

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization

International Bureau



(10) International Publication Number

WO 2015/148035 A1

(43) International Publication Date  
1 October 2015 (01.10.2015)

WIPO | PCT

(51) International Patent Classification:  
*B32B 7/12* (2006.01)      *B32B 27/34* (2006.01)  
*B32B 27/06* (2006.01)      *B32B 5/32* (2006.01)  
*B32B 27/30* (2006.01)

(71) Applicant: **HOLLISTER INCORPORATED** [US/US];  
2000 Hollister Drive, Libertyville, IL 60048 (US).

(72) Inventor: **CHANG, Moh-Ching**; 6 Point O'Woods Court,  
Lake in the Hills, IL 60156 (US).

(21) International Application Number:  
PCT/US2015/017503

(74) Agents: **PAE, Sun, Y.** et al.; Levenfeld Pearlstein, LLC, 2  
N. Lasalle St., Suite 1300, Chicago, IL 60602 (US).

(22) International Filing Date:  
25 February 2015 (25.02.2015)

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,  
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,  
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,  
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,  
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,  
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,  
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
14/226,260      26 March 2014 (26.03.2014)      US

[Continued on next page]

(54) Title: MULTILAYER FILM INCLUDING FOAM LAYER AND GAS BARRIER LAYER

(57) **Abstract:** A multilayer film includes an outer foam layer and a gas barrier layer. The multilayer film may also include at least one tie layer and at least one inner layer, and can be configured to have various film layer constructions. For example, the multilayer film can be configured as a five-layer, six-layer, or seven-layer films. The multilayer film can provide unique texture, softness, quietness, gas barrier properties, light weight and low cost per volume. Further, one or more layers of the multilayer film can contain a vinyl-bond rich triblock copolymer to provide sound absorbing properties.

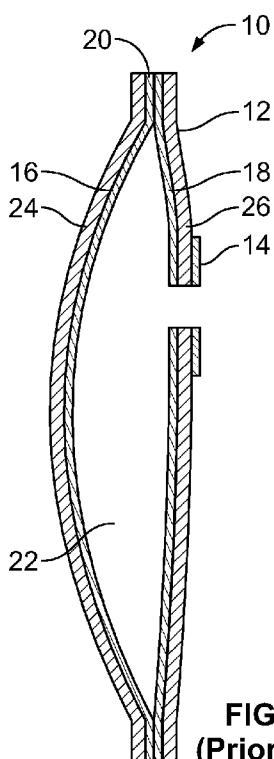


FIG. 1  
(Prior Art)



SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,

DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published:**

— *with international search report (Art. 21(3))*

## MULTILAYER FILM INCLUDING FOAM LAYER AND GAS BARRIER LAYER

## BACKGROUND

**[0001]** The present disclosure relates to multilayer films for ostomy products, and more particularly to multilayer films including a foamed layer having sound absorbing properties.

**[0002]** Ostomy appliances for collecting body waste, such as ostomy pouches, are used by patients who have had surgery such as a colostomy, ileostomy, or urostomy. Typically, an ostomy pouch includes two opposing walls, which are sealed around peripheral edges to define a cavity to collect body waste. Nonwovens have been commonly used with odor barrier films to make ostomy pouches. One example is a “3-layer” ostomy pouch including two layers of odor barrier films forming the opposing walls, and a nonwoven layer attached to the body side wall of the ostomy pouch. The nonwoven functions as a comfort panel to give soft touch feel to users and to reduce the wet slippery feel when the user perspires. Another example is a “4-layer” ostomy pouch including two layers of odor barrier films forming the opposing walls and two nonwoven layers, one attached to each of the walls.

**[0003]** Although nonwovens provide added comfort for users, there are some challenges in making ostomy pouches with nonwovens. For example, thickness variances for nonwovens are relatively greater than polymer films, which present process challenges in making ostomy pouches. Further, the process of maintaining consistent tension between a nonwoven and a film, and providing sufficient and precise energy to heat seal the nonwoven and the film are typically more complicated than between two polymeric films. Furthermore, the relatively high cost of nonwovens increases the cost to manufacture ostomy pouches which may result in increased costs to the user.

**[0004]** Another disadvantage of using nonwoven for ostomy pouches is that water can permeate through the nonwoven layer when a user takes a shower or swims. Further, when the nonwoven layer and the film layer are not laminated together, for example, sealed around their respective perimeters, the nonwoven layer is not very effective in reducing film noise.

**[0005]** In addition to providing comfort and softness, it is also highly desirable that ostomy pouches do not make noise during use for obvious reasons.

Ostomy pouches that include a quiet film to reduce the noise produced by the pouches, for example, the plastic crackling sound made by the pouch when a user moves around, have been developed. Examples of such a quiet film include the multilayer films disclosed in Giori, US 7,270,860, which is assigned to the assignee of the present application and incorporated herein in its entirety by reference.

**[0006]** When body waste is released from a stoma, flatus gas is often released together with the waste. The flatus gas passing through the stoma can cause a vibratory transient in body tissue, which is uncontrollable by the patient. Such release of the flatus gas from the stoma can accompany indiscreet noise, which can cause embarrassment to the patient. Conventional quiet films, however, could be improved upon to better insulate the flatus noise to prevent embarrassment.

**[0007]** Because of the inherent severe medical, social, and personal concerns related to the need for use of an ostomy appliance, improvements in ostomy appliances are desired. Any appreciable improvement in such ostomy appliances to provide greater discretion, privacy and comfort is of great importance in the quality of life of the increasing number of ostomy patients. The present disclosure provides improved ostomy appliances including a foam material that can replace conventional nonwoven layers according to various embodiments, to provide comfort and enhanced sound insulating properties.

#### BRIEF SUMMARY

**[0008]** A multilayer film including a gas barrier layer and an outer foam layer is provided according to various embodiments of the present disclosure. The multilayer film can provide unique texture, softness, quietness, gas barrier properties, light weight for thickness, and low cost per volume. Further, one or more layers of the multilayer film can contain a vinyl-bond rich triblock copolymer to provide improved sound absorbing properties. Thus, the multilayer film can be used to make ostomy pouches. Further, the multilayer film can be useful in other applications, such as food packaging films, oxygen/carbon dioxide/nitrogen barrier films, medical packaging films and as an alternative to nonwoven material.

**[0009]** In one aspect, a multilayer film including an outer foam layer and a gas barrier layer is provided. The multilayer film may have a modulus of about

2ksi to about 40ksi. Further, the multilayer film may also include at least one tie layer and at least one inner layer.

**[0010]** In one embodiment, the multilayer film may be configured as a six-layer film having a seal layer/tie layer/barrier layer/tie layer/inner layer/outer foam layer construction, or a seal layer/inner layer/tie layer/barrier layer/tie layer/outer foam layer construction. The inner layer may or may not be a foam layer.

**[0011]** In another embodiment, the multilayer film may be configured as a seven-layer film having a seal layer/tie layer/barrier layer/tie layer/inner layer/inner layer/outer foam layer construction, or a seal layer/inner layer/tie layer/barrier layer/tie layer/inner layer/outer foam layer construction. At least one of the inner layers may be a foam layer.

**[0012]** In yet another embodiment, the multilayer film may be configured as a five-layer film having a seal layer/tie layer/barrier layer/tie layer/outer foam layer construction.

**[0013]** The outer foam layer of any of the multilayer film embodiments may be formed from ethylene vinyl acetate (EVA), ethylene methyl acrylate (EMA), ethylene alpha olefin copolymers (ethylene based plastomers), ethylene based elastomers (olefin block copolymers, OBC), ethylene-propylene (EP) copolymers (PP-elastomer) or blends thereof. In one embodiment, the gas barrier layer is formed from a polymer blend comprising an amorphous polyamide and a functionalized rubber blend or compound. In some embodiments, at least one of the outer foam layer, inner layers, tie layers, and barrier layer may include a vinyl-bond rich triblock copolymer.

**[0014]** The multilayer layer film according to any of the embodiments may be configured to have a thickness of about 100 $\mu$ m to about 500 $\mu$ m.

**[0015]** In another aspect, a multilayer film comprising at least one foam layer, a gas barrier layer, and at least one tie layer is provided, in which the tie layer is formed from a polymeric mixture comprising at least one vinyl-bond rich triblock copolymer.

**[0016]** The polymeric mixture for the tie layer may comprise about 50 wt.% to about 99 wt.% of at least one vinyl-bond rich triblock copolymer. In some embodiments, the polymeric mixture may include a vinyl-bond rich SIS block copolymer and a vinyl-bond rich SEPS block copolymer. For example, the tie layer may be formed from a polymeric mixture comprising about 25 wt.% to about 60 wt.%

vinyl-bond rich SIS block copolymer, 25 wt.% to about 60 wt.% vinyl-bond rich SEPS block copolymer, about 1 wt.% to about 40% maleated LLDPE, and about 0 wt.% to about 5wt.% antioxidant masterbatch.

**[0017]** The multilayer film may be a seven layer film having a foam layer/inner layer/tie layer/gas barrier layer/tie layer/inner layer/seal layer configuration. In one embodiment, the multilayer film has a thickness of about 120 $\mu$ m to about 160 $\mu$ m and a film noise level in A-weighted sound pressure level (SPL (A)) of about 35dB to about 60dB, which is measured using a proprietary Hollister test method.

**[0018]** Any of the multilayer film embodiments comprising at least one foam layer, a gas barrier layer, and at least one tie layer formed from a polymeric mixture comprising at least one vinyl-bond rich triblock copolymer may be used to make an ostomy pouch. The ostomy pouch includes a first wall and a second wall, in which the first wall and the second wall are sealed along their peripheral edges to define a cavity. At least one of the first wall and the second wall may be formed from the foregoing multilayer film embodiments.

**[0001]** Other aspects, objectives and advantages will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0002]** The benefits and advantages of the present embodiments will become more readily apparent to those of ordinary skill in the relevant art after reviewing the following detailed description and accompanying drawings, wherein:

**[0003]** FIG. 1 is a cross-sectional illustration of a prior art ostomy appliance;

**[0004]** FIG. 2 is a cross-sectional illustration of an ostomy pouch according to an embodiment of the present disclosure;

**[0005]** FIG. 3 is a cross-sectional illustration of a six-layer composite film according to an embodiment;

**[0006]** FIG. 4 is a cross-sectional illustration a seven-layer composite film according to an embodiment;

**[0007]** FIG. 5 is a graph showing sound transmission loss data for composite film samples;

**[0008]** FIG. 6 is a cross-sectional illustration of a five-layer composite film according to an embodiment;

**[0009]** FIG. 7 is a cross-sectional illustration of an ostomy pouch according to another embodiment of the present disclosure; and

**[0010]** FIG. 8 is a graph showing film noise data in a-weighted sound pressure level for composite film samples;

**[0011]** FIG. 9 is a graph showing film noise data in mean overall sound pressure level for composite film samples;

**[0012]** FIG. 10 is a graph showing sound transmission loss data for laminate samples including barium sulfate;

**[0013]** FIG. 11 is graph showing sound transmission loss data for laminate samples including talc;

**[0014]** FIG. 12 is a cross-sectional illustration of a seven-layer film according to an embodiment;

**[0015]** FIG. 13 is a cross-sectional illustration of a six-layer film according to an embodiment; and

**[0016]** FIG. 14 is a cross-sectional illustration of a six-layer film according to another embodiment.

## DETAILED DESCRIPTION

**[0017]** While the present disclosure is susceptible of embodiment in various forms, there is shown in the drawings and will hereinafter be described a presently preferred embodiment with the understanding that the present disclosure is to be considered an exemplification and is not intended to limit the disclosure to the specific embodiment illustrated.

**[0018]** FIG. 1 is a cross-sectional illustration of a prior art one-piece ostomy pouch 10. The ostomy pouch 10 generally includes a pouch 12 and a skin barrier 14. The pouch 12 includes first and second opposing walls 16, 18, which are sealed around peripheral edges 20 thereof to define a cavity 22 for collecting body waste. The pouch 12 also includes a first nonwoven layer 24 attached to the first wall 16, and a second nonwoven layer 26 attached to the second wall 18. The nonwoven

layers 24, 26 are attached to the respective walls 16, 18 via heat sealing or an adhesive. Each of the first and second walls 16, 18 is formed of a suitable odor barrier film, which may be a single layer film or a multilayer film.

**[0019]** Typically, each side of the pouch is configured to have a total thickness of about 10mil to about 16mil. For example, each side includes a nonwoven layer heat sealed to a wall, in which the wall has a thickness of about 3mil and the nonwoven layer has a thickness of about 11mil to provide a total thickness of about 14mil. In another example, each side includes a nonwoven layer attached to a wall by an adhesive therebetween, in which the wall has a thickness of about 2.25mil, and the adhesive has a thickness of about 1.1 mil, and the nonwoven layer has a thickness of about 11mil to provide a total thickness of about 14.35mil.

**[0020]** FIG. 2 is a cross-sectional illustration of an embodiment of a one-piece ostomy pouch 110. The ostomy pouch 110 is similarly configured to the ostomy pouch 10 of FIG. 1, and generally includes a pouch 112 and a skin barrier 114. The pouch 112 includes first and second opposing walls 116, 118, which are sealed around peripheral edges 120 thereof by heat sealing or by any other suitable means to define a cavity 122 therebetween for collecting body waste.

**[0021]** Each of the first and second walls 116, 118 is formed of a multilayer composite film 124. The composite film 124 is designed to replace the film/nonwoven construction or the film/adhesive/nonwoven construction of prior art pouches. The composite film 124 includes at least one odor barrier film layer and at least one foam layer, which are coextruded. Thus, manufacturing processes of the pouch can be simplified by reducing number of suppliers required for film, nonwoven and adhesive, and eliminating steps for laminating or heat sealing the layers, which in turn provides cost savings. The foam layer of the composite film is configured to have softness sufficient for skin contact to replace the nonwoven layer of prior art pouches. The foam layer can be configured to have a skin contact quality soft feel by using rubbery resins and fine foam cells. Preferably, the foam layer also provides sound absorbing characteristics.

**[0022]** Preferably, the composite film 124 is configured to have a thickness similar to the total thickness of the film/nonwoven construction or the film/adhesive/nonwoven construction of prior art ostomy pouches. For example, the composite film 124 has an overall thickness of about 10 mil to about 16 mil. The composite film 125 can also be configured to have thinner thicknesses, for example,

about 7 mil, to provide a lower cost composite film which still has similar softness and film characteristics as the thicker composite films. In some embodiments, the first wall 116 and the second wall 118 can be formed of different composite films, or only one of the first and second walls 116, 118 can be formed of a composite film.

**[0023]** FIG. 3 is a cross-sectional illustration of an embodiment of the composite film 124. The composite film 124 has a six-layer construction including a seal layer 126, tie layers 128, 132, a barrier layer 130, and foam layers 134, 136. In this embodiment, the composite film 124 has the structure ABCBDE, where A represents the seal layer, B represents the tie layers, C represents the barrier layer, D represents an inner foam layer, and E represents an outer foam layer.

**[0024]** In other embodiments, the composite film can include more than six layers or less than six layers. For example, a composite film can have a five-layer construction including a barrier layer, two tie layers, a seal layer, and one foam layer (i.e. ABCBE). FIG. 6 is a cross-sectional illustration of a five-layer composite film embodiment including a seal layer 162, tie layers 164, 168, a barrier layer 166, and a foam layer 170. The composite film 160 has a seal/tie/barrier/tie/foam construction. Alternatively, a composite film can have a seven-layer construction including a barrier layer, two tie layers, a seal layer, and three foam layer (e.g. ABCBDDE).

**[0025]** The seal layer 126 is formed of a material having suitable heat sealability, such that the seal layers of the first and second walls 116, 118 can be heat sealed along their perimeter to form the pouch 112. Suitable materials for the seal layer 126 include ethylene based polymers, such as copolymers of ethylene with vinyl esters, e.g. EVA and EMA, ethylene alpha olefin copolymers (ethylene based plastomers), ethylene based elastomers (olefin block copolymers, OBC), and ethylene-propylene (EP) copolymers (PP-elastomer) and the blends thereof. Copolymers of ethylene with vinyl esters, such as ethylene vinyl acetate copolymer (EVA) and copolymers of ethylene methyl acrylate (EMA). Suitable EVA copolymers can contain about 5 wt.% to 35 wt.% vinyl acetate and more preferably, about 18 wt.% vinyl acetate, by weight of the copolymer. One such material is available from ExxonMobil as product Escorene<sup>®</sup> Ultra FL00218. Such a material has a melting point temperature of 86°C and a Shore A hardness of about 91. EVA is known to exhibit the necessary characteristics for joining to another EVA member, as by heat sealing, to provide an air-tight, liquid-tight seal at the joint or seal. EVA

materials can be blended to facilitate formation and film extrusion. For example, an EVA blend can have about 98 percent by weight (wt.%) EVA with about 2 wt.% anti-block and slip additives, in an EVA carrier. One suitable additive is available from A. Schulman Inc., as Polybatch® SAB-1982VA.

**[0026]** Suitable EMA copolymers can include about 5 wt.% to about 35 wt.% of the methyl acrylate and preferably about 15 wt.% to about 30 wt.% methyl acrylate. One such EMA copolymer is Lotryl®18AM02 supplied by Arkema Inc. This copolymer has a melting point of 83°C and specific gravity of 0.841. The EMA resins can also be blended with anti-block and slip additives in an EVA carrier. One suitable material for blending is the aforementioned Polybatch® SAB-1982VA. Such a blend can have, for example EMA at about 98 wt.%, with about 2 wt.% Polybatch® SAB-1982VA anti-block and slip additive.

