



(43) International Publication Date
22 December 2016 (22.12.2016)

(51) International Patent Classification:
H02G 3/04 (2006.01)

(21) International Application Number:
PCT/DK2016/050183

(22) International Filing Date:
14 June 2016 (14.06.2016)

(25) Filing Language: Danish

(26) Publication Language: English

(30) Priority Data:
PA 2015 70368 15 June 2015 (15.06.2015) DK

(71) Applicant: SILTEC A/S [DK/DK]; Funder Kirkevej 7,
8600 Silkeborg (DK).

(72) Inventor: GASBJERG, Frank Hviid; Niels Ebbesens Vej
15, 8660 Skanderborg (DK).

(74) Agent: PATRADE A/S; Fredens Torv 3A, 8000 Aarhus C
(DK).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- with amended claims (Art. 19(1))

(54) Title: CABLE TRAY

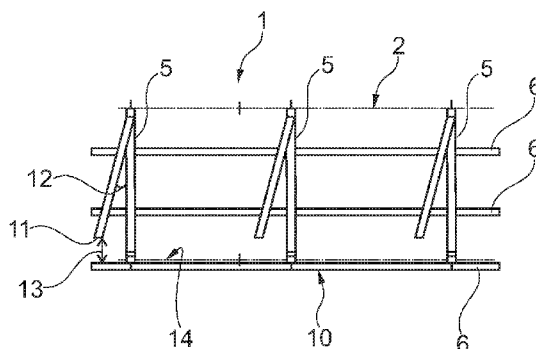


Fig. 6

(57) **Abstract:** There is disclosed a cable tray for carrying cables and hoses and of the type made of wire material with a number of juxtaposed U-bent wires and longitudinal wires fastened thereto such that a bottom and side walls for the cable tray are formed. The bottom is narrower in dimension than the height of the sidewalls such that cables can be stacked upon each other in the cable tray. The wires in a first sidewall are longer than the wires in a second sidewall and extend past the extension of the wires in a second sidewall. The wires in the first sidewall have an end section which is bent across the cable tray in direction towards and over the outer ends of the wires in the second sidewall of the cable tray. The longitudinal wires are only fastened to the wires in the first sidewall and possibly also to the end sections. The wire sections in the second side wall can thus be bent individually out of and into a plane perpendicular to the longitudinal direction of the cable tray. An opening between the outermost wire ends can hereby be increased or reduced in order to facilitate insertion of cables and prevent the cables from inadvertently being pressed out of the cable tray.



CABLE TRAY

Field of the Invention

The present invention concerns a cable tray for carrying cables or hoses and of the type made of wire material with a number of juxtaposed U-bent wires and longitudinal
5 wires fastened thereto such that a bottom and side walls for the cable tray are formed.

The sidewalls will extend in substantially parallel planes disposed about perpendicularly relative to a plane for the bottom of the cable tray. The wire elements in the sidewalls are largely rectilinear, and the wire parts in the bottom can be curving
10 as the bottom may have a curving shape. The bottom can be approximately semi-circular in shape and have a radius of curvature corresponding to half the distance between the two sidewalls.

Cable trays are typically used for fastening cables, tubes and/or hoses. In the present
15 description, such elements are said to be cables.

Background of the Invention

Cable trays are rectangular modules comprising a bottom and two side walls at the longitudinal sides of the bottom. The planes of the side walls are normally substantially at right angles to the plane of the bottom, though other angles between
20 bottom and side walls are possible as well.

It is known with cable trays made of wire material with U-bent wires and longitudinal wires fastened thereto at the bottom and the sides.

25 The cable trays are fastened to machines, buildings or other bases where there is a need for establishing an orderly cabling. Cable trays are mounted on the base and most often with several cable trays in continuation of each other. Mounting is effected by means of fittings, support holders or similar that are fastened to the base.

30 By vertical mounting on a vertical base, e.g. a wall or a machine frame, the sidewalls of the cable trays in the narrow cable trays will run substantially in parallel with the

plane of the base. Narrow cable trays can also be mounted on substantially vertical or inclining bases, e.g. inclining walls or ceilings.

5 Cable trays will often have a relatively wide bottom and relatively low sidewalls. In such wide cable trays the cables are arranged side by side and possibly in several layers. Typically, the cables have such a small diameter that up to 5-10 cables can be disposed side by side.

