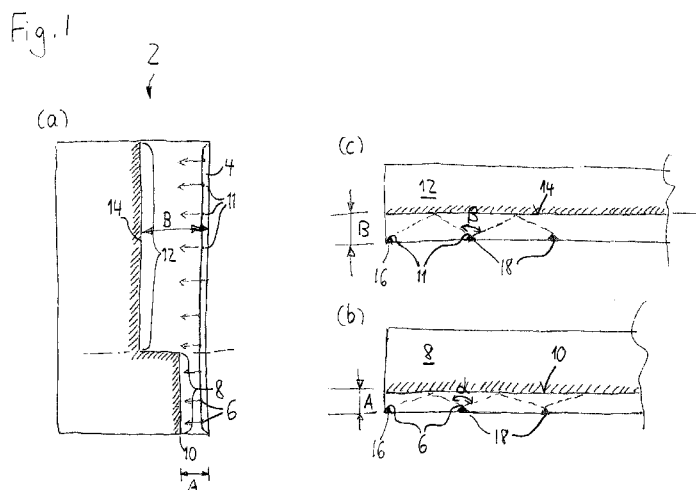




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(54) **Title:** REFRIGERATED SALES FURNITURE



(57) **Abstract:** A refrigerated sales furniture (2) comprises a refrigerated goods presentation space; at least one opening providing access to the refrigerated goods presentation space; a front frame comprising a lower beam, an upper beam, and a least a left outermost vertical beam (16) and a right outermost vertical beam; the goods presentation space comprising a lower goods presentation space area (8) extending from a rear portion of the refrigerated goods presentation space to a lower goods presentation space area front edge (40), and an upper goods presentation space area (12) extending from a rear portion of the refrigerated goods presentation space to an upper goods presentation space area front edge (14), the lower goods presentation space area front edge (10) being closer to the front frame than the upper goods presentation space area front edge (14); and at least one light unit of a first type (6) arranged at each vertical beam (16, 18) of the front frame in front of the lower goods presentation space area (8) and at least one light unit of a second type (11) arranged at each vertical beam (16, 18) of the front frame in front of the upper goods presentation space area (12), wherein the light units of the first type (11) are configured to project light rays with a wider horizontal light distribution angle range than the light units of the second type; wherein the light units of the first type (6) are arranged at the vertical beams (16, 18) such that the horizontally outermost light rays projected by respective horizontally adjacent light units (6) intersect in a plane corresponding to the lower goods presentation

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space area front edge (10) or in front of such plane, so as to illuminate the whole width of the lower goods presentation space area front edge (10); and wherein the light units of the second type (11) are arranged at the vertical beams (16, 18) such that the horizontally outermost light rays projected by respective adjacent light units (11) intersect in a plane corresponding to the upper goods presentation space area front edge (14) or in front of such plane, so as to illuminate the whole width of the upper goods presentation space area front edge (14).

Refrigerated Sales Furniture

5 The invention relates to a refrigerated sales furniture.

Conventional refrigerated sales furnitures are used to present perishable goods, particularly refrigerated or frozen goods like food, dairy products or beverages, to potential customers. Such refrigerated goods furnitures comprise a refrigerated goods presentation space with
10 shelves or racks arranged therein carrying the goods to be presented to the customers.

Mostly, an evaporator of a vapor compression cycle having an expansion device connected upstream thereof is arranged in the goods presentation space, and the air within the goods presentation space is led over the surface of the evaporator by means of one or more fans
15 in order to achieve cooling and in order to maintain the desired refrigerating or freezing temperature within the goods presentation space.

Further, the goods presentation space is often illuminated by light units, mostly light bulbs.

20 It has been discovered, that such illumination is energetically ineffective and expensive. Further, it has been discovered that consumers sometimes have difficulties in identifying goods stored in certain regions of the goods presentation space and in reading what is written on the goods or on the packaging of the goods.

25 Accordingly, it would be beneficial to provide a refrigerated sales furniture where the goods stored and presented within the refrigerated goods presentation space are illuminated such that they are well visible and readable no matter where they are situated in the refrigerated goods presentation space. At the same time, the illumination should be energy-efficient and inexpensive.

30 According to exemplary embodiments as described herein, a refrigerated sales furniture comprises a refrigerated goods presentation space; at least one opening/front opening providing access to the refrigerated goods presentation space; a front frame comprising a lower beam, an upper beam, and at least a left outermost vertical beam and a right outermost vertical beam; the goods presentation space comprising a lower goods presentation
35 space area extending from a rear portion of the refrigerated goods presentation space to a lower goods presentation space area front edge, and an upper goods presentation space

area extending from a rear portion of the refrigerated goods presentation space to an upper goods presentation space area front edge, the lower goods presentation space area front edge being closer to the front frame than the upper goods presentation space area front edge; and at least one light unit of a first type arranged at each vertical beam of the front frame in front of the lower goods presentation space area and at least one light unit of a second type arranged at each vertical beam of the front frame in front of the upper goods presentation space area, wherein the light units of the first type are configured to project light rays with a wider horizontal light distribution angle range than the light units of the second type; wherein the light units of the first type are arranged at the vertical beams such that the horizontally outermost light rays projected by respective horizontally adjacent light units intersect in a plane corresponding to the lower goods presentation space area front edge or in front of such plane, so as to illuminate the whole width of the lower goods presentation space area front edge; and wherein the light units of the second type are arranged at the vertical beams such that the horizontally outermost light rays projected by respective adjacent light units intersect in a plane corresponding to the upper goods presentation space area front edge or in front of such plane, so as to illuminate the whole width of the upper goods presentation space area front edge.

By such refrigerated sales furniture and particularly by providing at least one light unit of a first type and at least one light unit of a second type as defined in the independent claim, a uniform illumination of the whole front of the goods presentation space can be achieved and no illumination gaps occur in which goods might be difficult to identify or writings on the goods or on their packaging might be difficult to read for the customers.

Further, the refrigerated sales furniture as defined in the independent claim provides two different goods presentation space areas, namely a lower goods presentation space area and an upper goods presentation space area which can be arranged in a middle to upper portion of the refrigerated goods presentation space, and the front edge of the lower goods presentation space area is closer to the front frame than the front edge of the upper goods presentation space area. This is a type of refrigerated sales furniture which becomes more and more common. The inventors of the present subject matter have discovered that with conventional light units, particularly the goods arranged in the lower goods presentation space area and particularly the goods presented in middle portions between adjacent vertical beams of the front frame both in the lower and upper goods presentation space areas are illuminated insufficiently such that customers have difficulties identifying such goods and reading the writings on such goods or the packaging thereof.

By providing light units of the first type that project light rays with a wider horizontal light distribution angle than the light units of the second type at each vertical beam of the front frame in front of the lower goods presentation space area and particularly at positions of height corresponding to the lower goods presentation area and by providing light units of a second type that project light with a more narrow horizontal light distribution angle than the light units of the first type at each vertical beam of the front frame in front of the upper goods presentation space area, particularly at positions of height corresponding to the upper goods presentation space, these deficiencies have been remedied, a uniform illumination of the goods presented at the front edges of the lower and upper goods presentation space areas is achieved, and illumination gaps are reliably avoided.

Furthermore, the light units of the first and second types can be manufactured and installed easily and inexpensively, and they can be operated at reasonable costs and in an energy-efficient manner.

In refrigerated sales furnitures according to exemplary embodiments as described herein, one door or a pair of two doors is provided to selectively open and close the access to the goods presentation space area behind an opening formed by an upper and lower beam and two respective adjacent vertical beams, particularly the left and right outermost beams.

