embodiment of the present invention;

[0040] FIG. **14** is a perspective view of a bag with a closed end and an open end receiving a number of food elements according to an embodiment of the present invention;

[0041] FIG. **15** is a perspective view showing the inner and outer ply of a bag preventing the penetration of grease therethrough according to an embodiment of the present invention;

[0042] FIG. **16** is a sectional view along line **15-15** of FIG. **14** illustrating the inner and outer plies of the bag preventing the penetration of grease therethrough according to an embodiment of the present invention;

[0043] FIG. **17** is a flow diagram illustrating a method for constructing a bag according to an embodiment of the present invention;

[0044] FIG. **17** is a flow diagram illustrating a method for constructing a bag according to an embodiment of the present invention;

[0045] FIG. **18** is a table showing data related to embodiments of the present invention;

[0046] FIG. **19** is a table showing data related to embodiments of the present invention;

[0047] FIG. **20** is a table showing data related to embodiments of the present invention; and

[0048] FIG. **21** is a table showing data related to embodiments of the present invention.

DETAILED DESCRIPTION

[0049] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, which illustrate embodiments of the invention. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout. The prime notation, if used, indicates similar elements in alternative embodiments.

[0050] FIG. **1**A shows a perspective view of an embodiment of a food bag **15** having contained therein a food element **17** with a grease component G. As shown in FIG. **16**, for example, grease from the grease component G of the food element **17** is advantageously prevented from penetrating from within the bag **15** to outside the bag **15**. Also, for example, grease from other grease components not associated with the bag is advantageously prevented from penetrating from outside the bag **15** to within the bag **15**. Additionally, the bag **15** also can alternatively be utilized for carrying elements **19** other than food. For example, other elements **19** having components with similar characteristics to grease, as understood by those skilled in the art, can also be advantageously prevented from penetrating the walls or plies of the food bag **15**.

[0051] An embodiment of the bag **15** has an outer ply **31** and an inner ply **51**, as shown for example in all embodiments of FIGS. **6-9**, where an inner face of the outer ply **31** abuttingly adheres to an outer face of an inner ply **51**. An embodiment of the outer ply **31**, shown for example in all embodiments of FIGS. **2-3**, includes an inner face of a

grease-resistant film **33** abuttingly adhered to an outer face of a paper layer **35** with a tie layer **37**, such as, for example, a solventless adhesive, a plastic-type bonding material, a coax film, or other suitable tie layer, as understood by those skilled in the art. The grease-resistant film **33** can include a thermoplastic material, for example, selected from the group consisting of: polyethylene terephthalate (PET), polyethylene terephthalate polyester (PETP), polytrimethylene terephthalate (PTT), polybutylene terephthalate (PBT). The PTT and PBT are generally utilized for similar purposes as the PET, but may perform slightly better than the PET to varying degrees. The PTT and PBT, however, for example, may be slightly more expensive than the PET to varying degrees. Polyester films **33** such as the aforementioned are advantageously hard, strong, ductile, stiff, strong, dimensionally stable, puncture-resistant, grease-resistant, resistant to absorption, and have excellent barrier properties and chemical/mechanical properties as understood by those skilled in the art. Additionally, for example, the grease-resistant film **33** can also include other materials containing grease-resistant properties, as understood by those skilled in the art, such as resistance to mineral oils, solvents, and acids. For example, other materials that have generally similar properties as the aforementioned polyester films **33** can be, for example, plastics, polyvinyl chloride (PVC), polyamide (PA), polyethylene (PE), polystyrene (PS), and polypropylene (PP), as understood by those skilled in the art. The grease-resistant film **33**, for example, can be in the range of about 36 gauge to about 300 gauge and, for example, can be about 48 gauge for some applications such as pet food bags. The film **33**, however, can have other gauges for pet food bags and other applications as desired, as understood by those skilled in the art.

[**0052**] In one embodiment, the polyester film **33**, for example, can advantageously be treated with a coating **27** on the outer face of the outer ply **31** to advantageously provide enhanced barrier protection from grease penetrating from outside the bag **15** to within the bag **15**, protecting against abrasion and moisture, and providing an attractive gloss finish. The coatings **27** can also include printed indicia **29** as well. The coatings **27** can include, for example, flexography coatings **27**, proprietary coatings **27**, or other suitable coatings **27**. In an embodiment, for example, the coatings **27** can utilize Repellence™ barrier coatings or Aqua Crystal™ film coatings, both of which are manufactured by Exopack, LLC of Spartanburg, S.C., as understood by those skilled in the art. The coatings can facilitate adhesion and bonding and can enhance the coefficient of friction of the bag.

[**0053**] The coating **27** provided on the outer face of the polyester film **33** of the outer ply **31** provides oil, grease, and water resistance without the use of inferior traditional films and/or foils. The coatings **27** effectively preserve the quality of the package contents as well as the physical integrity of the bag **15** as a whole. The Repellence™ coating **27**, for example, is particularly advantageous for products that contain oil or grease and to bags **18** that may occasionally be subjected to rain or other elements **19**. The Aqua Crystal™ film coating **27**, for example, is advantageous in part because of its clarity and gloss thereby enhancing the appearance to consumers.

[**0054**] In one embodiment, the outer face of the polyester film **33**, for example, can have a coefficient of friction in a range of about 0.5 to about 0.9, as understood by those skilled in the art, but can alternatively feature differing ranges of coefficients of friction depending on the specific type of polyester film **33** employed in each instance and/or other applications. The coefficient of friction, for example, in a pet food bag application can advantageously be high enough so that the finished product does not have the tendency to slip or slide when positioned on a shelf or cabinet. An embodiment of the polyester film **33** may have a thickness varying from 36 gauge to 48 gauge, for example, but alternatively may have thicknesses above or below that range.

[**0055**] In one embodiment, the inner face of the grease-resistant film **33** of the outer ply **31** can advantageously include printed indicia **29** thereupon to enhance visual appearance of the bag **15**. The polyester film **33** is adapted to allow an amount of light to transmit therethrough, as understood by those skilled in the art, to thereby allow viewing of the printed indicia **29** from outside of the bag **15**. The polyester film **33** can be an amorphous classification which is highly transparent and colorless, or can alternatively be a semi-crystalline classification which is translucent or opaque with an off-white coloring. Amorphous polyester films **33** generally have better ductility than semi-crystalline polyesters, but less hardness and stiffness than the semi-crystalline type. The polyester film **33**, for example, can be printed with solvent-based inks or water based inks, and can be printed overall with a flood coat of white ink, which may advantageously allow for better graphics. The embodiment featuring the flood coat of white ink may also advantageously impart the ability to mask grease if it somehow penetrated through a cut or crack in the polyester film **33**. Also, for example, portions of the polyester film **33** can be treated with an acrylic chemical suitable for adhering to solvent based inks, water based inks, or other inks. In alternative embodiments, instead of reverse printing printed indicia **29** on the inner face of the polyester film **33**, printed indicia **29** can be surface printed on the outer face of the polyester film **33**, or otherwise can be left clear without any printed indicia **29** featured thereupon.