**[0027]** Another suitable material is an ethylene alpha olefin copolymers (ethylene based plastomers). One such a material is Exact® 0203 resin, supplied by ExxonMobil Corporation, which has a specific gravity of about 0.88, a Shore A hardness of about 95, a melting point temperature of about 95°C, and specific gravity of about 0.902. Another suitable resin is ethylene based elastomers (olefin block copolymers, OBC). One such material is Infuse® 9107 supplied by Dow. This material has a specific gravity of about 0.866, a Shore A hardness of about 60 and a melting point of about 121°C. Still another suitable resin is an ethylene-propylene copolymer (PP-elastomer) resin. It has excellent compatibility with polypropylene (PP) and polyethylene (PE). One such material is available from Dow Chemical as Versify®2200. This resin has melting point of about 82°C, a Shore A hardness of 94 and a Shore D hardness of 42. It has a specific gravity of 0.878. PP-elastomers such as Vistamaxx® from Exxon, and Notio® from Mitsui are also suitable.

**[0028]** For example, a blend for seal layer 126 can have about 49 wt. % EVA copolymer (Escorene® Ultra FL00218), about 49% ethylene alpha olefin copolymer (Exact® 0203), and about 2 wt.% Polybatch® SAB-1982VA anti-block and slip additive. Another example for a blend for seal layer 126 can have about 49 wt. % EMA copolymer (Lotryl®18AM02), about 49% OBC (Infuse® 9107), and about 2 wt.% Polybatch® SAB-1982VA anti-block and slip additive. Yet, another example for the seal layer 126 can have about 49 wt. % EMA copolymer (Lotryl®18AM02), about 49% ethylene-propylene copolymer (Versify®2200), and about 2 wt.% Polybatch® SAB-1982VA anti-block and slip additive.

**[0029]** In addition to heat sealability, the seal layer 126 can also provide sound absorbing properties. In such an embodiment, the seal layer 126 can comprise a vinyl-bond rich triblock copolymer, such as Hybrar<sup>®</sup>, to enhance sound absorbing properties and mechanical properties of the composite film. For example, the seal layer 126 can be formed from a blend of a vinyl-bond rich SIS triblock copolymer (Hybrar<sup>®</sup> 5127), a PP-elastomer (Vistamaxx<sup>®</sup>), and an EMA (Lotryl<sup>®</sup> 20MA08).

**[0030]** On either side of the barrier layer 130 are the tie layers 128, 132. The tie layers facilitate adhesion of the barrier layer 130 to the remainder of the composite film structure. The seal layer 126 and the inner foam layer 134 are adjacent to the tie layers 128, 132, respectively. The tie layers 128, 132 can be formed of the same material or different materials. Suitable materials for the tie layers 128, 132 include maleated polyolefins, such as a maleated ethylene methyl acrylate copolymers having maleic anhydride present at about 0.3 wt.% and methyl acrylate present at about 20 wt.% of the resin. One such material is available from Arkema, Inc. as Lotader<sup>®</sup> 4503.

**[0031]** In addition to the adhesion function, the tie layers 128, 132 can also provide sound absorbing properties. In such an embodiment, the tie layers 128, 132 can comprise a vinyl-bond rich triblock copolymer, such as Hybrar<sup>®</sup>, to enhance sound absorbing properties and mechanical properties of the composite film. For example, the tie layers 128, 132 can be formed from a blend of a vinyl-bond rich SIS block copolymer (Hybrar<sup>®</sup> 5127), a maleated LLDPE (Bynel<sup>®</sup> CXA41E710 supplied by DuPont), and an antioxidant, or can be formed from a blend of a vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125) and a maleated LLDPE (Bynel<sup>®</sup> CXA41E710).

**[0032]** The barrier layer 130 can be formed from various materials having gas barrier properties, such as, but not limited to, polyvinylidene chloride, vinylidene copolymer, polyamide, and ethylene-vinyl alcohol copolymer. Preferably, the barrier layer 130 is formed from a non-chlorine containing polymer that is substantially impermeable to malodor causing compounds typically encountered in ostomy pouches. Such malodor causing compounds can include sulfur containing compounds and indoles. Suitable barrier layer materials include resins such as amorphous polyamide (nylon) resin, which can be modified by an anhydride-modified olefinic polymer or copolymer, or an epoxy modified olefin polymer or copolymer to

decrease the rigidity of the barrier layer. For example, the barrier layer 130 can be formed from a blend of an amorphous polyamide, such as Selar<sup>®</sup> PA3426R, by DuPont Company, and a functionalized rubber blend or compound, such as Lotader<sup>®</sup> 4720.

**[0033]** The inner foam layer 134 and the outer foam layer 136 can be formulated from the same material or different materials. For example, the inner foam layer 134 can be formed from a polyolefin with a blowing agent and a color additive, and the outer foam layer 136 can be formed from the same polyolefin with a blowing agent, slip and antiblock agents, and a color additive. Ethylene based polymers, such as copolymers of ethylene with vinyl esters, e.g. EVA and EMA, ethylene alpha olefin copolymers (ethylene based plastomers), ethylene based elastomers (olefin block copolymers, OBC), and ethylene-propylene (EP) copolymers (PP-elastomer) and the blends thereof are suitable for the foam layers. One suitable material is an ethylene vinyl acetate (EVA) copolymer having a vinyl acetate content of about 5 wt.% to 35 wt.%, and preferably about 10 wt.% to about 30 wt.%. One such material is Escorene<sup>®</sup> FL00218, supplied by ExxonMobil Corporation. The material contains 18 wt.% vinyl acetate and has a melting point temperature of about 86°C and a Shore A hardness of about 91. Suitable EMA copolymers can include about 5 wt.% to about 35 wt.% methyl acrylate and preferably about 10 wt.% to about 30 wt.% methyl acrylate. One such EMA copolymer is Lotryl<sup>®</sup> 18AM02 supplied by Arkema Inc. This copolymer has a melting point of 83°C and specific gravity of 0.841.

**[0034]** Another suitable material is ethylene alpha olefin copolymers (ethylene based plastomers). One such material is Exact<sup>®</sup> 0203 resin, supplied by ExxonMobil Corporation, which has a specific gravity of about 0.88, a Shore A hardness of about 95, a melting point temperature of about 95°C, and specific gravity of about 0.902. Another suitable resin is ethylene based elastomers (olefin block copolymers, OBC). One such material is Infuse<sup>®</sup> 9107 supplied by Dow. This material has a specific gravity of about 0.866, a Shore A hardness of about 60 and a melting point of about 121°C. Still another suitable resin is an ethylene-propylene copolymer (PP-elastomer) resin. It has excellent compatibility with polypropylene (PP) and polyethylene (PE). One such material is available from Dow Chemical as Versify<sup>®</sup> 2200. This resin has melting point of about 82°C, a Shore A hardness of 94, a Shore D hardness of 42, and a specific gravity of 0.878.

**[0035]** Preferably, the foam layers 134, 136 also provide at least some sound absorbing properties. In such an embodiment, each of the foam layers 134, 136 comprises a vinyl-bond rich triblock copolymer, such as Hybrar® from Kuraray Co. Ltd., to enhance mechanical properties and sound absorbing properties of the composite film. For example, each of the foam layers can be formed from a blend comprising a vinyl-bond rich SIS block copolymer, e.g. Hybrar® 5125 and 5127, or a vinyl-bond rich SEPS block copolymer, e.g. Hybrar® 7125, or a vinyl-bond rich SEEPS block copolymer, e.g. Hybrar® 7311. The vinyl-bond rich triblock copolymers can be used alone with foaming agent or blended with other polyolefins, such as EMA (e.g. Lotryl® 20MA08), to form the foam layers 134, 136. The foam layers may also include other additive ingredients, such as a processing aid (e.g. Polyone® FDM 55802 from PolyOne).

**[0036]** In one embodiment, the six-layer composite film 124 has a total thickness of about 280 $\mu$ m (11mil), in which the seal layer 126 has a thickness of about 64 $\mu$ m, each of the tie layers 128, 132 has a thickness of about 4 $\mu$ m, the barrier layer 130 has a thickness of about 4 $\mu$ m, the inner foam layer 134 has a thickness of about 140 $\mu$ m, and the outer foam layer 136 has a thickness of about 64 $\mu$ m.

**[0037]** In this embodiment, the seal layer 126 is formed a blend comprising about 49 wt.% of EVA copolymer (Escorene® FL00218), about 49 wt.% of PP-elastomers (Vistamaxx® 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch® SAB-1982VA). Each of the tie layers 128, 132 is formed from a blend comprising about 80 wt.% EMA (Lotryl® 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel® CXA41E710). The barrier layer is formed from a blend comprising about 85 wt.% amorphous polyamide (Selar® PA3426R) and 15 wt.% functionalized rubber blend (Lotader® 4720). The inner foam layer 134 is formed from a blend comprising about 45 wt.% of EVA copolymer (Escorene® FL00218), about 45 wt.% of PP-elastomers (Vistamaxx® 3980FL), about 8 wt.% of color masterbatch, and about 2 wt.% of blowing agent (Safoam® FP-40 from Reedy International). The outer foam layer 136 is formed from a blend comprising about 48 wt.% of EVA copolymer (Escorene® FL00218), about 48 wt.% of PP-elastomers (Vistamaxx® 3980FL), about 2 wt.% of blowing agent (Safoam® FP-40), and about 2 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). The foam layers 134, 136, particularly the outer foam layer 136, include fine foam cells for soft skin touch

feel. Further, the slip agent is added to the blend for the outer foam layer 136 to improve the smooth sleek feel of the foam.

**[0038]** Preferably, the foam layers provide sound absorbing properties in addition to a smooth soft feel for improved comfort for wearers. Thus, at least one foam layer comprises a vinyl-bond rich triblock copolymer such as a vinyl-bond rich SIS block copolymer, e.g. Hybrar<sup>®</sup> 5125 and 5127, or a vinyl-bond rich SEPS block copolymer, e.g. Hybrar<sup>®</sup> 7125, or a vinyl-bond rich SEEPS block copolymer, e.g. Hybrar<sup>®</sup> 7311.

**[0039]** In one embodiment, the six-layer composite film 124 has a total thickness of about 288 $\mu$ m (11.3mil), in which the seal layer 126 has a thickness of about 20 $\mu$ m, each of the tie layers 128, 132 has a thickness of about 3 $\mu$ m, the barrier layer 130 has a thickness of about 4 $\mu$ m, the inner foam layer 134 has a thickness of about 238 $\mu$ m, and the outer foam layer 136 has a thickness of about 20 $\mu$ m.

**[0040]** In this embodiment, the seal layer 126 is formed from a blend comprising about 49 wt.% of EVA copolymer (Escorene<sup>®</sup> FL00218), about 49 wt.% of PP-elastomers (Vistamaxx<sup>®</sup> 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the tie layers 128, 132 is formed from a blend comprising about 80 wt.% EMA (Lotryl<sup>®</sup> 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710). The barrier layer 130 is formed from a blend comprising about 85 wt.% amorphous polyamide (Selar<sup>®</sup> PA3426R) and 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720). The inner foam layer 134 is formed from a blend comprising about 47 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 47 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 4 wt.% of color masterbatch, and about 2 wt.% of blowing agent (Safoam<sup>®</sup> FP-20). The outer foam layer 136 is formed from a blend comprising about 48 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 48 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 2 wt.% of blowing agent (Safoam<sup>®</sup> FP-20), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Preferably, the foam layers 134, 136 include fine foam cells for soft smooth feel, and open cell structure to maximize sound absorbing properties of the foam layers. Further, the slip agent is added to the blend for the outer foam layer 136 for improved smooth sleek feel of the foam.

**[0041]** In another embodiment, the six-layer composite film 124 has a total thickness of about 288 $\mu$ m (11.3mil), in which the seal layer 126 has a thickness of about 20 $\mu$ m, each of the tie layers 128, 132 has a thickness of about 3 $\mu$ m, the

barrier layer 130 has a thickness of about 40 $\mu$ m, the inner foam layer 134 has a thickness of about 202 $\mu$ m, and the outer foam layer 136 has a thickness of about 20 $\mu$ m. In this embodiment, the barrier layer 130 is formed from a low melting point nylon, and thus, a vinyl-bond rich SIS block copolymer (Hybrar<sup>®</sup> 5125 or 5127), which is thermally not as stable as has a lower melting point than the vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125) or SEEPS block copolymer (Hybrar<sup>®</sup> 7311), can be used for the foam layers 134, 136. In the previously described embodiment, the amorphous polyamide (Selar<sup>®</sup> PA3426R) used for the barrier layer has a relatively high melt flow temperature, thus requires a relatively high processing temperature. Therefore, the vinyl-bond rich SEPS or SEEPS block copolymer, which is more heat stable than the vinyl-bond rich SIS block copolymer, was selected for the foam layers. The vinyl-bond rich SIS block copolymers can provide additional cost benefits and improved sound absorbing properties in some embodiments.

**[0042]** In this embodiment, the seal layer 126 is formed from a blend comprising about 59 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 39 wt.% of PP-elastomers (Vistamaxx<sup>®</sup> 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the tie layers 128, 132 is formed from a blend comprising about 80 wt.% EMA (Lotryl<sup>®</sup> 20MA08) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710). The barrier layer 130 is formed from a blend comprising about 85 wt.% low melting point nylon (Grilon<sup>®</sup> BM13 from EMS-Grivory) and 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720). The inner foam layer 134 is formed from a blend comprising about 46.5 wt.% of vinyl-bond rich SIS block copolymer (Hybrar<sup>®</sup> 5127), about 46.5 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 5 wt.% of color masterbatch, and about 2 wt.% of blowing agent (Safoam<sup>®</sup> FP-20). The outer foam layer 136 is formed from a blend comprising about 48 wt.% of vinyl-bond rich SIS block copolymer (Hybrar<sup>®</sup> 5127), about 48 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 2 wt.% of blowing agent (Safoam<sup>®</sup> FP-20), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Preferably, the foam layers 134, 136 include fine foam cells for soft smooth feel, and open cell structure to maximize sound absorbing properties of the foam layers. Further, the slip agent is added to the blend for the outer foam layer 136 for an improved smooth sleek feel of the foam.

**[0043]** In some embodiments, a composite film includes at least one layer comprising a filler to provide improved sound absorbing or sound deadening properties. Fillers having a platelet shape, such as mica and talc, are preferred. For

example, a composite film having improved sound absorbing properties can include at least one sound absorbing foam layer comprising a vinyl-bond rich triblock copolymer and at least one other layer comprising a filler, such as mica, barium sulfate, and/or talc.

**[0044]** In one embodiment, a six-layer composite film 124 (FIG. 3) includes a seal layer comprising a filler. The composite film has a total thickness of about 288 $\mu$ m (11.3mil) including a seal layer 126 having a thickness of about 25 $\mu$ m, two tie layers 128, 132, each of which having a thickness of about 4 $\mu$ m, a barrier layer 130 having a thickness of about 4 $\mu$ m, an inner foam layer 134 having a thickness of about 166 $\mu$ m, and an outer foam layer 136 having a thickness of about 85 $\mu$ m. The seal layer 126 is formed from a polymer blend comprising about 33.3 wt.% of a EMA/mica blend (the EMA/mica blend includes about 50 wt.% mica (Suzorite<sup>®</sup> 60S from Imerys Pigments) and about 50 wt.% EMA (Lotryl<sup>®</sup> 20MA08)), about 25 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 40 wt.% of PP-elastomers (Vistamaxx<sup>®</sup> 3980FL), and about 1.7 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the tie layers 128, 132 is formed from a blend comprising about 80 wt.% EMA (Lotryl<sup>®</sup> 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710). The barrier layer 130 is formed from a blend comprising about 85 wt.% amorphous polyamide (Selar<sup>®</sup> PA3426R) and about 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720). The inner foam layer 134 is formed from a blend comprising about 55 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 31 wt.% of EMA (EMAC<sup>®</sup> 2207 from West Lake), about 11 wt.% of color masterbatch, and about 3 wt.% of blowing agent (Expancel<sup>®</sup> 950MB80 from Akzo). The outer foam layer 136 is formed from a blend comprising about 52 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 43 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 3 wt.% of blowing agent (Expancel<sup>®</sup> 950MB80), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA).

**[0045]** FIG. 7 is a cross-sectional illustration of a one-piece ostomy pouch 210 according to another embodiment. The ostomy pouch 210 is similarly configured as the ostomy pouch 110 of FIG. 2, and generally includes a pouch 212 and a skin barrier 214. In this embodiment, a first wall 216 is formed of a composite film 224, and a second wall 218 is formed of a film 226. Further, the ostomy pouch 210 includes a nonwoven layer 228 attached to the second wall 218 to accommodate

users who desire characteristics of a nonwoven comfort panel, for example, breathability.

**[0046]** The composite film 224 includes at least one sound absorbing foam layer comprising a vinyl-bond rich triblock copolymer such as a vinyl-bond rich SIS block copolymer, e.g. Hybrar® 5125 and 5127, or a vinyl-bond rich SEPS block copolymer, e.g. Hybrar® 7125, or a vinyl-bond rich SEEPS block copolymer, e.g. Hybrar® 7311. The composite film 224 can have any of the multilayer composite constructions discussed in this disclosure. For example, the composite film 224 can have a six-layer construction including a seal layer, two tie layers, a barrier layer, and two foam layers, as shown in FIG. 3. Alternatively, the composite film 224 can have a five-layer construction as shown in FIG. 6 or a seven-layer construction as shown in FIG. 4.

