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(54) **A COOLING APPLIANCE WITH A GUIDE FOR INSULATION MATERIAL**

KÜHLGERÄT MIT EINER FÜHRUNG FÜR ISOLIERMATERIAL

APPAREIL DE REFROIDISSEMENT DOTÉ D'UN GUIDE POUR MATÉRIAU D'ISOLATION

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Description

Technical field of the invention

[0001] The present invention relates to cooling appliances. In particular, the present invention relates to a cooling appliance (e.g. fridge, freezer, fridge/freezer combination or wine cabinet etc.) provided with an insulation volume that is filled through an inlet opening.

Background of the invention

[0002] Thermal insulation is of vital importance for energy performance of cooling appliances. With reference to the Fig.1 showing an exemplary prior art cooling appliance (101), thermal insulation is mostly achieved by an insulation material in the form of foam filled into an insulation volume (30) defined between an outer shell (21) and an inner liner (11) which serves as one or more walls of one or more cooling cabinets (17) and/or one or more freezing compartments (18).

[0003] With reference to the Fig. 2, the insulation material is generally introduced in a liquid form, through an inlet opening (41) formed on the outer shell (21) in an inlet direction (D1), projection of which corresponds to the inner liner (11) as soon as the insulation material enters into the insulation volume (30). This results in eddy streams around the projection of the inlet direction (D1) on the inner liner (11), disturbs the flow and compromises the linear velocity of the insulation material in the liquid form. In other words, the insulation material is prevented by the inner liner (11) from quickly reaching farther from the inlet opening (41). As a result, the insulation material cannot reach to the topmost zones of the cooling appliance (101) in a short time.

[0004] US 2012/266962 A1 discloses a foam manifold for injection molding cooling appliance case, which includes pipes placed into the insulation volume prior to introduction of the insulation material in the form of liquid. Yet, the pipes are permanently left inside the insulation volume and the pipe material inevitably has a higher thermal conductivity when compared to insulation foams (e.g. polyurethane foams) used in such insulation volumes; and therefore results in decreased thermal insulation performance in the insulation volume and inefficient use of the insulation volume. Furthermore, production costs are increased by the price of the pipes and further assembling steps related to the montage of the pipes. In addition, pressure drops inside the pipes and at the pipe connections increase the costs related to pumping of the insulation material in the form of liquid.

[0005] JP H08 61837 A discloses an expanded heat insulating material in a heat insulation box in which a vacuum heat insulation panel and the expanded heat insulating material are used as a heat insulation member.

[0006] JP H09 303949 A discloses a heat insulation box comprising an outer casing 3, an inner casing 2 and a foamable heat insulating material 5 which is filled into a space between the casings.

[0007] DE 44 39 349 A1 discloses a refrigerator cabinet comprising an inner and an outer box structure which after assembly are separated by an airspace which is subsequently filled with an expanding plastic foam to maximize thermal insulation.

[0008] Hence, it is desirable to improve cooling appliances considering the abovementioned shortcomings.

[0009] The invention provides an additional improvement, an additional advantage or an alternative to the prior art.

Objects of the invention

[0010] Primary object of the present invention is to overcome the abovementioned shortcomings encountered in the prior art.

[0011] Another object of the present invention is to provide a cooling appliance with improved insulation foam distribution.

[0012] Another object of the present invention is to provide a cooling appliance with optimal use of cooling cabinet volume without compromising the insulation distribution.

[0013] A further object of the present invention is to provide a low cost cooling appliance without compromising high performance in terms of thermal efficiency.

Summary of the invention

[0014] The present invention proposes a cooling appliance comprising an inner liner for defining at least one wall of a storage cabinet of the cooling appliance, the inner liner being substantially surrounding by an outer shell; an insulation volume between the inner liner and the outer shell for receiving an insulation material; and an inlet opening on the outer shell for introduction of insulation material into the insulation volume in a fluid state along an inlet direction.

[0015] The inner liner is provided with a guide which is located substantially at a projection of the inlet direction, said guide having a shape and size adapted to guide and deflect the insulation material at introduction of the insulation material.

[0016] According to the present invention, the guide is in the shape of a groove to guide the insulation material away from the inlet opening.

[0017] The inlet opening can be provided on an inlet portion of the outer shell, said inlet portion substantially corresponding to a plane and the inlet direction is substantially perpendicular to said plane.

[0018] The guide can have a shape and size adapted to guide the insulation material substantially parallel to the inlet direction and then at least partly deflect the insulation material to at least one side direction transverse to the inlet direction.

[0019] The guide can have a shape and size adapted to guide the insulation material substantially parallel to

the inlet direction and then deflect it towards the outer shell.

[0020] The cooling appliance can have a height in the inlet direction, and the guide can have a projection of length on the inlet direction; wherein the ratio (L:h) of the projection of length (L) of the guide to the height (h) on the inlet direction (D) is equal or less than 5:10.

[0021] The cooling appliance can comprise a freezing compartment at a distal portion of the cooling appliance relative to the inlet opening.