[**0056**] Embodiments of the invention can feature the paper layer **35** of the outer ply **31**, for example, advantageously having a greater bending stiffness or tensile stiffness than the polyester film **33** of the outer ply **31**. Also, for example, embodiments of the invention can feature the paper layer **35** of the outer ply **31** having a greater thickness than the polyester film **33** of the outer ply **31**, which additionally contributes to enhanced bending stiffness, modulus, and/or tensile strength of the paper layer **35** and increased stabilization of the bag, as understood by those skilled in the art. The range of thickness for the paper layer **35** can be generally in the range of about 1.75 millimeters to about 10 millimeters. For example, the minimum thickness of one embodiment includes a paper thickness of about 1.9 millimeters, which is relatively flimsy compared to paper **35** with advantageously greater thickness. For example, embodiments of the invention can feature a paper layer **35** of the outer ply **31** having a thickness in the range of about 3.5 millimeters to about 4.5 millimeters. The range of thickness for the polyester film **33** of the outer ply **31** can be generally in the range of about 0.25 millimeters to about 0.75 millimeters. For example, embodiments of the invention can feature a polyester film **33** of the outer ply **31** of about 48 gauge and/or having a thickness in the range of about 0.475 millimeters to about 0.485 millimeters. As

understood by those skilled in the art, an increased thickness of the paper layer **35** or the polyester film **33** can provide for increased bending stiffness and increased stabilization of the bag.

[**0057**] Stiffness, in this regard, is generally understood to be bending stiffness or tensile stiffness, although other suitable measurements of stiffness can also be utilized in accordance with the present invention, such as droop stiffness, folding endurance, or other alternative measurements. Bending stiffness, for example, is an expression of the rigidity of paper or paperboard and is a function of the cube of the caliper thickness. As understood by those skilled in the art, this property of bending stiffness is to some extent related to the modulus of elasticity of the product and its thickness. The bending stiffness of the paper layer generally increases as the thickness of the paper layer is increased, as understood by those skilled in the art.

[**0058**] There are several instruments in use in the industry that measure stiffness, and they all operate in such a manner to bend the product as a way of measuring stiffness. As understood by those skilled in the art, there are generally 2-point bending instruments and 4-point bending instruments. Solid fiber board and small fluted combined board (to be used in folding cartons) is typically measured with 2-point bending instruments. Commonly used instruments include Taber, Gurley, and L&W instruments to measure bending stiffness. In the United States, Taber Stiffness is the most common stiffness measurement, and Gurley Stiffness is also used quite often. L&W instruments are more common in European countries to measure stiffness. As such, in accordance with the present invention, Taber Stiffness and Gurley Stiffness are therefore two methods of measuring bending stiffness for the particular applications and thicknesses of the paper layer **35** and the polyester film **33** in the ordinary course, as understood by those skilled in the art.

[**0059**] With respect to the bending stiffness measurements, as understood by those skilled in the art, the TAPPI (Technical Association of the Pulp and Paper Industry) has industry standards for measuring stiffness that are utilized, acknowledged, and/or implemented in embodiments of the present invention. The Gurley Stiffness Value is measured using a Gurley Stiffness Testor, manufactured by W. and L. E. Gurley of Troy, N.Y. In essence, as understood by those skilled in the art, this instrument measures the externally applied moment required to produce a given deflection of a strip of material of specific dimensions fixed at one end and having a concentrated load applied to the other end. The results are obtained as "Gurley Stiffness" values in units of grams. There is a reasonable correlation between Gurley Stiffness and Taber Stiffness for paperboard grades, as understood by those skilled in the art. As referenced in TAPPI Test Method T-543, paragraph 4.1.5, the full range of Gurley values range from approximately 1.39 to 56,888 Gurley Stiffness units, which after using the proper conversion equation roughly corresponds to Taber values ranging from approximately 0 to 806.3 Taber Stiffness units, as understood by those skilled in the art.

[**0060**] The Tables **1-3** in FIGS. **18-20** show a variety of data relating to stiffness, puncture resistance, tear resistance, and tear initiation, as understood by those skilled in the art. An additional Table **4** is included in FIG. **21** showing the raw data utilized in the calculations of tables **1-3** of FIGS. **18-20**. The data from Table **4** of FIG. **21** includes properties of various materials and multi-layer combinations of materials. The raw data of Table **4** of FIG. **21** was used in tests to demonstrate the relative advantages of the multi-layer combinations. As understood by those skilled in the art, there are many different grades and gauges for the PET, paper, and film. As such, the tests are not intended to be a broad universal assertion derived from substituting a single example of a material for all types of that material. Rather, the tests are intended to provide an anecdotal indicator that fairly and adequately represents a benchmark of the clear advantages of combining different materials into a multi-layer combination, including advantageously enhancing stiffness, puncture resistance, tear resistance, and tear initiation, among other measurements. The raw data used a variety of materials, and Table **4** of FIG. **21** illustrates a number of abbreviations used to identify each material.

[**0061**] For example, in Tables **1-4**, particularly in the raw data included within Table **4** of FIG. **21**, the abbreviations which are used to illustrate various types of materials, as understood by those skilled in the art, are described as follows: CSR4 (i.e., tradename CSR4) represents a type of fluorocarbon treated, clay coated, bleached sheet of paper; MWK represents a type of multi-wall Kraft (MWK) brown paper; Trial BL Non-CC represents type of fluorocarbon treated, bleached (BL) sheet of paper that is non-clay-coated (Non-CC); W-RPSE represents a type of Royal Performance semi-extensible (RPSE) white paper; Ad One (i.e., Advantage One) represents a type of substrate of a heavy extensible sheet of paper; 65# BL-MWK represents a bleached (BL) multi-wall Kraft (MWK) sheet of paper having a basis weight of 65 lbs; 48 gauge PET represents a PET layer of 48 gauge; and 2.5 mil. FT 2510 coextruded film represents a nylon coextruded core film having a 2.5 mil. gauge and a 2510 grade specification. Furthermore, in Tables **1-4** in FIGS. **18-20**, the paper references correspond to the paper layer **35** of the outer ply **31**. The PET references correspond to the outer layer **33** of the outer ply **31**. The FT 2510 coextruded film references correspond to the multi-layer or mono-layer formation of the inner ply **51**.