**[0047]** The second wall 218 can be formed of a suitable monolayer or multilayer film, such as a composite film including at least one sound absorbing foam layer comprising a vinyl-bond rich triblock copolymer. For example, the film 226 can be the same composite film as the composite film 224 or a different composite film. In one embodiment, the composite film 224 and the film 226 are the same composite film having a six-layer construction of FIG. 3, which includes two foam layers 134, 136 comprising a vinyl-bond rich triblock copolymer. In another embodiment, the film 226 is a different composite film than the composite film 224. For example, the film 226 can be a thinner composite film than the composite film 224. For example, the composite film 224 can have a thickness of about 11 mil, while the film 226 is a composite film having a thickness of about 7 mil.

**[0048]** Alternatively, the film 226 can be a suitable polymeric film, which does not include a foam layer. The film 226 can be a single layer film or a multilayer film. Preferably, the multilayer film includes at least one odor barrier layer. For example, the film 226 can be a six-layer film having a thickness of about 2.24 mil (57 $\mu$ m) and a seal layer/tie layer/barrier layer/tie layer/inner layer/seal layer construction. In another example, the film 226 can be a seven-layer film having a seal layer/inner layer/tie layer/barrier layer/tie layer/inner layer/seal layer construction. In some embodiments, the multilayer film for the second wall 218 includes at least one layer comprising a vinyl-bond rich triblock copolymer.

**[0049]** Although the embodiments of FIGS. 2 and 7 are a one-piece ostomy appliance with a closed-end pouch, the above discussed multilayer composite

films can be used to make other types of ostomy appliances, such as two-piece ostomy appliances and drainable ostomy pouches.

### Examples and Test Results

**[0050]** Three composite film samples and a control laminate were prepared and tested for their mechanical and sound absorbing properties. Each of the composite film samples had a total thickness of about 288 $\mu\text{m}$  (11.3mil) and a seven-layer construction (seal layer/tie layer/barrier layer/tie layer/foam layer/foam layer/foam layer). Each of the foam layers included vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125) for sound absorbing properties. The control laminate, which is currently used in some known ostomy pouches, had a total thickness of about 11.3mil including a PE nonwoven layer, an adhesive layer, and a multilayer barrier film.

TABLE 1 – Composite Film Samples and Control Laminate

Sample Code	Foam 1	Foam 2	Foam 3	Tie 1	Barrier	Tie 2	Seal
X3299	<b>85<math>\mu\text{m}</math></b> 50% Hybrar <sup>®</sup> 7125 + 46% Lotryl <sup>®</sup> 20MA08 + 2% Safoam <sup>®</sup> FP-20 + 2% Polybatch <sup>®</sup> SAB-1982VA	<b>83<math>\mu\text{m}</math></b> 65% Hybrar <sup>®</sup> 7125 + 34% EMAC <sup>®</sup> 2207 + 1% Safoam <sup>®</sup> FP-20	<b>83<math>\mu\text{m}</math></b> 65% Hybrar <sup>®</sup> 7125 + 34% EMAC <sup>®</sup> 2207 + 1% Safoam <sup>®</sup> FP-20	<b>4<math>\mu\text{m}</math></b> 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	<b>4<math>\mu\text{m}</math></b> 85% Selar <sup>®</sup> PA3426R +15% Lotader <sup>®</sup> 4720	<b>4<math>\mu\text{m}</math></b> same as Tie 1	<b>25<math>\mu\text{m}</math></b> 50% Lotryl <sup>®</sup> 20MA08 + 48% Vistamaxx <sup>®</sup> 3980FL + 2% Polybatch <sup>®</sup> SAB-1982VA
X3300	<b>85<math>\mu\text{m}</math></b> 50% Hybrar <sup>®</sup> 7125 + 46% Lotryl <sup>®</sup> 20MA08 + 2% Safoam <sup>®</sup> FPE-20 + 2% Polybatch <sup>®</sup> SAB-1982VA	<b>83<math>\mu\text{m}</math></b> 65% Hybrar <sup>®</sup> 7125 + 34% EMAC <sup>®</sup> 2207 + 1% Safoam <sup>®</sup> FPE-20	<b>83<math>\mu\text{m}</math></b> 65% Hybrar <sup>®</sup> 7125 + 34% EMAC <sup>®</sup> 2207 + 1% Safoam <sup>®</sup> FPE-20	<b>4<math>\mu\text{m}</math></b> 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	<b>4<math>\mu\text{m}</math></b> 85% Selar <sup>®</sup> PA3426R +15% Lotader <sup>®</sup> 4720	<b>4<math>\mu\text{m}</math></b> same as Tie 1	<b>25<math>\mu\text{m}</math></b> 50% Lotryl <sup>®</sup> 20MA08 + 48% Vistamaxx <sup>®</sup> 3980FL + 2% Polybatch <sup>®</sup> SAB-1982VA
X3301	<b>85<math>\mu\text{m}</math></b> 50% Hybrar <sup>®</sup> 7125 + 46% Lotryl <sup>®</sup> 20MA08 + 2% Expancel <sup>®</sup> 950MB80 + 2% Polybatch <sup>®</sup> SAB-1982VA	<b>83<math>\mu\text{m}</math></b> 65% Hybrar <sup>®</sup> 7125 + 34% EMAC <sup>®</sup> 2207 + 1% Expancel <sup>®</sup> 950MB80	<b>83<math>\mu\text{m}</math></b> 65% Hybrar <sup>®</sup> 7125 + 34% EMAC <sup>®</sup> 2207 + 1% Expancel <sup>®</sup> 950MB80	<b>4<math>\mu\text{m}</math></b> 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	<b>4<math>\mu\text{m}</math></b> 85% Selar <sup>®</sup> PA3426R +15% Lotader <sup>®</sup> 4720	<b>4<math>\mu\text{m}</math></b> same as Tie 1	<b>25<math>\mu\text{m}</math></b> 50% Lotryl <sup>®</sup> 20MA08 + 48% Vistamaxx <sup>®</sup> 3980FL + 2% Polybatch <sup>®</sup> SAB-1982VA

	Nonwoven	Adhesive	57 $\mu\text{m}$ (2.24mil) 6-layer film					
Control	<b>203.2<math>\mu\text{m}</math></b> (8mil) PE nonwoven	<b>28<math>\mu\text{m}</math></b> (1.1mil) adhesive	<b>Seal</b> 97.5% Escorene <sup>®</sup> FL00218 + 2.5% Polybatch <sup>®</sup> SAB- 1982VA	<b>Inner</b> 87%-89.5% Escorene <sup>®</sup> FL00218 + 10.5%-13% Schulman <sup>®</sup> T92030 Beige	<b>Tie 1</b> 80% Lotryl <sup>®</sup> 18MA0 2 + 20% Bynel <sup>®</sup> CXA- 41E710	<b>Barrier</b> 85% Selar <sup>®</sup> PA3426 R+15% Lotader <sup>®</sup> 4720	<b>Tie 2</b> same as Tie 1	<b>Seal</b> 97.5% Escorene <sup>®</sup> FL00218 + 2.5% Polybatch <sup>®</sup> SAB- 1982VA

**[0051]** As summarized in Table 1, Sample X3299 is a seven-layer composite film 140 (FIG. 4) having a foam layer 1/foam layer 2/foam layer 3/tie layer

1/barrier layer/tie layer 2/seal layer construction. The seal layer 142 has a thickness of about 25 $\mu$ m, and is formed of a blend comprising about 50 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 48 wt.% of PP-elastomers (Vistamaxx<sup>®</sup> 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the tie layer 1 (148) and tie layer 2 (144) has a thickness of about 4 $\mu$ m, and is formed from a blend comprising about 80 wt.% EMA (Lotryl<sup>®</sup> 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710). The barrier layer 146 has a thickness of about 4 $\mu$ m, and is formed from a blend comprising about 85 wt.% amorphous polyamide (Selar<sup>®</sup> PA3426R) and about 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720). Each of the foam layer 2 (152) and the foam layer 3 (150) has a thickness of about 83 $\mu$ m, and is formed from a blend comprising about 65 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 34 wt.% of EMA (EMAC<sup>®</sup> 2207), and about 1 wt.% of blowing agent (Safoam<sup>®</sup> FP-20). The foam layer 1 (154) has a thickness of about 85 $\mu$ m, and is formed from a blend comprising about 50 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 46 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 2 wt.% of blowing agent (Safoam<sup>®</sup> FP-20), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Thus, the composite film 140 of Sample X3299 has a total thickness of about 288 $\mu$ m (11.3mil).

**[0052]** Sample X3300 is also a seven-layer composite film 140 having the same layer construction as Sample X3299, which is illustrated in FIG. 4. The seal layer 142 has a thickness of about 25 $\mu$ m, and is formed from a blend comprising about 50 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 48 wt.% of PP-elastomers (Vistamaxx<sup>®</sup> 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the tie layer 1 (148) and tie layer 2 (144) has a thickness of about 4 $\mu$ m, and is formed from a blend comprising about 80 wt.% EMA (Lotryl<sup>®</sup> 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710). The barrier layer 146 has a thickness of about 4 $\mu$ m, and is formed from a blend comprising about 85 wt.% amorphous polyamide (Selar<sup>®</sup> PA3426R) and about 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720). Each of the foam layer 2 (152) and the foam layer 3 (150) has a thickness of about 83 $\mu$ m, and is formed from a blend comprising about 65 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 34 wt.% of EMA (EMAC<sup>®</sup> 2207), and about 1 wt.% of blowing agent (Safoam<sup>®</sup> FP-20). The foam layer 1 (154) has a thickness of about 85 $\mu$ m, and is formed from a blend comprising about 50 wt.% of vinyl-bond rich SEPS block copolymer

(Hybrar® 7125), about 46 wt.% of EMA (Lotryl® 20MA08), about 2 wt.% of blowing agent (Safoam® FPE-20), and about 2 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). Thus, the composite film 140 of Sample X3300 has a total thickness of about 288 $\mu$ m (11.3mil).

**[0053]** Sample X3301 is also a seven-layer composite film 140 having the same layer construction as Sample X3299, which is illustrated in FIG. 4. The seal layer 142 has a thickness of about 25 $\mu$ m, and is formed from a blend comprising about 50 wt.% of EMA (Lotryl® 20MA08), about 48 wt.% of PP-elastomers (Vistamaxx® 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch® SAB-1982VA). Each of the tie layer 1 (148) and tie layer 2 (144) has a thickness of about 4 $\mu$ m, and is formed from a blend comprising about 80 wt.% EMA (Lotryl® 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel® CXA41E710). The barrier layer 146 has a thickness of about 4 $\mu$ m, and is formed from a blend comprising about 85 wt.% amorphous polyamide (Selar® PA3426R) and about 15 wt.% functionalized rubber blend (Lotader® 4720). Each of the foam layer 2 (152) and the foam layer 3 (150) has a thickness of about 83 $\mu$ m, and is formed from a blend comprising about 65 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar® 7125), about 34 wt.% of EMA (EMAC® 2207), and about 1 wt.% of blowing agent (Expancel® 950MB80 from Akzo). The foam layer 1 (154) has a thickness of about 85 $\mu$ m, and is formed from a blend comprising about 50 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar® 7125), about 46 wt.% of EMA (Lotryl® 20MA08), about 2 wt.% of blowing agent (Expancel® 950MB80), and about 2 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). Thus, the composite film 140 of Sample X3301 has a total thickness of about 288 $\mu$ m (11.3mil).

**[0054]** The layers of Samples X3299, X3300, and X3301 were coextruded to form the composite film 140. Each layer was extruded using a separate extruder with appropriate settings for the particular polymer blend.

**[0055]** The control laminate had a thickness of about 11.3mil, and included a PE nonwoven laminated to a six-layer odor barrier film with an adhesive between them. The six-layer odor barrier film had a thickness of about 2.24mil (57 $\mu$ m), and a seal layer/tie layer/barrier layer/tie layer/inner layer/seal layer construction. Each of the seal layers was formed from a blend of about 97.5 % wt. EVA copolymer (Escorene® FL00218 available from ExxonMobil Corporation) and about 2.5 wt.% anti-block/slip additive (Polybatch® SAB1982VA available from

Schulman Inc.) Each of the tie layers was formed from a blend of about 80 wt.% EMA (Lotryl<sup>®</sup> 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710.) The barrier layer was formed from a blend of about 85 wt.% of an amorphous polyamide (Selar<sup>®</sup> PA3426R) and about 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720.) The inner layer was formed from a blend of about 87 wt.%-89.5 wt.% EVA copolymer (Escorene<sup>®</sup> FL00218) and about 10.5 wt.%-13 wt.% Schulman<sup>®</sup> T92030 Beige.

**[0056]** Mechanical properties of the sample composites and the control laminate were evaluated, and their data is summarized in Table 2.

TABLE 2 – Mechanical Properties of Samples

		X3299	X3300	X3301	Control
<b>Actual Total Thickness (μm)</b>		280	288	294	280
<b>Elmendorf Tear at 800 mm (mN)</b>	<b>MD</b>	23154	24036	14058	-
	<b>CD</b>	13327	15872	9847	-
<b>Elmendorf Tear at 800 mm (mN/mil)</b>	<b>MD</b>	2049	2127	1244	-
	<b>CD</b>	1179	1405	871	-
<b>Elmendorf Tear at 800 mm (gf/mil)</b>	<b>MD</b>	209	217	127	-
	<b>CD</b>	120	143	89	-
<b>Tensile Strength (N/mm<sup>2</sup>)</b>	<b>MD</b>	6.9	6.6	4.3	6.9
	<b>CD</b>	6.7	6.5	4.0	2.8
<b>Tensile Strength (psi)</b>	<b>MD</b>	1000	951	626	1001
	<b>CD</b>	965	937	586	405
<b>Tensile Yield (N/mm<sup>2</sup>)</b>	<b>MD</b>	2.8	2.1	2.3	3.6
	<b>CD</b>	2.3	2.2	1.7	2.5
<b>Tensile Yield (psi)</b>	<b>MD</b>	412	308	333	522
	<b>CD</b>	327	312	245	356
<b>Elongation at Break (%)</b>	<b>MD</b>	628	746	532	254
	<b>CD</b>	746	745	679	403
<b>Elongation at Yield (%)</b>	<b>MD</b>	42.9	37.9	32.4	137
	<b>CD</b>	33.4	35.1	37.3	86
<b>Modulus (N/mm<sup>2</sup>)</b>	<b>MD</b>	46.7	34.2	36.7	33.8
	<b>CD</b>	37.8	32.8	26.5	26.2
<b>Modulus (ksi)</b>	<b>MD</b>	6.8	5.0	5.3	4.9
	<b>CD</b>	5.5	4.8	3.8	3.8

**[0057]** The modulus data as shown in Table 2 indicate that Samples X3299, X3300, and X3301 have similar softness as the control laminate. The tensile strength data in machine direction (MD) and cross direction (CD) indicates that the control laminate has more anisotropicity. The elongation at break data indicates that

Samples X3299, X3300, and X3301 are more ductile than the control laminate. Further, Samples X3299, X3300, and X3301 have good Elmendorf tear strength. Overall, the data indicates that Samples X3299, X3300, and X3301 have suitable mechanical properties for ostomy pouches.

**[0058]** Samples X3299, X3300, and X3301 and the control laminate were tested according to ASTM E2611-09 (Standard Test Method for Measurement of Normal Incidence Sound Transmission of Acoustical Materials Based on the Transfer Matrix Method) using Brüel & Kjaer Sound Impedance Tube Kit-Type 4206T. In this test, a sound source (e.g. loudspeaker) is mounted at one end of an impedance tube, and the sample is placed in a holder in the tube at a distance away from the sound source. The loudspeaker generates broadband, stationary random sound waves that propagate as plane waves. The plane waves hit the sample with part of the waves reflected back into the source tube, part absorbed by the laminate sample, and part passing through the sample to a receiving tube. By measuring the sound pressure at four fixed locations (two in the source tube and two in the receiving tube) and calculating the complex transfer function using a four-channel digital frequency analyzer, the transmission loss of the laminate sample is determined.

**[0059]** The sound tube transmission loss test data for laminate samples are plotted and shown in FIG. 5. Transmission loss expressed in decibel (dB) shows the degree of sound reduced or absorbed by the samples. The most audible range of human hearing is between about 1,000 Hz to 4,000 Hz. As shown in FIG. 5, Samples X3299, X3300, and X3301 have significantly better sound reduction/absorption properties than the control laminate. For example, Samples X3299 and X3300 provided more sound reduction than the control laminated by more than about 6dB at around 3,500-4,000 Hz frequencies. In ostomy applications, an improvement in the sound transmission loss of about 6dB represents a significant reduction of embarrassing flatulence gas noise.

**[0060]** In addition to the sound absorbing properties, the laminate samples were also evaluated for film noise properties. The film noise properties are different than the sound absorbing properties in that the sound absorbing properties are indicative of sample's ability for reducing flatulence noise, whereas the film noise properties are indicative of a level of noise produced by the sample itself, for example, crackling noise made by the sample. The film noise of the laminate samples were measured and plotted in FIGS. 8 and 9. FIG. 8 is a graph of a-weighted sound

pressure level, and FIG. 9 is a graph of mean overall sound pressure level of the laminate samples, the control sample and a commercial film for ostomy pouch. The commercial film, which was a multilayer film including a barrier layer comprising vinylidene chloride-methyl acrylate copolymer, had a thickness of 3 mil. As can be seen in FIGS. 8 and 9, Samples X3299, X3300, and X3301 have significantly lower sound pressure levels than the control laminate and the commercial film. Thus, in addition to providing superior sound absorbing properties, the laminate samples also make less noise than the control laminate and the commercial film. That is, ostomy pouches made using the laminate samples can reduce flatulence gas noise better, and are also quieter than those made using the control laminate or the commercial film.

**[0061]** Preferably, a composite film also includes at least one layer comprising a filler, such as talc, barium sulfate and/or mica, to further enhance sound absorbing properties. Two-layer laminate samples including a layer comprising barium sulfate or talc (Sample 302-2 and Sample 303-3) were prepared and evaluated for their sound absorbing properties. A two-layer control sample was also prepared. The compositions of the two-layer laminate samples and the control sample are summarized in Table 3.