[0022] The insulation volume can be substantially filled with an insulating foam formed from the insulation material fed in fluid state. The insulating foam can comprise polyurethane.

Brief description of the figures

[0023] The accompanying drawings are given solely for the purpose of exemplifying the invention whose advantages over prior art were outlined above and will be explained in detail hereinafter:

Figure 1 shows a cross section of an exemplary prior art cooling appliance, emphasizing the vicinity (A) of its fluid inlet.

Figure 2 is detail from the Fig.1 showing the vicinity (A) around the fluid inlet and blockage of fluid flow by the inner liner of the prior art cooling appliance.

Figure 3 is a perspective view of an exemplary cooling appliance according to the present invention, wherein the inlet direction is emphasized.

Figure 4 is perspective view of the inner liner in a cooling appliance according to the present invention, wherein the vicinity (E) around an exemplary guide formed thereon is emphasized.

Figure 5 is detail from the Fig.4 showing the vicinity (E) around the guide.

Detailed description of the invention

[0024] Referring to the figures summarized above, the present invention proposes a cooling appliance (100) comprising an inner liner (10) for defining at least one wall of a storage cabinet (15) of the cooling appliance, the inner liner being substantially surrounding by an outer shell (20), an insulation volume (30) between the inner liner (10) and the outer shell (20) for receiving an insulation material, and an inlet opening (40) on the outer shell (20) for introduction of an insulation material into the insulation volume (30) in a fluid state along an inlet direction (D).

[0025] In the cooling appliance according to the present invention, the inner liner (10) is provided with a guide (50) which is located substantially at a projection of the inlet direction (D), said guide (50) having a shape and size adapted to guide and deflect the insulation material at said introduction.

[0026] Such guide (50) provides a better solution to the problem of poor distribution of insulation material, when compared to simply increasing the distance of between the inner liner (10) and the outer shell (20) along a full height (h) of the cooling appliance (100), which would result in decreased volume of cooling compartment (15) and/or freezing compartment (16). The guide (50) allows a maximized volume in a compartment (i.e. the cooling compartment (15) or freezing compartment (16)) in vicinity of the inlet opening, without compromising the improved distribution of insulation material throughout the insulation volume (30).

[0027] In case where the cooling appliance (100) is of top-freezer type (as exemplified in the Fig.3), the present invention further eliminates sweating on outer shell portions around the freezing compartment (16), thanks to increased availability of uniformly distributed insulation material at the respective zones around the freezer (16) which are distal relative to the inlet opening (40). Accordingly, in an embodiment, the cooling appliance (100) can comprise a freezing compartment (16) at a distal portion of the cooling appliance (100) relative to the inlet opening (40), thereby the technical solution described in this section is obtained.

[0028] In an embodiment, the inlet opening (40) can be provided on an inlet portion (25) of the outer shell (20). In this case, the inlet portion (25) substantially corresponds to a plane (x/y) and the inlet direction (D) is substantially perpendicular to said plane (x/y). This provides facilitated alignment of the inlet direction (D) towards the guide (50), thereby further decreasing costs related to the production of the cooling appliance (100).

[0029] The guide (50) is a groove having a shape and size adapted to guide the insulation material away from the inlet opening (40). In other words, insulation material reaches far end of the insulation volume (30) compared to the inlet opening (40), when it is guided and deflected by the guide (50). In a further embodiment according to the present invention, the guide (50) can have a size adapted to guide the insulation material substantially parallel to the inlet direction (D) and then at least partly deflect the insulation material to at least one side direction (-x/x) transverse to the inlet direction (D). This provides a further enhanced uniformity in distribution of the insulation material in directions substantially transverse to the inlet direction (D).

[0030] The guide (50) is formed at an edge of the inner liner (10) that is substantially in a shape of a rectangle prism. The edge is the closest edge of the inner liner (10) to the inlet opening (40). The guide (50) faces the inlet opening (40), thus the insulation material introduced flows directly in the guide (50). The guide (50) lies along and/or parallel the inlet direction (D) on the inner liner (10). Then, the insulation material reaches an edge of the guide (50) and guided by the guide (50) towards the

insulation volume (30) and the outer shell (20) by an inclined form of the guide (50). It may be inclined with a slope or a face with a radius.

[0031] In a further embodiment of the cooling appliance according to the present invention, the guide (50) can have a size adapted to guide the insulation material substantially parallel to the inlet direction (D) and then deflect the insulation material towards the outer shell (20). This results in that the insulation material in the form of liquid directed to the outer shell (20) impacts thereto at a distance from the inlet opening (40) along which the insulation material is guided; and scatters in the directions parallel to the outer shell (20) at such distance, thereby further enhancing the distribution of the insulation material.