According to a further embodiment, the light units at the left outermost beam are arranged such that at least an area of width of the respective lower and upper goods presentation space area front edge is illuminated, the area of width extending between a left edge position substantially straightly behind the left outermost beam and a right edge position forming a horizontal middle position of the lower and upper goods presentation space area front edges between the left outermost vertical beam and the vertical beam adjacent to the right, or the area of width extending between a left edge position which is situated to the left about 1 to 10cm from a position substantially straight behind the left outermost beam and a right edge position which is situated to the right about 1 to 10cm from a position forming a horizontal middle position of the lower and upper goods presentation space area front edges between the left outermost vertical beam and the vertical beam adjacent to the right.

According to a further embodiment, the light units at the right outermost beam are arranged such that at least an area of width of the respective lower and upper goods presentation space area front edges is illuminated, the area of width extending between a right edge position substantially straight behind the right outermost beam and a left edge position forming a horizontal middle position of the lower and upper goods presentation space area

front edges between the right outermost vertical beam and the vertical beam adjacent to the left, or the area of width extending between a right edge position which is situated to the right about 1 to 10cm from a position substantially straight behind the right outermost beam and a left edge position which is situated to the left about 1 to 10cm from a position forming a horizontal middle position of the lower and upper goods presentation space area front edges between the right outermost vertical beam and the vertical beam adjacent to the left.

In these embodiments, the area of the refrigerated goods presentation space extending from the left edge to a middle position between the left outermost vertical beam and the vertical beam adjacent to the right and/or the area of the refrigerated goods presentation space extending from the right edge to a middle position between the right outermost vertical beam and the vertical beam adjacent to the left can be illuminated reliably and uniformly.

By making the area of width broader so as to achieve an overlap of illumination at the lower and upper goods presentation space area front edges with the illumination provided by the light units at the respective adjacent vertical beam, a particularly uniform illumination also in the critical middle region of the lower and upper goods presentation space area front edges can be achieved and illumination gaps can be avoided even more reliably.

According to a further embodiment, the front frame comprises at least one further vertical beam.

There are refrigerated sales furnitures having a left outermost vertical beam, a further vertical beam and a right outermost vertical beam, where no light units have to be present at the further vertical beam. In such refrigerated sales furnitures, the horizontally outermost light rays projected by the light units of the first type that are arranged at the left outermost and right outermost vertical beams intersect in a plane corresponding to the lower goods presentation space area front edge or in front of such plane, and particularly roughly behind the further vertical beam, so as to illuminate the whole width of the lower goods presentation space area front edge. Likewise, the horizontally outermost light rays projected by the light units of the second type that are arranged at the left outermost and right outermost vertical beams intersect in a plane corresponding to the upper goods presentation space area front edge or in front of such plane, and particularly roughly behind the further vertical beam, so as to illuminate the whole width of the upper goods presentation space area front edge.

Such embodiment relates to refrigerated sales furnitures of greater width, the front frames of which comprise a left outermost vertical beam, a right outermost vertical beam and one further vertical beam arranged therebetween or two or more vertical beams arranged side
5 by side therebetween.

In such refrigerated sales furnitures of greater width, one door or a pair of two doors or even more doors can be provided to selectively open and close the access to the goods presentation space area behind an opening formed by an upper and lower beam and two
10 respective adjacent vertical beams.

According to a further embodiment, at least one pair of light units of the first type is arranged at the at least one further vertical beam in front of the lower goods presentation space area and wherein at least one pair of light units of the second type is arranged at the
15 at least one further vertical beam in front of the upper goods presentation space area.

According to a further embodiment, each pair of light units comprises a left light unit and a right light unit arranged at the same height. By providing pairs of light units of the first and second types, according to this embodiment the same kind of light units of the first type
20 can be used at all the vertical beams at positions of height corresponding to the upper goods presentation space area, and likewise the same kind of light units can be used at all the vertical beams at positions of height corresponding to the lower goods presentation space area. Thereby, the number of different parts for the refrigerated sales furniture can be kept at a minimum which contributes to low costs.

25 According to a further embodiment, the left light unit of a pair of light units is arranged at the respective vertical beam such that at least an area of width of the respective lower or upper goods presentation space area front edge is illuminated, the area of width extending between a right edge position substantially straight behind the respective beam and a left edge position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge between the respective vertical beam and the vertical beam adjacent to the left, or the area of width extending between a right edge position which is situated to the right about 1 to 10cm from a position substantially straight behind the respective beam and a left edge position which is situated to the left about 1 to 10cm
30 from a position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge between the respective vertical beam and the vertical beam adjacent to the left.

According to a further embodiment, the right light unit of a pair of light units is arranged at the respective vertical beam such that at least an area of width of the respective lower or upper goods presentation space area front edge is illuminated, the area of width extending
5 between a left edge position substantially straight behind the respective beam and a right edge position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge between the respective vertical beam and the vertical beam adjacent to the right, or the area of width extending between a left edge position which is situated to the left about 1 to 10cm from a position substantially straight behind
10 the respective beam and a right edge position which is situated to the right about 1 to 10cm from a position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge between the respective vertical beam and the vertical beam adjacent to the right.

15 By arranging the light units of each pair of light units according to this embodiment a uniform illumination of the whole lower and upper goods presentation space area front edges can be achieved and illumination gaps that often occurred with conventional illumination systems especially at positions behind the vertical beams and at positions in the middle of the front edges between two laterally adjacent vertical beams can reliably be avoided. If
20 the area of width of the respective light units is such that an overlap with the area of width of the laterally adjacent light unit is achieved, an even more uniform illumination can be achieved and illumination gaps can be avoided even more reliably.

According to a further embodiment, the light units of the first type are configured to project light rays with a horizontal light distribution angle of $75 - 103^\circ$, particularly about
25 99° , and/or wherein the light units of the second type are configured to project light rays with a horizontal light distribution angle of $55 - 80^\circ$, particularly about 70° .

Such light distribution angles have been found as particularly suitable uniformly illuminating the whole lower and upper goods presentation space area front edges and for avoiding
30 illumination gaps.

According to alternative embodiments light units of third and fourth types are arranged at the at least one further vertical beam that illuminate the respective areas of width extending
35 between a left edge position forming the horizontal middle portion of the respective lower or upper goods presentation space area front edge between the respective beam and the beam adjacent to the left and a right edge position forming a horizontal middle portion

of the respective lower or upper goods presentation space area front edge between the respective beam and the vertical beam adjacent to the right. By such embodiments the number of the light units can be kept low, but at the same time a uniform illumination is achieved.

5

According to a further embodiment, the light units of the third type are configured to project light rays with a horizontal light distribution angle of $150 - 180^\circ$, particularly about 170° , and/or wherein the light units of the fourth type are configured to project light rays with a horizontal light distribution angle of $105 - 160^\circ$, particularly about 135° . Such horizontal light distribution angles have been found particularly effective for providing a uniform illumination of the lower and upper goods presentation space area front edges and for avoiding illumination gaps.

10

According to a further embodiment, the lower goods presentation space area comprises at least one lower goods presentation shelf and wherein the upper goods presentation space area comprises at least two middle and upper goods presentation shelves, and/or wherein the front edge of the lower goods presentation shelf is arranged at a horizontal distance of $50 - 500\text{mm}$, particularly 90mm from the front frame, and/or wherein the front edges of the middle and upper goods presentation shelves are arranged at a horizontal distance of $50 - 500\text{mm}$ from the front frame. A refrigerated sales furniture comprising such lower, middle and upper goods presentation shelves and having such horizontal distances between the respective front edges and the front frame can be illuminated particularly effectively while avoiding illumination gaps very reliably.

20

According to a further embodiment, respective adjacent vertical beams of the front frame are arranged at a distance of $500-2000$, particularly 1250mm . A refrigerated sales furniture having such distances between respective adjacent vertical beams of the front frame can be illuminated particularly effectively while illumination gaps can be avoided very reliably.