TABLE 3 – Laminate Samples and Control Sample

	First Layer (1 mil)	Second Layer (2 mil)
<b>Control</b>	50.0wt.% of Lotryl® 20MA08 + 48.0wt.% Vistamaxx® 3980FL + 2.0wt.% Polybatch® SAB-1982VA	60wt.% Hybrar® 5125 + 38wt.% Lotryl® 20MA08 + 2wt.% Polybatch® SAB-1982VA
<b>Sample 302-2</b>	20.0wt.% of Lotryl® 20MA08 + 48.0wt.% Vistamaxx® 3980FL + 30.0wt.% Huberbrite® HB1 + 2.0wt.% Polybatch® SAB-1982VA	60wt.% Hybrar® 5125 + 38wt.% Lotryl® 20MA08 + 2wt.% Polybatch® SAB-1982VA
<b>Sample 302-3</b>	20.0wt.% of Lotryl® 20MA08 + 48.0wt.% Vistamaxx® 3980FL + 30.0wt.% Luzenac® HAR T-84 + 2.0wt.% Polybatch® SAB-1982VA	60wt.% Hybrar® 5125 + 38wt.% Lotryl® 20MA08 + 2wt.% Polybatch® SAB-1982VA

**[0062]** Each of the samples (Sample 302-2 and Sample 303-3) and the control sample had a total thickness of about 3 mil, and included a first layer having a thickness of about 1 mil and a second layer having a thickness of 2 mil. The second layer of Sample 302-2, Sample 303-3, and the control sample was formed of the same film comprising about 60 wt.% of a vinyl-bond rich SIS block copolymer (Hybrar® 5125), about 38 wt.% of EMA (Lotryl® 20MA08), and about 2 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). The first layer of Sample 302-2

comprised about 20.0 wt.% of EMA (Lotryl® 20MA08), about 48.0 wt.% of PP-elastomers (Vistamaxx® 3980FL), about 30.0 wt.% barium sulfate (Huberbrite® HB1 from Huber), and about 2.0 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). The first layer of Sample 302-3 comprised about 20.0 wt.% of EMA (Lotryl® 20MA08), about 48.0 wt.% of PP-elastomers (Vistamaxx® 3980FL), about 30.0 wt.% talc (Luzenac® HAR T-84 from Imerys), and about 2.0 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). The first layer of the control sample comprised about 50.0 wt.% of EMA (Lotryl® 20MA08), about 48.0 wt.% of PP-elastomers (Vistamaxx® 3980FL), and about 2.0 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA).

**[0063]** Multiple samples of Sample 302-2, Sample 303-3, and Control were tested according to ASTM E2611-09. The sound tube transmission loss test data for these samples are plotted and shown in FIGS. 10 and 11. The sound transmission loss expressed in decibel (dB) shows the degree of sound reduced or absorbed by the samples. FIG. 10 shows the sound transmission loss data of Sample 302-2 samples and the control samples. FIG. 11 shows the sound transmission loss data of Sample 302-3 samples and the control samples. As shown in FIGS. 10 and 11, Sample 302-2 including a second layer comprising about 30 wt.% barium sulfate and Sample 302-3 including a second layer comprising about 30 wt.% talc have higher sound transmission loss data than the control samples, which did not include any filler. Thus, a composite film including at least one layer comprising a filler, such as barium sulfate or talc, can provide better sound absorbing properties than those that do not include a filler.

**[0064]** Additional multilayer film samples including an outer foam layer and a gas barrier layer were prepared and tested for their mechanical and sound absorbing properties.

TABLE 4 – Multilayer Film Samples

Sample Code	Skin (Foam)	Inner-2 (Foam)	Inner-1 (Foam)	Tie 1	Barrier	Tie 2	Seal
X3299-1 (280µm)	232µm 50% Hybrar® 7125 + 46% Lotryl® 20MA08 + 2% Safoam® FP-20 + 2% Polybatch® SAB-1982VA	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Safoam® FP-20	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Safoam® FP-20	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	25µm 50% Lotryl® 20MA08 + 48% Vistamaxx® 3980FL + 2% Polybatch® SAB-1982VA
X3300-1 (288µm)	232µm 50% Hybrar® 7125 + 46% Lotryl® 20MA08 + 2% Safoam®	65% Hybrar® 7125 + 34% EMAC®	65% Hybrar® 7125 + 34% EMAC®	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15%	(a*) same as Tie 1	25µm 50% Lotryl® 20MA08 + 48% Vistamaxx®

	FPE-20 + 2% Polybatch® SAB-1982VA	2207 + 1% Safoam® FPE-20	2207 + 1% Safoam® FPE-20		Lotader® 4720		3980FL + 2% Polybatch® SAB-1982VA
X3301-1 (294µm)	50% Hybrar® 7125 + 46% Lotryl® 20MA08 + 2% Expancel® 950MB80 + 2% Polybatch® SAB-1982VA	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Expancel® 950MB80	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Expancel® 950MB80	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	17µm 50% Lotryl® 20MA08 + 48% Vistamaxx® 3980FL + 2% Polybatch® SAB-1982VA
X3356-1 (249µm)	44% Hybrar® 7125 + 52% EMAC® 2207 + 2% Safoam® FP-20 + 2% Polybatch® SAB-1982VA	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Safoam® FP-20	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Safoam® FP-20	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	28µm 50% Lotryl® 20MA08 + 48% Vistamaxx® 3980FL + 2% Polybatch® SAB-1982VA
X3357-2 (175µm)	44% Hybrar® 7125 + 50% EMAC® 2207 + 3% Safoam® FP-20 + 3% Polybatch® SAB-1982VA	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Safoam® FP-20	65% Hybrar® 7125 + 34% EMAC® 2207 + 1% Safoam® FP-20	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	19µm 50% Lotryl® 20MA08 + 48% Vistamaxx® 3980FL + 2% Polybatch® SAB-1982VA
X3438 (277µm)	50% Hybrar® 7125 + 46% Lotryl® 20MA08 + 0.8% Expancel® 920DU40 + 1% Hydrobrite® 550 + 2.2% Polybatch® SAB-1982VA	64.2% Hybrar® 7125 + 34% EMAC® 2207 + 0.8% Expancel® 920DU40 + 1% Hydrobrite® 550	64.2% Hybrar® 7125 + 34% EMAC® 2207 + 0.8% Expancel® 920DU40 + 1% Hydrobrite® 550	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	20µm 50% Lotryl® 20MA08 + 48% Vistamaxx® 3980FL + 2% Polybatch® SAB-1982VA
X3537 (221µm)	51.5% Hybrar® 7125 + 45% Lotryl® 20MA08 + 1% Expancel® 920DU40 + 0.5% Hydrobrite® 550 + 2% Polybatch® SAB-1982VA	64.5% Hybrar® 7125 + 34% EMAC® 2207 + 1% Expancel® 920DU40 + 0.5% Hydrobrite® 550	64.5% Hybrar® 7125 + 34% EMAC® 2207 + 1% Expancel® 920DU40 + 0.5% Hydrobrite® 550	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	22µm 98% EMAC® 2207 + 2% Polybatch® SAB-1982VA
X3609C (200µm)	51.4% Hybrar® 7125 + 44% Lotryl® 20MA08 + 2.6% (EV(920DU)50) + 2% Polybatch® SAB-1982VA	65% Hybrar® 7125 + 32.4% EMAC® 2207 + 2.6% (EV (920DU)50)	65% Hybrar® 7125 + 32.4% EMAC® 2207 + 2.6% (EV (920DU)50)	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	30µm 98% EMAC® 2207 + 2% Polybatch® SAB-1982VA
X3610 (204µm)	46% Hybrar® 7125 + 39% Lotryl® 20MA08 + 2.6% (EV(920DU)50) + 2.4% Polybatch® SAB-1982VA + 10% Color MB	65% Hybrar® 7125 + 32.4% EMAC® 2207 + 2.6% (EV (920DU)50)	65% Hybrar® 7125 + 32.4% EMAC® 2207 + 2.6% (EV (920DU)50)	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	25µm 98% EMAC® 2207 + 2% Polybatch® SAB-1982VA
X3629 (199µm)	46% Vistamaxx®	65% Hybrar®	65% Hybrar®	(a*) 80% Lotryl® 18MA02 +	(b*) 85% Selar®	(a*) same as	22µm 98% EMAC® 2207 + 2%

	6102+ 49.4% EMAC® 2207+2.6% (EV(920DU)50) +2% Polybatch® SAB-1982VA	7125 + 32.4% EMAC® 2207+2.6% (EV (920DU)50)	7125 + 32.4% EMAC® 2207 +2.6% (EV (920DU)50)	20% Bynel® CXA41E710	PA3426R +15% Lotader® 4720	Tie 1	Polybatch® SAB-1982VA
X3630 (198µm)	163µm			(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	23µm 98% EMAC® 2207 + 2% Polybatch® SAB-1982VA
X3631 (201µm)	51% Vistamaxx® 6102 + 44% Elvax® 450 + 3% (EV(920DU)50) +2% Polybatch® SAB-1982VA	65% Hybrar® 7125 + 32.4% EMAC® 2207+2.6% (EV (920DU)50)	65% Hybrar® 7125 + 32.4% EMAC® 2207+2.6% (EV (920DU)50)	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	19µm 75% Elvax® 450 + 24% Elvax® 3170A + 1% Polybatch® SAB-1982VA
X3632 (200µm)	168µm			(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	20µm 99% EMAC® 2207 + 1% Polybatch® SAB-1982VA
X3633 (201µm)	46% Vistamaxx® 6102+ 49% EMAC® 2207+3% (EV(920DU)50) +2% Polybatch® SAB-1982VA	68% Vistamaxx® 6102+29% EMAC® 2207+3% (EV (920DU)50)	68% Vistamaxx 6102+29% EMAC® 2207+3% (EV (920DU)50)	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	21µm 99% EMAC® 2207 + 1% Polybatch® SAB-1982VA
X3634 (200µm)	168µm			(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R +15% Lotader® 4720	(a*) same as Tie 1	19µm 99% EMAC® 2207 + 1% Polybatch® SAB-1982VA

Sample Code	Skin	Inner-2	Tie 1	Barrier	Tie 2	Inner-1	Seal
X3635 (205µm)	136µm 46% Vistamaxx® 6102+ 47% EMAC® 2207+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	16µm 65% Hybrar® 7125 + 32.4% EMAC® 2207+2.6% (EV (920DU)50)	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	19µm 65% Hybrar® 7125 + 32.4% EMAC® 2207 + 2.6% (EV (920DU)50)	22µm 99% EMAC® 2207 + 1% Polybatch® SAB-1982VA
X3651 (196µm)	134µm 46% Vistamaxx® 6102+ 47% EMAC®	15µm 55% Hybrar® 7125+45% EMAC®	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader®	(a*) same as Tie 1	18µm 55% Hybrar® 7125+45% EMAC®	17µm 99% EMAC® 2207 + 1% Polybatch® SAB-1982VA

	2207+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	2207		4720		2207	
X3652 (210µm)	141µm 46% Vistamaxx® 6102+ 47% EMAC® 2207+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	17µm 55% Hybrar® 7125+45% EMAC® 2207	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	19µm 55% Hybrar® 7125+45% EMAC® 2207	21µm 40% Vistamaxx® 3980FL + 58% Lotryl® 20MA08+ 2% Polybatch® SAB-1982VA
X3653 (202µm)	129µm 46% Vistamaxx® 6102+ 49.4% EMAC® 2207+2.6% (EV(920DU)50) +2% Polybatch® SAB-1982VA	16µm 65% Hybrar® 7125 + 32.4% EMAC® 2207+2.6% (EV (920DU)50)	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	19µm 65% Hybrar® 7125 + 32.4% EMAC® 2207+2.6% (EV (920DU)50)	26µm 40% Vistamaxx® 3980FL + 58% Lotryl® 20MA08+ 2% Polybatch® SAB-1982VA
X3654 (144µm)	74µm 46% Vistamaxx® 6102+ 47% EMAC® 2207+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	13µm 55% Hybrar® 7125+45% EMAC® 2207	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	17µm 55% Hybrar® 7125+45% EMAC® 2207	28µm 40% Vistamaxx® 3980FL + 58% Lotryl® 20MA08+ 2% Polybatch® SAB-1982VA
X3655 (198µm)	130µm 46% Vistamaxx® 3980FL + 47% Lotryl® 20MA08+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	14µm 55% Hybrar® 7125+45% EMAC® 2207	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	17µm 55% Hybrar® 7125+45% EMAC® 2207	25µm 40% Vistamaxx® 3980FL + 58% Lotryl® 20MA08+ 2% Polybatch® SAB-1982VA
X3656 (153µm)	90µm 46% Vistamaxx® 3980FL + 47% Lotryl® 20MA08+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	15µm 55% Hybrar® 7125+45% EMAC® 2207	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	14µm 55% Hybrar® 7125+45% EMAC® 2207	22µm 40% Vistamaxx® 3980FL + 58% Lotryl® 20MA08+ 2% Polybatch® SAB-1982VA
X3657 (202µm)	130µm 47% Vistamaxx® 3980FL + 47% Lotryl® 20MA08+4% Expancel® 950MB80+2% Polybatch® SAB-1982VA	15µm 55% Hybrar 7125+45% EMAC2207	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	18µm 55% Hybrar® 7125+45% EMAC® 2207	27µm 40% Vistamaxx® 3980FL + 58% Lotryl® 20MA08+ 2% Polybatch® SAB-1982VA
X3706 (148µm)	88µm 46% Vistamaxx® 3980FL + 47% Elvaloy® AC1820+5% (EV(920DU)50) +2% Polybatch® SAB-1982VA	15µm 65% Hybrar® 7125+35% Elvaloy® AC1820	(a*) 80% Lotryl® 18MA02 + 20% Bynel® CXA41E710	(b*) 85% Selar® PA3426R + 15% Lotader® 4720	(a*) same as Tie 1	11µm 65% Hybrar® 7125+35% Elvaloy® AC1820	19µm 99% EMAC® 2207 + 1% Polybatch® SAB-1982VA

X3707 (158 $\mu$ m)	86 $\mu$ m 46% Vistamaxx <sup>®</sup> 6202FL + 47% Elvaloy <sup>®</sup> AC1820+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	15 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	16 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	23 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3708 (155 $\mu$ m)	86 $\mu$ m 61% Vistamaxx <sup>®</sup> 6202FL+ 32% Elvaloy <sup>®</sup> AC 1820+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	14 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	21 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	30 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3709 (157 $\mu$ m)	84 $\mu$ m 61% Vistamaxx <sup>®</sup> 6202FL+ 32% Elvaloy <sup>®</sup> AC 1820+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	18 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd <sup>®</sup> AO 181	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	17 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd AO 181	21 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3710 (146 $\mu$ m)	88 $\mu$ m 51% Hybrar <sup>®</sup> 7125+42% Lotryl <sup>®</sup> 20MA08+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	16 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd <sup>®</sup> AO 181	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	16 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd AO 181	21 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3711 (146 $\mu$ m)	83 $\mu$ m 51% Hybrar <sup>®</sup> 7125+42% Lotryl <sup>®</sup> 20MA08+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	17 $\mu$ m 65% Vistamaxx <sup>®</sup> 6102+35% Lotryl <sup>®</sup> 20MA08	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	14 $\mu$ m 65% Vistamaxx <sup>®</sup> 6102+35% Lotryl <sup>®</sup> 20MA08	22 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3712 (150 $\mu$ m)	85 $\mu$ m 51% Hybrar <sup>®</sup> 7125+42% Lotryl <sup>®</sup> 20MA08+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	18 $\mu$ m 85% Vistamaxx <sup>®</sup> 3980+15% Lotryl <sup>®</sup> 20MA08	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	14 $\mu$ m 85% Vistamaxx <sup>®</sup> 3980+15% Lotryl <sup>®</sup> 20MA08	24 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3713 (130 $\mu$ m)	81 $\mu$ m 47% Vistamaxx <sup>®</sup> 3980+46% Lotryl <sup>®</sup> 20MA08+5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA	18 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd <sup>®</sup> AO 181	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	12 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd <sup>®</sup> AO 181	19 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3714 (148 $\mu$ m)	68 $\mu$ m 38% Vistamaxx <sup>®</sup> 3980+57.5% Lotryl <sup>®</sup> 20MA08+2.5% (EV(920DU)50) +2%	17 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd <sup>®</sup> AO 181	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	21 $\mu$ m 64% Hybrar <sup>®</sup> 5127+ 34% Vistamaxx <sup>®</sup> 6202+2% Preadd <sup>®</sup> AO 181	9 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA

	Polybatch <sup>®</sup> SAB-1982VA						
X3715 (160 $\mu$ m)	69 $\mu$ m 38% Vistamaxx <sup>®</sup> 3980+56.5% Elvaloy <sup>®</sup> AC1820+2.5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA +1% Polyone <sup>®</sup> FDM 55802	42 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	13 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	11 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3716 (151 $\mu$ m)	72 $\mu$ m 38% Vistamaxx <sup>®</sup> 3980+57% Elvaloy <sup>®</sup> AC1820+1.5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA +1.5% Polyone <sup>®</sup> FDM 55802	39 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	13 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	14 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA
X3717 (157 $\mu$ m)	69 $\mu$ m 38% Vistamaxx <sup>®</sup> 3980+56.5% Elvaloy <sup>®</sup> AC1820+1.5% (EV(920DU)50) +2% Polybatch <sup>®</sup> SAB-1982VA +2% Polyone <sup>®</sup> FDM 55802	43 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	(a*) 80% Lotryl <sup>®</sup> 18MA02 + 20% Bynel <sup>®</sup> CXA41E710	(b*) 85% Selar <sup>®</sup> PA3426R + 15% Lotader <sup>®</sup> 4720	(a*) same as Tie 1	10 $\mu$ m 65% Hybrar <sup>®</sup> 7125+35% Elvaloy <sup>®</sup> AC1820	15 $\mu$ m 99% EMAC <sup>®</sup> 2207 + 1% Polybatch <sup>®</sup> SAB-1982VA

a\*, thickness - 3  $\mu$ m to 5  $\mu$ mb\*, thickness - 3  $\mu$ m to 5  $\mu$ m

**[0065]** The first 15 samples in Table 4 (X3299-1, X3300-1, X3301-1, X3356-1, X3357-2, X3438, X3537, X3609C, X3610, X3629, X3630, X3631, X3632, X3633, X3634) were seven layer films having a foam /foam/foam/tie/barrier/tie/seal configuration similar to the seven-layer film 140 of FIG. 4. Each of the foam layers included a foaming agent, such as, Safoam<sup>®</sup> FP-20, Expance<sup>®</sup> 950MB80, Expance<sup>®</sup>920DU40 from Akzo, or EV(920DU)50 from Polychem Dispersion.

