Claims

1. Multilayer thermoplastic container for storing and transporting liquid content, in particular for flammable or explosive contents, wherein the container is made of at least three layers and has a layer that is permanently electrostatic non-chargeable or electrically discharging,
characterized by
a layer (14) integrated in the wall of the container body and made of electrically conductive and/or permanently antistatic HDPE plastic material, which divides the remaining residual wall into at least two insulating HDPE plastic layers (12, 16), with each layer having a thickness of less than 2.5 mm.

2. Plastic container according to claim 1,
characterized in that
the innermost layer (12) in contact with the liquid content is made of HDPE virgin material and the second integrated HDPE layer (14) which is covered by the innermost virgin material layer (12) is rendered electrically conductive by suitable additives (e.g., electrically conductive carbon black), wherein the electrically conductive layer (14) is covered on the outside by at least one additional electrically non-conductive or insulating HDPE layer (16).

3. Plastic container according to claim 2,
characterized in that
the additional, electrically non-conductive or insulating HDPE layer (16) is interrupted by a narrow, vertically extending plastic strip (28) made of an electrically conductive plastic material - similar to a viewing strip -, which - when viewed in the radial direction - has only the thickness of the additional, electrically non-conductive or insulating HDPE layer (16) and has a positive and electrically conductive connection with the integrated, electrically conductive HDPE layer (14).

4. Plastic container according to claim 1, 2, or 3,

characterized by

a four-layer wall construction, wherein the fourth plastic layer (18) externally covers the existing three layers (12, 14, 16) and is also made of electrically conductive HDPE plastic material.

5. Plastic container according to claim 1, 2, 3 or 4,

characterized in that

the innermost layer (12) made of insulating plastic (HDPE virgin material) in contact with the content has a thickness of less than/equal to 2.5 mm (up to about 45% of the total wall thickness), the integrated electrically conductive plastic layer (14) has a wall thickness of less than/equal to 5% of the total wall thickness, the additional, electrically non-conductive or insulating HDPE layer (16) also has a thickness of less than/equal to 2.5 mm (up to about 45% of the total wall thickness), and the outer, electrically conductive plastic layer (18) also has a wall thickness of less than/equal to 5% of the total wall thickness.

6. Plastic container according to claim 1, 2, 3, 4 or 5,

characterized in that

at least one narrow vertically extending plastic strip (28) made of electrically conductive plastic material is inserted in the outer, electrically conductive plastic layer (18) and the following, electrically non-conductive or insulating HDPE layer (16), wherein the strip (28) - when viewed in the radial direction - has only the thickness of the two layers (16, 18) and has a positive and electrically conductive connection with the inner integrated, electrically conductive HDPE layer (14).

7. Plastic container according to claim 1, 2, 3, 4, 5 or 6,
characterized in that
at least one narrow vertically extending plastic strip (26) made of electrically conductive plastic material is inserted in the innermost layer (12) which is in contact with the content and is made of insulating plastic (HDPE virgin material), wherein the strip (28) - when viewed in the radial direction - has only the thickness of this layer (12) and is has a positive and electrically conductive connection with the inner integrated, electrically conductive HDPE layer (14).

8. Plastic container according to one of the preceding claims 1 to 7,
characterized in that
a so-called "barrier layer" made of polyamide PA or EVOH, optionally two admer/bonding agent layers (20, 22, 24), is arranged between the inner integrated, electrically conductive HDPE layer (14) and the covering electrically non-conductive or insulating HDPE layer (16) (made of a virgin material and/or regrind material).

9. Plastic container according to one of the preceding claims 1 to 8,
characterized in that
the inner integrated electrically conductive HDPE layer (14) is in electrically conductive contact with the content disposed in the interior of the container via at least one contact strip (26), which is made of electrically conductive plastic material and which is inserted into the innermost layer (12) made of insulating plastic (HDPE virgin material) and in contact with the content, and that the inner integrated electrically conductive HDPE layer (14) is in electrically conductive contact with the outer electrically conductive plastic layer (16) via at least one additional contact strip (30) made of electrically conductive plastic material (without addition of carbon black), which is inserted into the remaining layers (16, 20, 22, 24) that externally cover the inner integrated electrically conductive HDPE layer (14).