[**0062**] FIG. **18**, for example, shows the percent increase in machine-direction tensile stiffness and cross-direction tensile stiffness, as understood by those skilled in the art, for the following comparisons: 48 gauge PET, CSR4 paper, and 2.5 mil. FT 2510 coextruded film v. PET; 48 gauge PET, CSR4 paper, and 2.5 mil. FT 2510 coextruded film v. 2.5 mil. FT 2510 coextruded film; 48 gauge PET, Advantage One paper, and 2.5 mil. FT 2510 coextruded film v. PET; and 48 gauge PET, Advantage One paper, and 2.5 mil. FT 2510 coextruded film v. 2.5 mil. FT 2510 coextruded film.

[**0063**] FIG. **19**, for example, shows the percent increase in dull-puncture and sharp-puncture, as understood by those skilled in the art. FIG. **20**, for example, shows the percent increase in machine-direction tear resistance and cross-direction tear resistance, as understood by those skilled in the art. FIG. **20**, for example, also shows the percent increase in machine-direction tear initiation and cross-direction tear initiation, as understood by those skilled in the art. Each of the tables in FIGS. **19-20** illustrate data relating to the following comparisons: 48 gauge PET v. paper; and 48 gauge PET and 2.5 mil. FT 2510 coextruded film v. paper.

[**0064**] In this manner, in some embodiments of the invention, the paper layer **35** advantageously enhances the appear-

ance of the bag **15** as a whole, and also advantageously enhances durability and product handling by consumers. Various base-weights of paper can be utilized, for example, ranging from about 30 lbs.-force per square inch to about 50 lbs.-force per square inch, as understood by those skilled in the art. Embodiments of the paper layer **35**, for example, also can be clay-coated and bleached, as understood by those skilled in the art, or alternatively can be manufactured without clay-coating and without bleach. Embodiments of the paper layer **35** can also be treated with a fluorocarbon chemical to improve grease-resistance, as understood by those skilled in the art, or alternatively can be manufactured without applying a fluorocarbon chemical treatment or with applying a non-fluorocarbon treatment in some applications, for example. Also, for example, portions of the outer face of the paper layer **35** by illustrate printed indicia **29** printed thereupon. Procedures for printing printed indicia **29** can include process printing, rotogravure printing, innovative flexographic printing, or other processes of printing as understood by those skilled in the art. The paper layer **35** can also be treated with a chemical to advantageously provide enhanced protection from grease penetrating through the paper layer **35** of the bag **15**.

[0065] The technical requirements of the paper layer **35** may be reduced because the grease-resistant polyester and nylon layers solve the grease problem. Thus, even though grease-resistant paper **35** may still be utilized in certain embodiments, it is no longer necessary to utilize grades of paper layers **35** that have some degree of grease-resistant properties, because the other layers prevent grease penetration. As a result, other less expensive grades of paper that don't offer any grease-resistance may be utilized. In accordance with embodiments of the present invention, a paper layer **35** can be selected having a sufficient thickness that advantageously contributes to the bending stiffness and stability of the bag **15** without having to address concerns of grease-resistance which are duly addressed by the polyester film **33**. Paper bags **18** are also more difficult to attach zippers and handles thereto.

[0066] The adhesive abuttingly adhering the paper layer **35** to the grease-resistant film **33**, for example, can be is preferably a tie layer **37**, but can alternatively be a solvent-based adhesive. The tie layer **37** can advantageously include an element **19** of polyurethane to better adhere the paper layer **35** to the polyester film **33**, if desired.

[0067] An embodiment of the inner ply **51'**, shown for example in FIG. **7**A, includes a single-layer or mono-layer film having a grease-resistant component. More specifically, the film layer or laminate can be a nylon or polypropylene material, such as biaxially oriented polypropylene (BOPP). The film laminate can alternatively be a material of which merely a component is nylon material (e.g., polyhexamethyleneadipamide) or polypropylene, and can alternatively be other materials capable of resisting grease elements. Other grease-resistant materials can alternatively be utilized, such as for example, metalized films, ethylene vinyl alcohol, polyester, or other specialty resins. These grease-resistant materials, for example, are advantageously capable of resisting and preventing penetration or absorption of grease, mineral oils, solvents, and acids.

[0068] A polypropylene film mono-layer for the inner ply **51'** shown in FIG. **7**A can have properties such as enhanced grease-resistance, rigidity, translucence, good chemical resistance, toughness, good fatigue resistance, integral hinge properties, and good heat resistance. For example, one of several types of polypropylene can be used. Each suits particular specifications and cost. Homopolymers are a general purpose grade polypropylene. Block copolymers can incorporate 5-15% ethylene, have much improved impact resistance extending to temperatures below −20 degrees C., and their toughness can be further enhanced by the addition of impact modifiers, traditionally elastomers in a blending process. Random copolymers can incorporate co-monomer units arranged randomly (as distinct from discrete blocks) along the polypropylene long chain molecule, typically contain 1-7% ethylene, and are generally selected where a lower melting point, more flexibility, and enhanced clarity are advantageous. A nylon film mono-layer for the inner ply **51** can have such properties as high wear and abrasion resistance, high strength, low coefficient of friction characteristics, self-lubrication characteristics, noise dampening characteristics, good electrical insulation, resistance to alkalies and organic chemicals, and light weight.

[0069] Another alternative embodiment of the inner ply **51**, shown for example in FIGS. **4**-**5** and FIG. **7**, includes a multi-layer film laminate having a more grease-resistant material **55** positioned between a pair of films **53**, **54**. The inner ply **51** can be a co-extruded multi-layer structure, but can also be any suitable laminate structure. The films **53**, **54** may be heat-sealable depending on the application or manufacturing procedures utilized to construct the bag. More specifically, for example, an inner face of a first film **53** is abuttingly adhered to an outer face of a grease-resistant material **55** and an inner face of the grease-resistant material **55** is abuttingly adhered to an outer face of a second film **54**. If the films **53**, **54** are heat-sealable, then the films **53**, **54** are adapted to advantageously melt and closingly seal at least one of the bag ends **23**, **25** responsive to heat being applied thereto, as understood by those skilled in the art. The inner ply **51** as a whole in this embodiment has a thickness of, for example, in the range of about 1.5 mm to about 3.5 mm, but alternatively can have other varying measures of thickness or gauge.