**[0066]** Samples X3299-1, X3300-1, and X3301-1 were made using the same materials as samples X3299, X3300, X3301, respectively, but were configured to have a different thickness. X3299-1 had a total thickness of about 280 $\mu$ m  $\pm$  10%, in which the three foam layers together had a thickness of about 232 $\mu$ m  $\pm$  10%, each of the barrier and tie layers had a thickness of about 3-5 $\mu$ m  $\pm$  10%, and the seal layer had a thickness of about 25 $\mu$ m  $\pm$  10%. All thicknesses provided in Table 4 had a tolerance of  $\pm$  10%, thus, the tolerance will not be repeated hereinbelow. X3300-1 had a total thickness of about 288 $\mu$ m, in which the three foam layers together had a thickness of about 232 $\mu$ m, each of the barrier and tie layers had a thickness of about

3-5 $\mu$ m, and the seal layer had a thickness of about 25 $\mu$ m. X3301-1 had a total thickness of about 294 $\mu$ m, in which the three foam layers together had a thickness of about 261 $\mu$ m, each of the barrier and tie layers had a thickness of about 3-5 $\mu$ m, and the seal layer had a thickness of about 17 $\mu$ m.

**[0067]** Sample X3356-1 had a total thickness of about 249 $\mu$ m, in which the three foam layers together had a thickness of about 209 $\mu$ m, each of the barrier and tie layers had a thickness of about 3-5 $\mu$ m, and the seal layer had a thickness of about 28 $\mu$ m. The outer foam layer was formed from a blend comprising about 44 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 52 wt.% of EMA (EMAC<sup>®</sup> 2207), about 2 wt.% of blowing agent (Safoam<sup>®</sup> FP-20), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the two inner foam layers was formed from a blend comprising about 65 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 34 wt.% of EMA (EMAC<sup>®</sup> 2207), and about 1 wt.% of blowing agent (Safoam<sup>®</sup> FP-20). Each of the two tie layers was formed from a blend comprising about 80 wt.% EMA (Lotryl<sup>®</sup> 18MA02) and about 20 wt.% MAH grafted LLDPE (Bynel<sup>®</sup> CXA41E710). The barrier layer was formed from a blend comprising about 85 wt.% amorphous polyamide (Selar<sup>®</sup> PA3426R) and about 15 wt.% functionalized rubber blend (Lotader<sup>®</sup> 4720). The seal layer was formed from a blend comprising about 50 wt.% of EMA (Lotryl<sup>®</sup> 20MA08), about 48 wt.% of PP-elastomers (Vistamaxx<sup>®</sup> 3980FL), and about 2 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA).

**[0068]** Sample X3357-2 had a total thickness of about 175 $\mu$ m, in which the three foam layers together had a thickness of about 144 $\mu$ m, each of the barrier and tie layers had a thickness of about 3-5 $\mu$ m, and the seal layer had a thickness of about 19 $\mu$ m. The outer foam layer was formed from a blend comprising about 44 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar<sup>®</sup> 7125), about 50 wt.% of EMA (EMAC<sup>®</sup> 2207), about 3 wt.% of blowing agent (Safoam<sup>®</sup> FP-20), and about 3 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). The two inner foam layers, two tie layers, barrier layer, and seal layer were formed from the same polymer blends used to make the respective layers of X3356-1.

**[0069]** Sample X3438 had a total thickness of about 277 $\mu$ m, in which the three foam layers together had a thickness of about 245 $\mu$ m, each of the barrier and tie layers had a thickness of about 3-5 $\mu$ m, and the seal layer had a thickness of about 20 $\mu$ m. The outer foam layer was formed from a blend comprising about 50 wt.% of

vinyl-bond rich SEPS block copolymer (Hybrar® 7125), about 46 wt.% of EMA (Lotryl® 20MA08), about 0.8 wt.% of foam microspheres (Expancel® 920DU40), 1% white mineral oil (Hydrobrite® 550 from Sonneborn), and about 2.2 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). Each of the two inner foam layers was formed from a blend comprising about 64.2 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar® 7125), about 34 wt.% of EMA (EMAC® 2207), and about 0.8 wt.% of foam microspheres (Expancel® 920DU40), 1% white mineral oil (Hydrobrite® 550). The two tie layers, barrier layer, and seal layer were formed from the same polymer blends used to make the respective layers of X3356-1.

**[0070]** Sample X3438 had a total thickness of about 277µm, in which the three foam layers together had a thickness of about 245µm, each of the barrier and tie layers had a thickness of about 3-5µm, and the seal layer had a thickness of about 20µm. The outer foam layer was formed from a blend comprising about 50 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar® 7125), about 46 wt.% of EMA (Lotryl® 20MA08), about 0.8 wt.% of foam microspheres (Expancel® 920DU40), 1% white mineral oil (Hydrobrite® 550 from Sonneborn), and about 2.2 wt.% of slip and antiblock agent (Polybatch® SAB-1982VA). Each of the two inner foam layers was formed from a blend comprising about 64.2 wt.% of vinyl-bond rich SEPS block copolymer (Hybrar® 7125), about 34 wt.% of EMA (EMAC® 2207), and about 0.8 wt.% of foam microspheres (Expancel® 920DU40), 1% white mineral oil (Hydrobrite® 550). The two tie layers, barrier layer, and seal layer were formed from the same polymer blends used to make the respective layers of X3356-1.

**[0071]** Similarly, samples X3537, X3609C, X3610, X3629, X3630, X3631, X3632, X3633, and X3634 were formed using polymer blends. The film constructions of these samples are summarized in Table 4 above. As shown, at least one foam layer of the film samples disclosed in Table 4 included vinyl-bond rich SEPS block copolymer (Hybrar® 7125), except samples X3632 and X3633, which did not include a vinyl-bond rich triblock copolymer in any of the layers.

**[0072]** Sample X3632 had a total thickness of about 200µm, in which the three foam layers together had a thickness of about 168µm, each of the barrier and tie layers had a thickness of about 3-5µm, and the seal layer had a thickness of about 20µm. The outer foam layer was formed from a blend comprising about 46 wt.% of ethylene-propylene copolymer (Vistamaxx® 6102), about 49 wt.% of EMA (EMAC® 2207), about 3 wt.% of masterbatch containing 50% Expancel® 920DU40

microspheres (EV(920DU)50), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). Each of the two inner foam layers was formed from a blend comprising about 68 wt.% of ethylene-propylene copolymer (Vistamaxx<sup>®</sup> 6102), about 29 wt.% of EMA (EMAC<sup>®</sup> 2207), and about 3 wt.% of masterbatch containing 50% Expance<sup>®</sup> 920DU40 microspheres (EV(920DU)50). The two tie layers and barrier layer were formed from the same polymer blends used to make the respective layers of X3356-1. The seal layer was formed of a blend comprising about 99 wt.% of EMA (EMAC<sup>®</sup> 2207) and about 1 wt.% of a slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA).

**[0073]** Sample X3633 had a total thickness of about 201 $\mu$ m, in which the three foam layers together had a thickness of about 168 $\mu$ m, each of the barrier and tie layers had a thickness of about 3-5 $\mu$ m, and the seal layer had a thickness of about 21 $\mu$ m. The outer foam layer was formed from a blend comprising about 46 wt.% of ethylene-propylene copolymer (Vistamaxx<sup>®</sup> 6102), about 47 wt.% of EMA (EMAC<sup>®</sup> 2207), about 5 wt.% of masterbatch containing 50% Expance<sup>®</sup> 920DU40 microspheres (EV(920DU)50), and about 2 wt.% of slip and antiblock agent (Polybatch<sup>®</sup> SAB-1982VA). The two inner foam layers, two tie layers, barrier layer, and seal layer were formed from the same polymer blends used to make the respective layers of X3632.

**[0074]** Samples X3635, X3651, X3652, X3653, X3654, X3655, X3656, X3657, X3706, X3707, X3708, X3709, X3710, X3711, X3712, X3713, X3714, X3715, X3716, and X3717 were also seven-layer films, but these film samples had a different film construction than the foregoing film samples. These film samples had a seal (302)/inner-1 (304)/tie (306)/ barrier (308)/tie (310)/inner-2 (312)/outer foam (314) construction similar to a multilayer film 300 shown in FIG. 12. In these samples, the two inner layers may or may not be foam layers. For example, the inner layers of sample X3635 and X3653 were foam layers comprising a foaming agent, while the inner layers of the other samples were not foam layers.

**[0075]** Further, at least one of the outer foam layer and inner layers of these film samples included a vinyl-bond rich triblock copolymer for sound absorbing properties. The film constructions of these samples are summarized in Table 4 above.

**[0076]** Other multilayer film embodiments may include a vinyl-bond rich triblock copolymer in a tie, barrier, or seal layer. The multilayer films may also be configured to have different layer constructions. For examples, a multilayer film

may be configured similar to a six-layer film 320 shown in FIG. 13, which has a seal (322)/inner (324)/tie (326)/barrier (328)/tie (330)/foam (332) construction. In another example, a multilayer foam film may have a seal (342)/tie (344)/barrier (346)/tie (348)/inner (350)/foam (352) construction similar to a six-layer film 340 of FIG. 14. The inner layers of these multilayer films may or may not be a foam layer.

**[0077]** Film properties of the multilayer film samples were evaluated and summarized in Table 5.

TABLE 5 – Film Properties of Multilayer Foam Film Samples

Film Codes	Thickness, um	Elmendorf Tear, gf/mil		Tensile Strength (psi)		Elongation at Break (%)		Modulus (1000 psi)		Film Noise SPL(A) dB
		MD	CD	MD	CD	MD	CD	MD	CD	
<b>X3299-1</b>	280	209	120	1000	965	628	746	6.8	5.5	34.8
<b>X3300-1</b>	288	217	143	951	937	746	745	5.0	4.8	32.2
<b>X3301-1</b>	294	127	89	626	586	532	679	5.3	3.8	29.8
<b>X3356-1</b>	249	212	112	1106	1035	657	745	7.2	6.0	31.9
<b>X3357-2</b>	175	73	45	667	464	264	506	8.8	7.4	49.9
<b>X3438</b>	277	211	140	740	776	544	745	5.1	3.6	32.4
<b>X3537</b>	221	138	59	624	769	362	745	5.2	3.9	32.2
<b>X3609C</b>	200	199	70	667	841	315	745	5.8	4.7	37.8
<b>X3610</b>	204	192	87	653	841	315	745	6.1	5.0	40.5
<b>X3629</b>	199	88	48	769	870	405	745	7.7	7.0	36.6
<b>X3630</b>	198	94	58	769	812	251	745	9.1	6.9	38.8
<b>X3631</b>	201	141	25	740	1059	291	745	7.9	6.4	41.8
<b>X3632</b>	200	99	21	957	972	669	741	5.0	4.9	37.3
<b>X3633</b>	201	85	20	754	812	470	703	5.6	4.5	35.8
<b>X3634</b>	200	107	20	653	827	289	727	6.0	5.5	37.9
<b>X3635</b>	205	164	29	769	914	448	734	5.4	4.2	38.0
<b>X3651</b>	196	151	28	812	899	554	717	5.0	4.2	37.0
<b>X3652</b>	210	180	40	986	957	641	738	5.6	4.4	40.3
<b>X3653</b>	202	189	31	1015	1059	597	737	6.3	5.6	41.7
<b>X3654</b>	144	151	35	943	1030	489	732	5.7	4.9	44.2
<b>X3655</b>	198	179	50	827	769	537	619	7.8	6.5	36.3
<b>X3656</b>	153	153	43	972	841	524	607	8.1	6.5	38.8
<b>X3657</b>	202	87	44	667	479	452	475	6.7	5.1	32.1
<b>X3706</b>	148	139	37	1218	1247	588	708	8.3	7.4	43.7
<b>X3707</b>	158	156	77	783	885	340	743	5.7	4.7	46.5
<b>X3708</b>	155	55	62	783	885	370	744	5.5	4.8	44.3
<b>X3709</b>	157	22	21	682	827	331	654	5.5	4.6	48.8
<b>X3710</b>	146	73	58	624	682	306	641	4.1	3.3	46.6
<b>X3711</b>	146	75	42	1088	899	698	742	4.5	3.5	48.3
<b>X3712</b>	150	171	79	1131	1044	602	718	6.4	5.4	45.1
<b>X3713</b>	130	78	34	841	885	381	603	7.2	5.9	40.6
<b>X3714</b>	148	32	30	783	943	363	649	6.7	5.5	40.5
<b>X3715</b>	160	87	30	754	783	637	435	4.7	5.5	41.1
<b>X3716</b>	151	96	35	899	986	466	683	5.6	5.1	41.4
<b>X3717</b>	157	108	26	841	1044	318	709	6.8	5.9	43.6

**[0078]** As summarized in Table 4 and Table 5, the multilayer film samples were relatively thin films having a total thickness of about 130 $\mu$ m (5.1mil) to

about 300 $\mu\text{m}$  (11.8mil), and included at least an outer foam layer and a gas barrier layer. In other embodiments, the multilayer film may be configured to have a total thickness of about 50 $\mu\text{m}$  (2.0mil) to about 800 $\mu\text{m}$  (31.5mil), preferably about 100 $\mu\text{m}$  (3.9mil) to about 500 $\mu\text{m}$  (19.7mil), and more preferably about 120 $\mu\text{m}$  (4.7mil) to about 350 $\mu\text{m}$  (13.8mil). The multilayer film samples had good mechanical properties as exhibited by Elmendorf tear, tensile strength, and elongation at break test result. Further, the multilayer film samples had softness suitable for ostomy, packaging and many other similar applications. The multilayer film samples were tested according to ASTM D882. As summarized in Table 5, the multilayer film samples had a modulus of about 3ksi to about 8ksi. In other embodiments, the multilayer film may have a modulus of about 2ksi to about 40ksi. Further, the multilayer film samples had relatively low film noise levels of about 30dB to about 50dB.

**[0079]** In some embodiments, a multilayer film may comprise at least one foam layer, a gas barrier layer, and at least one tie layer comprising a vinyl-bond rich triblock copolymer. For example, a multilayer film may be a seven-layer film having a schematic cross-sectional view similar to that illustrated in FIG. 12 with a foam layer 314/first inner layer 312/first tie layer 310/gas barrier layer 308/second tie layer 306/second inner layer 304/seal layer 302 construction, in which the first and second tie layers comprise a vinyl-bond rich triblock copolymer. Samples of such seven-layer films were prepared and tested for their mechanical and sound absorbing properties. The details of the seven-layer film samples are summarized in Table 6.

