(19) DANMARK

(10) DK/EP 2816687 T3

Patent- og
Varemærkestyrelsen

(12) # Oversættelse af europæisk patentskrift

(51) Int.Cl.: *H 02 G 3/04 (2006.01)* *H 02 G 3/06 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2015-12-14**

(80) Dato for Den Europæiske Patentmyndigheds
bekendtgørelse om meddelelse af patentet: **2015-08-19**

(86) Europæisk ansøgning nr.: **13193879.7**

(86) Europæisk indleveringsdag: **2013-11-21**

(87) Den europæiske ansøgnings publiceringsdag: **2014-12-24**

(30) Prioritet: **2013-06-20 FR 1355868**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

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(54) Benævnelse: **Sektion af kabelbakke med tværgående fastlåsning, kabelbakke, der omfatter sådanne sektioner og fremgangsmåde til fremstilling heraf**

(56) Fremdragne publikationer:
EP-A1- 1 505 702
EP-A1- 2 276 129
WO-A1-2013/007855
ES-U- 1 076 189

Description

The invention relates to the field of cable trays, and more particularly to the assembly of sections of cable trays.

Cable trays can be used to support cables, notably electrical, telephone, optical fibre, or computer network cables, over considerable heights (in vertical configurations) or over long distances (in horizontal configurations).

Cable trays are formed from sections which are generally made of metal, notably steel, stainless steel, or plastic or composite material if appropriate.

For many years, in the absence of any international or European regulations concerning this matter, the longitudinal dimension of cable tray sections has usually been three metres, as mentioned on page 2, lines 12 and 13, of the document FR2737355.

The desired networks of cable trays are constructed from these sections.

For this purpose, the sections of cable trays are positioned end to end, and these sections are then conventionally fixed, using joining pieces, typically fishplates or flat plates which may be hinged if necessary, or alternatively by using angle pieces.

The sections are also fixed, from place to place, on brackets or hangers, or are suspended, with a typical spacing of about one and a half metres between the supports.

Two types of cable tray sections can be distinguished, namely sections made of sheet (which may or may not be perforated) and sections made of wire trellis. The invention is more particularly concerned with cable trays comprising sections made of wire trellis or end parts made of wire trellis.

Wire trellis sections comprise longitudinal wires, called warp wires, and transverse wires, called weft wires, intersecting the warp wires, and conventionally imparting a U-shaped cross section to the trellis.

The sections may undergo further treatment, depending on the environment in which they are to be placed. Thus, metal sections may be galvanized, plastic-coated, or coated with a layer of epoxy resin.

Over many years, manufacturers of cable trays have developed very many technical solutions for facilitating the joining of cable tray sections by means of fishplates, both as regards the number of tools and parts and the time taken for fitting the fishplates onto the sections.

The variety of technical solutions clearly demonstrates the importance attached to these fishplates by the manufacturers.

Four major methods of fitting fishplates onto wire trellis cable trays can be distinguished, as follows:

- fitting the fishplate or joining piece by bolting, as described in the documents EP0298825, EP0399790 and EP0617493;

- fitting the fishplate by welding, as described in the documents EP0571307 and WO2013007855;

- fitting the fishplate by force-fitting or snap-fitting, as described in the documents FR2208219, US5384937, US6193434 and FR2879036;

- fitting sliding fishplates, as described in the documents EP822364 and EP1193821.

The manufacture of fishplates or joining pieces and their subsequent fitting onto wire trellises incurs considerable costs.

The fitting of fishplates onto each section of cable trays in the factory requires the provision of tools and is time-consuming.

Moreover, in the factory, the fitter may not have easy access to the two wings of each cable tray section onto which the fishplates are to be fitted.

In an attempt to overcome these drawbacks, proposals have been made to modify the configuration of the end parts of cable tray sections made of wire trellis so as to enable them to be joined without the use of an attached part, as illustrated in the documents FR2966987, DE19946388, EP973238, EP1511142 and FR2971110. The cable tray sections described in these prior documents have proved to be difficult and expensive to manufacture.

The document ES1076189 BASOR discloses a wire trellis cable tray with a U-shaped cross section, provided at a first end with a joining device, the joining device taking the form of a clamp adapted to interact with a second end of a similar section, the clamps projecting on the outside of the section.

The cable tray described in the document ES 1076189 has numerous drawbacks, namely:

- the assembly of two sections must be carried out in the longitudinal direction. If the assembly is to be performed in a space of restricted length, assembly becomes impossible;

- the sections conventionally have a length of three metres, and the manual movement of these sections in their longitudinal direction is laborious;

- the sections comprise a doubling of the weft wire at their ends, increasing production costs and time;

• the clamps project from the section for a considerable length so as to be able to interact with the two end weft wires of an adjacent section. Consequently, the ends of the sections may be damaged during the transport, handling or storage of the sections.