[0032] Considering that the cooling appliance (100) can have a height (h) in the inlet direction (D), and the guide can have a projection of a length (L) thereof substantially parallel to the inlet direction (D); the ratio (L:h) of the projection of length (L) of the guide to the height (h) on the inlet direction (D) is equal or less than 5:10 (e.i. 0.5). The ratio (L:h) values within this range is found to be optimal to both guiding the insulation material in the form of fluid to a sufficient distance from the inlet opening (40) to reach the distal end of the cooling appliance relative to the inlet opening. The range can further be between 0.05 and 0.06, which corresponds to further optimized values in the above described terms.

[0033] The insulation volume (30) can be substantially filled with an insulating foam formed from the insulation material fed in fluid state. The insulating foam can comprise polyurethane. The improved distribution uniformity of the insulation material further avails improvement of optical properties of the cooling appliance, by avoidance of bumps on the outer shell or inner liner, thanks to elimination of the need to excessive use of the insulation material.

[0034] Thus, the above-mentioned problems are solved, with the cooling appliance according to the present invention.

List of reference signs

[0035]

10	inner liner
11	inner liner of the prior art cooling appliance
15	storage cabinet
16	freezing compartment
17	storage cabinet of the prior art cooling appliance
18	freezing compartment of the prior art cooling appliance
20	outer shell
21	outer shell of the prior art cooling appliance
25	inlet portion
30	insulation volume
40	inlet opening
41	inlet opening of the prior art cooling appliance
50	guide
100	cooling appliance
101	prior art cooling appliance
D	inlet direction
D1	inlet direction at the prior art cooling appliance
h	height of the cooling appliance
L	length of the guide in a direction substantially parallel to the height

Claims

1. A cooling appliance (100) comprising:

- an inner liner (10) for defining at least one wall of a storage cabinet (15) of the cooling appliance, the inner liner being substantially surrounded by an outer shell (20),
- an insulation volume (30) between the inner liner (10) and the outer shell (20) for receiving an insulation material,
- and an inlet opening (40) on the outer shell (20) for introduction of an insulation material into the insulation volume (30) in a fluid state along an inlet direction (D); **wherein**

the inner liner (10) is provided with a guide (50) which is located substantially at a projection of the inlet direction (D), said guide (50) having a shape and size adapted to guide and deflect the insulation material at the introduction, and **characterised by** said guide (50) being in the shape of a groove to guide the insulation material away from the inlet opening (40).

2. The cooling appliance according to the claim 1, wherein the inlet opening (40) is provided on an inlet portion (25) of the outer shell (20), said inlet portion (25) substantially corresponding to a plane (x/y) and the inlet direction (D) is substantially perpendicular to said plane (x/y).

3. The cooling appliance according to any one of the claims 1 to 2, wherein the guide (50) has a shape and size adapted to guide the insulation material substantially parallel to the inlet direction (D) and then at least partly deflect the insulation material to at least one side direction (-x/x) transverse to the inlet direction (D).

4. The cooling appliance according to any one of the claims 1 to 3, wherein the guide (50) has a shape and size adapted to guide the insulation material substantially parallel to the inlet direction (D) and then deflect the insulation material towards the outer shell (20).

5. The cooling appliance according to any one of the claims 1 to 4, said cooling appliance (100) having a height (h) in the inlet direction (D), and the guide having a projection of length (L) on the inlet direction (D); wherein the ratio (L:h) of the projection of length (L) of the guide to the height (h) on the inlet direction (D) is equal or less than 5:10.

6. The cooling appliance according to any one of the claims 1 to 5, wherein the cooling appliance (100) comprises a freezing compartment (16) at a distal portion of the cooling appliance (100) relative to the inlet opening (40).

7. The cooling appliance according to any one of the claims 1 to 6, wherein the insulation volume (30) is substantially filled with an insulating foam formed from the insulation material fed in fluid state.

8. The cooling appliance according to the claim 7, wherein the insulating foam comprises polyurethane.

Patentansprüche

1. Kühlgerät (100), das Folgendes umfasst:

   - einen Kühlgutbehälter (10) zum Definieren mindestens einer Wand eines Aufbewahrungsfachs (15) des Kühlgeräts, wobei der Kühlgutbehälter im Wesentlichen von einem Außenmantel (20) umgeben ist,
   - ein Isoliervolumen (30) zwischen dem Kühlgutbehälter (10) und dem Außenmantel (20) zum Aufnehmen eines Isoliermaterials,
   - und eine Einlassöffnung (40) an dem Außenmantel (20) zum Einleiten eines Isoliermaterials im flüssigen Zustand in einer Einlassrichtung (D) in das Isoliervolumen (30), wobei

   der Kühlgutbehälter (10) mit einer Führung (50) versehen ist, die im Wesentlichen im Verlauf der Einlassrichtung (D) liegt, wobei die Führung (50) eine Form und Größe aufweist, die so ausgelegt ist, dass das Isoliermaterial beim Einleiten geleitet und umgeleitet wird, und **dadurch gekennzeichnet, dass** die Führung (50) die Form einer Nut aufweist und so das Isoliermaterial von der Einlassöffnung (40) weg leitet.