TABLE 6 – Seven-Layer Film Samples

Sample Code	Foam 1	Inner 1	Tie 1	Barrier	Tie 2	Inner 2	Seal
X3747	79 $\mu\text{m}$ 85% EMAC <sup>®</sup> 2207 + 8% Maxithen <sup>®</sup> EVA 8AA0621F Beige+ 2% Polybatch <sup>®</sup> AMF 905+ 3% (EV(920DU)50) +2% Schulman <sup>®</sup> SAB 1982VA	13 $\mu\text{m}$ 75% Vistamaxx <sup>®</sup> 3980+ 25% Elvaloy <sup>®</sup> AC1820	14 $\mu\text{m}$ 39% Hybrar <sup>®</sup> 5127+ 39% Hybrar <sup>®</sup> 7125+ 20% Bynel <sup>®</sup> CXA41E710 + 2% Preadd <sup>®</sup> AO181	4 $\mu\text{m}$ Blend: 85% Selar <sup>®</sup> PA3426R +15% Lotader <sup>®</sup> 4720	17 $\mu\text{m}$ 39% Hybrar <sup>®</sup> 5127+ 39% Hybrar <sup>®</sup> 7125+ 20% Bynel <sup>®</sup> CXA41E710 + 2% Preadd <sup>®</sup> AO181	9 $\mu\text{m}$ 75% Vistamaxx <sup>®</sup> 3980+ 25% Elvaloy <sup>®</sup> AC1820	15 $\mu\text{m}$ 98.5% EMAC <sup>®</sup> 2207 + 1.5% Schulman <sup>®</sup> SAB 1982VA
X3748	71 $\mu\text{m}$ 96.5% EMAC <sup>®</sup> 2207+ 1.5% (EV(920DU)50) + 2% Schulman <sup>®</sup> SAB 1982VA	12 $\mu\text{m}$ 75% Vistamaxx <sup>®</sup> 3980+ 25% Elvaloy <sup>®</sup> AC1820	13 $\mu\text{m}$ 39% Hybrar <sup>®</sup> 5127+ 39% Hybrar <sup>®</sup> 7125+ 20% Bynel <sup>®</sup> CXA41E710 + 2% Preadd <sup>®</sup> AO181	4 $\mu\text{m}$ Blend: 85% Selar <sup>®</sup> PA3426R +15% Lotader <sup>®</sup> 4720	17 $\mu\text{m}$ 39% Hybrar <sup>®</sup> 5127+ 39% Hybrar <sup>®</sup> 7125+ 20% Bynel <sup>®</sup> CXA41E710 + 2% Preadd <sup>®</sup> AO 181	9 $\mu\text{m}$ 75% Vistamaxx <sup>®</sup> 3980+ 25% Elvaloy <sup>®</sup> AC1820	20 $\mu\text{m}$ 98.5% EMAC <sup>®</sup> 2207 + 1.5% Schulman <sup>®</sup> SAB 1982VA
X3749	77 $\mu\text{m}$ 86.5% EMAC <sup>®</sup>	12 $\mu\text{m}$ 75%	14 $\mu\text{m}$ 39% Hybrar <sup>®</sup>	4 $\mu\text{m}$ Blend:	17 $\mu\text{m}$ 39% Hybrar <sup>®</sup>	12 $\mu\text{m}$ 75%	15 $\mu\text{m}$ 98.5%

	2207+ 8% Maxithen® EVA 8AA0621F Beige+ 2% Polybatch® AMF 905+ 1.5% (EV(920DU)50) + 2% Schulman® SAB 1982VA	Vistamaxx® 3980+ 25% Elvaloy® AC1820	5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	85% Selar® PA3426R +15% Lotader® 4720	5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	Vistamaxx® 3980+ 25% Elvaloy® AC1820	EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3750	<b>72µm</b> 94% EMAC® 2207+ 2% Polybatch® AMF 905 + 2% (EV(920DU)50) + 2% Schulman® SAB 1982VA	<b>12µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>14µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>4µm</b> Blend: 85% Selar® PA3426R +15% Lotader® 4720	<b>16µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>12µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>14µm</b> 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3751	<b>74µm</b> 28% Vistamaxx® 3980+ 19% Vistamaxx® 6202+ 47.5% Elvaloy® AC1820+ 1.5% (EV(920DU)50) + 2% Schulman® SAB 1982VA+ 2% Polyone® FDM 55802	<b>13µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>15µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>5µm</b> Blend: 85% Selar® PA3426R +15% Lotader® 4720	<b>14µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>9µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>15µm</b> 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3801	<b>78µm</b> 94.5% EMAC® 2207+ 2% Polybatch® AMF 905 1.5% (EV(920DU)50) + 2% Schulman® SAB 1982VA	<b>13µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>19µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>4µm</b> Blend: 85% Selar® PA3426R +15% Lotader® 4720	<b>16µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>10µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>19µm</b> 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3804	<b>75µm</b> 93% EMAC® 2207+ 2% Polybatch® AMF 905 + 3% (EV(920DU)50) + 2% Schulman® SAB 1982VA	<b>12µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>13µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>4µm</b> Blend: 85% Selar® PA3426R +15% Lotader® 4720	<b>14µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>12µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>18µm</b> 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3806	<b>75µm</b> 94% EMAC® 2207+ 2% Polybatch® AMF 905 + 2% (EV(920DU)50) + 2% Schulman® SAB 1982VA	<b>11µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>15µm</b> 50% Hybrar® 5127+ 30% Hybrar® 7125+ 19% Bynel® CXA41E710 + 1% Preadd® AO 181	<b>4µm</b> Blend: 85% Selar® PA3426R +15% Lotader® 4720	<b>17µm</b> 50% Hybrar® 5127+ 30% Hybrar® 7125+ 19% Bynel® CXA41E710 + 1% Preadd® AO 181	<b>10µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>15µm</b> 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3807	<b>65µm</b> 94% EMAC® 2207+ 2% Polybatch® AMF 905 2% (EV(920DU)50) + 2% Schulman® SAB 1982VA	<b>9µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>14µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>4µm</b> Blend: 85% Selar® PA3426R +15% Lotader® 4720	<b>14µm</b> 39% Hybrar® 5127+ 39% Hybrar® 7125+ 20% Bynel® CXA41E710 + 2% Preadd® AO 181	<b>8µm</b> 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	<b>14µm</b> 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA

X3809	73 $\mu$ m 96% EMAC® 2207+ 2% (EV(920DU)50) + 2% Schulman® SAB1982VA	9 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	18 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	5 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	15 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	8 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	13 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3810	76 $\mu$ m 96% EMAC® 2207+ 2% (EV(920DU)50) + 2% Schulman® SAB1982VA	14 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	15 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	4 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	15 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	13 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	16 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3811	72 $\mu$ m 95.5% EMAC® 2207+ 2.5% (EV(920DU)50) + 2% Schulman® SAB1982VA	19 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	12 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	4 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	9 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	15 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	16 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3813	75 $\mu$ m 88% EMAC® 2207+ 8% Maxithen® UNS8AA3681F + 2% (EV(920DU)50) + 2% Schulman® SAB1982VA	11 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	17 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	4 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	15 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	9 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	15 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3814	76 $\mu$ m 86.5% EMAC® 2207+ 9% Maxithen® UNS8AA3681F + 2.5% (EV(920DU)50) + 2% Schulman® SAB1982VA	18 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	10 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	4 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	7 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	17 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	14 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3815	68 $\mu$ m 86.5% EMAC® 2207+ 9% Maxithen® UNS8AA3681F + 2.5% (EV(920DU)50) + 2% Schulman® SAB1982VA	11 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	8 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	4 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	7 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	12 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	14 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman® SAB 1982VA
X3816	78 $\mu$ m 86% EMAC® 2207+ 9% Maxithen® UNS8AA3681F + 3% (EV(920DU)50) + 2% Schulman® SAB1982VA	18 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	7 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	4 $\mu$ m Blend: 85% Selar® PA3426R +15% Lotader® 4720	7 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+ 18% Bynel® CXA41E710 + 2% Preadd® AO 181	16 $\mu$ m 75% Vistamaxx® 3980+ 25% Elvaloy® AC1820	14 $\mu$ m 97% EMAC® 2207 + 3% Polytechs® AB-SL-PE- 10N-ER-5
X3819	75 $\mu$ m 93% EMAC® 2207+ 2% Polybatch® AMF905	20 $\mu$ m 72% Vistamaxx® 3980+ 10% EMAC®	10 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+	3 $\mu$ m Blend: 85% Selar® PA3426R	6 $\mu$ m 50% Hybrar® 5127+ 30% Hybrar® 7125+	20 $\mu$ m 72% Vistamaxx® 3980+ 10%	13 $\mu$ m 98.5% EMAC® 2207 + 1.5% Schulman®

	3% (EV(920DU)50) + 2% Schulman® SAB1982VA	2207+ 18% Maxithen® UNS8AA36 81F	18% Bynel® CXA41E710 + 2% Preadd® AO 181	+15% Lotader® 4720	18% Bynel® CXA41E710 + 2% Preadd® AO 181	EMAC® 2207+ 18% Maxithen® UNS8AA36 81F	SAB 1982VA
--	---	--	--	--------------------------	--	---	------------

**[0080]** Raw materials used in making the seven-layer film samples in Table 6 are summarized in Table 7.

TABLE 7 – Raw Materials Used in Seven-layer Film Samples

Raw Material	Supplier	Description
Bynel® CXA41E710	DuPont	maleated LLDPE
Elvaloy® AC 1820	DuPont	EMA copolymer
EMAC® 2207	West Lake	EMA copolymer
Hybrar® 7125	Kuraray	vinyl-bond rich SEPS block copolymer
Hybrar® 5127	Kuraray	vinyl-bond rich SIS triblock copolymer
Lotader® 4720	Arkema	random terpolymer of ethylene, acrylic ester and maleic anhydride
Selar® PA3426R	DuPont	amorphous polyamide
Vistamaxx® 3980FL	Exxon	propylene-based elastomer
Vistamaxx® 6202FL	Exxon	propylene-based elastomer
Schulman® SAB1982VA	A. Schulman	Slip & Antiblock Masterbatch
AB SL PE 10N-ER5	Polytechs	Slip & Antiblock Masterbatch
Preadd® AO181	Premix	Antioxidant Masterbatch
EV(920DU)50	Polychem Dispersion	Foaming Agent
Polybatch® AMF 905	A. Schulman	Processing Aid
Polyone® FDM 55802	Polyone	Processing Aid
Maxithen® EVA 8AA0621F	Gabriel Chemie	Color Masterbatch
Maxithen® UNS8AA3681F	Gabriel Chemie	Color Masterbatch

**[0081]** Mechanical and sound absorbing properties of the seven-layer film samples were evaluated and summarized in Table 8.

TABLE 8 – Film Properties of Seven-layer Film Samples

Sample Codes	Thickness, um	Elmendorf Tear, gf/mil		Tensile Strength (psi)		Elongation at Break (%)		Modulus (1000 psi)		Film Noise SPL(A) dB**
		MD	CD	MD	CD	MD	CD	MD	CD	
<b>X3747</b>	153	102	118	1015	914	461	632	7.8	6.0	47.2
<b>X3748</b>	149	106	109	1189	1262	481	706	8.1	6.9	46.7
<b>X3749</b>	154	132	163	1291	1218	544	701	8.4	6.7	45.3
<b>X3750</b>	136	117	121	1247	1247	490	680	8.7	7.3	51.0
<b>X3751</b>	145	183	207	1233	1291	610	689	8.0	6.3	49.6
<b>X3801</b>	147	130	150	1162	1233	473	668	8.6	7.2	49.5
<b>X3804</b>	147	131	214	1074	995	542	693	6.8	5.2	49.6
<b>X3806</b>	154	103	84	1162	1193	502	682	8.2	5.7	49.9
<b>X3807</b>	124	13	70	1115	1048	441	659	7.4	5.9	52.5
<b>X3809</b>	146	103	109	1141	1089	496	670	7.0	5.6	48.9
<b>X3810</b>	145	75	49	1150	1109	492	679	7.4	6.2	51.7
<b>X3811</b>	149	92	103	1211	1090	544	675	7.6	5.9	51.7
<b>X3813</b>	147	86	82	1159	1192	476	688	7.9	6.0	51.7
<b>X3814</b>	150	70	65	1159	1114	503	673	8.4	7.0	53.2
<b>X3815</b>	126	54	84	1132	1118	481	677	7.6	6.3	53.6
<b>X3816</b>	150	64	86	1193	986	528	640	7.5	5.9	52.3

<b>X3819</b>	147	98	178	1218	1118	544	680	7.2	6.1	46.1
<b>Control 1</b> (* <sup>a</sup> )	389	43	103	1001	405	254	403	4.9	3.8	50.3
<b>Control 2</b> (* <sup>b</sup> )	102									60.6

\*a: a commercial laminate for ostomy pouch having a PE nonwoven/adhesive/57  $\mu\text{m}$  odor barrier film laminate structure, in which the odor barrier film is a five-layer film having a skin layer/tie layer/nylon odor barrier layer/tie layer/heat seal layer construction.

\*b: a commercial 4-mil multilayer odor barrier film for ostomy pouch including a PVDC barrier layer.

\*\* The film noise levels were measured using a proprietary Hollister test method in A-weighted sound pressure level (SPL (A)).

**[0082]** As summarized in Table 6 and Table 8, the seven-layer film samples were relatively thin films having a total thickness of about 124 $\mu\text{m}$  (4.9mil) to about 154 $\mu\text{m}$  (6.1mil), and including an outer foam layer, an outer seal layer, two inner layers, two tie layer, and a gas barrier layer, in which each of the tie layers comprised a vinyl-bond rich triblock copolymer. For example, some seven-layer film samples included tie layers formed from a polymeric mixture comprising 39% vinyl-bond rich SIS copolymer (Hybrar<sup>®</sup> 5127), 39% vinyl-bond rich SEPS copolymer (Hybrar<sup>®</sup> 7125), 20% maleated LLDPE (Bynel<sup>®</sup> CXA41E710), and 2% antioxidant masterbatch (Preadd<sup>®</sup> AO 181). These samples include X3747, X3748, X3749, X3750, X3751, X3801, X3804, and X3807, in which each of the tie layers has a thickness of about 13 $\mu\text{m}$  (0.5mil) to about 19 $\mu\text{m}$  (0.7mil). Other seven-layer film samples included tie layers formed from a polymeric mixture comprising 50% vinyl-bond rich SIS copolymer (Hybrar<sup>®</sup> 5127), 30% vinyl-bond rich SEPS copolymer (Hybrar<sup>®</sup> 7125), 18-19% maleated LLDPE (Bynel<sup>®</sup> CXA41E710), and 1-2% antioxidant masterbatch (Preadd<sup>®</sup> AO 181). These samples include X3806, X3809, X3810, X3811, X3813, X3814, X3815, X3816, and X3819, in which each of the tie layers has a thickness of about 6 $\mu\text{m}$  (0.2mil) to about 18 $\mu\text{m}$  (0.7mil). The seven-layer film samples did not include a vinyl-bond rich triblock copolymer other than in the tie layers. In other embodiments, the tie layers maybe formed from a polymeric mixture comprising about 50 wt.% to about 99 wt.% of at least one vinyl-bond rich triblock copolymer, preferably about 60 wt.% to about 90 wt.%, and more preferably about 70 wt.% to about 85 wt.%.

**[0083]** As shown in Table 8, the seven-layer film samples had good mechanical properties as exhibited by Elmendorf tear, tensile strength, and elongation at break test results. Further, the seven-layer film samples had softness suitable for ostomy, packaging and many other similar applications. The seven-layer film samples were tested according to ASTM D882. As summarized in Table 8, the seven-

layer film samples had a modulus of between about 5ksi and about 9ksi. In other embodiments, a multilayer film comprising a foam layer, a gas barrier layer, and at least one tie layer formed from a polymeric mixture comprising a vinyl-bond rich triblock copolymer may have a modulus of about 2ksi to about 40ksi, preferably about 4ksi to about 20ksi, and more preferably about 5ksi to about 10ksi.

**[0084]** Further, the seven-layer film samples had relatively low film noise levels of about 45dB to about 54dB(SPL (A)), which is comparable to a commercial laminate material for an ostomy pouch including a multilayer odor barrier film, nonwoven and an adhesive layer therebetween, which has a film noise level of about 50.3dB(SPL (A)). Further, the seven-layer film samples had lower film noise levels than a commercial multilayer odor barrier film having a thickness of about 4 mil(102  $\mu$ m), which has a film noise level of about 60.6dB(SPL (A)). This is a significant improvement in the sound absorbing property of a film considering that the seven layer samples were about 20% to 50% thicker than the commercial 4 mil odor barrier film, since the noise level of a plastic film is known to increase with the thickness. In other embodiments, a multilayer film comprising a foam layer, a gas barrier layer, and at least one tie layer formed from a polymeric mixture comprising about 50 wt.% to about 99 wt.% of at least one vinyl-bond rich triblock copolymer, and having a thickness of about 120 $\mu$ m to about 160 $\mu$ m may have a film noise level of about 35dB to about 60dB (SPL(A)), and preferably about 45dB to about 55dB(SPL (A)). The film noise levels were measured using a proprietary Hollister test method in A-weighted sound pressure level (SPL (A)).

**[0085]** In the present disclosure, the words “a” or “an” are to be taken to include both the singular and the plural. Conversely, any reference to plural items shall, where appropriate, include the singular. All of the concentrations noted herein as percentage are percent by weight unless otherwise noted. The cross-sectional views of the multilayer film embodiments in the present disclosure drawings are schematic illustrations, in which layer thicknesses are exaggerated for easy understanding and are not proportional.

**[0086]** From the foregoing it will be observed that numerous modifications and variations can be effectuated without departing from the true spirit and scope of the novel concepts of the present invention. It is to be understood that no limitation with respect to the specific embodiments illustrated is intended or should be inferred. The disclosure is intended to cover by the appended claims all such

modifications as fall within the scope of the claims.

## CLAIMS

What is claimed is:

1. A multilayer film including an outer foam layer and a gas barrier layer, wherein the multilayer film has a modulus of about 2ksi to about 40ksi.
2. The multilayer film of claim 1, further including at least one tie layer and at least one inner layer.
3. The multilayer film of claim 2, wherein the multilayer film is a six-layer film having a seal layer/tie layer/barrier layer/tie layer/inner layer/outer foam layer construction.
4. The multilayer film of claim 3, wherein the inner layer is a foam layer.
5. The multilayer film of claim 2, wherein the multilayer film is a seven-layer film having a seal layer/tie layer/barrier layer/tie layer/inner layer/inner layer/outer foam layer construction.
6. The multilayer film of claim 5, wherein at least one of the inner layers is a foam layer.
7. The multilayer film of claim 2, wherein the multilayer film is a seven-layer film having a seal layer/inner layer/tie layer/barrier layer/tie layer/inner layer/outer foam layer construction.
8. The multilayer film of claim 7, wherein at least one of the inner layers is a foam layer.
9. The multilayer film of claim 2, wherein the multilayer film is a six-layer film having a seal layer/inner layer/tie layer/barrier layer/tie layer/outer foam layer construction.
10. The multilayer film of claim 9, wherein the inner layer is a foam layer.

11. The multilayer film of claim 2, wherein the multilayer film is a five-layer film having a seal layer/tie layer/barrier layer/tie layer/outer foam layer construction.

12. The multilayer film of claim 1, wherein the outer foam layer is formed from a polymer selected from ethylene vinyl acetate (EVA), ethylene methyl acrylate (EMA), ethylene alpha olefin copolymers, ethylene based elastomers, ethylene-propylene (EP) copolymers, and blends thereof, and a foaming agent.