The object of the solution proposed below is to overcome the drawbacks of the prior art.

A first aim is to propose a cable tray section which is easily manufactured.

A second aim is to propose a cable tray section permitting easy assembly with an adjacent section.

A third aim is to propose a cable tray section providing good mechanical strength characteristics during assembly with an adjacent section.

In the first place, a cable tray section is proposed, comprising:

• a wire trellis formed by assembling longitudinal warp wires and transverse weft wires defining a bottom and two wings;

• lateral assembly parts attached to the wings of the section, these assembly parts comprising a loop and two arms essentially perpendicular to the loop, specifically an upper arm and a lower arm;

• the assembly part comprising a hook defining a concavity oriented towards the outside of the section, this hook being placed in the continuation of the upper arm;

• the loop extending obliquely with respect to the wing so as to allow transverse snap-fitting of the section onto an adjacent section.

The section has the following features, which may be combined if appropriate:

- the concavity is essentially circular and its inner radius is essentially equal to the radius of the weft wires of the section;

- the hook is tangential to an end weft wire of the section;

- the assembly parts are welded onto two weft wires of the section by their arms;

- the attached assembly parts are formed by bending a wire.

In the second place, what is proposed is a cable tray formed by assembling at least two sections as described above.

In the third place, what is proposed is a wire trellis panel formed by the assembly of longitudinal warp wires and transverse weft wires, the panel comprising U-shaped parts provided with a loop and with two arms, separate from the wires of the panel, parallel to the warp wires and partially projecting from the panel.

Also proposed is a wire trellis panel formed by the assembly of longitudinal warp wires and transverse weft wires, the panel comprising lateral assembly parts each comprising a loop and two arms essentially perpendicular to the base, specifically an upper arm carrying a hook defining a concavity in the weft wires and a lower arm having an offset at the position of the hook in the upper arm, the loop extending obliquely relative to the wire trellis panel.

Other characteristics and advantages of the invention will be more fully apparent, in detail, from the following description of some embodiments, referring to the attached drawings, in which:

- Figure 1 is a perspective top view of a cable tray section;

- Figure 2 is a perspective top view of a step of assembling two sections;

- Figure 3 is a perspective top view of the area of the joint between two assembled sections;

- Figure 4 is a sectional view through the plane IV-IV of Figure 3, the assembled configuration being shown in broken lines;

- Figure 5 is a cross-sectional detail view of the wing of two assembled sections;

- Figure 6 is a cross-sectional detail view from above of the wing of two assembled sections;

- Figure 7 is a perspective top view of part of a wire trellis panel in a step of manufacturing cable tray sections;

- Figure 8 is a perspective top view of part of a wire trellis panel in another step of manufacturing cable tray sections.

Figure 1 shows, in perspective, a section 1 of a wire trellis cable tray 2 having a U-shaped cross section, formed by assembling longitudinal warp wires 3 and transverse weft wires 4defining a bottom 5 and two lateral wings 6.

In the illustrated embodiments, the warp wires 3 and the weft wires 4 have an identical cross section. In a variant, the warp wires and/or the weft wires have a suitable cross section for the anticipated loads on each part of the section.

The wings 6 extend on either side of the bottom 5 and are essentially perpendicular thereto.

In a variant embodiment, which is not shown, the wings of the cable tray are not perpendicular to the bottom, the section having a flared cross section such that the sections can be stacked on one another. The section may have a flat-bottomed V-shaped cross section, which is known and is described, for example, in the documents WO2013041741, EP818862, WO2006076746 and US2002030143.

The warp wires 3 are fitted by welding onto the outside of the weft wires 4. Each wing 6 has an upper warp wire, called the edge wire 3a, the ends 4a of the weft wires being rounded, smooth or chamfered so as not to form a cutting part above the edge wire 3a.

In the embodiment shown in Figure 1, six warp wires 3 extend over the bottom 5 of each section 1, and each lateral wing 6 comprises two warp wires 3, including the edge wire 3a.

Each section 1 comprises a male end part provided with assembly parts 7, 8.

In the illustrated embodiment, an assembly part 7 is placed on each wing 6 and two assembly parts 8 are positioned on the bottom 5 of each section 1. The number of assembly parts 7, 8 is adapted to the dimensions of the section.

Each of these assembly parts 7, 8 is formed by a wire bent back on itself, forming a part projecting beyond the end weft wire 4b. The wire used to make the assembly parts 7, 8 is advantageously the same as that used for the warp wires and/or the weft wires.