10 It is also known with narrow cable trays where the bottom is relatively narrow and the sidewalls are relatively high. In such cable trays cables are arranged typically in several layers upon each other, with a few or no cables disposed side by side. Cables in such cable trays typically have a diameter which is slightly less than the spacing between the two sidewalls such that two cables typically cannot be disposed side by side.

15 The cables can either be laid loosely in the cable trays or they can be fastened to the cable tray by common fastening means, e.g. fittings, cable ties or similar means for cables, hoses and/or tubes.

20 In cable trays of wire it is therefore easy to fasten the cables with suitable spacing for selected wires in the cable tray.

25 Since time is used when mounting and replacing cables for fastening them to the cable trays, it is desired that they can be provided loosely in the cable trays. However, this is difficult with cable trays at sites where cleaning is required. Cleaning of cable trays and cables provided therein is typically effected by high-pressure flushing. This may provide the risk that the cables are brought in disorder and even pressed completely out of the cable trays if they are not fastened to the cable trays.

30 For the sake cleaning it is preferred in some installations to use narrow cable trays as dust accumulation is minimised when the cables are stacked upon each other.

When the cable trays are mounted with the cables stacked upon each other in vertical direction, it is normal to use narrow cable trays. If it is desired that the cables are to

appear in an orderly fashion with disposition and without risk of being pressed out of the cable trays by cleaning, it is necessary to fasten the cables to the tray in order to ensure that they remain in the cable trays.

- 5 There is a need for establishing narrow cable trays of wire where the cables are provided largely one by one upon each other, and where there is no need for fastening the cables to the wires in order to provide easy placing and replacement of the cables, and where there is no risk of the cables being pressed out of the cable trays during cleaning.

10 **Object of the Invention**

It is the object of the invention to provide a cable tray that fulfils this need.

Also, it is the object of the invention to provide a cable tray which can be made based on existing techniques for making cable trays of wire.

15

Moreover, it is the object of the invention to provide a cable tray which is easy to clean by high-pressure flushing without the risk that the cables are pressed out of the cable tray.

Description of the Invention

- 20 These objects of the invention are achieved by a cable tray of the kind indicated in the introduction, which is peculiar in that the bottom has a dimension in width that is less than the height of the sidewalls such that cables can be stacked upon each other in the cable tray, that the wires in a first sidewall are longer than the wires in the second sidewall, extending past the extension of the wires in a second sidewall, that the wires
- 25 in the first sidewall have an end section which is bent across the cable tray in direction towards and over the outer ends of the wires in the second sidewall of the cable tray, that the longitudinal wires are only fastened to the wires in the first sidewall and possibly also to the end sections, that each of the juxtaposed wires is adapted such that a wire section in the first sidewall and a wire section in the second sidewall in a
- 30 situation with cables or hoses provided in the cable tray can be disposed in a plane perpendicular to the longitudinal direction of the cable tray, and that the wire in the second sidewall, when cables or hoses are to be placed in the cable tray, are bent in direction away from the wire in the first sidewall by bending in direction out of the

plane perpendicular to the longitudinal direction of the cable tray, or by an outwardly directed bending in the plane perpendicular to the longitudinal direction of the cable tray.

- 5 The U-shaped wires forming the sidewalls are disposed in a plane perpendicular to the longitudinal direction of the cable tray, and juxtaposed wire sections in the legs of the U form the sidewalls and are disposed in two parallel planes extending in longitudinal direction of the cable tray in a situation with cables or hoses provided in the cable tray.

10

Since the wires in the second sidewall are not mutually fastened to the longitudinal wires it is possible to bend these wire sections from a position in a plane perpendicular to the longitudinal direction of the cable tray out of this plane so that a distance is created between these two outermost wire ends, the distance being greater than the distance when both wire sections are provided in the plane perpendicular to the longitudinal direction. Cables can hereby easily be inserted in the cable tray. The wires are made with such bending resistance that the bending can be performed by a fitter without use of tools. The wires may alternatively be made of a stronger wire quality such that the bending is to be performed with a tool.

20

When the wire section has been bent into the plane perpendicular to the longitudinal direction of the cable tray and into the plane forming the sidewall, the distance between the two wire ends is reduced. By suitable dimensioning is achieved that the distance becomes so small that cables cannot pass through irrespectively if they are pressed against the opening between the two outermost wire ends by cleaning with high-pressure equipment.

25

- As alternative to bending in direction out of the plane perpendicular to the longitudinal direction of the cable tray, an outwards directed bending in the plane perpendicular to the longitudinal direction of the cable tray can be performed. It is only to be ensured that a larger opening can be established that subsequently can be reduced by bending the wire section into the plane perpendicular to the longitudinal direction of the cable tray.