13. The multilayer film of claim 1, wherein the gas barrier layer comprises a polymer selected from polyvinylidene chloride, vinylidene copolymer, polyamide, and ethylene-vinyl alcohol copolymer.

14. The multilayer film of claim 13, wherein the gas barrier layer is formed from a polymer blend comprising an amorphous polyamide and a functionalized rubber blend or compound.

15. The multilayer film of claim 2, wherein at least one of the outer foam layer, inner layers, tie layers, and barrier layer comprises a vinyl-bond rich triblock copolymer.

16. The multilayer film of claim 1, wherein the multilayer film has a thickness of about 100 $\mu$ m to about 500 $\mu$ m.

17. A multilayer film comprising at least one foam layer, a gas barrier layer, and at least one tie layer, wherein the tie layer is formed from a polymeric mixture comprising at least one vinyl-bond rich triblock copolymer.

18. The multilayer film of claim 17, wherein the polymeric mixture comprises about 50 wt.% to about 99 wt.% of at least one vinyl-bond rich triblock copolymer.

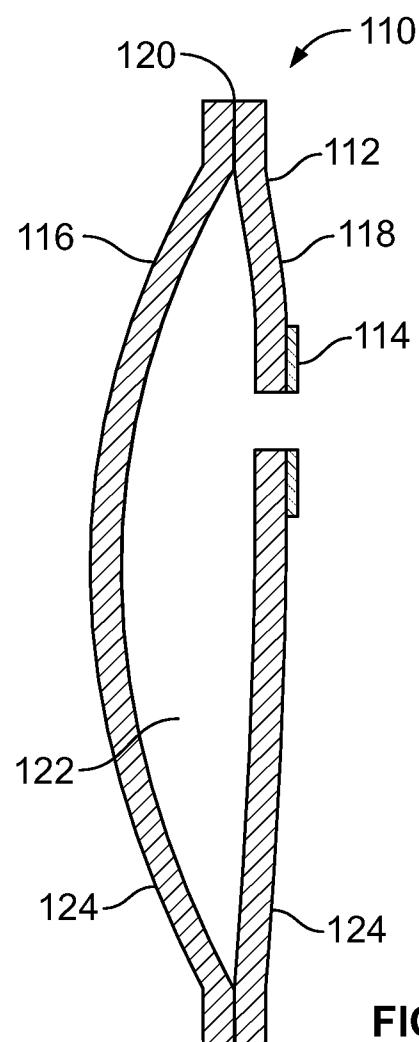
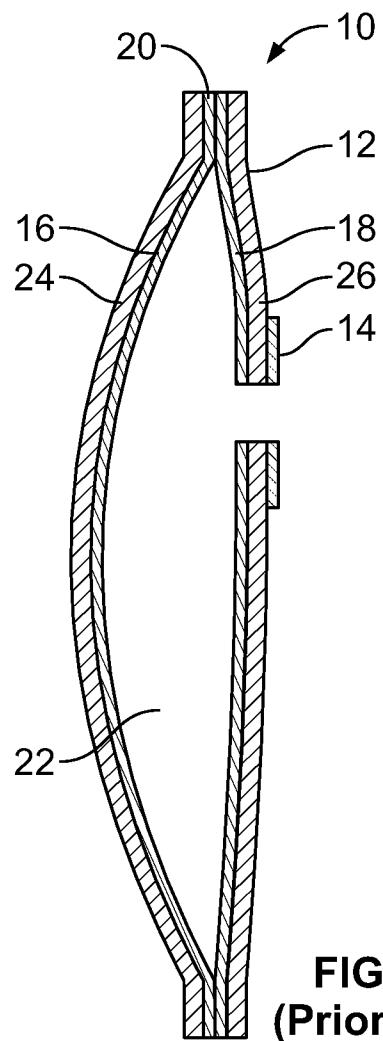
19. The multilayer film of claim 18, wherein the polymeric mixture comprises a vinyl-bond rich SIS block copolymer and a vinyl-bond rich SEPS block copolymer.

20. The multilayer film of claim 19, wherein the polymeric mixture comprises about 25 wt.% to about 60 wt.% vinyl-bond rich SIS block copolymer, 25 wt.% to about 60 wt.% vinyl-bond rich SEPS block copolymer, about 1 wt.% to about 40 wt.% maleated LLDPE, and about 0 wt.% to about 5wt.% antioxidant masterbatch.

21. The multilayer film of any of claims 17-20, wherein the multilayer film is a seven layer film having a foam layer/inner layer/tie layer/gas barrier layer/tie layer/inner layer/seal layer configuration.

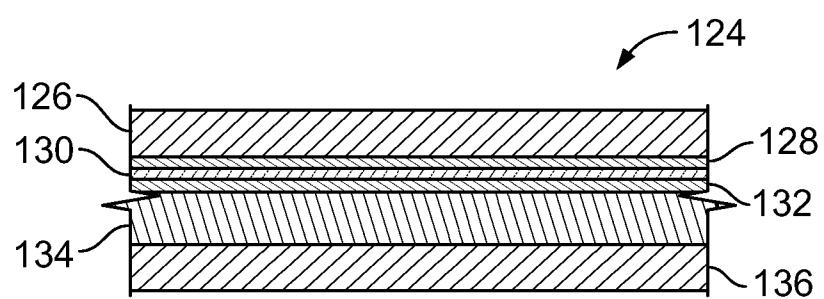
22. An ostomy pouch, comprising a first wall, a second wall, wherein the first wall and the second wall are sealed along their peripheral edges to define a cavity; and wherein at least one of the first wall and the second wall is formed from the multilayer film of any of claims 17-21.

1/8

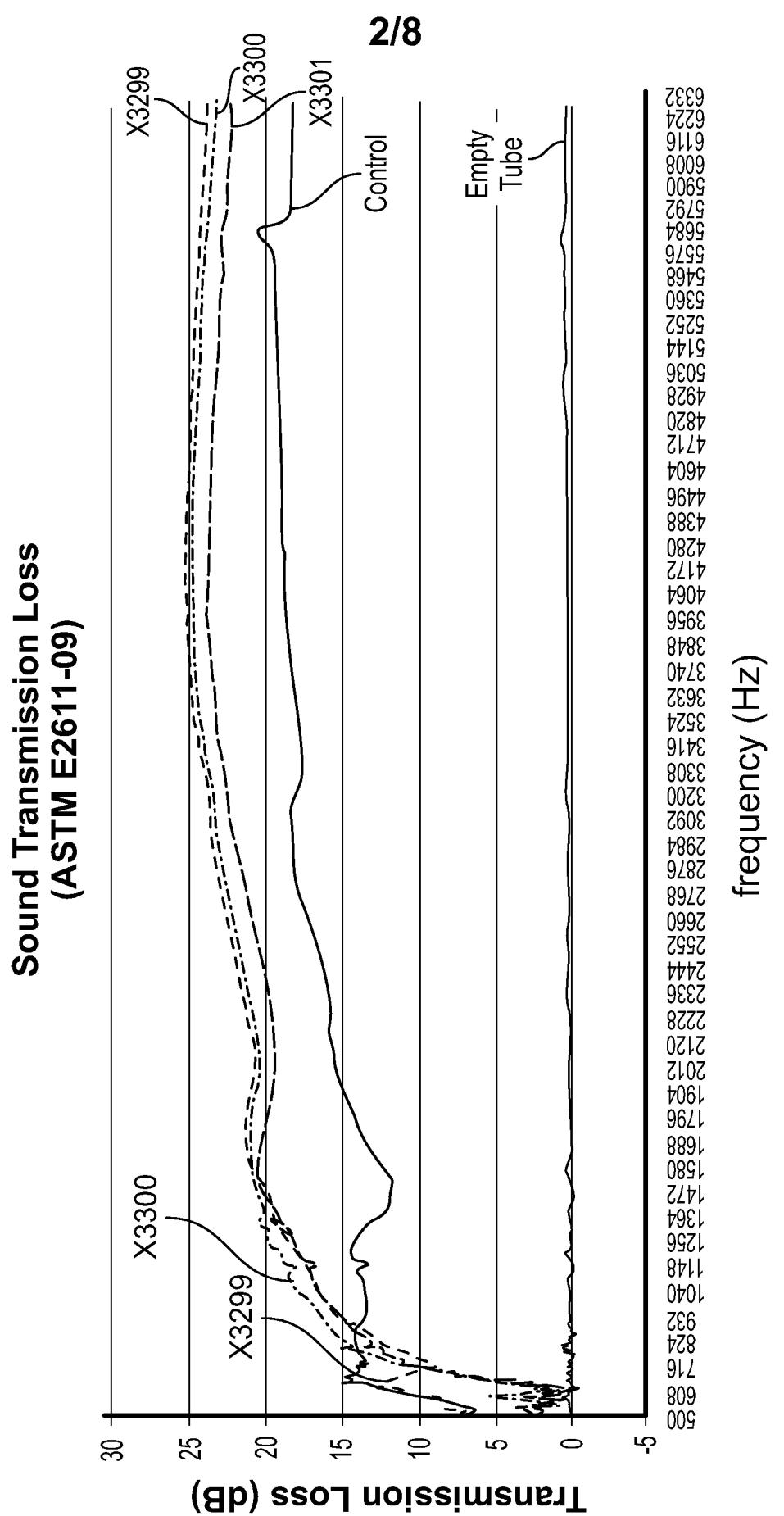


**FIG. 1**  
(Prior Art)

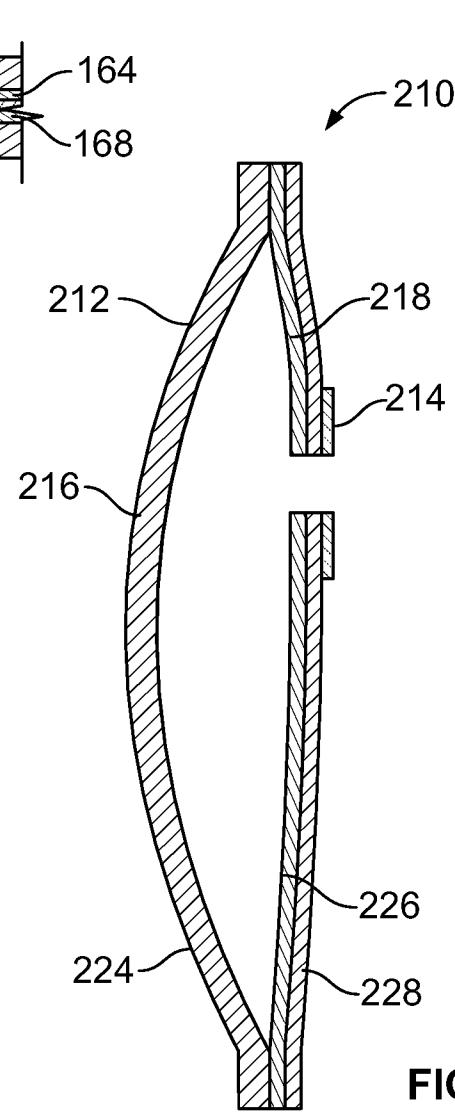
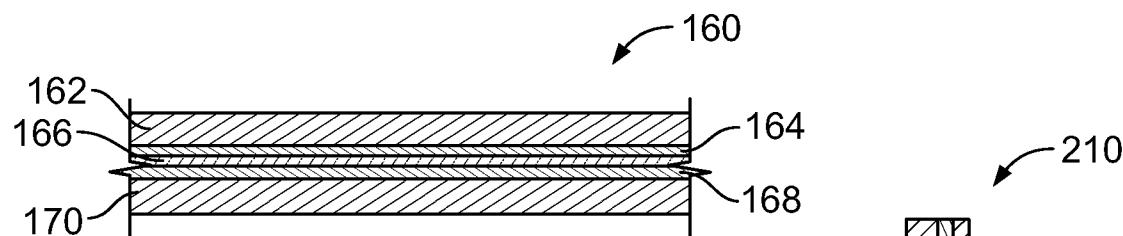
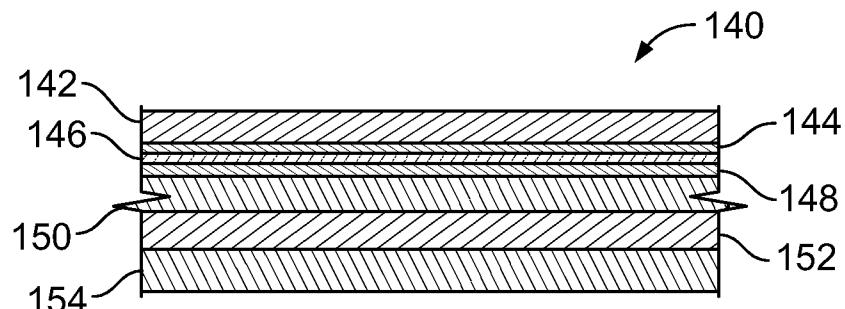
**FIG. 2**



**FIG. 3**

**FIG. 5**

3/8



4/8

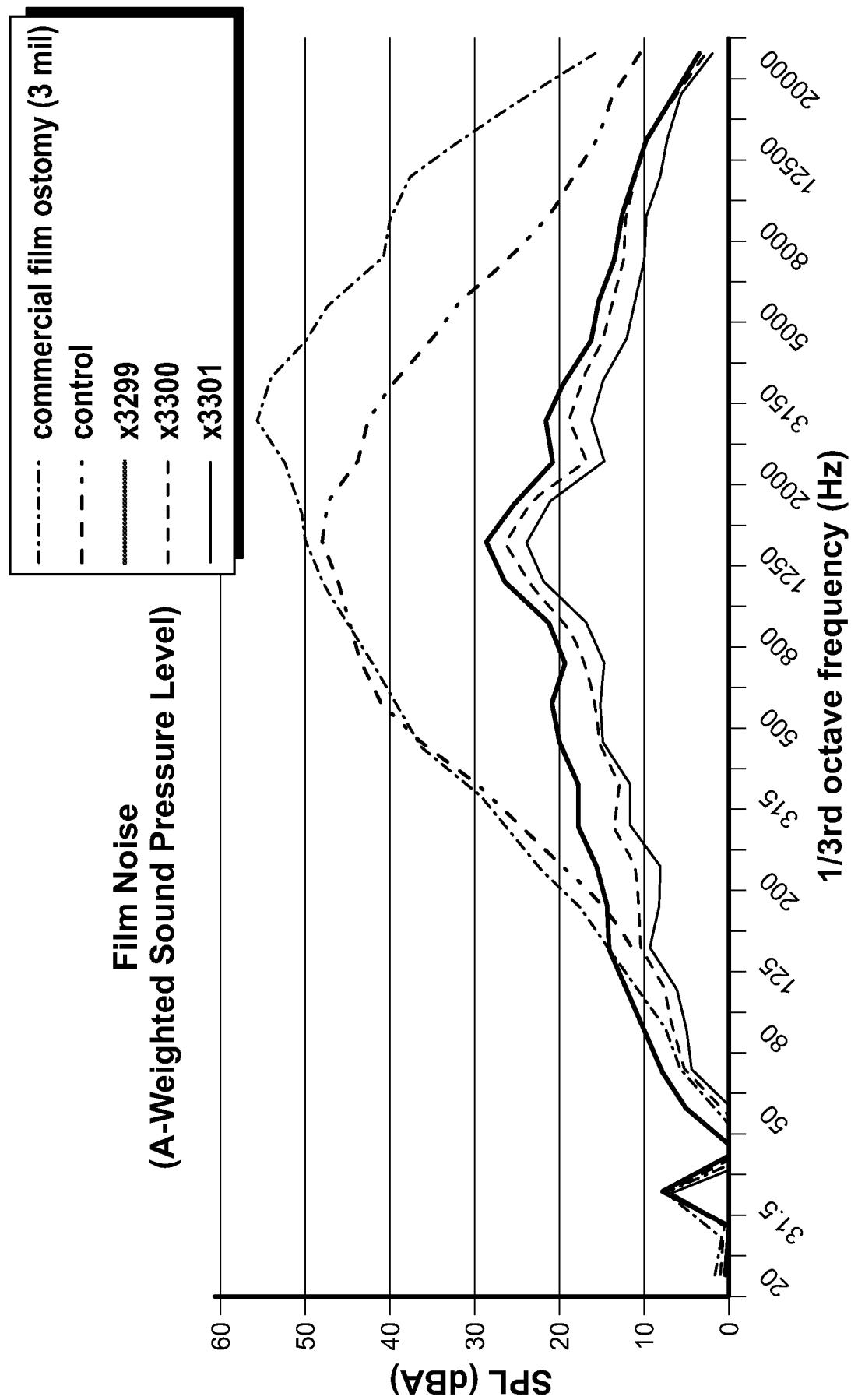
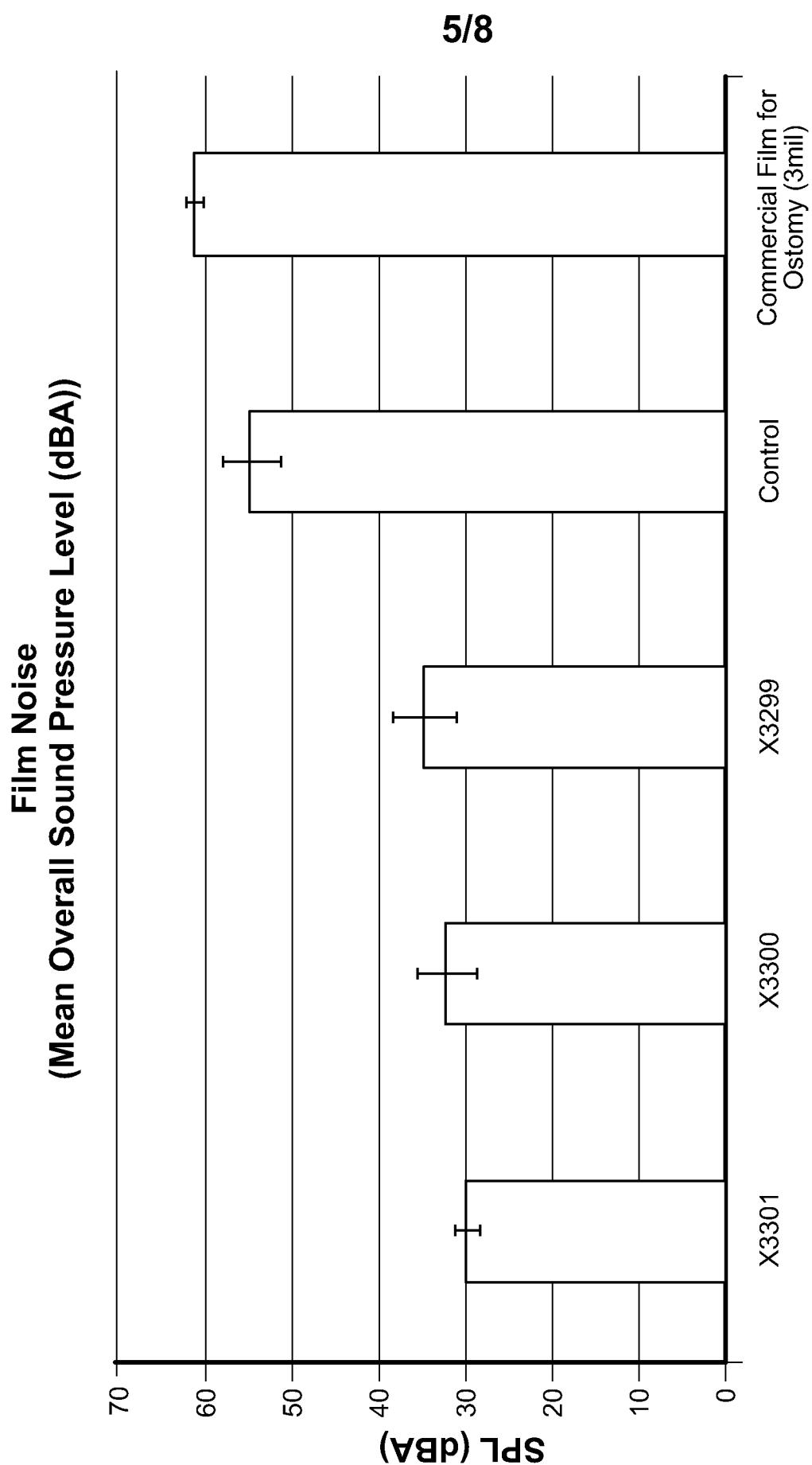


