A freezer door subassembly has a glass door and a door post against which the glass door bears in the closed position via a flexible seal. The glass door has a laminated assembly. The latter is held on its vertical edge section, which is adjacent to the door post in the closed position, by a frame profile. The flexible seal is arranged between the frame profile and the door post. The frame profile has a plastic profile base body which is coated on its visible sides by a decorative layer. The result is a freezer door subassembly which is improved in terms of freedom from condensation.
FREZER DOOR SUBASSEMBLY AND FREEZER WITH A FREEZER DOOR SUBASSEMBLY OF THIS TYPE

[0001] The invention relates to a freezer door subassembly according to the preamble of claim 1. The invention relates, furthermore, to a freezer equipped with such a freezer door subassembly.

[0002] A freezer door subassembly of this type is known through prior public use. So that, in the known freezer door subassembly, market requirements in terms of the freedom of the subassembly from condensation after the opening and reclosing of the glass door and when the subassembly is in continuous operation are fulfilled, the subassembly has to be formed/design in a highly complicated way, in order to prevent the undesirable condensation or resublimation of water or ice on the subassembly/subassembly surface. The result of this, for example, is that the energy outlay for operating a freezer with a known freezer door subassembly of this type is high.


[0004] An object of the present invention is to develop a freezer door subassembly of the type initially mentioned, in such a way that no shortcomings as to freedom from condensation have to be allowed for, while at the same time a freezer which is more energy-efficient is obtained, as compared with the prior art, and which is at least similarly attractive visually is to be obtained as a result.

[0005] This object is achieved, according to the invention, by means of a freezer door subassembly having the features specified in the characterizing part of claim 1.

[0006] A frame profile with a basic plastic profile body avoids, in the region of the lateral laminated structure receptacle, an undesirable heat bridge between the inner space of the freezer and its surroundings. The result of this is that the complicated measures, such as are in the prior art, do not have to be taken in order to ensure a freedom of, in particular, the frame profile from condensation.

[0007] In particular, there is no need to heat the frame profile. At the same time, the decorative layer ensures a visually attractive exterior of the frame profile. Owing to the good heat insulation properties of the frame profile, the requirements as to the cooling capacity of the freezer are reduced. Overall, therefore, the result is a higher energy efficiency of the freezer. According to the invention, a doorpost is also understood to mean a part of a freezer body against which the glass door bears in its closing position.

[0008] PVC, as a material for the basic plastic profile body, as claimed in claim 2, has proved to be advantageous for constructing a freezer on account of its material properties. Depending on the desired combination of material properties, the other materials of the material list contained in claim 2 also afford individual advantages. Foam thermoplastics may be used, for example, in a density range of between 0.2 and 1.4 kg/l. In particular, a density in the region of 0.65 kg/l is preferred.

[0009] A decorative metal foil as claimed in claims 3 and 4 is not only visually attractive, but, because of its good heat-conducting properties, also leads to some thermal compensation on the visible side of the frame profile.

[0010] A seal as claimed in claim 5 affords the possibility of producing the doorpost from plastic in its portion facing the inner space of the freezer or adjacent to this inner space, since a magnetic portion, necessary for securing the glass door in the closing position, together with the seal, can be arranged so as to be offset outward. This improves the insulation properties of the doorpost, since an undesirable heat bridge in the region of the metallic portion of the doorpost can at least largely be avoided. The profile element prevents, in the region of the interspace, an undesirable convection inside the freezer. According to this claim, the profile element also forms a separation between the seal and the inner space when, in the closing position of the glass door, the profile element does not at the same time bear against the doorpost and against the frame profile or against the laminated structure. On the contrary, in the closing position, it is perfectly possible for free spaces to remain, which, however, are substantially narrower than the interspace, thus resulting in the desired prevention of convection by the profile element.

[0011] A plastic profile as claimed in claim 6 has an additional heat insulation action.

[0012] A profile element as claimed in claim 7 does not lead to any increased outlay in terms of the mounting of the freezer door subassembly.

[0013] By means of a heat-conducting metal foil as claimed in claim 8, the situation is avoided where condensation water occurs or is precipitated in the glass reception region and in hollow chambers of the frame profile. Internal condensation in the laminated structure is consequently avoided. The heat-conducting metal foil and the decorative metal foil surround three sides of the basic plastic profile body, so that a risk of the warping of the latter due to temperature changes to which the frame profile is exposed is reduced.