[0070] Embodiments of the first and second films **53**, **54** of the inner ply **51** include a material, for example, selected from the group consisting of: polyethylene (PE) and oriented polypropylene (OPP). These films **53**, **54**, for example, are heat-sealable and are advantageously capable of melting and bonding together to form a sealable closure in various applications. Embodiments of the grease-resistant material **55** of the inner ply **51** include a material selected from the group consisting of: nylon and polypropylene. Other grease-resistant materials **55** can alternatively be utilized, such as for example, metalized films, ethylene vinyl alcohol, polyester, or other specialty resins. These grease-resistant materials, for example, are advantageously capable of resisting and preventing penetration or absorption of grease, mineral oils, solvents, and acids. The first and second films **53**, **54** are adhered to the grease-resistant material **55** of the inner ply **51**, for example, by tie layers **57** of chemical bond. One embodiment of the tie layers **57** that can be utilized in securing the grease-resistant material **55** between the films **53**, **54** is solvent-based petroleum distolate. Alternatively, other suitable adhesives can be utilized as the tie layers **57** as understood by those skilled in the art.

[0071] After the inner face of the outer ply **31** is abuttingly adhered to the outer face of the inner ply **51** with an adhesive **38**, as shown in FIGS. **6-8**, in one embodiment, the lateral sides **73** of the bag **15** can be joined and overlapped so that the bag **15** defines a tubular bag body **21**, for example, having a pair of opposing open bag ends **23**, **25** as shown in FIG. **9**. In one embodiment, a portion of the second film **54** overlies a portion of the polyester film **33** to advantageously define an overlapping seam **75** of the tubular bag body **21** extending along a longitudinal extent of the bag **15**. The outer ply **31** has a substantially similar longitudinal length from one bag end **23**, **25** to the other bag end **23**, **25** along a circumferential periphery of each of the opposing bag ends **23**, **25**. Also, for example, the inner ply **51** has a substantially similar longitudinal length from one bag end **23**, **25** to the other bag end **23**, **25** along a circumferential periphery of each of the opposing bag ends **23**, **25**.

[0072] As shown, for example, in FIGS. **10-11**, an embodiment can include a portion of at least one of the inner and outer plies **51**, **31** of at least one of the opposing bag ends **23**, **25** foldingly and adheringly overlying another portion of the one bag end **23** to define an overlapping seam extending along substantially an entire transverse extend of the one bag end **23** to thereby closingly seal the one bag end **23** so that the food element when positioned therein is retained within inner confines of the bag **15** between the opposing pair of bag ends **23**, **25**. Embodiments can include the inner face of the inner ply **51** of at least one of the opposing bag ends **23** adheringly overlying the outer face of the outer ply **31** of the same bag end **23** to define an overlapping seam substantially extending along a transverse extent of the bag end **23**. Embodiments can also include the outer face of the outer ply **31** of at least one of the opposing bag ends **23** adheringly overlying the same outer face of the same outer ply **51** of the same bag end **23** to define an overlapping seam substantially extending along a transverse extent of the bag end **23**.

[0073] Additionally, such as shown in FIG. **11**, embodiments of a bag and/or bag closure can include an adhesive **64** including components of rosin ester and ethylene vinyl acetate adhering a portion of at least one of the inner and outer plies **51**, **31** of at least one of the opposing bag ends **23** to another portion of the same bag end **23** to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends **23**. The hot melt adhesive **64** can be supplied, for example, as Product No. 70-4467 from NATIONAL STARCH AND CHEMICAL COMPANY, 10 Finderne Avenue, Bridgewater, N.J. 08807. Alternatively, for example, the adhesive **64** can further include a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

[0074] Another embodiment of the bag **15**, as shown for example in FIGS. **11**A-**11**D, can include a tubular bag body having a pair of opposing bag ends **23**, **25** and an inner face of an outer ply **31** abuttingly adhering to an outer face of an inner ply **51**. The outer ply **31** can include a grease-resistant film, and the inner ply **51** can include a grease-resistant material. An end portion of at least one of the inner and outer plies **51**, **31** of at least one of the opposing bag ends **23** can adheringly overlie another portion of the same bag end **23** with an adhesive **64** including components of rosin ester and ethylene vinyl acetate so that the grease resistant film of the outer ply **31** contacts the adhesive **64** and the grease resistant material of the inner ply **51** contacts the adhesive **64** to thereby define an overlapping seam substantially extending along a transverse extent of the same bag end **23** to thereby closingly seal the bag end **23**. Alternatively, for example, the adhesive **64** can further include a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

[0075] Another embodiment of the bag **15**, as shown for example in FIG. **11** E, can include a tubular bag body having a pair of opposing bag ends **23**, **25** and an inner face of an outer ply **31** abuttingly adhering to an outer face of an inner ply **51**. The outer ply **31** can include a polyester film, and the inner ply **51** can include a polymeric material. An end portion of at least one of the inner and outer plies **51**, **31** of at least one of the opposing bag ends **23** can adheringly overlie another portion of the same bag end **23** with an adhesive **64** including components of rosin ester and ethylene vinyl acetate so that the polyester material of the outer ply **31** contacts the adhesive **64** and the polymeric material of the inner ply **51** contacts the adhesive **64** to thereby define a bag closure to thereby define an overlapping seam substantially extending along a transverse extent of the same bag end **23** to thereby closingly seal the bag end **23**. Alternatively, for example, the adhesive **64** can further include a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

[0076] Within the adhesives industry, hot melts, for example, have good performance and usage benefits, as understood by those skilled in the art. Hot melt adhesives are solvent-free adhesives, that are characteristically solid at temperatures below 180 degrees F. (° F.), are low viscosity fluids above 180° F., and rapidly set upon cooling. The development of hot melt adhesive technology stemmed from the previous use of molten wax for bonding. Hot melt adhesives are used in a variety of manufacturing processes. There are a number of hot melt adhesives in use, with the most common being those used for hot melt pressure sensitive adhesive applications: ethylene vinyl acetate (EVA) copolymers, compatible with paraffin, the original hot melt; styrene-isoprene-styrene (SIS) copolymers; styrene-butadiene-styrene (SBS) copolymers; ethylene ethyl acrylate copolymers (EEA); and polyurethane reactive (PUR).

[0077] Generally, these polymers do not exhibit the full range of performance characteristics required for an end product by themselves. For this reason, for example, a variety of tackifying resins, waxes, antioxidants, plasticizers, viscosity reducers, and other materials can be added to

the adhesive formulation to enhance the polymer performance, as understood by those skilled in the art.

[0078] For example, one of the most recent hot melt adhesive advances is the PUR adhesive, which is a 100 percent solid, one-component urethane prepolymer that behaves like a standard hot melt until it reacts with moisture to crosslink or chain extend, forming a new polyurethane polymer. By curing the polymer in this way, PURs have performance characteristics that are more enhanced than those of standard hot melts. Unlike many of the other hot melts, which require a slot die or roll coater, PURs are applied to a substrate as a dot or a thin glue line, set in seconds, and are structurally rigid in minutes, following a final set. These adhesives have been accepted in many manufacturing industries, for example, where they can be applied in small bond points to eliminate use of mechanical fasteners, such as staples, screws, rivets, clips, snaps, nails or stitching.