2. Kühlgerät nach Anspruch 1, wobei die Einlassöffnung (40) an einem Einlassabschnitt (25) des Außenmantels (20) vorgesehen ist, wobei der Einlassabschnitt (25) im Wesentlichen einer Ebene (x/y) entspricht und die Einlassrichtung (D) im Wesentlichen senkrecht zu der Ebene (x/y) verläuft.

3. Kühlgerät nach einem der Ansprüche 1 bis 2, wobei die Führung (50) eine Form und Größe aufweist, die so ausgelegt ist, dass das Isoliermaterial im Wesentlichen parallel zur Einlassrichtung (D) geleitet und dann zumindest teilweise in mindestens einer Seitenrichtung (-x/x) umgeleitet wird, die quer zur Einlassrichtung (D) verläuft.

4. Kühlgerät nach einem der Ansprüche 1 bis 3, wobei die Führung (50) eine Form und Größe aufweist, die so ausgelegt ist, dass das Isoliermaterial im Wesentlichen parallel zur Einlassrichtung (D) geleitet und dann zum Außenmantel (20) hin umgeleitet wird.

5. Kühlgerät nach einem der Ansprüche 1 bis 4, wobei das Kühlgerät (100) in Einlassrichtung (D) eine Höhe (h) und die Führung in Einlassrichtung (D) einen Verlauf der Länge (L) aufweist, wobei das Verhältnis (L:h) des Verlaufs der Länge (L) der Führung zur Höhe (h) in Einlassrichtung (D) maximal 5:10 beträgt.

6. Kühlgerät nach einem der Ansprüche 1 bis 5, wobei das Kühlgerät (100) an einem distalen Abschnitt in Bezug auf die Einlassöffnung (40) ein Gefrierfach (16) umfasst.

7. Kühlgerät nach einem der Ansprüche 1 bis 6, wobei das Isoliervolumen (30) im Wesentlichen mit einem Isolierschaum gefüllt ist, der aus dem in flüssigem Zustand eingespeisten Isoliermaterial gebildet ist.

8. Kühlgerät nach Anspruch 7, wobei der Isolierschaum Polyurethan umfasst.

Revendications

1. Appareil de refroidissement (100) comprenant :

   - un revêtement intérieur (10) pour définir au moins une paroi d'un compartiment de stockage (15) de l'appareil de refroidissement, le revêtement intérieur étant substantiellement entouré par une coque extérieure (20),
   - un volume d'isolation (30) entre le revêtement intérieur (10) et la coque extérieure (20) pour recevoir un matériau isolant,
   - et un orifice d'entrée (40) sur la coque extérieure (20) pour l'introduction d'un matériau isolant dans le volume d'isolation (30) dans un état fluide le long d'une direction d'entrée (D) ; dans lequel le revêtement intérieur (10) est doté d'un guide (50) situé substantiellement sur une projection de la direction d'entrée (D), ledit guide (50) ayant une forme et une taille adaptées afin de guider et de dévier le matériau isolant lors de l'introduction, et **caractérisé en ce que** ledit gui-

de revêt la forme d'une gorge pour guider le matériau isolant à l'écart de l'orifice d'entrée (40).

2. Appareil de refroidissement selon la revendication 1, dans lequel l'orifice d'entrée (40) est prévu sur une partie d'entrée (25) de la coque extérieure (20), ladite partie d'entrée (25) correspondant substantiellement à un plan (x/y) et la direction d'entrée (D) étant substantiellement perpendiculaire audit plan (x/y).

3. Appareil de refroidissement selon l'une quelconque des revendications 1 à 2, dans lequel le guide (50) possède une forme et une taille adaptées afin de guider le matériau isolant substantiellement parallèlement à la direction d'entrée (D) et dévie ensuite au moins partiellement le matériau isolant vers au moins une direction latérale (-x/x) transversale à la direction d'entrée (D).

4. Appareil de refroidissement selon l'une quelconque des revendications 1 à 3, dans lequel le guide (50) possède une forme et une taille adaptées afin de guider le matériau isolant substantiellement parallèlement à la direction d'entrée (D) et dévie ensuite le matériau isolant vers la coque extérieure (20).

5. Appareil de refroidissement selon l'une quelconque des revendications 1 à 4, ledit appareil de refroidissement (100) ayant une hauteur (h) dans la direction d'entrée (D) et le guide ayant une projection de longueur (L) sur la direction d'entrée (D) ; dans lequel le ratio (L:h) de la projection de longueur (L) du guide par rapport à la hauteur (h) sur la direction d'entrée (D) est égal ou inférieur à 5:10.

6. Appareil de refroidissement selon l'une quelconque des revendications 1 à 5, dans lequel l'appareil de refroidissement (100) comprend un compartiment de congélation (16) en une partie distale de l'appareil de refroidissement (100) par rapport à l'orifice d'entrée (40).

7. Appareil de refroidissement selon l'une quelconque des revendications 1 à 6, dans lequel le volume d'isolation (30) est substantiellement comblé à l'aide d'une mousse isolante formée par le matériau isolant introduit à l'état fluide.