10. Method for producing a multilayer plastic container,
characterized in that
three different plastic materials are supplied from at least three extruders to a peripheral manifold where they are formed into an at least three-layer tubular preform,
wherein the inner layer is made of an electrically non-conductive plastic material (HDPE virgin material), the integrated layer covered by the inner layer is made of an electrically conductive plastic material (e.g., HDPE with addition of carbon black), and an additional outer layer which is also made of an electrically non-conductive plastic material (HDPE), and
wherein this tubular preform is expanded in a corresponding blow mold with compressed air to a hollow plastic body.

CLAIMS

1. A multilayer thermoplastic container for storing and transporting a liquid bulk material, comprising:

at least two insulating high-density polyethylene (HDPE) plastic layers forming an inner layer made of HDPE virgin material and an outer electrically non-conductive or insulating HDPE layer, each of the at least two layers having a thickness of less than 2.5 mm, and

an intermediate layer made of HDPE plastic material comprising an additive which renders the intermediate layer electrically conductive, said intermediate layer disposed at least in a wall of the container intermediate between the inner layer and the outer layer,

wherein the inner layer is interrupted by a first narrow, vertically extending plastic strip made of an electrically conductive plastic material which has a radial thickness substantially identical to a radial thickness of the inner layer, and wherein the outer layer is interrupted by a second narrow, vertically extending plastic strip made of an electrically conductive plastic material which has a radial thickness substantially identical to a radial thickness of the outer layer, with both the first and second narrow, vertically extending plastic strip being electrically connected with the intermediate layer.

2. The plastic container of claim 1, wherein the additive is conductive carbon black.

3. The plastic container of claim 1, further comprising a fourth layer made of electrically conductive HDPE plastic material and externally covering the outer layer.

4. The plastic container of claim 3, wherein the inner layer and the outer layer each have a radial thickness that does not to exceed about 45% of a total container wall thickness, and the intermediate layer and the fourth layer each have a radial wall thickness of no more than 5% of the total container wall thickness.

5. The plastic container of claim 3, further comprising at least one narrow, vertically extending plastic strip made of electrically conductive plastic material and introduced in the fourth layer and the outer layer, wherein the strip has a radial thickness substantially identical to a radial thickness of the combined fourth and outer layer, and is electrically connected with the intermediate layer.

6. The plastic container of claim 1, further comprising at least one narrow, vertically extending plastic strip made of electrically conductive plastic material and introduced in the inner layer, wherein the strip has a radial thickness substantially identical to a radial thickness of the inner layer and is electrically connected with the intermediate layer.

7. The plastic container of claim 1, further comprising a barrier layer construction made of a polyamide PA or ethyl vinyl alcohol (EVOH) layer sandwiched between two layers having a bonding agent, wherein the barrier layer construction is arranged between the intermediate layer and the outer layer.

8. The plastic container of claim 1, wherein the outer layer is made of virgin material or regrind material, or both.

9. The plastic container of claim 7, further comprising

at least one first contact strip made of electrically conductive plastic material and introduced in the inner layer for providing electric contact between the intermediate layer and the bulk material in the container, and

at least one additional contact strip made of electrically conductive plastic material that does not contain carbon black, wherein the at least one additional contact strip is introduced in the barrier layer construction for providing electric contact between intermediate layer and the outer layer.

10. The plastic container of claim 1, wherein the content comprises flammable or explosive content.

11. A method for producing a multilayer plastic container, comprising the steps of:

supplying three different plastic materials from at least three extruders to a peripheral distributor,

forming an at least three-layer tubular preform having an inner layer made of HDPE virgin material, an outer electrically non-conductive or insulating HDPE layer and an intermediate layer disposed between the inner layer and the outer layer, wherein the inner layer and the outer layer are made of an electrically non-conductive plastic material, and the intermediate layer is made of HDPE plastic material comprising an additive which renders the intermediate layer electrically conductive,

wherein the inner layer is interrupted by a first narrow, vertically extending plastic strip made of an electrically conductive plastic material which has a radial thickness substantially identical to a radial thickness of the inner layer, and wherein the outer layer is interrupted by a second narrow, vertically extending plastic strip made of an electrically conductive plastic material which has a radial thickness substantially identical to a radial thickness of the outer layer, with both the first and second narrow, vertically extending plastic strip being electrically connected with the intermediate layer, and

expanding the tubular preform in a blow mold into a hollow plastic body.

12. The method of claim 11, wherein the intermediate layer comprises carbon black as an additive.