[0014] A heat-conducting foil as claimed in claim 9 has good thermal conductivity.

[0015] Foil thicknesses as claimed in claim 10 have proved to be sufficient for the intended use of the decorative metal foil or of the heat-conducting metal foil.

[0016] Materials for the basic plastic profile body as claimed in claim 11 can easily be adapted to the respective technical requirements/designs, particularly with regard to the heat-conducting properties, by means of an appropriate selection of the thermoplastic/filler material combination.

[0017] A decorative layer as claimed in claim 12 can advantageously cover irregularities in the surface quality of the visible sides of the basic plastic profile body. This applies particularly when the material used for the basic plastic profile body is a foamed thermoplastic. Alternatively, a non-vapor-deposited duroplastic or thermoplastic decorative foil may also be used. As a further variant, it is also possible to provide the visible sides of the basic plastic profile body with a decorative lacquer.

[0018] Carrier materials as claimed in claim 13 and coatings as claimed in claim 14 and claim 15 have proved to be particularly suitable material combinations for such decorative layers in the form of vapor-deposited foils.

[0019] An adhesion promoter or an adhesive according to the variant specified in claim 16 forms a connecting layer which has proved to be suitable/advantageous for the reliable connection of the metal foil to the basic plastic profile body.

[0020] A further object of the invention is to provide a visually attractive and energy-efficient freezer with a glass door which is as condensation-free as possible.

[0021] This object is achieved, according to the invention, by means of a freezer having the features specified in claim 17.
The advantages of the freezer correspond to those which were explained above with reference to the freezer door subassembly.

The decorative layer can be applied to the basic plastic profile body, for example, by the hot-pressing method if a decorative foil is used.

The decorative layer may also be applied to the basic plastic profile body by means of a coextrusion method. In a preferred variant, the decorative layer is directly applied as a decorative strip to the basic plastic profile body when the latter is cooled to a specific temperature after extrusion has taken place. In this case, an adhesion promoter is also additionally introduced between the decorative strip and the basic plastic profile body, for example by the decorative strip being coated with the adhesion promoter. The decorative layer may also be laminated on the basic plastic profile body, in which case an adhesive is used for this purpose, if appropriate in addition to the adhesion promoter. The decorative layer may also be embossed by the embossing method, an adhesion promoter also being introduced between the decorative layer and the basic plastic profile body. Overall, connection is possible using adhesives or adhesion primers for an adhesion promoter to be employed, these adhesion materials being adapted to the respective material pairing for the decorative layer, on the one hand, and the basic plastic profile body, on the other hand.

An exemplary embodiment of the invention is explained in more detail below with reference to the drawing. The single FIG. 1 shows a horizontal section through a detail of a freezer door subassembly.

The freezer door subassembly 1 is an integral part of a freezer, otherwise not illustrated in any more detail. The freezer door subassembly 1 has a glass door designated as a whole by 2. This, in the closing position, bears against a doorpost 4 via a flexible seal 3.

The glass door 2 comprises, as laminated insulating glass, a laminated structure 5 with a plurality of, in the exemplary embodiment illustrated with three, glass panes spaced apart from one another with the aid of spacer elements 6, to be precise an inner pane 8 facing an inner space 7 of the freezer, a middle pane 9 and an outer pane 10. The middle pane 9 lies between the inner pane 8 and the outer pane 10.

The laminated structure 5 is received, at its vertical edge portion 11 adjacent to the doorpost 4 in the closing position, by a likewise vertically running frame profile 12. In the region of this receptacle, the frame profile 12 is designed as an essentially U-shaped reception groove 13 for the laminated structure 5. The spacer elements 6 are connected to the panes 8 to 10 via layers of a primary sealing material 13a consisting of butyl rubber, that is to say via adhesive layers. Between a bottom 14 of the reception groove 13 and the spacer elements 6, sealing elements 15 consisting of plastic, in particular of polyurethane, are arranged as secondary sealing materials, which seal off with respect to the surroundings the inner space formed by the panes 8 and 9 or 9 and 10 of the laminated structure 5.