25

According to a further embodiment, the light units of the first and second types each comprise a light source and an optical element; and/or wherein the light units of the third and fourth types each comprise a light source and an optical element.

30

According to a further embodiment, the light sources are substantially dot-formed light sources, particularly LEDs. LEDs provide efficient illumination and have reduced energy requirements compared to conventional light bulbs. By using such an optical element, the

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light emitted by the respective light unit, particularly the respective LED, can be projected with the desired light distribution angle range.

5 According to a further embodiment, the light sources of the light units of the first and second types are formed as light sources of equal kind; and/or wherein the light units of the third and fourth types are formed as light sources of equal kind. By such embodiment, the number of different parts for the refrigerated sales furniture can be reduced further which contributes to low costs. The different light distribution angle ranges for the light units of the first and second types are achieved by providing different optical elements for the light
10 units of the first and second types.

Likewise, the light sources of the light units of the third and fourth types can be formed as light sources of equal kind to achieve a further cost reduction, and likewise in this case a different light distribution angle ranges for the light units of the third and fourth types are
15 achieved by providing different optical elements.

According to a further embodiment, the optical elements of the light units of the first and second types and, if present, of the light units of the third and fourth types are formed as one of an optical lens, an indirect reflector and an optical light distributor.
20

According to a further embodiment, a number of light units of the first type is arranged in a lower portion of each vertical beam of the front frame corresponding to the lower goods presentation space area, and wherein a number of light units of the second type is arranged in a middle to upper portion of each vertical beam of the front frame corresponding to the
25 upper goods presentation space area. By such embodiment a uniform illumination of the lower and upper goods presentation space area front edges over the full height of the refrigerated space is ensured.

According to a further embodiment, the light units of the first and/or second types are arranged at the vertical beams in rows of corresponding height, and/or wherein the light units of the first and/or second types are distributed equidistantly over the vertical height of the
30 lower and/or middle to upper portions of each vertical beam of the front frame. By such embodiment a uniform illumination of the lower and upper goods presentation space area front edges over the full height of the refrigerated space is ensured.

35 According to a further embodiment, the vertical beams are provided with receiving spaces in which the light units of the first and second types and, if present, the light units of the

third and fourth types are arranged. According to this embodiment, the respective light units are securely integrated into the vertical beams, and they do not protrude out or only protrude little out of the vertical beams.

- 5 According to a further embodiment, the refrigerated sales furniture further comprises at least one door providing access to the refrigerated goods presentation space, wherein the front frame is formed as a door frame, and wherein the at least one door is arranged in front of the door frame. By such door(s) the opening providing access to the refrigerated goods presentation space can be selectively opened or closed.

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According to a further embodiment, one door or a pair of two doors is provided between two laterally adjacent vertical beams.

- 15 As a matter of course, the light units are provided with power in a known manner, in order to emit the light and to provide the illumination as desired.

Embodiments of the invention are described in greater detail below with reference to the figures, wherein:

- 20 Fig. 1 shows a schematic side view of a first refrigerated sales furniture from the left, wherein the left side wall has been removed for better visibility (Fig. 1(a)); a schematic top view onto a detail of the first refrigerated sales furniture extending from a rear portion of the lower goods presentation space area to the plane of the door frame, wherein for better visibility the furniture ceiling, the upper goods presentation space area, the upper door frame beam, the lower door frame beam and the back of the lower goods presentation space area are omitted (Fig. 1(b));
- 25 and a top view of another detail of the first refrigerated sales furniture extending from a rear portion of the upper goods presentation space area to the plane of the door frame, wherein for better visibility the furniture ceiling, the upper door frame beam, the lower door frame beam and the back of the lower goods presentation space area are omitted (Fig. 1(c)).
- 30

- Fig. 2 shows a schematic top view onto an upper goods presentation space area of a second refrigerated sales furniture, wherein for better visibility the side walls, the rear walls, the upper and lower door frame beams, the furniture ceiling, and the lower goods presentation space area are omitted, to allow a view on the illumination situation within the refrigerated goods presentation space.
- 35

Fig. 3 shows a schematic top view onto a lower goods presentation space area of the second refrigerated sales furniture, wherein for better visibility the side walls, the rear walls, the upper and lower door frame beams, the furniture ceiling, and the upper goods presentation space area are omitted, to allow a view on the illumination situation within the refrigerated goods presentation space.

Fig. 4 shows a schematic side view onto an intermediate vertical beam of the second refrigerated sales furniture of Figs. 2 and 3 (Fig. 4(a)); a schematic horizontal sectional view through the vertical beam taken along line X-X in Fig. 4(a) (Fig. 4(b)); and a schematic horizontal sectional view through the vertical beam, taken along line Y-Y in Fig. 4(a) (Fig. 4(c)).

Fig. 5 shows a schematic side view onto an intermediate vertical beam of the second refrigerated sales furniture of Figs. 2 and 3 (Fig. 5(a)); a schematic horizontal sectional view through the vertical beam taken along line X-X in Fig. 5(a) (Fig. 5(b)); and a schematic horizontal sectional view through the vertical beam, taken along line Y-Y in Fig. 5(a) (Fig. 5(c)).

Fig. 1(a) shows a schematic side view of a first refrigerated sales furniture 2 from the left, wherein the left side wall has been removed for better visibility.

Fig. 1(b) shows a schematic top view onto a detail of the first refrigerated sales furniture 2 extending from a rear portion of the lower goods presentation space area 8 to the plane of the door frame, wherein for better visibility the furniture ceiling, the upper goods presentation space area, the upper door frame beam, the lower door frame beam and the back of the lower goods presentation space area are omitted.

Fig. 1(c) shows a top view of another detail of the first refrigerated sales furniture 2 extending from a rear portion of the upper goods presentation space area 8 to the plane of the door frame, wherein for better visibility the furniture ceiling, the upper door frame beam, the lower door frame beam and the back of the lower goods presentation space area are omitted.

The first refrigerated sales furniture 2 of Fig. 1 comprises a door frame with a left outermost vertical beam 16 (Figs. 1(b) and (c)), a number of further vertical beams 18, two of which are visible in Figs. 1(b) and (c) and a right outermost vertical beam (not shown), as

well as a lower horizontal beam extending from the left outermost to the right outermost vertical beam (not shown), and an upper horizontal beam extending from the left outermost vertical beam 16 to the right outermost vertical beam (not shown). Two respectively adjacent vertical beams define the space for a door or a pair of doors that are attached, for example via a hinge to one of the vertical beams, namely the left outermost vertical beam 16, the further vertical beams 18 and the right outermost beam (not shown), and can be opened to provide access to the refrigerated goods presentation space and closed to prevent cold air from flowing out of the refrigerated goods presentation space. The doors are not shown in Fig. 1.

Although the first refrigerated sales furniture 2 comprises doors providing access to the refrigerated goods presentation space, that are however not shown in Fig. 1, it is understood that also refrigerated sales furnitures without doors can be provided. In this case the door frame is better called front frame and the front opening(s) providing access to the refrigerated goods presentation space maintain open all the time.

In the interior of the first refrigerated sales furniture 2, a lower goods presentation space area 8 and an upper goods presentation space area 12 are provided, wherein the lower goods presentation space area 8 is smaller in height than the upper goods presentation space area 12. The lower goods presentation space area 8 extends from a rear portion of the refrigerated goods presentation space, typically a rear wall to a lower goods presentation space area front edge 10 which is at a distance A from the plane of the doorframe. The upper goods presentation space area 12 extends from a rear portion of the refrigerated goods presentation space, typically a rear wall, to an upper goods presentation space front edge 14 which is at a distance B from the vertical plane of the door frame. As can be seen in Fig. 1, front edge 10 of the lower goods presentation space 8 is closer to the door frame than the front edge 14 of the upper goods presentation space area 12.