In the embodiment shown in Figure 1, the assembly parts 7, 8 are fixed, by welding for example, to the outside of the weft wires 4.

More precisely, the assembly parts 7, 8 are fixed to two continuous weft wires, namely the end weft wire 4b and the weft wire 4 immediately adjacent to this end weft wire 4b. In a variant embodiment (not shown), the assembly parts 7, 8 are fixed to more than two weft wires.

The interval between the weft wires 4 is constant in the section 1 for the illustrated embodiment. In a variant embodiment (not shown), the weft wire density of the male end part of the section is different from that of the rest of the section.

The assembly parts 7, 8 comprise a loop 9 projecting beyond the end weft wire 4a and two longitudinal arms 10 extending from the loop 9.

The assembly parts 7, 8 are fixed, by welding for example, to the outside of the section 1.

The assembly parts 7 carried by the wings 6 comprise a loop 9a which is different from the loop 9b of the assembly parts 8 fixed to the bottom 5 of the sections 1.

The assembly parts 7 carried by the wings will be described first.

A lateral assembly part 7 carried by each wing 6 of the section comprises an upper arm 11 and a lower arm 12. The upper arm 11 is located near the edge wire 3a, and the lower arm 12 is near the warp wire 3 next to the edge wire 3a.

As can be seen, notably, in Figure 3, the loop 9a of the lateral assembly part 7 comprises a hook 13 in the continuation of the upper arm 11. This hook 13 defines a concavity oriented towards the outside of the section 1a, this concavity 14 being adapted to engage with an end weft wire 4c of an adjacent section 1b.

The loop 9a of the assembly part 7 comprises, in the continuation of the hook 13, a straight portion 15, this straight portion 15 being essentially longitudinal.

In the continuation of the lower arm 12, the loop 9a of the lateral assembly part 7 has an offset 16 extending transversely in line with the hook 13.

In the continuation of this offset 16, the loop 9a comprises a straight portion 17, this straight portion 17 being essentially longitudinal.

When the two sections 1a, 1b are assembled, the two straight portions 15, 17 of the loop 9a of a first section 1a extend, when viewed from above, on either side of the warp wires 3 of the second section 1b. This arrangement is apparent, notably, in Figure 6.

As can be seen, particularly in Figures 4 and 5, the loop 9a of the lateral assembly parts 7 is oblique and is inclined towards the inside of the section 1.

If the section 1 is viewed from the end (Figures 4 and 5), the lateral assembly parts 7 have an inverted Z profile, which, as explained below, can be used to facilitate the assembly of two sections 1a, 1b by transverse snap-fitting.

The upper arm 11 of each of the lateral assembly parts 7 is in contact with the upper warp wire 3 of section 1, thus enabling the assembly to be made more rigid. This is because the lateral assembly part 7 can be welded along the whole of the upper arm 11 in contact with the upper warp wire 3 of the wing 6, thus increasing the strength of the weld.

Similarly, when two sections 1 are assembled, there is no play between the straight portion 15 and the edge wire 3a of the adjacent section 1b, and consequently the mechanical strength of the cable tray 2 is increased.

The assembly parts 8 fixed to the bottom 5 of sections 1a, 1b will now be described.

The joining loops 9b of the assembly parts 8 appear, when viewed from above, as a double bend comprising a first curved section 18 and a second curved section 19.

The first curved section 18 has a concavity oriented towards the outside of the section 1a, 1b, while the second curved section 19 has a concavity oriented towards the inside of the section 1a, 1b.

In order to impart greater structural rigidity to the assembly means, the space between the double bend and the end weft wire 4a is minimal, or even non-existent. This arrangement makes it possible to stiffen the joining loop 9b with respect to bending around an axis parallel to the end weft wire 4b, the latter acting as a stiffener against which the first curved section 18 bears.

The two curved sections 18, 19 preferably have a profile forming an arc of a circle. The first curved section 18 has a radius of curvature essentially equal to the radius of the end weft wire 4a of the female end part of a section 1a, 1b.

Thus the end weft wire 4a mates as closely as possible with the first curved section 18. This arrangement makes it possible, notably, to limit undesirable movements of the sections 1a, 1b with respect to one another.

Similarly, the second curved section 19 has a radius of curvature essentially equal to, or slightly greater than, the radius of the end weft wire 4a. This imparts a degree of compactness to the joining loop 9b, increasing its bending rigidity.

However, for reasons associated with manufacturing, the diameter of the wire of the assembly parts 7, 8 is less than or equal to the diameter of the end weft wire 4a.