8. Appareil de refroidissement selon la revendication 7, dans lequel la mousse isolante comprend du polyuréthane.

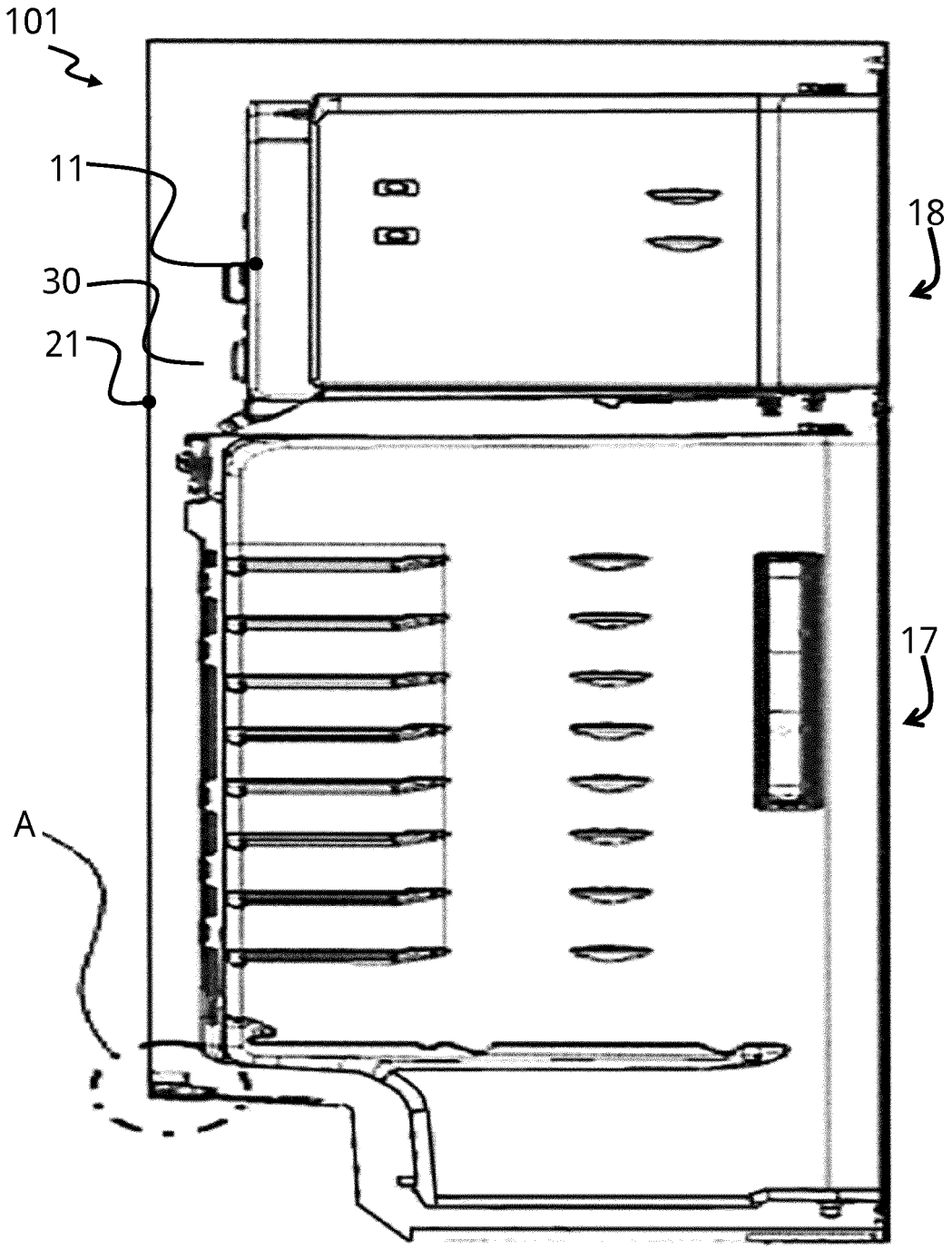

Figure 1
(prior art)