Both in the lower and upper goods presentation space areas 8 and 12 product shelves or racks can be provided, the front edges of which extend to the lower and upper goods presentation space area front edges 10, 14, respectively, and on which goods to be presented and sold to the customers are supported.

At each vertical beam 16, 18, light units are arranged to illuminate the lower and upper goods presentation space areas 8, 12 particularly their front portions. Typically, such light units are arranged equidistantly over the entire height of the vertical beams 16, 18 and according to exemplary embodiments as described herein the light units 6 that are arranged

in front of the lower goods presentation space area 8 are of a first type and project light rays with a wider horizontal light distribution angle range than the light units of the second type 11 which are arranged in front of the upper refrigerated presentation space area 12.

5 In Fig. 1(b) it can be seen that the horizontal light distribution angle range of the light units 6 project light rays with a horizontal light distribution angle range α . Likewise, in Fig. 1(c) it can be seen that the light units 11 arranged in front of the upper goods presentation space area 12 project light with a horizontal light distribution angle range β . The horizontal light distribution angle range α of the light unit 6 arranged in front of the lower goods presentation area 10 is wider than the horizontal light distribution angle range β of the light unit 11
10 arranged in front of the upper goods presentation space area 12. In order to avoid illumination gaps at the lower and upper goods presentation space area front edges 10 and 14, α and β are such that the outermost light rays projected by a light unit 6, 11 of one vertical beam 16, 18 intersect, with the outermost light rays projected by the respective horizontally adjacent light unit, in a plane corresponding to the lower and upper goods presentation space area front edge 10, 14, respectively, or in front of such plane, so as to illuminate the
15 whole width of the lower and upper goods presentation space area front edges 10, 14.

In Fig. 1(b) it can be seen that the right outermost light ray of the light unit 6 arranged at
20 the left outermost vertical beam 16 intersects with the left outermost light ray of the horizontal light distribution angle range of the light unit 6 at the vertical beam 18 directly adjacent to the left outermost beam 16.

The same can be seen in Fig. 1(c), where the horizontal light distribution angle range β is
25 smaller than α , which is sufficient for uniformly illuminating the upper goods presentation space area front edge 14 since the distance B is greater than the distance A.

Suitable angle ranges α and β depend on the distance between adjacent vertical beams 16, 18 and particularly the distance between adjacent light units 6, 11 and on the distance between the respective goods presentation space area front edge 10, 14 to be illuminated and
30 the doorframe particularly the light units 6, 11 attached at the doorframe.

According to an embodiment of the present invention, the light units 6 and 11 are arranged in a plurality of rows at the vertical beams 16 and 18.

35 Fig. 2 shows a schematic top view onto an upper goods presentation space area 22 of a second refrigerated sales furniture 20, wherein for better visibility the side walls, the rear

walls, the upper and lower door frame beams, the furniture ceiling, and the lower goods presentation space area are omitted, to allow a view on the illumination situation within the refrigerated goods presentation space.

5 The doorframe of the second refrigerated sales furniture 20 comprises a left outermost vertical beam 28, two adjacent intermediate vertical beams 30 and a right outermost vertical beam 32 as well as the upper and lower beams which are not visible in Fig. 2. Each of the vertical beams 28, 30 and 32 is disposed equidistantly to the respective adjacent vertical beam. Pairs of doors 34 are disposed at adjacent vertical beams 28, 30 and 32.

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In the second refrigerated sales furniture 20, light units 36 of equal kind are arranged at each beam 28, 30, 32, wherein the outermost beams 28 and 32 comprise one respective light unit 36 and wherein the intermediate vertical beams 30 comprise respective pairs of light units 36.

15

All the light units 36 project light with a horizontal light distribution angle range β' , wherein β' is approximately the half of β of Fig. 1.

20

The light unit 36 at the left outermost vertical beam 28 is arranged such that it illuminates the left half of the upper goods presentation space area front edge 24 arranged behind the access portion which is defined by the double door width 26 extending between the left outermost vertical beam 28 and the intermediate vertical beam 30 adjacent to the right.

25

Likewise, the left light unit 36 of the pair of light units arranged at the intermediate vertical beam 30 adjacent to the left outermost beam 28 is arranged such that it illuminates the right half of such upper goods presentation space area front edge 24.

30

The right light unit 36 of the pair of light units arranged at the intermediate vertical beam 30 adjacent to the left outermost vertical beam 28 is arranged such that the left half of the upper goods presentation space area front edge 24 located behind the access portion defined by the double door width 26 between the two intermediate vertical beams 30 is illuminated, and so on.

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In principle, it is sufficient to achieve a uniform illumination of the upper goods presentation space area front edge 24 if the outermost light rays of two laterally adjacent light units 36 intersect in a plane corresponding to the vertical plane of the upper goods presentation space area front edge 24 or in a plane being situated in front of such plane.

By such arrangement it is made sure that the entire width of the upper goods presentation space area front edge 24 is illuminated.

5 Fig. 3 shows a schematic top view onto a lower goods presentation space area 38 of the second refrigerated sales furniture 20, wherein for better visibility the side walls, the rear walls, the upper and lower door frame beams, the furniture ceiling, and the upper goods presentation space area are omitted, to allow a view on the illumination situation within the refrigerated goods presentation space.

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According to Fig. 3, light units 42 having a broader light distribution angle range α' than the light distribution angle range β' are arranged at the lower parts of the beams 28, 30 and 32 in front of the lower goods presentation space 38, wherein α' is approximately the half of α of Fig. 1.

15

Again, the left and right outermost vertical beams 28 and 32 are equipped with one respective light unit 42 and the intermediate vertical beams 30 comprise respective pairs of light units 42.

20 Since the distance A is smaller than the distance B, the horizontal light distribution angle range of the light units 42 must be wider than that of the light units 36 in the upper part of the beams 28, 30 and 32.

25 The width of the horizontal light distribution angle ranges α'/β' necessary for illuminating the entire width of the lower and upper goods presentation space area front edges 40, 24 must be chosen such that the outermost light rays projected by respective horizontally adjacent light units 36, 42 intersect in a plane corresponding to the front edge 40 of the lower goods presentation space area 38 and, respectively, the front edge 24 of the upper goods presentation space area 22.

30

The width of such horizontal light distribution angle ranges α' and β' depend on the double door width 26 and consequently the width of the front edge to be illuminated and on the horizontal distance A and B, respectively, between the door frame/the horizontal position of the light units 36/42 and the front edge 24/40.

35

In Fig. 3, for comparison between the width of the horizontal light distribution angles α' and β' the front edge 24 of the upper goods presentation space area and the outermost light

rays projected by the light units of the upper part of the beams 28, 30 and 32 are depicted in dashed lines.

Fig. 4(a) shows a schematic side view onto an intermediate vertical beam 30 of the second refrigerated sales furniture 20; Fig. 4(b) shows a schematic horizontal sectional view through the vertical beam 30 taken along line X-X in Fig. 4(a); and Fig. 4(c) shows a schematic horizontal sectional view through the vertical beam, taken along line Y-Y in Fig. 4(a).

Fig. 5(a) shows a schematic side view onto an intermediate vertical beam 30 of the second refrigerated sales furniture 20; Fig. 5(b) shows a schematic horizontal sectional view through the vertical beam 30 taken along line X-X in Fig. 5(a); and Fig. 5(c) shows a schematic horizontal sectional view through the vertical beam, taken along line Y-Y in Fig. 5(a).