[0079] Furthermore, for example, all groups of pine chemicals, except generally plant sterols, can also be used by the adhesives and sealants industry. Pine chemicals are renewable, naturally occurring materials derived from the pine tree (genus *Pinus*). The range of chemical classes obtained from pine trees includes numerous plant sterols, terpenes (or turpentine), resin acids (or rosin) and fatty acids. Rosin resins, including esters and polymerized rosins, are used as tackifiers to modify the properties of selected polymers to produce adhesives and sealants. Polyterpene resins are used to modify non-polar polymers for these same applications. Tall oil fatty acids can be dimerized to produce dimer fatty acids that, in turn, are the major ingredient in thermoplastic polyamide adhesives.

[0080] For example, as understood by those skilled in the art, there can be three major classes of tackifier resins for the adhesives industry: terpene, hydrocarbon and rosin resins. Terpene resins (pine-based) and hydrocarbon resins (petrochemical-based) are both hydrocarbons; that is, they contain only carbon and hydrogen. Although they are somewhat similar in that respect, they impart somewhat different properties to the resultant adhesives. Terpene-based resins are more diverse than petrochemical hydrocarbons in that these resins are readily modified with other chemicals (e.g., phenol) to produce an array of products. Notably, for example, rosin resins significantly differ from the previous two types in that they contain carboxylic acid and/or ester groups. These resins are generally more polar and narrower in molecular weight, for example, making them good tackifiers for a variety of end-use applications.

[0081] Within the adhesives industry, hot melts have excellent performance and usage benefits. New polymer and tackifier technologies are available to formulators, thus allowing adhesives that can be applied outside traditional paper and non-woven bonding. New uses in publishing, graphics, electronics and semi-structural applications will drive growth of hot melts.

[0082] End users, for example, can expect hot-melt packaging adhesives to run faster in some applications and perform on a range of substrates. Terpene phenolic resins, derivatives of alpha-pinene, can deliver enhanced adhesion qualities to difficult substrates such as recycled cardboard. They offer better green strength, making them useful for high-speed packaging lines with short set times. Rosin esters are commonly used to increase adhesion and the temperature performance range of ethylene vinyl acetate (EVA) based adhesives, but Applicant has advantageously recognized that this combination of elements in a hot melt adhesive can advantageously be used as a closure (e.g., end, sides, or other overlap region) for a bag in applications, for example, of a polyester or grease-resistant material facing another polymeric or grease resistant material. Rosin esters have the added benefit of being compatible with a range of polymers, thus limiting formulating complexity.

[0083] As understood by those skilled in the art, ethylene vinyl acetate (EVA), for example, can be produced by the random copolymerization of ethylene and vinyl acetate in predetermined ratio. The presence of VA reduces the crystallinity as the large acetoxy group distorts the chain structure. The stiffness of EVA varies with VA content. However, beyond about 60 percent VA, the stiffness rises sharply as pure vinyl acetate is a glass-like substance at room temperature. The practical limit for "mechanical" uses of EVA is about 20 percent VA content; however, for "adhesive" uses higher levels of VA can be used. High VA level copolymers are typically used in adhesive applications, while lower vinyl acetate containing copolymers, whose tensile moduli and surface hardness are greater, find greatest use in films, profile extrusions and injection molding. The higher percent VA resins have a good compatibility with other materials. Thus, EVA is widely used in blends and compounds. One main application, for example, is hot melt adhesives, where the EVA is blended with tackifier and paraffin wax.

[0084] As understood by those skilled in the art, the polarity of the VA molecule makes the copolymers receptive to high filler loadings and to combination with tackifiers and other adhesive components. The addition of the rosin ester to EVA produces a compatible mixture. The increase in the VA amount decreases the crystallinity of EVA and the elastic and viscous modules, but increases the peel strength and the tack. The tackifier improves the adhesion and increases the "open time" of the formulation.

[0085] In a further embodiment in which the bag ends or other bag closures are heat-sealed, each of the pair of bag ends **23**, **25** is adapted to be positioned so that opposingly facing first and second portions of the inner ply **51** are compressed between opposingly facing first and second portions of the outer ply **31** to define a compressed lip **71**, as shown in FIGS. **12-13**. The compressed lip **71**, for example, can have a first portion of the second heat-sealable film **54** of the inner ply **51** meltingly bonded with an opposingly facing second portion of the second heat-sealable film **54** of the inner ply **51** along a transverse extent of at least one of the pair of bag ends **23**, **25** responsive to heat applied thereto. Application of the heat to the bag end **23**, **25** thereby advantageously closingly seals at least one of the pair of bag ends **23**, **25** so that the food element **17**, when positioned therein, is retained within inner confines of the bag **15** defined by other unsealed portions of the second heat-sealable film **54** positioned between the opposing bag ends **23**, **25**. FIGS. **14-16** show an embodiment of a bag where the food element **17** is positioned inside the bag, illustrating the grease component G being prevented from penetrating the inner and outer plies **51**, **31** of the food bag **15**.

[0086] Each of the materials used to construct the bag **15** can have a different range of melting temperatures. The

polyester film **33** of the outer ply **31**, for example, has a melting point temperature greater than the heat-sealable film **53** of the inner ply **51**. In one embodiment, the polyester film **33** of the outer ply **31** has a melting temperature in the range of about 300 degrees Fahrenheit to about 475 degrees Fahrenheit, and preferably greater than 425 degrees Fahrenheit. In one embodiment, the heat-sealable film **53** of the inner ply **51** has a melting point temperature in the range of about 220 degrees Fahrenheit to about 300 degrees Fahrenheit, and preferably greater than 240 degrees Fahrenheit. As understood by those skilled in the art, the polyethylene heat-sealable film **53** of the inner ply **51** has a lower melting temperature and therefore melts easier and at lower temperatures than the grease-resistant polyester film **33** of the outer ply **31**. A sufficiently low melting point temperature for the heat-sealable film **53** of the inner ply **51** advantageously allows for the melting and bonding of the second heat-sealable film **54** to closingly seal the bag end **23**, **25**, as understood by those skilled in the art.

[**0087**] For example, as understood by those skilled in the art, heat-sealing bag machine performs the function of forming and shaping the multi-layered structure into a bag **15** by accordingly compressing and melting the bag ends **23**, **25** to closingly seal the bag ends **23**, **25**. The heat-sealing bag machine has an extended heater belt and/or heated jaws that carry out the heat-sealing procedure. The heat can alternatively be applied, for example, by heated rollers, a heated wire/wires, or a heated air zone that adequately melts the heat-sealable film **53**, as understood by those skilled in the art. The extended heater belt and/or heated jaws can mass-produce the heat-sealed products through a continuous high-speed operation, which manufactures a quality product in massive quantities to be delivered to customers in the ordinary course of business. In some applications, for example, the bag manufacturer typically heat-seals one end of each bag and delivers the bag to a customer, and the customer fills the bag with the proper elements and ultimately heat-seals the other end of the bag. The heat-sealing process can form bags with a lip as herein described, or can alternatively form bags that have a flattened top end and flattened bottom end to thereby provide the capability of stacking multiple bags neatly on top of one another.