30

5 The cable trays can therefore be said to be designed with a safeguard that secures the cables inside the cable tray. This safeguard allows the cables to be laid down into the tray in an easy way and such that they cannot fall out of the tray under cleaning, for example if they are flushed with a water jet, e.g. from a high-pressure cleaner, directed from below and upwards against the cables.

10 According to a further embodiment, the cable tray according to the invention is thus peculiar in that the wire is made of stainless steel. This is particularly suited for cable trays that are to be cleaned. e.g. by flushing with water jet, for example from a high-pressure cleaner.

15 The spacing between the two sidewalls will preferably correspond to the diameter of the cables to be carried in the cable tray. The cables will hereby lie in an orderly stacked way upon each other. The amount of dust appearing on the cables is hereby reduced.

20 The cable tray is normally made of metal wires, including particularly corrosion-proof materials of e.g. steel, steel alloys such as AISI 316 or 304, and/or hot- or electro-galvanised steel, aluminium, aluminium alloys, or similar cleaning-friendly materials. Cleaning-friendly cable trays are achieved thereby, and since the cable trays are made of wire it is also possible to clean the cables mounted in the trays without needing to disassemble the cable trays. It is thereby possible to use the cable trays in conditions where frequent cleaning is required, e.g. due to official requirements such as in pharmaceutical industry and food industry, including slaughterhouses.

25 The wires in the cable tray are soldered or welded together in the points of contact where two wires are crossing each other. However, it is also possible to make the cable tray of wires of dimensionally stable plastic which is welded or glued together.

30 According to a further embodiment, the cable tray is peculiar in that the wire thickness is typically 2 - 25 mm.

35 The wire thickness is typically 2-24 mm, depending on the size of the cable tray and desired load capacity for the cable tray and thereby the weight to be carried by the cable tray. The longitudinal wires will usually have a greater diameter than the U-bent wires.

However, it is important that the wires used for forming the sidewalls in the second sidewall have a thickness and material properties that enable easy bending. Such bending can advantageously be performed manually and without use of tools. However, it may also be done by means of tools.

5

According to a further embodiment, the cable tray is peculiar in that the wire thickness is 3 mm, and that the wire has a tensile strength of 840-900 N/mm².

10 A suitable material for the U-shaped wires for forming the sidewall is wire of stainless steel of Ø3 mm and a tensile strength of 840-900 N/mm². Such a wire can be bent manually without use of tools and will be dimensionally stable in bent condition. It is preferred to use longitudinal wires having greater diameter, typically Ø4 mm, together with the former.

15 By delivering and mounting cable trays, they will usually be made with the wires in bent out condition so as to be ready for laying cables in the cable trays.

20 According to a particular embodiment, the cable tray is peculiar in that a longitudinal wire is fastened to the outermost part of the end sections in the first sidewall. The end sections located above the cable tray hereby appear dimensionally stable, and there is no risk of cables being inserted between juxtaposed end sections. The longitudinal wire will preferably be fastened at the side of the wire facing away from the cable tray.

25 According to a further embodiment, the cable tray is peculiar in that the wire in the second sidewall is bent in direction away from the wire in the first sidewall by bending in direction out of the plane perpendicular to the longitudinal direction of the cable tray, or by an outwardly directed bending in the plane perpendicular to the longitudinal direction of the cable tray.

30

According to a further embodiment, the cable tray is peculiar in that the wire in the second sidewall is bent at an angle between 10 and 25°, preferably between 13 and 17°. This will provide that a spacing can be established between the two outermost wire ends, providing easy access for laying cables in the cable tray and subsequently
35 for ensuring that the cables are retained in the cable tray.

According to a further embodiment, the cable tray is peculiar in that the spacing between the two outermost wire ends with the U-bent wire disposed in a plane perpendicular to the longitudinal direction of the cable tray is less than the spacing between the two sidewalls. A cable typically with a diameter corresponding to the distance between the two sidewalls may therefore not inadvertently be pressed out of the cable tray.

According to a further embodiment, the cable tray is peculiar in that the spacing between the two outermost wire ends with the end section of the U-bent wire in the second sidewall disposed outside the plane perpendicular to the longitudinal direction of the cable tray is greater than the spacing between the two sidewalls. A cable typically having a diameter corresponding to the distance between the two sidewalls may therefore easily be passed through the opening and placed in the cable tray.