In Figs. 4(a) and 5(a), a horizontal sectional line X-X extends through an upper portion of the intermediate vertical beam 30 positioned in front of the upper goods presentations space area of the second refrigerated sales furniture 20, and likewise, a horizontal sectional line Y-Y extends through a lower part of the intermediate vertical beam 30 positioned in front of the lower goods presentation space area.

In Figs. 4(b) and 4(c), the beam profile 44 generally has a front wall and a rear wall, which is parallel to the front wall and has a smaller width than the front wall such that the width of the beam is tapering forming an oblique left side and an oblique right side. In receiving spaces on the oblique left and right sides LED modules 46 are arranged and supplied with electric power via electric wiring (not shown).

The LED modules 46 are oriented obliquely rearwards to the left in case of the left LED module 46 and to the right in case of the right LED module 46.

Referring now to Fig. 4(b), the light unit 36 is provided with two optical elements 48, which are positioned obliquely at the side walls of the beam profile 46 and directly behind the LED modules 46 such that light emitted by the LED modules are projected with a horizontal light distribution angle range β' .

For the light unit 42 depicted in Fig. 4(c), the beam profile 44 is identical and the LED module 46 is of equal kind as the LED module 46 of the light unit 36 depicted in Fig. 4(b).

However, the optical elements 50 are formed differently so as to achieve a wider horizontal light distribution angle range α' .

5 In Fig. 5, the profile of the intermediate vertical beam 30 has two different vertical sections, the lower section of which corresponding to the beam profile 44 as depicted in Figs. 4(b) and (c), and the upper section of which having a generally triangular form with a vertical front side, an oblique left rear side part and an oblique right rear side part, wherein receiving spaces for LED modules 54 are arranged in such oblique rear side parts, and wherein the LED modules 54 are inserted into such receiving spaces. The LED modules 54
10 are provided with optical elements 56 that project the light emitted by the LED modules 54 with a horizontal light distribution angle range β' . Furthermore, shielding legs 58 can be provided that prevent the consumers from being dazzled.

15 According to Fig. 4, the different light distribution angle ranges α' and β' are attained by having a beam of uniform profile, by using LED modules of equal kind, and by using different optical elements 48, 50.

20 According to Fig. 5, the different horizontal light distribution angle ranges α' and β' are achieved by the vertical beam having different profiles in its upper and lower parts, by using different LED modules 54 and 46 and by using different optical elements 56 and 50.

The optical elements 48, 50, 56 in the embodiments of Figs. 4 and 5 are formed as optical lenses. Alternatively, indirect reflectors or optical light distributors can be employed.

25 While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention is not limited to the particular embodiment disclosed,
30 but that the invention will include all embodiments falling within the scope of the appended claims.

Reference Numerals

- 2 first refrigerated sales furniture
- 5 4 vertical beam of door frame
- 6 light units with wider horizontal light distribution angle range
- 8 lower goods presentation space area
- 10 lower goods presentation space area front edge
- 11 light units with narrower horizontal light distribution angle range
- 10 12 upper goods presentation space area
- 14 upper goods presentation space area front edge
- 16 left outermost vertical beam
- 18 (intermediate) vertical beam(s)
- 20 second refrigerated sales furniture
- 15 22 upper goods presentation space area
- 24 upper goods presentation space area front edge
- 26 double door width
- 28 left outermost vertical beam
- 30 (intermediate) vertical beam(s)
- 20 32 right outermost vertical beam
- 34 doors
- 36 light unit(s)
- 38 lower goods presentation space area
- 40 lower goods presentation space area front edge
- 25 42 light units
- 44 beam profile
- 46 LED module(s)
- 48 optical element(s)
- 50 optical element(s)
- 30 52 upper beam profile
- 54 LED module(s)
- 56 optical element(s)
- 58 shielding leg
- 60 lower beam profile
- 35 A distance between lower goods presentation space area front edge and door frame
- B distance between upper goods presentation space area front edge and door frame
- α horizontal light distribution angle range

β horizontal light distribution angle range
 α' horizontal light distribution angle range
 β' horizontal light distribution angle range

CLAIMS

5

1. Refrigerated sales furniture, comprising
a refrigerated goods presentation space;
at least one opening (34) providing access to the refrigerated goods presentation
space;

10 a front frame comprising a lower beam, an upper beam, and at least a left outermost
vertical beam (28) and a right outermost vertical beam (32);

the goods presentation space comprising a lower goods presentation space area (38)
extending from a rear portion of the refrigerated goods presentation space to a lower goods
presentation space area front edge (40), and an upper goods presentation space area (22)
15 extending from a rear portion of the refrigerated goods presentation space to an upper
goods presentation space area front edge (24), the lower goods presentation space area
front edge (40) being closer to the front frame than the upper goods presentation space ar-
ea front edge (24); and

at least one light unit of a first type (42) arranged at each vertical beam (28, 32) of the
20 front frame in front of the lower goods presentation space area (38) and at least one light
unit of a second type (36) arranged at each vertical beam (28, 32) of the front frame in
front of the upper goods presentation space area (22),

wherein the light units of the first type (42) are configured to project light rays with a
wider horizontal light distribution angle range than the light units of the second type;

25 wherein the light units of the first type (42) are arranged at the vertical beams (28, 32)
such that the horizontally outermost light rays projected by respective horizontally adja-
cent light units (42) intersect in a plane corresponding to the lower goods presentation
space area front edge (40) or in front of such plane, so as to illuminate the whole width of
the lower goods presentation space area front edge (40); and

30 wherein the light units of the second type (36) are arranged at the vertical beams (28,
32) such that the horizontally outermost light rays projected by respective adjacent light
units (36) intersect in a plane corresponding to the upper goods presentation space area
front edge (24) or in front of such plane, so as to illuminate the whole width of the upper
goods presentation space area front edge (24).

35

2. Refrigerated sales furniture of claim 1,

wherein the light units (42, 36) at the left outermost beam (28) are arranged such that at least an area of width of the respective lower and upper goods presentation space area front edge (24) is illuminated,

the area of width extending between a left edge position substantially straight behind
5 the left outermost beam (28) and a right edge position forming a horizontal middle position of the lower and upper goods presentation space area front edges (40, 24) between the left outermost vertical beam (28) and the vertical beam adjacent to the right, or

the area of width extending between a left edge position which is situated to the left
10 about 1 to 10cm from a position substantially straight behind the left outermost beam (28) and a right edge position which is situated to the right about 1 to 10cm from a position forming a horizontal middle position of the lower and upper goods presentation space area front edges (40, 24) between the left outermost vertical beam (28) and the vertical beam adjacent to the right.

15 3. Refrigerated sales furniture of claim 1 or 2,

wherein the light units (42, 36) at the right outermost beam (32) are arranged such that at least an area of width of the respective lower and upper goods presentation space area front edges (40, 24) is illuminated,

the area of width extending between a right edge position substantially straightly be-
20 hind the right outermost beam (32) and a left edge position forming a horizontal middle position of the lower and upper goods presentation space area front edges (40, 24) between the right outermost vertical beam (32) and the vertical beam adjacent to the left, or

the area of width extending between a right edge position which is situated to the right
25 about 1 to 10cm from a position substantially straight behind the right outermost beam (32) and a left edge position which is situated to the left about 1 to 10cm from a position forming a horizontal middle position of the lower and upper goods presentation space area front edges (40, 24) between the right outermost vertical beam (32) and the vertical beam adjacent to the left.

30 4. Refrigerated sales furniture of any of the preceding claims,

wherein the front frame comprises at least one further vertical beam (30).

5. Refrigerated sales furniture of claim 4, wherein at least one pair of light units of the
35 first type (42) is arranged at the at least one further vertical beam (30) in front of the lower goods presentation space area (22) and wherein at least one pair of light units of the second type (36) is arranged at the at least one further vertical beam (30) in front of the upper goods presentation space area (22).