Glued/applied to the bottom 14 via an adhesion promoter, between the sealing elements 15 and the frame profile 12, is a heat-conducting metal foil 16. This extends in the reception groove 13 between the inner pane 8 and the outer pane 10. The heat-conducting metal foil 16 consists of aluminum and has a thickness of 0.1 mm. Other foil thicknesses of between 0.01 and 2 mm are also possible. The heat-conducting metal foil 16 may also consist of another highly heat-conducting material. In principle, it is also conceivable to use a nonmetallic heat-conducting foil or coating instead of a metal foil. What may be envisaged in this regard according to the invention are also decorative foils consisting of a coating of a titanium nitride compound or a boron nitride compound or an aluminum nitride compound or a silicon nitride or silicon oxynitride compound or a silicon oxide compound or an aluminum/silicon/titaniu m compound or a compound consisting of tantalum silicides or undoped or doped polysilicon and/or amorphous silicon or a titanium tungsten compound or titanium silicides or a titanium oxynitride compound or a tungsten silicide compound or molybdenum silicide compound, applied by the thin-layer technique, such as, for example, plasma deposition (PE-CVD method), or a sputtering method to a foil carrier material with an adhesion promoter/adsorptive layer.

The frame profile 12 is designed as a hollow chamber profile. It has a basic plastic profile body 17 consisting, in the exemplary embodiment illustrated, of polyvinyl chloride (PVC). The basic plastic profile body 17 is coated on its visible sides, that is to say on the lower side and on the left side in FIG. 1, with a decorative layer in the form of a decorative metal foil 18. The latter consists, for example, of aluminum and has a thickness of 0.1 mm. Depending on the decoration requirements, the decorative metal foil/decorative foil 18 may also consist of other metals. The decorative metal foil/decorative foil 18 may also have another thickness of between 0.01 and 2 mm.

The basic plastic profile body 17 is covered on top (see FIG. 1) by a cover plate 18a which is latched into an upper latching receptacle of the basic plastic profile body 17.

The flexible seal 3 is arranged between a wall 19, upper in FIG. 1, of the cover plate 18a and a lower wall 20, facing this upper wall 19, of the doorpost 4. Said seal has a construction known, for example, from WO 2005/021886 A1, with three elastic sealing walls, to be precise an inner wall 21 facing the inner space 7, a middle wall 22 and an outer wall 23. The sealing walls 21 to 23 are integral parts of the one-piece sealing profile 24 consisting of a plastic softer than the material of the frame profile 12, for example of soft PVC. The sealing profile 24 has in a known way a latching profile portion 24a which is latched into a reception chamber 24b of the cover plate 18a. The sealing profile 24 has a reception chamber 25 for a magnet 26 above the middle wall 22 and the outer wall 23 in FIG. 1. Said magnet cooperates, in the closing position of the glass door, with a metallic portion 27 of the lower wall 20 of the doorpost 4.

The seal 3, as seen from the inner space 7, is offset outward to an extent such that an interspace 28 is formed adjacent to the seal 3 between the doorpost 4 and the edge portion 11 of the laminated structure 5. Said interspace is partially filled by a profile element 29. The latter constitutes a separation between the seal 3 and the inner space 7. The profile element 29 is designed as a hollow chamber profile. In the closing position of the glass door 2, a duct 30 of defined width remains between the profile element 29 and the doorpost 4, thus ensuring that, in the closing position, the profile element 29 does not bear at the same time against the glass door 2 and against the doorpost 4 and thus undesirably influences the closing position. The profile element 29 is formed in one piece with the cover plate 18a.

Owing to the illustrated set-up of the freezer door subassembly 1, a temperature distribution in the freezer door subassembly 1 is achieved, which prevents undesirable con-
ensation on the visible side of the frame profile 12 during operation. This is achieved by means of a combination of the following measures:

First, the configuration of the basic profile body 17 from plastic prevents the formation of a heat bridge between the inner space 7 and the surroundings of the freezer. What is achieved thereby is that the temperature of the frame profile 12 in the region of the visible sides is sufficiently high to prevent condensation on these visible sides. Since the seal 3 is arranged so as to be offset outward, it is sufficient to draw the metallic portion 27 only just beyond the middle of the doorpost 4. A remaining wall 31 of the doorpost 4, that is to say the portion which faces or is adjacent to the inner space 7, is formed by a U-shaped profile portion consisting of plastic, for example of PVC. As a result, and due to an inner filling of the doorpost 4 consisting of a material which likewise has poor thermal conductivity, in the example illustrated of PUR foam, it is made possible that the outside of the doorpost 4 does not become too cold and therefore likewise does not experience condensation. Undesirable convection in the region of the interspace 28 is effectively prevented by the profile element 29. As a result, in particular, an excessive cooling of the seal 3 is avoided. On account of the heat-conducting property of the heat-conducting metal foil 16, sufficient heat is introduced from the outside of the glass door 2 into the edge portion 11 and into the bottom 14 of the reception groove 13, so that the formation of condensation water in this region on account of excessive cooling is advantageously prevented. In particular, inner condensation in the laminated structure 5 is effectively avoided. The heat-conducting metal foil 16 thus makes a heat-conducting connection between the inside and the outside of the laminated structure 5.