According to a further embodiment, the cable tray is peculiar in that the spacing between the two sidewalls is between 7 and 20 mm, preferably between 7 and 12 mm. The width is, as mentioned, adapted to the diameter of the cable to be placed in the cable tray such that the cables are stacked upon each other.

According to a further embodiment, the cable tray is peculiar in that the height of a cable tray is between 70 and 120 mm. These are suitable dimensions for a large part of the cable trays used for carrying signal and power cables.

If the height of the cable tray is 84 mm and the spacing between the two sidewalls is 7.5 mm, the wires in the end section of the first sidewall bent across the cable tray in direction against and over the outer ends of the wires in the second sidewall of the cable tray will be disposed about 12 mm below the outer wire ends in the second sidewall. This is achieved by bending the wires in the second sidewall in an angle of about 15°.

The distance between the U-bent wires will typically be 60 – 100 mm. The distance is preferably between 70 and 90 mm.

Description of the Drawing

The invention will now be explained below with reference to the drawing, where:

- Fig. 1 shows a cable tray according to the invention as seen from above;
- 5 Fig. 2 shows the cable tray of Fig. 1 as seen from the side;
- Fig. 3 shows the cable tray of Figs. 1 and 2 in perspective view;
- Fig. 4 shows a side view of the cable tray of Fig. 1;
- Fig. 5 is an enlarged view of Fig. 4;
- Fig. 6 shows an enlarged detail of the cable tray shown in Fig. 2;
- 10 Fig. 7 is a schematic end view of a cable tray according to the invention with cables provided therein;
- Fig. 8 shows a partial view of a cable tray according to the invention with the wire in the second sidewall bent out of a plane perpendicular to the longitudinal direction of the cable tray; and
- 15 Fig. 9 shows a partial view of the cable tray in Fig. 8 with the wire in the second sidewall disposed in a plane perpendicular to the longitudinal direction of the cable tray.

Detailed Description of Embodiments of the Invention

Figs. 1-5 show different views and details of a cable tray 1 according to the invention.

20

In the following explanation, identical or corresponding products in various Figures are denoted with the same reference number, and therefore no specific explanation will therefore be given to the details in connection with each Figure.

- 25 In the Figures appears a cable tray 1 made of wire material. The cable tray 1 has a bottom 2 and a first sidewall 3 and a second sidewall 4. The bottom 4 is curved and is approximately in the form of a semi-circle. However, it may also appear with a curving shape such that the bottom is approximately plane. The sidewalls 3, 4 and the bottom 2 are formed by a series of juxtaposed U-bent wires 5. The juxtaposed U-
- 30 shaped wires 5 are mutually attached to the longitudinal wires 6 running longitudinally 7 of the cable tray 1.

The bottom of the cable tray has a width 8 which is substantially narrower in size than the height 9 of the sidewalls 3, 4. It appears that the wire in the first sidewall 3 is longer than the wire in the second sidewall 4. Thus there is a wire section 10 extending past the extension of the wires in the second sidewall 4. The wire section 10 is bent across outer ends 11 of the wires in the second sidewall 4 of the cable tray.

It appears that the U-bent wires 5 are only fastened to the longitudinal wires 6 at the first sidewall 3 and the bent end section 10.

The wires in the second sidewall 4 can therefore be bent individually in an angle 12 such as it clearly appears in Fig. 6.

Hereby an opening 13 appears between the outer ends 11 of the wires in the second sidewall and the bottom side 14 of the bent end section 10. The opening 13 will have a size greater than the width 8 of the bottom. At the same time, the width 8 of the bottom 2 will correspond to the distance between two parallel planes containing the wires of the sidewalls.

As it clearly appears on Fig. 5, a longitudinal wire 6 is fastened to the outermost part 15 of the end sections 10 in the first sidewall.

In Fig. 7 is seen a cable tray 1 according to the invention in which cables 16 are placed. The cables 16 are arranged stacked upon each other in a vertical stack. The cables 16 have a diameter largely corresponding to the spacing between the two sidewalls 3, 4.

The situation illustrated in Fig. 7 corresponds to the situation illustrated in Fig. 9, i.e. with the wire 5 in the sidewalls 3, 4 disposed in the same plane 17 perpendicular to the longitudinal direction 7 of the cable tray. Hereby is formed an opening 13 with a size that is less than the diameter of the cables 16.

Figs. 8 and 9 show a situation where the cables 16 are omitted for the sake of clarity. Fig. 8 illustrates how the wire in the second sidewall 4 is bent in an angle 12, out of

the plane 17 containing the wires in the situation shown in Figs. 7 and 9. This plane is indicated by a broken line.