6. Refrigerated sales furniture of claim 5, wherein each pair of light units (42, 36) comprises a left light unit and a right light unit arranged at the same height.

5 7. Refrigerated sales furniture of claim 6,

wherein the left light unit of a pair of light units (42, 36) is arranged at the respective vertical beam (30) such that at least an area of width of the respective lower or upper goods presentation space area front edge (40, 24) is illuminated,

10 the area of width extending between a right edge position substantially straight behind the respective beam (30) and a left edge position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective vertical beam (30) and the vertical beam adjacent to the left, or

15 the area of width extending between a right edge position which is situated to the right about 1 to 10cm from a position substantially straight behind the respective beam (30) and a left edge position which is situated to the left about 1 to 10cm from a position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective vertical beam (30) and the vertical beam adjacent to the left.

20 8. Refrigerated sales furniture of claim 6 or 7,

wherein the right light unit of a pair of light units (42, 36) is arranged at the respective vertical beam (30) such that at least an area of width of the respective lower or upper goods presentation space area front edge (40, 24) is illuminated,

25 the area of width extending between a left edge position substantially straight behind the respective beam (30) and a right edge position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective vertical beam (30) and the vertical beam adjacent to the right, or

30 the area of width extending between a left edge position which is situated to the left about 1 to 10cm from a position substantially straight behind the respective beam (30) and a right edge position which is situated to the right about 1 to 10cm from a position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective vertical beam (30) and the vertical beam adjacent to the right.

35 9. Refrigerated sales furniture of any of the preceding claims, wherein the light units of the first type (42) are configured to project light rays with a horizontal light distribution angle of $75 - 103^\circ$, particularly about 99° , and/or wherein the light units of the second type

(42) are configured to project light rays with a horizontal light distribution angle of 55 – 80°, particularly about 70°.

10. Refrigerated sales furniture of any of claims 1 to 3,

5 wherein the front frame comprises at least one further vertical beam (18),

wherein at least one light unit of a third type (6) is arranged at the at least one further vertical beam (18) in front of the lower goods presentation space area (8) such that the horizontally outermost light rays projected by respective horizontally adjacent light units (6) intersect in a plane corresponding to the lower goods presentation space area front edge (40) or in front of such plane, so as to illuminate the whole width of the lower goods presentation space area front edge (40);

10 wherein at least one light unit of a fourth type (11) is arranged at the at least one further vertical beam (18) in front of the upper goods presentation space area (12) such that the horizontally outermost light rays projected by respective horizontally adjacent light units (11) intersect in a plane corresponding to the upper goods presentation space area front edge (24) or in front of such plane, so as to illuminate the whole width of the upper goods presentation space area front edge (24);

15 wherein the light units of the third type (6) are configured to project light rays with a wider horizontal light distribution angle range than the light units of the fourth type (11).

20

11. Refrigerated sales furniture of claim 10,

wherein the light units of the third and fourth types (6, 11) are arranged at the respective vertical beam (18) such that at least an area of width of the respective lower or upper goods presentation space area front edge (40, 24) is illuminated,

25 the area of width extending between a left edge position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective further vertical beam (18) and the vertical beam adjacent to the left and a right edge position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective further vertical beam (18) and the vertical beam adjacent to the right, or

30 the area of width extending between a left edge position which is situated to the left about 1 to 10cm from a position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge (40, 24) between the respective further vertical beam (18) and the vertical beam adjacent to the left and a right edge position which is situated to the right about 1 to 10cm from a position forming a horizontal middle position of the respective lower or upper goods presentation space area front edge

35

(40, 24) between the respective further vertical beam (18) and the vertical beam adjacent to the right.

12. Refrigerated sales furniture of claim 10 or 11, wherein the light units of the third type
5 (6) are configured to project light rays with a horizontal light distribution angle of 150 – 180°, particularly about 170°, and/or wherein the light units of the fourth type (11) are configured to project light rays with a horizontal light distribution angle of 105 – 160°, particularly about 135°.

10 13. Refrigerated sales furniture of any of the preceding claims, wherein the lower goods presentation space area comprises at least one lower goods presentation shelf and wherein the upper goods presentation space area comprises at least two middle and upper goods presentation shelves, and/or wherein the front edge of the lower goods presentation shelf is arranged at a horizontal distance of 50 – 250mm, particularly 90mm from the front frame,
15 and/or wherein the front edges of the middle and upper goods presentation shelves are arranged at a horizontal distance of 500 – 500mm from the front frame.

14. Refrigerated sales furniture of any of the preceding claims, wherein respective adjacent vertical beams (28, 30, 32) of the front frame are arranged at a distance of 500 -
20 2000mm, particularly 1250mm.

15. Refrigerated sales furniture of any of the preceding claims, wherein the light units of the first and second types (42, 36) each comprise a light source (46) and an optical element (48, 50); and/or wherein the light units of the third and fourth types each comprise a light
25 source and an optical element.

16. Refrigerated sales furniture of any of the preceding claims, wherein the light sources are substantially dot-formed light sources, particularly LEDs.

30 17. Refrigerated sales furniture of claim 15 or 16, wherein the light sources of the light units of the first and second types (42, 36) are formed as light sources of equal kind; and/or wherein the light units of the third and fourth types are formed as light sources of equal kind.

35 18. Refrigerated sales furniture of any of claims 15 to 17, wherein the optical elements (48, 50) of the light units of the first and second types (42, 36) and, if present, of the light

units of the third and fourth types are formed as one of an optical lens, an indirect reflector and an optical light distributor.

19. Refrigerated sales furniture of any of the preceding claims, wherein a number of light units of the first type (42) is arranged in a lower portion of each vertical beam (28, 30, 32) of the front frame corresponding to the lower goods presentation space area (38), and wherein a number of light units of the second type (42) is arranged in a middle to upper portion of each vertical beam (28, 30, 32) of the front frame corresponding to the upper goods presentation space area (22).

10

20. Refrigerated sales furniture of claim 19, wherein the light units of the first and/or second types (42, 36) are arranged at the vertical beams (28, 30, 32) in rows of corresponding height, and/or wherein the light units of the first and/or second types (42, 36) are distributed equidistantly over the vertical height of the lower and/or middle to upper portions of each vertical beam (28, 30, 32) of the front frame.

15

21. Refrigerated sales furniture of any of the preceding claims, wherein the vertical beams (28, 30, 32) are provided with receiving spaces in which the light units of the first and second types (42, 36) and, if present, the light units of the third and fourth types are arranged.

20

22. Refrigerated sales furniture of any of the preceding claims,
further comprising at least one door (34) providing access to the refrigerated goods presentation space,

25

wherein the front frame is formed as a door frame, and
wherein the at least one door (34) is arranged in front of the door frame.

23. Refrigerated sales furniture of claim 22, wherein one door or a pair of two doors (34) is provided between two laterally adjacent vertical beams (28, 30, 32).