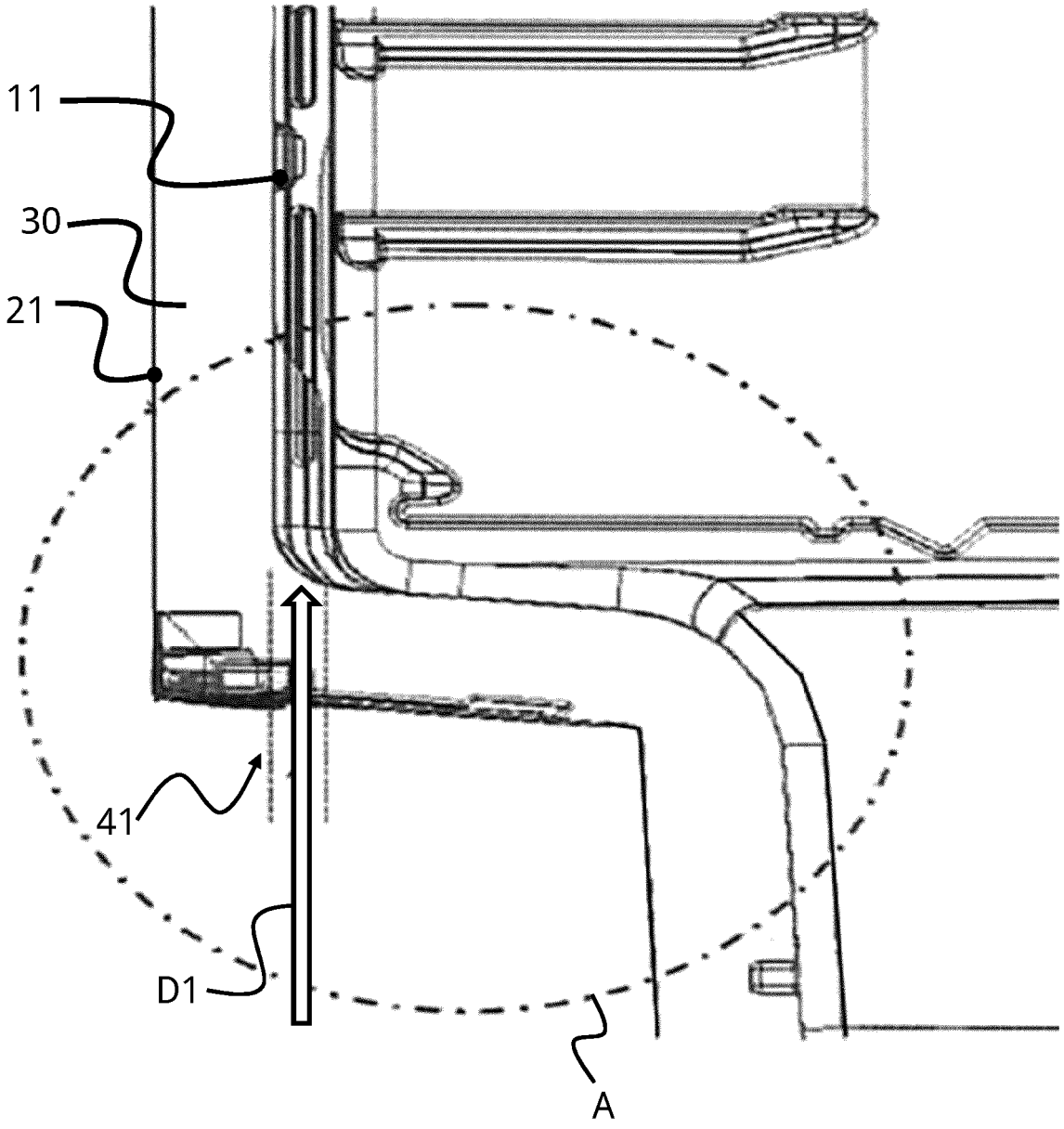

Figure 2
(prior art)