It appears on Fig. 8 that the opening 13 will be greater when the wire is bent out.

5 Hereby is ensured that the cables 16 can be inserted in the opening 13 when the wire in the second sidewall 4 is bent into the position shown in Fig. 8. After placing the cables in the cable tray, the wire in the second sidewall 4 is bent to the position shown in Fig. 9 so that the opening 13 is diminished.

10 High-pressure flushing is typically applied when clearing cable trays. When flushing occurs, impacting the cables 16, the cables 16 cannot be pressed out of the cable tray 1 since they cannot pass the opening 13 when the wire is disposed in the position illustrated in Figs. 7 and 9.

CLAIMS

1. A cable tray for carrying cables or hoses and of the type made of wire material with a number of juxtaposed U-bent wires and longitudinal wires fastened thereto such that a bottom and side walls for the cable tray are formed, **characterised in** that the bottom has a dimension in width that is less than the height of the sidewalls such that cables can be stacked upon each other in the cable tray, that the wires in a first sidewall are longer than the wires in the second sidewall, extending past the extension of the wires in a second sidewall, that the wires in the first sidewall have an end section which is bent across the cable tray in direction towards and over the outer ends of the wires in the second sidewall of the cable tray, that the longitudinal wires are only fastened to the wires in the first sidewall and possibly also to the end sections, that each of the juxtaposed wires is adapted such that a wire section in the first sidewall and a wire section in the second sidewall in a situation with cables or hoses provided in the cable tray can be disposed in a plane perpendicular to the longitudinal direction of the cable tray, and that the wire in the second sidewall, when cables or hoses are to be placed in the cable tray, are bent in direction away from the wire in the first sidewall by bending in direction out of the plane perpendicular to the longitudinal direction of the cable tray, or by an outwardly directed bending in the plane perpendicular to the longitudinal direction of the cable tray.
2. A cable tray according to claim 1, **characterised in** that a longitudinal wire is fastened to the outermost part of the end sections in the first sidewall.
3. A cable tray according to claim 1 or 2, **characterised in** that the wire is made of stainless steel.
4. A cable tray according to any preceding claim, **characterised in** that the wire thickness is typically 2 - 25 mm.
5. A cable tray according to claim 4, **characterised in** that the wire thickness is 3 mm, and that the wire has a tensile strength of 840-900 N/mm².

6. A cable tray according to any preceding claim 3-5, **characterised in** that the wire in the second sidewall is bent at an angle between 10 and 25°, preferably between 13 and 17°.
- 5 7. A cable tray according to any preceding claim, **characterised in** that the spacing between the two outermost wire ends with the U-bent wire disposed in a plane perpendicular to the longitudinal direction of the cable tray is less than the spacing between the two sidewalls.
- 10 8. A cable tray according to claim 7, **characterised in** that the spacing between the two outermost wire ends with the end section of the U-bent wire in the second sidewall disposed outside the plane perpendicular to the longitudinal direction of the cable tray is greater than the spacing between the two sidewalls.
- 15 9. A cable tray according to any preceding claim, **characterised in** that the spacing between the two sidewalls is between 7 and 20 mm, preferably between 7 and 12 mm.
10. A cable tray according to any preceding claim, **characterised in** that the height of a cable tray is between 70 and 120 mm.

AMENDED CLAIMS

received by the International Bureau on 30 August 2016 (30.08.2016)

1. A cable tray (1) for carrying cables (16) or hoses and of the type made of wire material with a number of juxtaposed U-bent wires (5) fastened to a longitudinal profile such that a bottom (2) and side walls (3,4) for the cable tray are formed,
5 wherein the bottom (2) has a dimension in width (8) that is less than the height (9) of the sidewalls (3,4) such that cables (16) can be stacked upon each other in the cable tray, wherein the wires in a first sidewall (3) are longer than the wires in the second sidewall (4), extending past the extension of the wires in a second sidewall, and wherein the wires in the first sidewall have an end section (10) which is bent across
10 the cable tray in direction towards and over the outer ends (11) of the wires in the second sidewall (4) of the cable tray, **characterised in** that the longitudinal profile are formed of longitudinal wires (6), that the longitudinal wires (6) are only fastened to the wires (5) in the first sidewall (3) and possibly also to the end sections (10), that each of the juxtaposed wires (5) is adapted such that a wire section in the first sidewall and a wire section in the second sidewall in a situation with cables or hoses provided
15 in the cable tray can be disposed in a plane (17) perpendicular to the longitudinal direction (7) of the cable tray (1) and that the wire in the second sidewall (4), when cables or hoses are to be placed in the cable tray, are bent in direction away from the wire in the first sidewall (3) by bending in direction out of the plane (17) perpendicular to the longitudinal direction (7) of the cable tray, or by an outwardly directed bending in the plane (17) perpendicular to the longitudinal direction (7) of the cable tray.
20

2. A cable tray according to claim 1, **characterised in** that a longitudinal wire (6) is
25 fastened to the outermost part (15) of the end sections (10) in the first sidewall.