Fig. 1
Z ↓

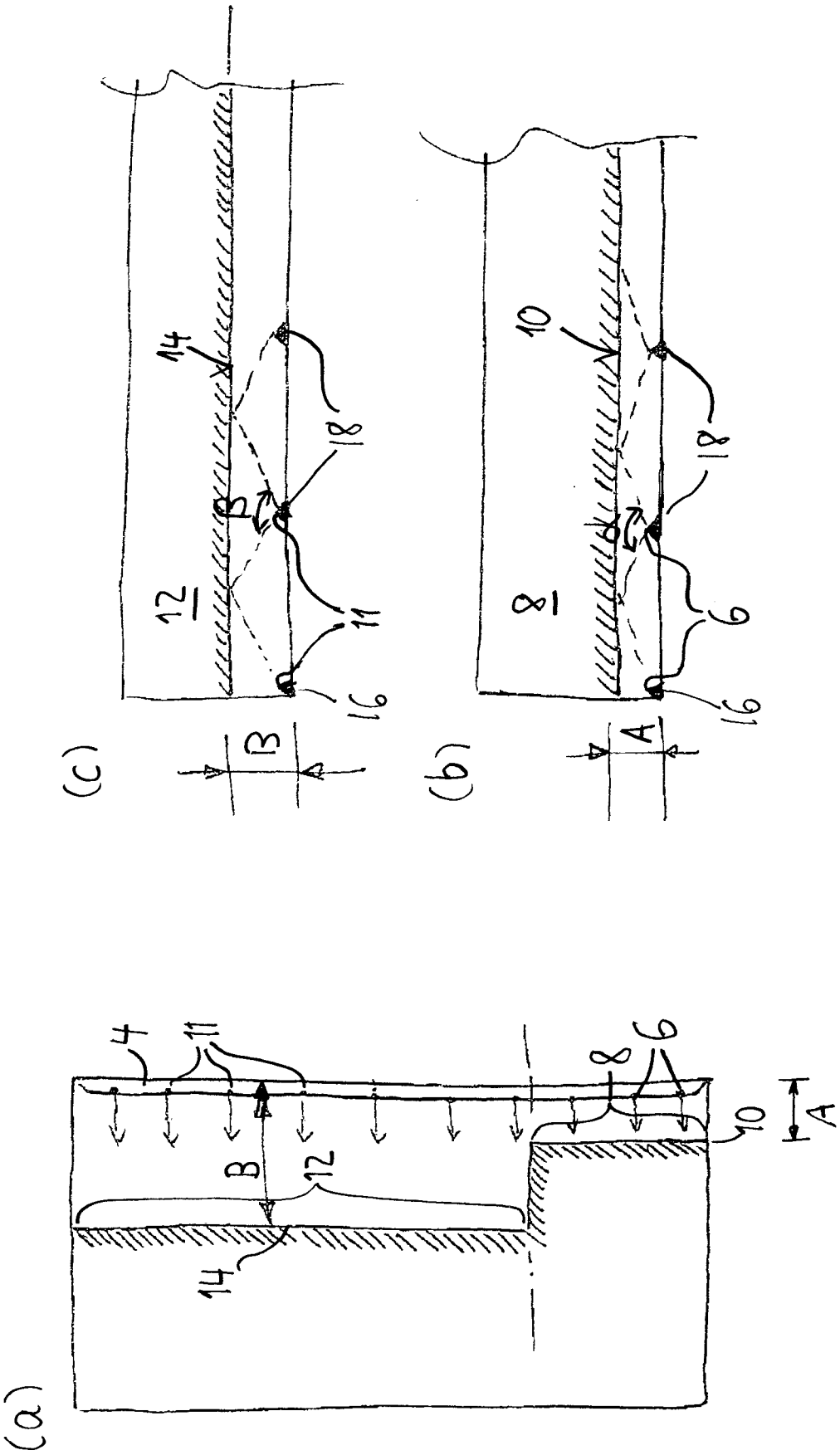


Fig. 3
20

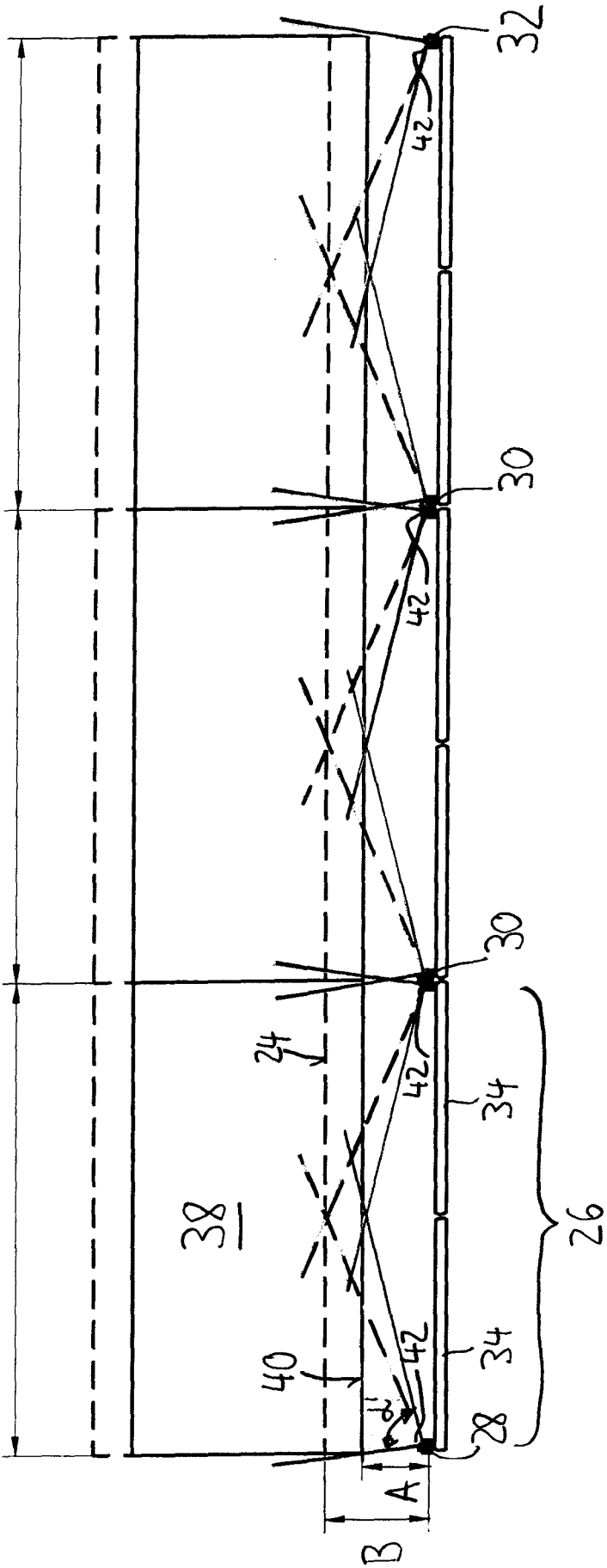


Fig. 4

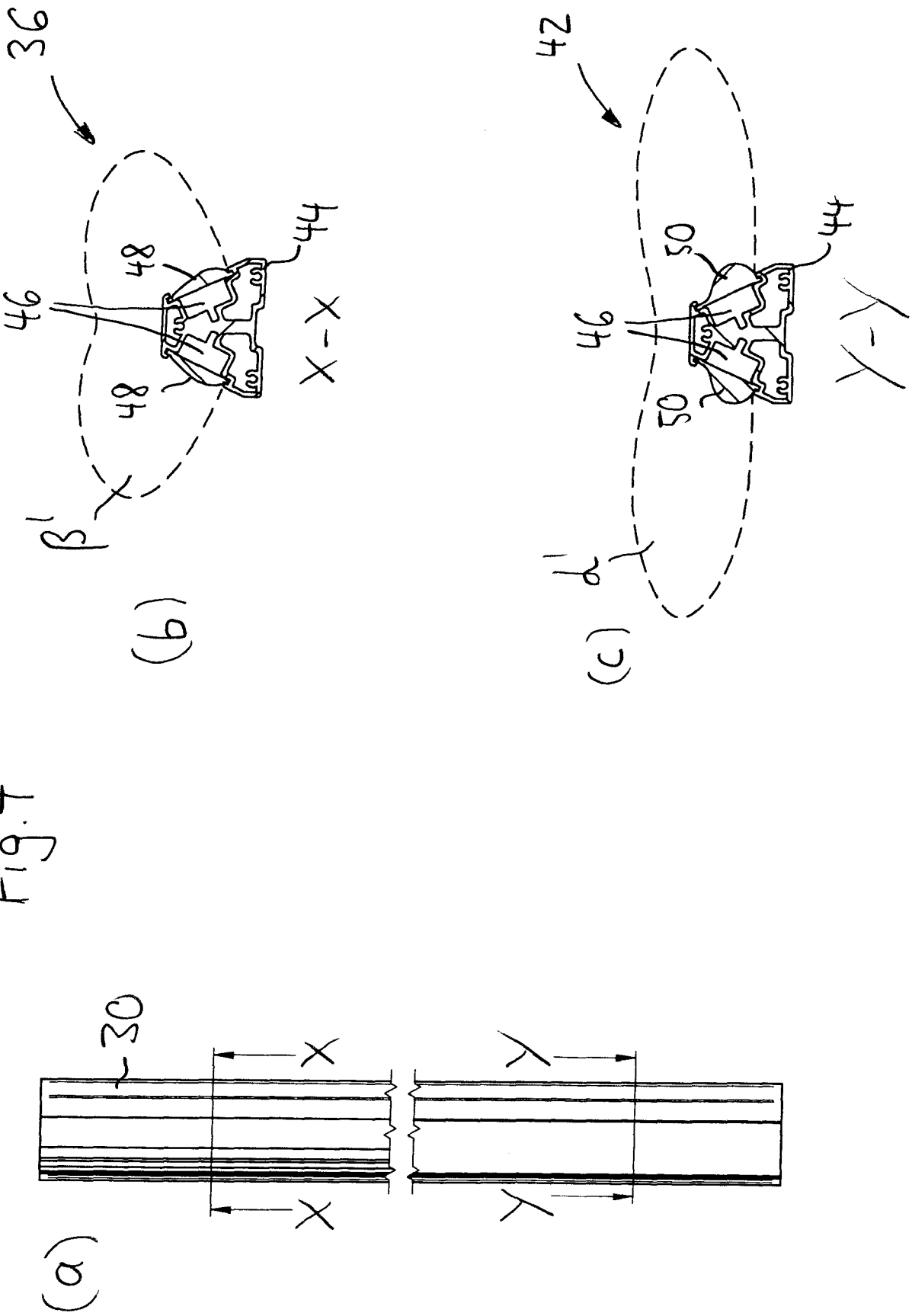
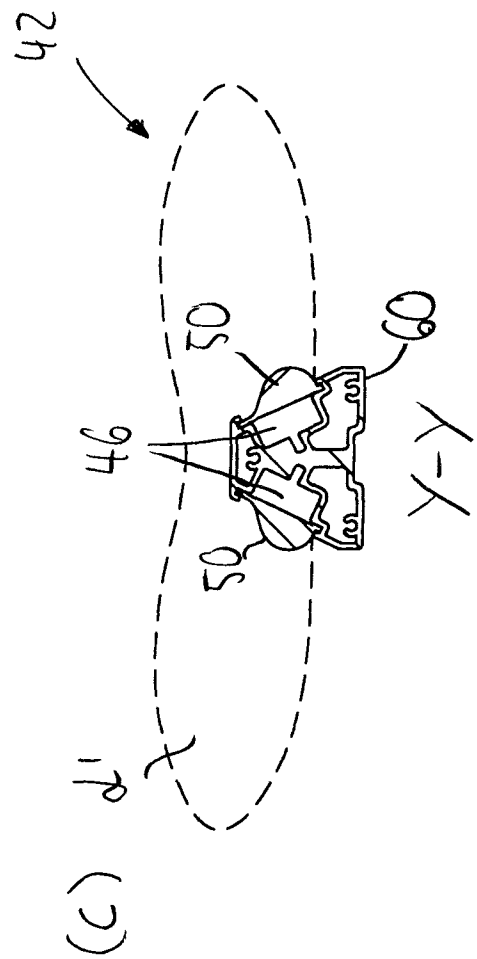
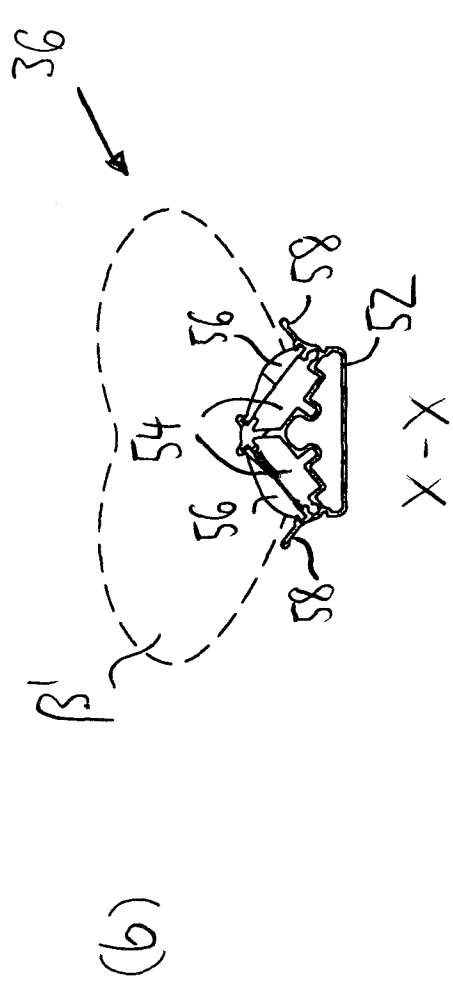
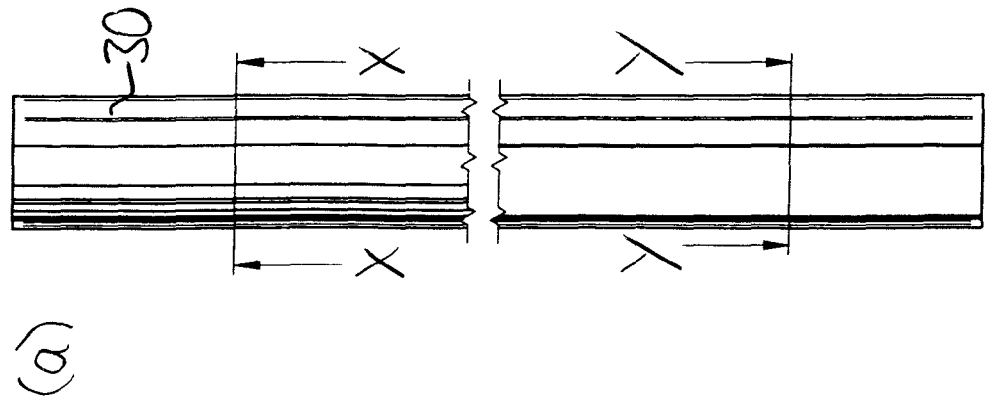


Fig.5



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/079216

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47F11/10

ADD. A47F3/04 F21W131/405

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47F F21W F21Y F21V

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 092 859 A1 (EPTA S P A [IT]) 26 August 2009 (2009-08-26)	1,10, 13-23
A	paragraphs [0081], [0090], [0164]; figures 1-5	6-8
Y	US 1 807 332 A (ABRAHAMSON,W.) 26 May 1931 (1931-05-26)	1-5, 9-15, 17-23
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A	WO 2008/047335 A1 (NUALIGHT LTD [IE]; KELLY WILLIAM [IE]; O'SHAUGHNESSY PAUL [IE]; BOUCHI) 24 April 2008 (2008-04-24) figure 13	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

12 August 2015

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/079216

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