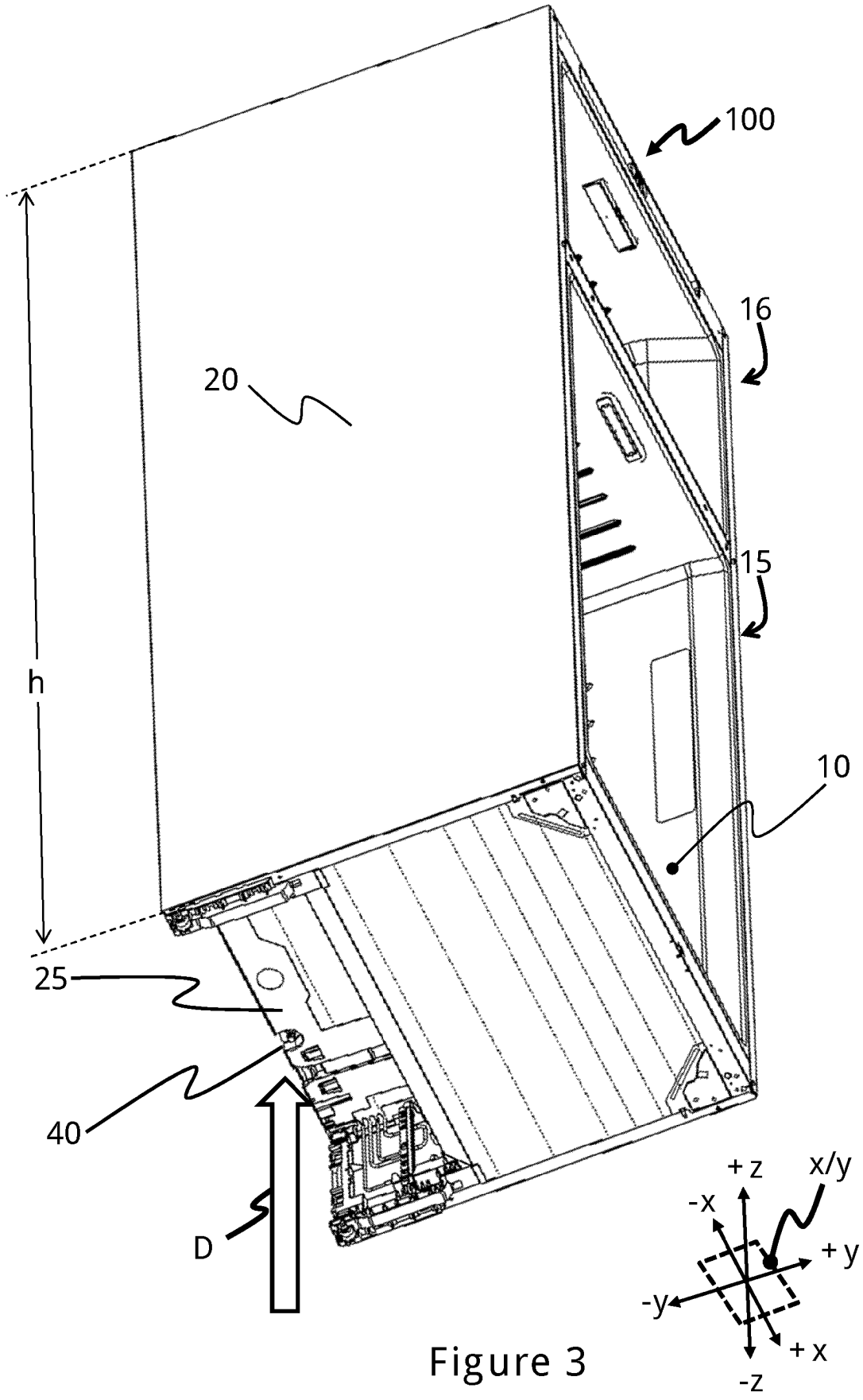

Figure 3

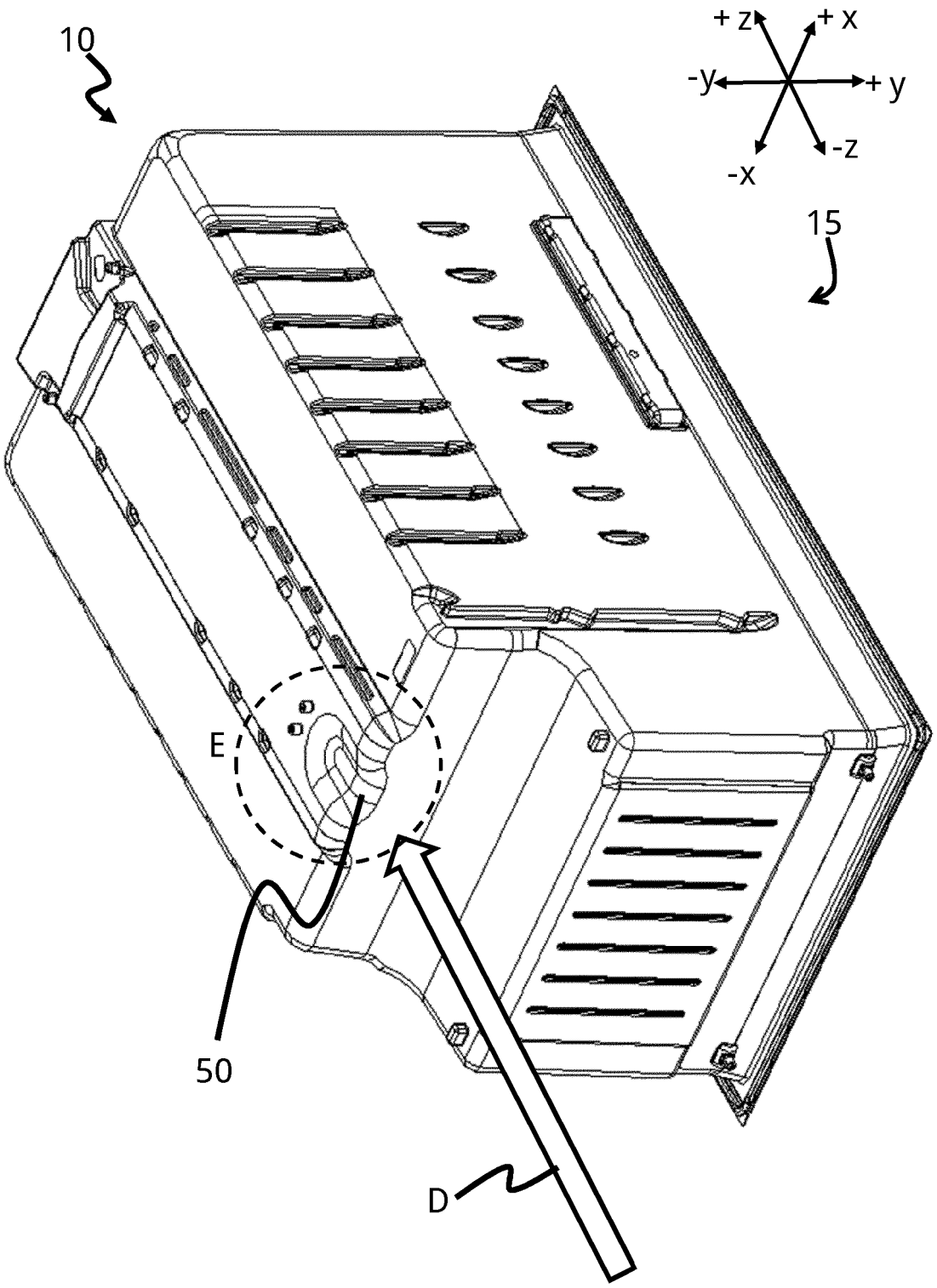

Figure 4