3. A cable tray according to claim 1 or 2, **characterised in** that the wire is made of stainless steel.

30 4. A cable tray according to any preceding claim, **characterised in** that the wire thickness is typically 2 - 25 mm.

5. A cable tray according to claim 4, **characterised in** that the wire thickness is 3 mm, and that the wire has a tensile strength of 840-900 N/mm².

5 6. A cable tray according to any preceding claim 3-5, **characterised in** that the wire in the second sidewall (4) is bent at an angle (12) between 10 and 25°, preferably between 13 and 17°.

10 7. A cable tray according to any preceding claim, **characterised in** that the spacing (13) between the two outermost wire ends with the U-bent wire (5) disposed in a plane (17) perpendicular to the longitudinal direction of the cable tray is less than the spacing (8) between the two sidewalls (3,4).

15 8. A cable tray according to claim 7, **characterised in** that the spacing (13) between the two outermost wire ends with the end section of the U-bent wire (5) in the second sidewall disposed outside the plane perpendicular to the longitudinal direction of the cable tray is greater than the spacing (8) between the two sidewalls (3,4).

20 9. A cable tray according to any preceding claim, **characterised in** that the spacing (8) between the two sidewalls (3,4) is between 7 and 20 mm, preferably between 7 and 12 mm.

25 10. A cable tray according to any preceding claim, **characterised in** that the height of a cable tray (1) is between 70 and 120 mm.

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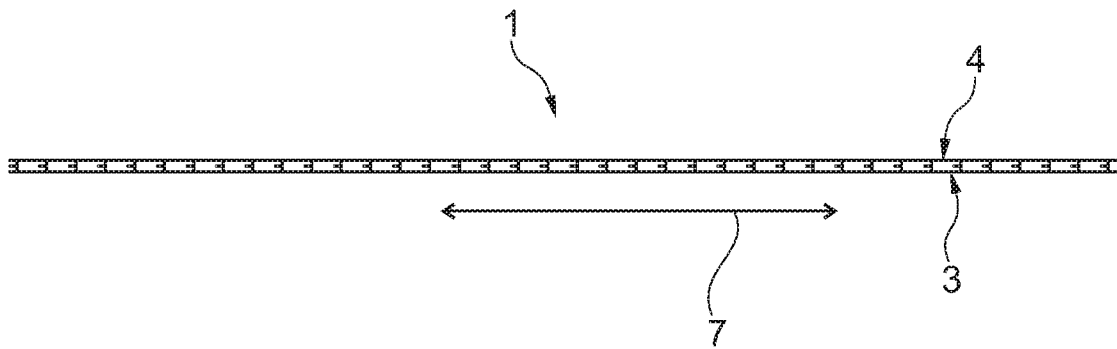