[**0088**] To describe the heat-sealing process more specifically, for example, the polyethylene portion of the heat-sealable film **53** of the inner ply **51** at the bag ends **23**, **25** is heated to a melting point temperature of at least 220 degrees Fahrenheit, in one embodiment for example, to melt the heat-sealable polyethylene film of the bag ends **23**, **25**. Alternatively, the temperature could be raised in excess of 300 degrees Fahrenheit, in one embodiment for example, to melt not only portions of the polyethylene heat-sealable films **53** together but also to melt portions of the polyester films **33** together as well, thus advantageously forming an even tighter closed seal at the bag ends **23**, **25**. In one embodiment, for example, the manufacturer utilizing the heat-sealing bag machine will seal only one end **23**, **25** portion of the bag **15**, thereby leaving another end **23**, **25** portion of the bag **15** open to eventually fill the bag **15** with food or other elements **19**. The distributor of the goods, for example, then fills the bag **15** with the food or other elements **19**, and thereafter seals the other end **23**, **25** portion of the bag **15** after the bag **15** is full.

[**0089**] As illustrated in FIGS. **1-17**, and as described above herein, the present invention also includes embodiments of methods of assembling, positioning, using, and constructing a multi-layered bag **15**. Initially, for example, before any of the layers are bonded or adhered together, the method of constructing a bag **15** can include printing printed indicia **29** on the inner face of the grease-resistant film **33** of the outer ply **31** to advantageously enhance visual appearance of the bag **15**. Also, before adhering the layers of film, the method can include clay-coating and bleaching the paper layer **35**, and treating the paper layer **35** with a chemical to advantageously provide enhanced protection from grease penetrating through the paper layer **35** of the bag **15**.

[**0090**] Embodiments of the method of the present invention of constructing a bag **15**, for example, can include adhering an inner face of a grease-resistant polyester film **33** with an outer face of a paper layer **35** to create an outer ply **31**. The method can also include adhering an inner face of a first film **54** to an outer face of a grease-resistant material **55** and adhering an inner face of the grease-resistant material **55** to an outer face of a second film **53** to create a multi-layer inner ply **51**. The method can also include adhering an inner face of the outer ply **31** to an outer face of the inner ply **51** to create a laminate with a pair of opposing ends **23**, **25**. The method can also include overlying a portion of an inner face of the inner ply **51** located at one lateral side of the laminate onto a portion of an outer face of the outer ply **31** located at another lateral side of the laminate to define an overlapping seam extending along a longitudinal extent of a tubular portion of the bag. The method can also include adheringly overlying an end portion of at least one of the inner and outer plies **51**, **31** of at least one of the opposing bag ends **23** onto another portion of the same bag end **23** with an adhesive **64** including components of rosin ester and ethylene vinyl acetate to define an overlapping seam substantially extending along a transverse extent of the same bag end **23** to thereby closingly seal the bag end **23**.

[**0091**] Embodiments of the method of the present invention can further include adhering an inner face of the inner ply **51** of at least one of the opposing bag ends **23** against an outer face of the outer ply **31** of the same bag end **23** to define an overlapping seam substantially extending along a transverse extent of the bag end **23**. The method can further include closingly sealing the overlapping seam responsive to the adhering to thereby prevent grease from penetrating from within the bag **15** to outside the bag **15** and prevent grease from penetrating from outside the bag **15** to within the bag **15**.

[**0092**] The method can also include adhering an outer face of the outer ply **31** of at least one of the opposing bag ends **23** against the same outer face of the same outer ply **31** of the same bag end **23** to define an overlapping seam substantially extending along a transverse extent of the bag end **23**. The method can further include closingly sealing the overlapping seam responsive to the adhering to thereby prevent grease from penetrating from within the bag **15** to outside the bag **15** and prevent grease from penetrating from outside the bag **15** to within the bag **15**.

[**0093**] Embodiments of the bags and methods of the present invention have important benefits and advantages. The combined use of polymeric structures and paper, for example, combines the advantages of the thickness and

bending stiffness of paper with the puncture-resistant and grease-resistant properties of polyester, including in some embodiments the heat-sealable characteristics of films such as polyethylene. Furthermore, the grease-resistant properties of the inner ply **51**, **51'** offer enhanced grease-resistance in addition to the grease-resistance properties of the outer ply **31**, both of which contribute to the advantageous quality of the invention. Embodiments of the bag provide increased barrier protections from grease, endurance, strength, physical integrity, and heat-sealable characteristics not offered with other bags **18**. The bag **15** advantageously prevents problems customarily associated with greasy products such as pet food, for example, and eliminates the absorption and penetrable effect of the grease component included in such foods as pet food. Various bags **18** are often used in other settings where greasy elements **19** are contained within the bags **18**, and embodiments of the bag advantageously contribute to solving such problematic concerns attributable to the grease. Other applications of the bag **15** may include dry foods, beverages, feed, soil, lawn and garden, building materials, and other markets to advantageously prevent grease from penetrating from outside the bag **15** to within the bag **15** and to prevent grease from penetrating from within the bag **15** to outside the bag **15**. Furthermore, embodiments of the invention offer enhanced strength to allow the bag to carry over twenty-five pounds of pet food with relative ease.

[**0094**] A further advantage of the present invention is the advantages of the adhesive **64** including components of rosin ester and ethylene vinyl acetate adhering a portion of at least one of the inner and outer plies **51**, **31** of at least one of the opposing bag ends **23** to another portion of the same bag end **23** to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends **23**.

[**0095**] A further advantage of the present invention is the environmentally friendly composition of the structure of the present invention by producing bags **18** that are less toxic and increasingly biodegradable, while maintaining inexpensive costs relative to other types of potentially environmentally friendly bags **18**. Further, the bag **15** can advantageously be manufactured on existing equipment previously utilized for manufacturing bags **18**, so there is no necessity to invest in new and expensive bag **15** manufacturing equipment.

[**0096**] Embodiments of the invention can have many alternative bag styles in addition to the embodiments described, such as for example bag styles of a gusseted pinch-bottom bag, a pinch-bottom bag not gusseted, other various pinch-bottom styles of bags, and block-bottom bags of various constructs. Such features are interchangeable, as understood by those skilled in the art, and are determined by the requirements of the marketplace.