FIG. 8

**FIG. 9**

6/8

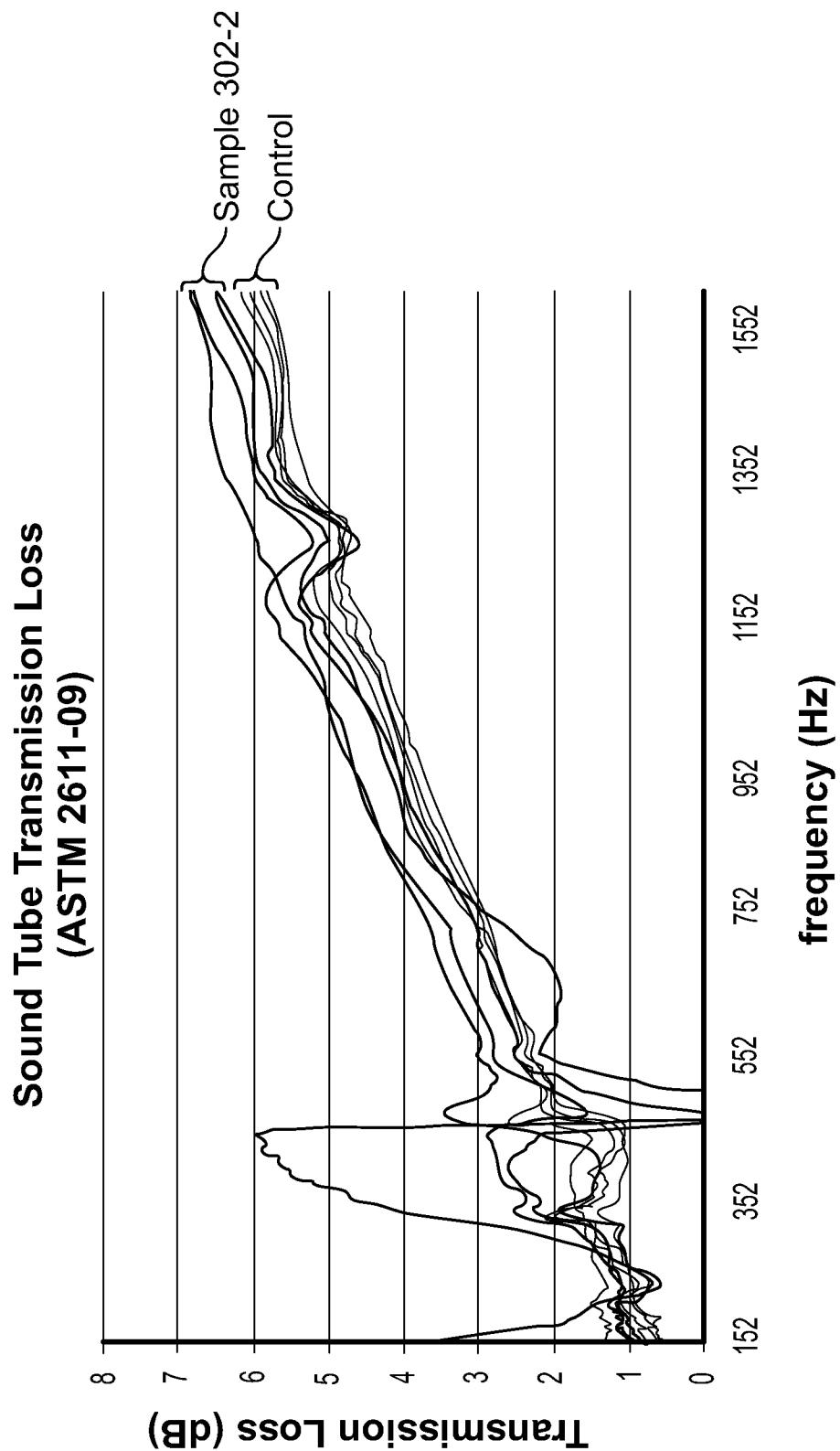


FIG. 10

7/8

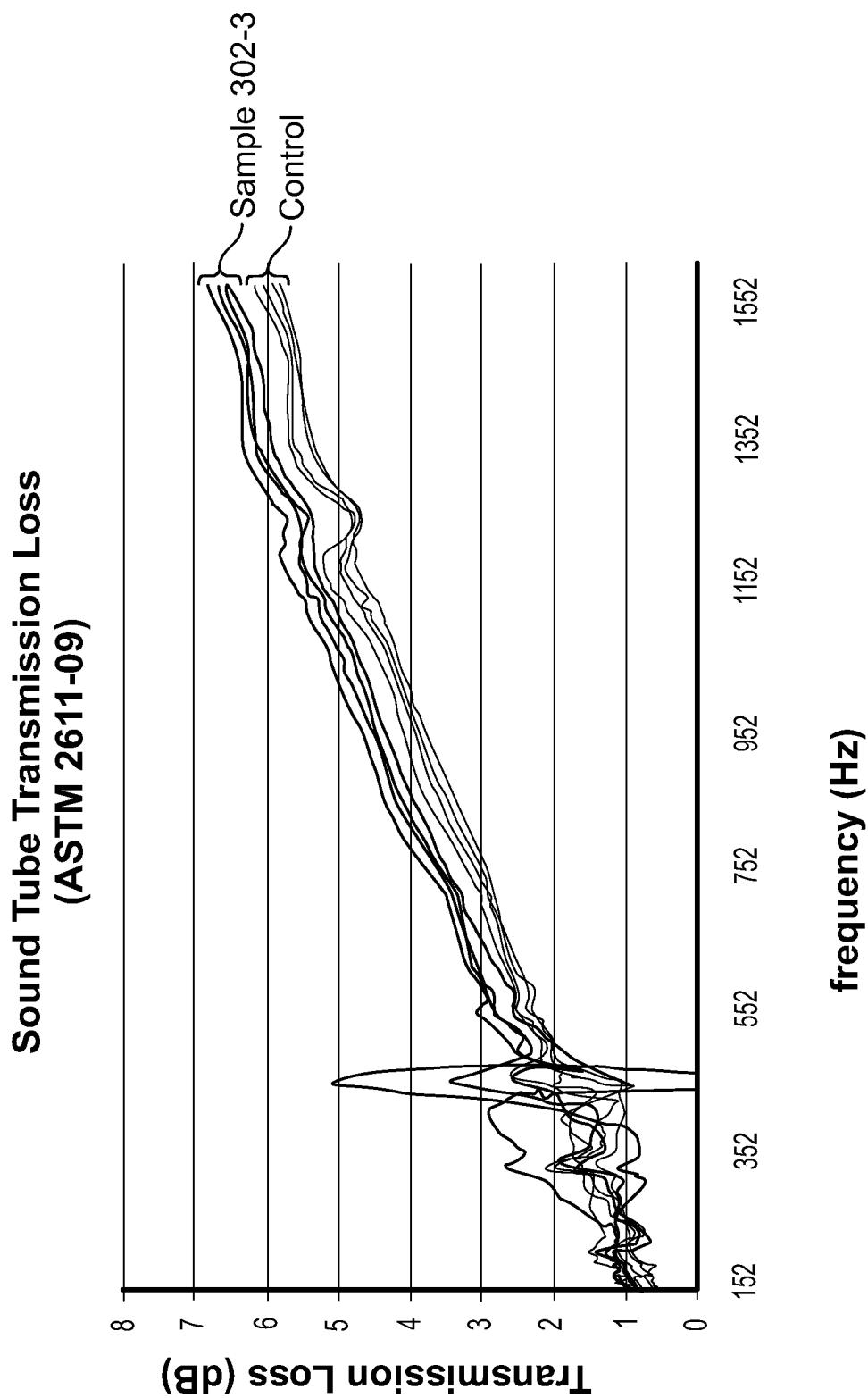
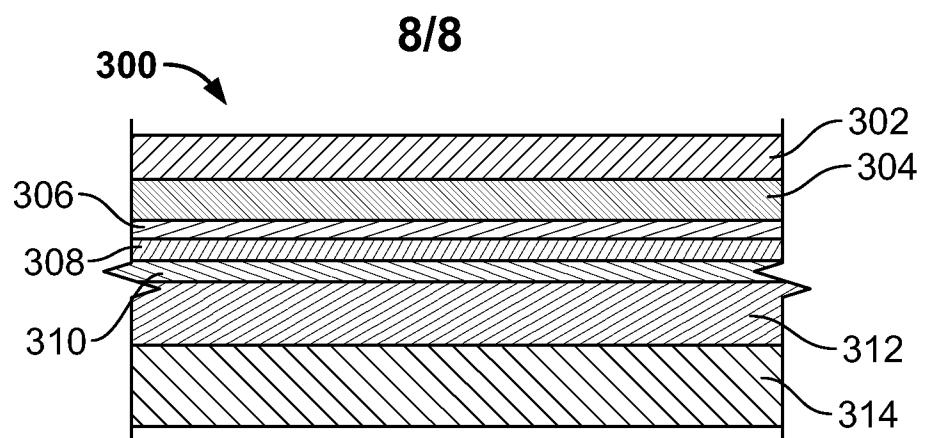
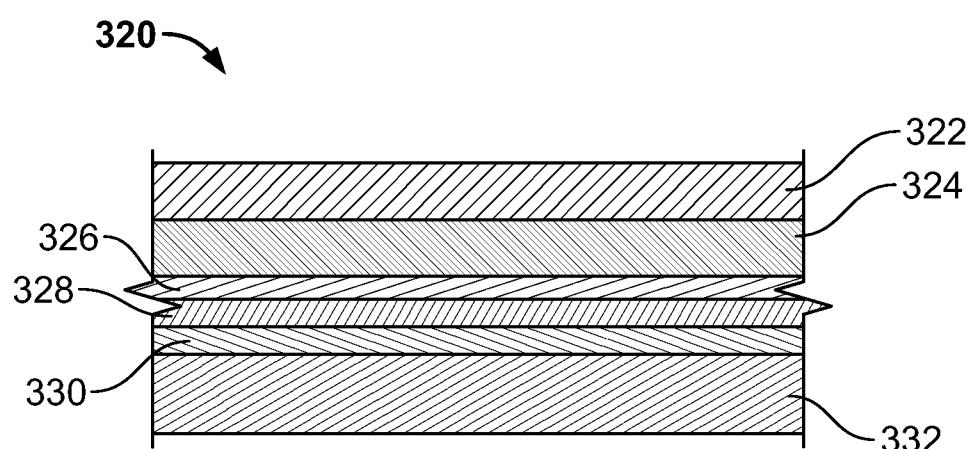


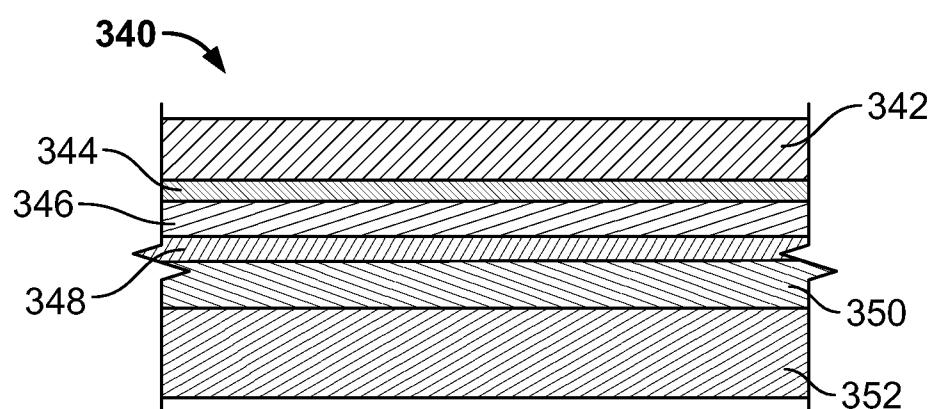
FIG. 11



**FIG. 12**



**FIG. 13**



**FIG. 14**

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2015/017503

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>				
INV. B32B7/12      B32B7/06      B32B7/30      B32B7/34      B32B5/32				
ADD.				
According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>				
Minimum documentation searched (classification system followed by classification symbols)				
B32B				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)				
EPO-Internal, WPI Data				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category*	Citation of document, with indication, where appropriate, of the relevant passages			Relevant to claim No.
X	WO 2007/093186 A1 (COLOPLAST AS [DK]; BACH ANDERS [DK]) 23 August 2007 (2007-08-23) claims 9,16 page 8, lines 9-11 page 4, lines 8-11; claims 18,19 page 7, lines 14-17 claim 14 page 6, lines 9-15 ----- -/-			1,4,12, 15,22 2,3, 5-11,13, 14,16-21
Y				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		<input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>				
Date of the actual completion of the international search		Date of mailing of the international search report		
23 April 2015		06/05/2015		
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer  Yildirim, Zeynep		

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/017503

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 01/00408 A1 (DOW CHEMICAL CO [US]; DOLLINGER SUSAN E [US]; REGNIER FRANCOIS J F [FR] 4 January 2001 (2001-01-04) page 2, line 17 - page 3, line 10 page 5, lines 6-7 page 10, lines 9-11 page 11, lines 12-15 page 15, line 30 - page 16, line 5 page 16, lines 8-11 page 28, lines 13-23; table XII page 17, lines 5-7 ----- US 2010/330356 A1 (JOKISCH CARL [DE] ET AL) 30 December 2010 (2010-12-30) claims 1-20 paragraph [0081] ----- JP 2005 255830 A (TOSOH CORP) 22 September 2005 (2005-09-22) abstract ----- EP 0 958 916 A2 (HOLLISTER INC [US]) 24 November 1999 (1999-11-24) claims 1-18 ----- WO 2014/116444 A1 (HOLLISTER INC [US]) 31 July 2014 (2014-07-31) claims 1-24 the whole document -----	2,3, 5-11,13, 14,16-21  1-22  1-22  1-22  1-22
A		
A		
A		
X,P		

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No

PCT/US2015/017503

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 2007093186	A1	23-08-2007	EP US WO	1986705 A1 2009030361 A1 2007093186 A1		05-11-2008 29-01-2009 23-08-2007
WO 0100408	A1	04-01-2001	AU WO	5764400 A 0100408 A1		31-01-2001 04-01-2001
US 2010330356	A1	30-12-2010	CA CN EP KR US WO	2713116 A1 101959678 A 2268483 A1 20100127225 A 2010330356 A1 2009106498 A1		03-09-2009 26-01-2011 05-01-2011 03-12-2010 30-12-2010 03-09-2009
JP 2005255830	A	22-09-2005		NONE		
EP 0958916	A2	24-11-1999	DE DE DK EP US	69919070 D1 69919070 T2 0958916 T3 0958916 A2 6258423 B1		09-09-2004 30-12-2004 20-12-2004 24-11-1999 10-07-2001
WO 2014116444	A1	31-07-2014	US WO	2014207094 A1 2014116444 A1		24-07-2014 31-07-2014