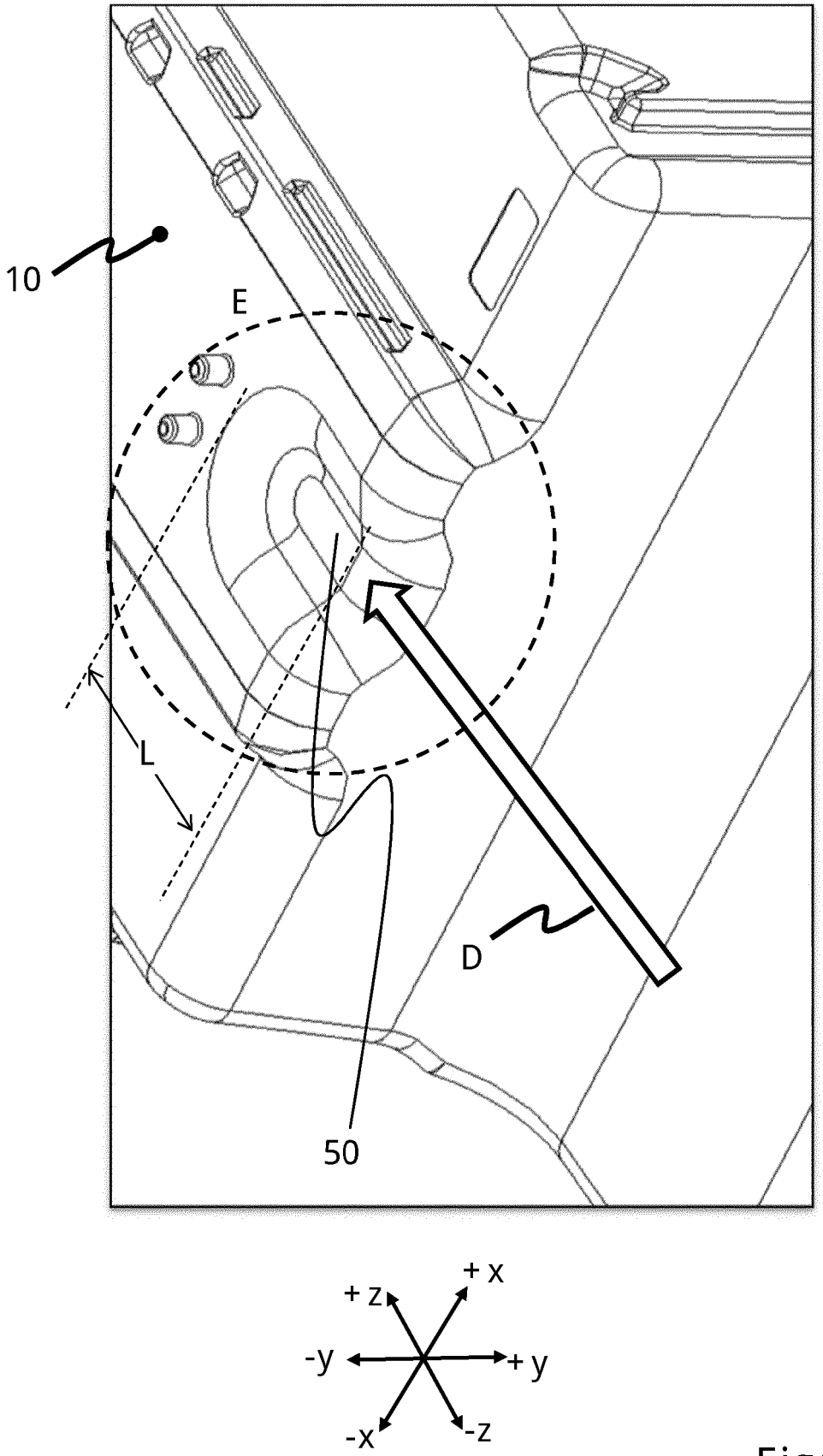

Figure 5

REFERENCES CITED IN THE DESCRIPTION

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