[**0097**] In the drawings and specification, there have been disclosed embodiments of the present invention, and although specific terms are employed, the terms are used in a descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims. The invention has been described in considerable detail with specific reference to the illustrated embodiments. It will be apparent, however, that various modifications and changes can be made within the spirit and scope of the invention as described in the foregoing specification.

That claimed is:

1. A food bag to carry a food element having a grease component so that grease from the grease component is substantially prevented from penetrating from within the bag to outside the bag and also so that grease from other grease components not associated with the food bag is substantially prevented from penetrating from outside the bag to within the bag, the food bag comprising:

a tubular bag body having a pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply, the outer ply including an inner face of a grease-resistant polyester film abuttingly adhered to an outer face of a paper layer with a solventless adhesive, the paper layer having a greater thickness and bending stiffness than the polyester film, the inner face of the polyester film having printed indicia thereon to enhance visual appearance of the bag, the polyester film adapted to allow an amount of light to transmit therethrough to thereby allow viewing of the printed indicia from outside of the bag, and the inner ply including an inner face of a first film abuttingly adhered to an outer face of a grease-resistant material and an inner face of the grease-resistant material abuttingly adhered to an outer face of a second film, a portion of the second film overlying a portion of the polyester film to define an overlapping seam of the tubular bag body extending along a longitudinal extent of the bag, the outer ply having a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends, the inner ply having a substantially similar longitudinal length from the one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends, and a portion of at least one of the inner and outer plies of at least one of the opposing bag ends foldingly and adheringly overlying another portion of the one bag end to define an overlapping seam extending along substantially an entire transverse extent of the one bag end to thereby closingly seal the one bag end so that the food element when positioned therein is retained within inner confines of the bag between the opposing pair of bag ends.

2. A food bag to carry a food element having a grease component so that grease from the grease component is prevented from penetrating from within the bag to outside the bag and also so that grease from other grease components not associated with the food bag is prevented from penetrating from outside the bag to within the bag, the food bag comprising:

a tubular bag body having a pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply, the outer ply including an inner face of a grease-resistant polyester film abuttingly adhered to an outer face of a paper layer, the paper layer having a greater thickness and bending stiffness than the polyester film, the inner face of the polyester film having printed indicia thereon to enhance visual appearance of the bag, the polyester film adapted to allow an amount of light to transmit therethrough to thereby allow viewing of the printed indicia from outside of the bag, and the inner ply including a grease-resistant material, a portion of the grease-resistant material overlying a portion of the polyester film to

define an overlapping seam of the tubular bag body extending along a longitudinal extent of the bag, the outer ply having a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends, the inner ply having a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends, and a portion of at least one of the inner and outer plies of at least one of the opposing bag ends adheringly overlying another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends to thereby closingly seal the at least one of the pair of bag ends so that the food element when positioned therein is retained within inner confines of the bag between the opposing pair of bag ends.

3. A bag defined by claim 2, wherein the outer ply includes an inner face of a grease-resistant polyester film abuttingly adhered to an outer face of a paper layer with a solventless adhesive, and wherein the inner ply comprises one or more layers of a polymeric material.

4. A bag defined by claim 2, wherein the polyester film of the outer ply is selected from the group consisting of: polyethylene terephthalate (PET), polyethylene terephthalate polyester (PETP), polytrimethylene terephthalate (PTT), polybutylene terephthalate (PBT), and wherein the grease-resistant material of the inner ply is selected from the group consisting of: nylon and polypropylene.

5. A bag defined by claim 2, wherein the polyester film is treated with a coating on the outer face of the outer ply to provide an enhanced coefficient of friction in a range of about 0.5 to about 0.9, and wherein the paper layer has a greater thickness than the polyester film to thereby enhance bending stiffness and increase stabilization of the bag.

6. A bag defined by claim 2, wherein the paper layer is clay coated and bleached, and wherein the paper layer is treated with a chemical to provide enhanced protection from grease penetrating through the paper layer of the bag.

7. A bag defined by claim 6, wherein the paper layer has a thickness in the range of about 3.5 millimeters to about 4.5 millimeters, and wherein the polyester film has a thickness in the range of about 0.475 millimeters to about 0.485 millimeters.

8. A bag defined by claim 2, wherein an inner face of the inner ply of at least one of the opposing bag ends adheringly overlies an outer face of the outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end.

9. A bag defined by claim 2, wherein an outer face of the outer ply of at least one of the opposing bag ends adheringly overlies the same outer face of the same outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end.

10. A bag defined by claim 2, wherein an adhesive including components of rosin ester and ethylene vinyl acetate adheres a portion of at least one of the inner and outer plies of at least one of the opposing bag ends to another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends.

11. A bag defined by claim 10, wherein the adhesive further includes a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

12. A bag comprising:

a bag body having a pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply, the outer ply including an inner face of a grease-resistant polyester film abuttingly adhered to an outer face of a paper layer, the paper layer having a greater bending stiffness than the polyester film, the inner ply including a grease-resistant material, and an end portion of at least one of the inner and outer plies of at least one of the opposing bag ends adheringly overlying another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of the same bag end to thereby closingly seal the bag end.

13. A bag defined by claim 12, wherein the polyester film is abuttingly adhered to the paper layer with a solventless adhesive, wherein the inner face of the polyester film has printed indicia thereon to enhance visual appearance of the bag, and wherein the polyester film allows an amount of light to transmit therethrough to thereby allow viewing of the printed indicia from outside the bag.

14. A bag defined by claim 12, wherein a portion of the inner ply overlies a portion of the outer ply to define an overlapping seam of the tubular bag body extending along a longitudinal extent of the bag, the outer ply having a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of each of the opposing bag ends, and the inner ply having a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of the opposing bag ends.

15. A bag defined by claim 12, wherein the polyester film of the outer ply is selected from the group consisting of: polyethylene terephthalate (PET), polyethylene terephthalate polyester (PETP), polytrimethylene terephthalate (PTT), polybutylene terephthalate (PBT), and wherein the grease-resistant material of the inner ply is selected from the group consisting of: nylon and polypropylene.

16. A bag defined by claim 12, wherein the polyester film is treated with a coating on the outer face of the outer ply to provide an enhanced coefficient of friction in a range of about 0.5 to about 0.9, and wherein the paper layer has a greater thickness than the polyester film to thereby enhance bending stiffness and increase stabilization of the bag.

17. A bag defined by claim 12, wherein the paper layer is clay coated and bleached, and wherein the paper layer is treated with a chemical to provide enhanced protection from grease penetrating through the paper layer of the bag.