The decorative metal foil/decorative foil 18 ensures an attractive visual appearance of the frame profile 12. At the same time, the decorative metal foil/decorative foil 18, together with the heat-conducting metal foil 16, ensures that the basic plastic profile body 17 is surrounded on three sides by metal foil. This reduces the risk of a warping of the basic plastic profile body 17 of the frame profile 12.

What is claimed is:

1. A freezer door subassembly (1) characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

2. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

3. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

4. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

5. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

6. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

7. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

8. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

9. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

10. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.

11. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, chromium, molybdenum, or a combination thereof.
12. The freezer door subassembly as claimed in claim 1, characterized in that the decorative layer is designed as a vapor-deposited or sputtered or plasma-deposited duroplastic or thermoplastic foil.

13. The freezer door subassembly as claimed in claim 12, characterized by a foil carrier material of the decorative layer consisting of polyvinylidenedifluoride (PVDF) or of polyester or acrylonitrile/styrene/acrylate copolymers (ASA) or polycarbonate (PC) or of duroplastic-impregnated paper foil.

14. The freezer door subassembly as claimed in claim 11, characterized by a coating of the decorative layer, consisting of at least one coating from the group: aluminum or chromium or indium or titanium or tantalum or tungsten or titanium nitride or titanium oxynitride or titanium oxide or boronitride or boroxynitride or aluminum nitride or aluminum oxynitride or silicon oxide or silicon oxynitride or silicon nitride or an aluminum/silicon/titanium compound (AlSiTi) or tantalum silicide (TaSi) or an aluminum/tungsten compound or tungsten silicide or molybdenum silicide (MoSi) or undoped or doped silicon or polysilicon or amorphous silicon.

15. The freezer door subassembly as claimed in claim 14, characterized by an at least two-layer decorative layer set-up, consisting of a combination of the coating of the decorative layer according to the group elements or group compounds mentioned in claim 14.

16. The freezer door subassembly as claimed in claim 1, characterized by a connecting layer between the metal foil (16, 18) and the basic plastic profile body (17), comprising: adhesion promoter: polyurethane (PUR), polyester (PE), chlorinated polyolefins, maleic acid-grafted polyolefins, nanochlorinated polyvinylchloride (PVC) and copolymers; and/or as adhesive: ethylene/vinylacetate copolymers (EVA), single-component polyurethane (1K-PUR), two-component polyurethane (2K-PUR), polyamide (PA), cyanoacrylates, methacrylates, epoxides, atactic polyalpha-olefins (APAO), natural and synthetic rubbers, polyvinylchloride (PVC), polyvinylalcohol (PVA), silicones.

17. A freezer with a freezer door subassembly as claimed in one of claim 1.

18. The freezer door subassembly as claimed in claim 2, characterized in that the decorative layer (18) is designed as a metal foil, with a metal from the following group: aluminum, high-grade steel, brass, titanium, tantalum, tungsten, chromium, indium.

19. The freezer door subassembly as claimed in claim 2, characterized in that the decorative layer (18) is designed as a nonmetallic heat-conducting foil, with a compound from the following group: titanium nitride or titanium oxynitride or titanium oxide, boron nitride or boroxynitride or aluminum nitride or silicon oxide or silicon oxynitride or silicon nitride or an aluminum/silicon/titanium compound (AlSiTi) or tantalum silicide (TaSi) or a titanium/tungsten compound or tungsten silicide or molybdenum silicide (MoSi) or undoped or doped silicon or polysilicon or amorphous silicon.

20. The freezer door subassembly as claimed in claim 2, characterized in that the seal (3) has a magnetic body (26) which cooperates with a metallic portion (27) of the doorpost (4) in the closing position of the glass door (2), the seal (3), as seen from the freezer inner space (7), being arranged so as to be offset outward to an extent such that an interspace (28) is formed adjacent to the seal (3) between the doorpost (4) and the edge portion (11) of the laminated structure (5), which interspace is filled at least partially by a profile element (29) which forms a separation between the seal (3) and the inner space (7).

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