Fig. 1

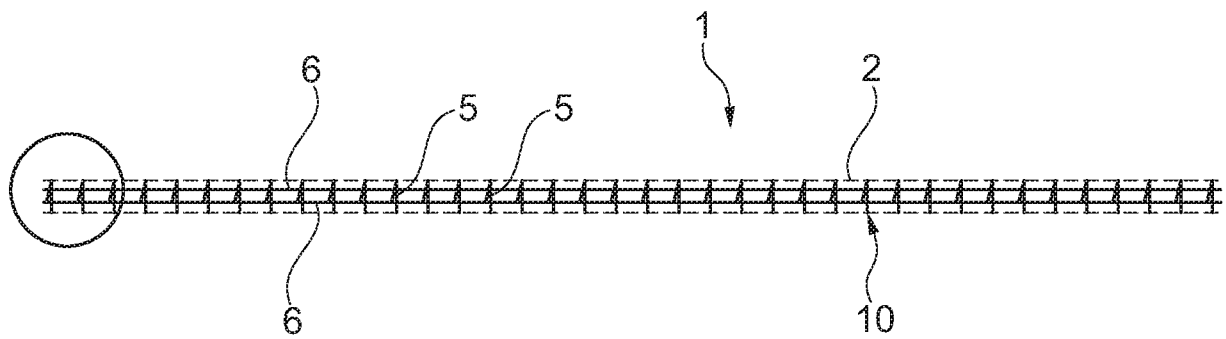


Fig. 2

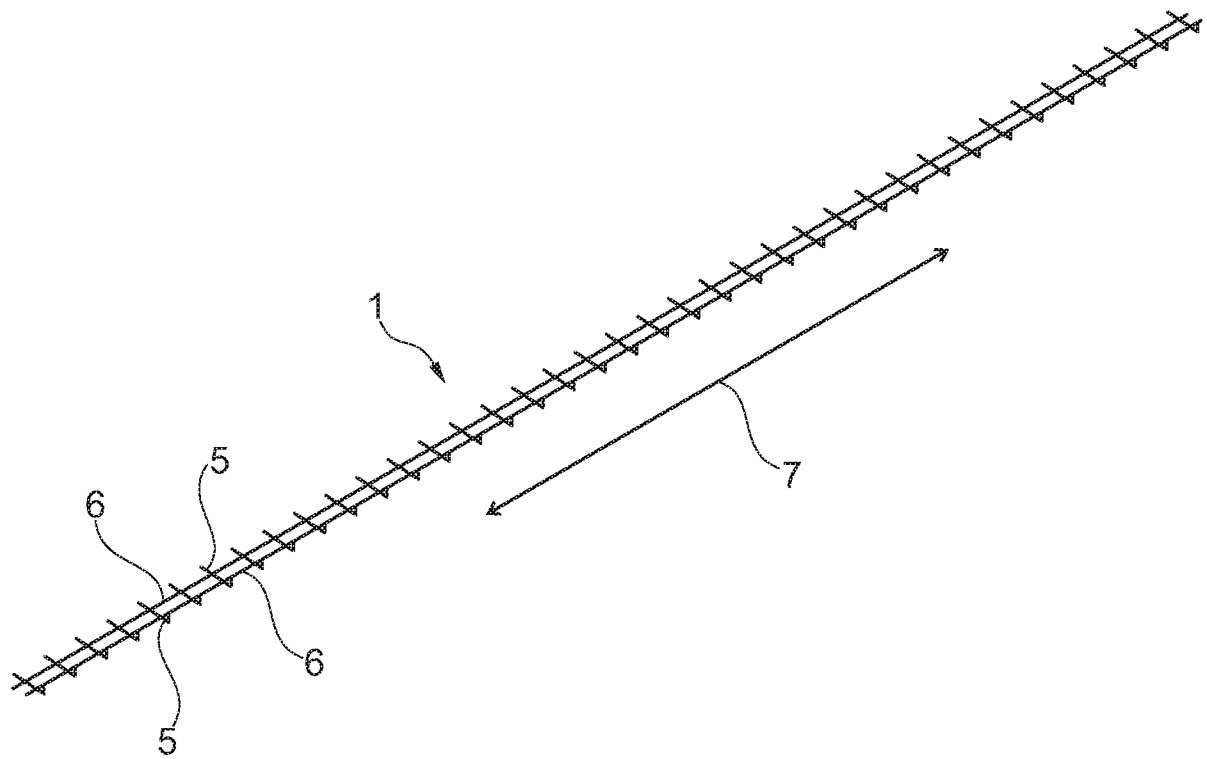


Fig. 3

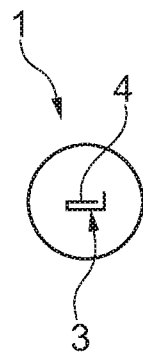


Fig. 4

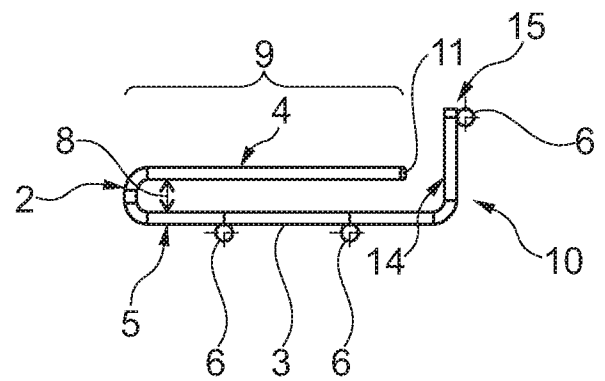


Fig. 5

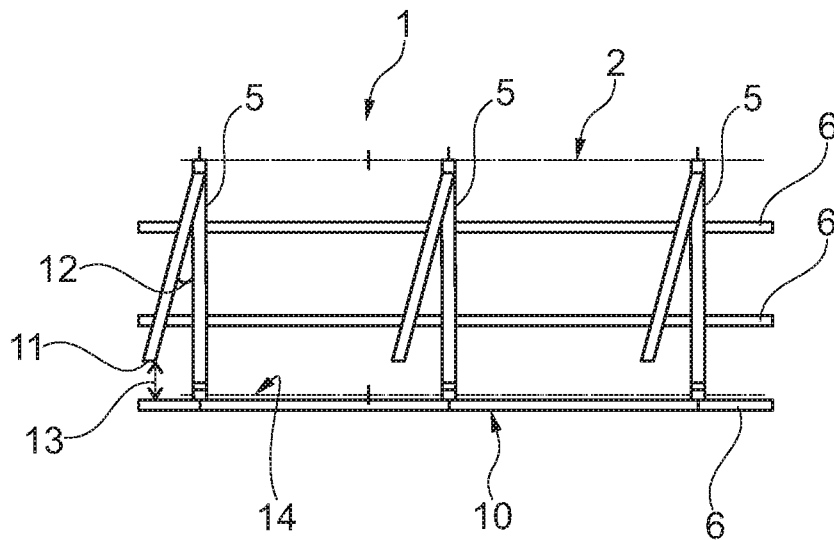


Fig. 6

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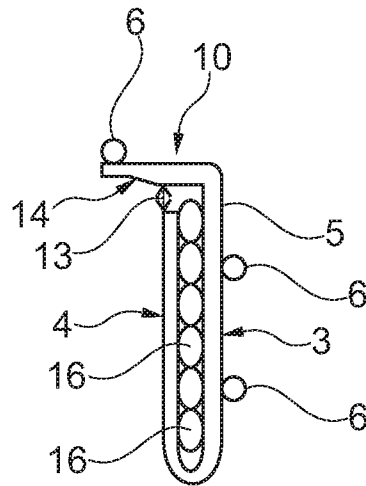


Fig. 7

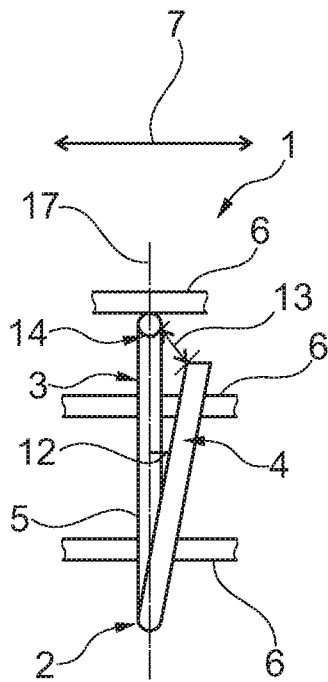


Fig. 8

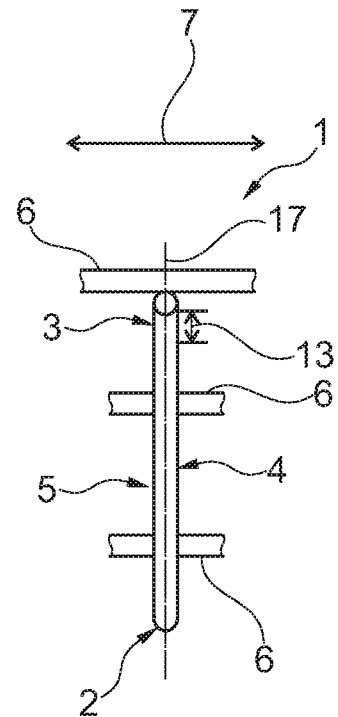


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2016/050183

A. CLASSIFICATION OF SUBJECT MATTER H02G 3/04 (2006.01) 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) IPC/CPC: H02G, H05K Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched DK, NO, SE, FI: Classes as above. Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5893539 A (TRAN et al.) 1999.04.13, figures.	1 – 10
A	EP 2369703 A2 (ROGER) 2011.09.28	1 – 10
A	US 2004/0245411 A1 (PHELAN et al.) 2004.12.09	1 – 10
A	FR 2991518 A3 (PEMSA PEQUENO MATERIAL ELECTRICO, S.A.) 2013.12.06	1 – 10
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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