18. A bag defined by claim 17, wherein the paper layer has a thickness in the range of about 3.5 millimeters to about 4.5 millimeters, and wherein the polyester film has a thickness in the range of about 0.475 millimeters to about 0.485 millimeters.

19. A bag defined by claim 12, wherein an inner face of the inner ply of at least one of the opposing bag ends adheringly overlies an outer face of the outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end.

20. A bag defined by claim 12, wherein an outer face of the outer ply of at least one of the opposing bag ends adheringly overlies the same outer face of the same outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end.

21. A bag defined by claim 12, wherein an adhesive including components of rosin ester and ethylene vinyl acetate adheres a portion of at least one of the inner and outer plies of at least one of the opposing bag ends to another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends.

22. A bag defined by claim 21, wherein the adhesive further includes a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

23. A bag comprising:

a bag body having a pair of opposing open bag ends and an inner face of an outer ply abuttingly adhering to an outer face of an inner ply, the outer ply including a grease-resistant film, the inner ply including a grease-resistant material, and an end portion of at least one of the inner and outer plies of at least one of the opposing bag ends adheringly overlying another portion of the same bag end with an adhesive including components of rosin ester and ethylene vinyl acetate so that the grease resistant film of the outer ply contacts the adhesive and the grease resistant material of the inner ply contacts the adhesive to thereby define an overlapping seam substantially extending along a transverse extent of the same bag end to thereby closingly seal the bag end.

24. A bag defined by claim 23, wherein the polyester film of the outer ply is selected from the group consisting of: polyethylene terephthalate (PET), polyethylene terephthalate polyester (PETP), polytrimethylene terephthalate (PTT), polybutylene terephthalate (PBT), and wherein the grease-resistant material of the inner ply is selected from the group consisting of: nylon and polypropylene.

25. A bag defined by claim 23, wherein an inner face of the inner ply of at least one of the opposing bag ends adheringly overlies an outer face of the outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end.

26. A bag defined by claim 23, wherein an outer face of the outer ply of at least one of the opposing bag ends adheringly overlies the same outer face of the same outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end.

27. A bag defined by claim 23, wherein the adhesive further includes a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

28. A bag comprising:

a bag body having an inner face of an outer ply abuttingly adhering to an outer face of an inner ply, the outer ply including a polyester material, the inner ply including a polymeric material, and a portion of at least one of the inner and outer plies adheringly overlying another portion of the same bag end with an adhesive including components of rosin ester and ethylene vinyl acetate so that the polyester material of the outer ply contacts the adhesive and the polymeric material of the inner ply contacts the adhesive to thereby define a bag closure.

29. A bag defined by claim 28, wherein the polyester material of the outer ply is selected from the group consisting of: polyethylene terephthalate (PET), polyethylene terephthalate polyester (PETP), polytrimethylene terephthalate (PTT), polybutylene terephthalate (PBT), and wherein the grease-resistant material of the inner ply is selected from the group consisting of: nylon and polypropylene.

30. A bag defined by claim 28, wherein an inner face of the inner ply of at least one of the opposing bag ends adheringly overlies an outer face of the outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end to thereby closingly seal the bag end.

31. A bag defined by claim 28, wherein an outer face of the outer ply of at least one of the opposing bag ends adheringly overlies the same outer face of the same outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end to thereby closingly seal the bag end.

32. A bag defined by claim 28, wherein the adhesive further includes a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

33. A method of constructing a bag, the method comprising:

(a) adhering an inner face of a grease-resistant polyester film with an outer face of a paper layer to create an outer ply;

(b) adhering an inner face of a first film to an outer face of a grease-resistant material and adhering an inner face of the grease-resistant material to an outer face of a second film to create a multi-layer inner ply;

(c) adhering an inner face of the outer ply to an outer face of the inner ply to create a laminate with a pair of opposing ends;

(d) adheringly overlying a portion of an inner face of the inner ply located at one lateral side of the laminate onto a portion of an outer face of the outer ply located at another lateral side of the laminate to define an overlapping seam extending along a longitudinal extent of a tubular portion of the bag; and

(e) adheringly overlying an end portion of at least one of the inner and outer plies of at least one of the opposing bag ends onto another portion of the same bag end with an adhesive including components of rosin ester and

ethylene vinyl acetate to define an overlapping seam substantially extending along a transverse extent of the same bag end to thereby closingly seal the bag end.

34. A method defined by claim 33, wherein the grease-resistant film of the outer ply comprises a thermoplastic material selected from the group consisting of: polyethylene terephthalate (PET), polyethylene terephthalate polyester (PETP), polytrimethylene terephthalate (PTT), polybutylene terephthalate (PBT), wherein the pair of heat-sealable films of the inner ply comprises a material selected from the group consisting of: polyethylene (PE) and oriented polypropylene (OPP), and wherein the grease-resistant film of the inner ply comprises a material selected from the group consisting of: nylon and polypropylene.

35. A method defined by claim 33, further comprising before step (d) cutting each of the pair of opposing ends so that the outer ply has a substantially similar longitudinal length from one bag end to the other bag end along a circumferential periphery of each of the pair of opposing bag ends and the inner ply has a substantially similar longitudinal length from one bag end to the other bag end along the circumferential periphery of each of the pair of opposing bag ends.

36. A method defined by claim 33, further comprising:

(f) adhering an inner face of the inner ply of at least one of the opposing bag ends against an outer face of the outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end; and

(g) closingly sealing the overlapping seam responsive to the adhering to thereby prevent grease from penetrating from within the bag to outside the bag and prevent grease from penetrating from outside the bag to within the bag.

37. A method defined by claim 33, further comprising:

(f) adhering an outer face of the outer ply of at least one of the opposing bag ends against the same outer face of the same outer ply of the same bag end to define an overlapping seam substantially extending along a transverse extent of the bag end; and

(g) closingly sealing the overlapping seam responsive to the adhering to thereby prevent grease from penetrating from within the bag to outside the bag and prevent grease from penetrating from outside the bag to within the bag.

38. A bag defined by claim 33, further comprising applying an adhesive including components of rosin ester and ethylene vinyl acetate to adhere and closingly seal a portion of at least one of the inner and outer plies of at least one of the opposing bag ends to another portion of the same bag end to define an overlapping seam substantially extending along a transverse extent of at least one of the pair of bag ends.

39. A bag defined by claim 38, wherein the adhesive further includes a component selected from the group consisting of: styrene-isoprene-styrene copolymers, styrene-butadiene-styrene copolymers, ethylene ethyl acrylate copolymers, polyurethane reactive adhesives, tackifiers, waxes, paraffin, antioxidants, plasticizers, plant sterols, terpene resins, polyterpene resins, turpentines, hydrocarbon resins, resin acids, fatty acids, polymerized rosins, and polyamide adhesives.

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