In order to form a cable tray 2, the operator starts by placing an end of a first section 1a provided with assembly parts 7, 8 above the end of an adjacent section 1b having no assembly parts 7, 8. This positioning is shown in Figure 2 and in Figure 4 in solid lines.

The operator then lowers the first section 1a onto the adjacent section 1b, in the direction of the arrow oriented towards the bottom 5 of the section 1 of Figure 4.

The oblique loop 9a of the lateral assembly parts 7 then comes into contact with the edge wire 3a of the wings 6. Under a pressure directed towards the bottom 5 of the adjacent section 1, each oblique loop 9a slides on the edge wire 3a of the wings 6, thereby elastically deforming the wings 6 of the first section 1 by pushing them towards the inside of this section, as represented by the rounded arrow of Figure 4.

When the oblique base 9 of the lateral assembly parts 7 is below the wire 3 edges 3a of the wings 6 of the adjacent section, the wings 6 of the first section 1 return to their original position, the tops of the assembly parts 7, 8 becoming engaged with the undersides of the edge wires 3 of the adjacent section 1b and the hooks 13 becoming engaged with the weft wires 4 of the adjacent section 1b. Thus the transverse snap-fitting is completed.

Additionally, when the snap-fitting is completed, the hooks 13 of the central assembly parts 8 are engaged with a weft wire 4 of the adjacent section 1b, thereby fully locking the sections 1 with respect to one another.

The assembly parts 7, 8 can be manufactured separately from the wire trellis panel or simultaneously with this panel.

When the panel has been completed and U-shaped parts 20 have been welded to it, the U-shaped parts 20 are bent independently of the panel to shape them into hooks 13 and/or offsets 16. The end result is the same as in the first case, that is to say a wire trellis panel provided with assembly parts 7, 8.

In a variant, the panel can receive assembly parts 7, 8 previously formed by a separate machine and welded after the panel has been made.

When the panel has been provided with assembly parts 7, 8, it can be bent to form a U-shaped section 1, or alternatively it can be stored so that it can be exported and then bent subsequently. Storage in panel form can facilitate transportation, since panels require less space than U-shaped sections 1.

A section 1 of cable tray 2 comprising the assembly parts as described above can provide any, or preferably all, of the following benefits:

- Simplicity and speed of manufacture: the section 1 can be manufactured independently of the assembly parts 7, 8; the latter, being adapted to a large number of sections 1, are attached and welded to the sections 1 subsequently, thus making the manufacturing process simple and fast.

- Robustness of a cable tray 2 made from at least two sections 1: the lateral assembly parts 7 come into contact with the edge wire 3a of the wings 6, thus preventing the two sections from pivoting with respect to one another. Moreover, the central assembly parts 8 allow a better distribution of forces over the bottom of each of the sections 1, thus preventing the concentration of forces.

- Ease of use: the operator only has to perform a simple transverse interlocking movement, in which a first section has to be positioned above an adjacent section, and a downward force has to be applied to the first section so that the lateral assembly parts 7 are made to interact with the wings 6 of the adjacent section, thereby creating a temporary elastic deformation of the wings 6 of the first section 1, which complete the snap-fitting by returning to their initial position.

Patentkrav

1. Sektion (1) af kabelbakke (2), der omfatter:
- et trådnet, som dannes ved samling af langsgående kædetråde (3) og tværgående skudtråde (4), der afgrænser en bund (5) og to sider (6)
- sidesamlebeslag (7), der er monteret på siderne (6) af sektionen (1), og som omfatter en løkke (9) og to arme (10), der i det væsentlige er vinkelrette på sløjfen (9), nemlig en øvre arm (11) og en nedre arm (12)
kendetegnet ved, at:
- samlebeslaget omfatter en krog (13), der afgrænser en konkavitet (14), som vender mod det ydre af sektionen (1), idet denne krog (13) er placeret i forlængelse af den øvre arm (11)
- sløjfen (9) strækker sig ud på skrå i forhold til siden (6), således at der muliggøres en tværgående fastlåsning af sektionen (1) på en tilstødende sektion (1).

2. Sektion (1) ifølge krav 1, kendetegnet ved, at konkaviteten (14) i det væsentlige er cirkelformet, og dens indre radius i det væsentlige er lig med radiussen af sektionens skudtråde (4).

3. Sektion (1) ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at krogen (13) er tangent til en skudtråd i enden af sektionen (1).

4. Sektion (1) ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at samlebeslagene (7) er svejset på to skudtråde (4) af sektionen (1) gennem deres arme (10).

5. Sektion (1) ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at de monterede samlebeslag (7) dannes ved bøjning af en tråd.

6. Kabelbakke (2) fremstillet ved samling af mindst to sektioner (1) ifølge et hvilket som helst af de foregående

krav.

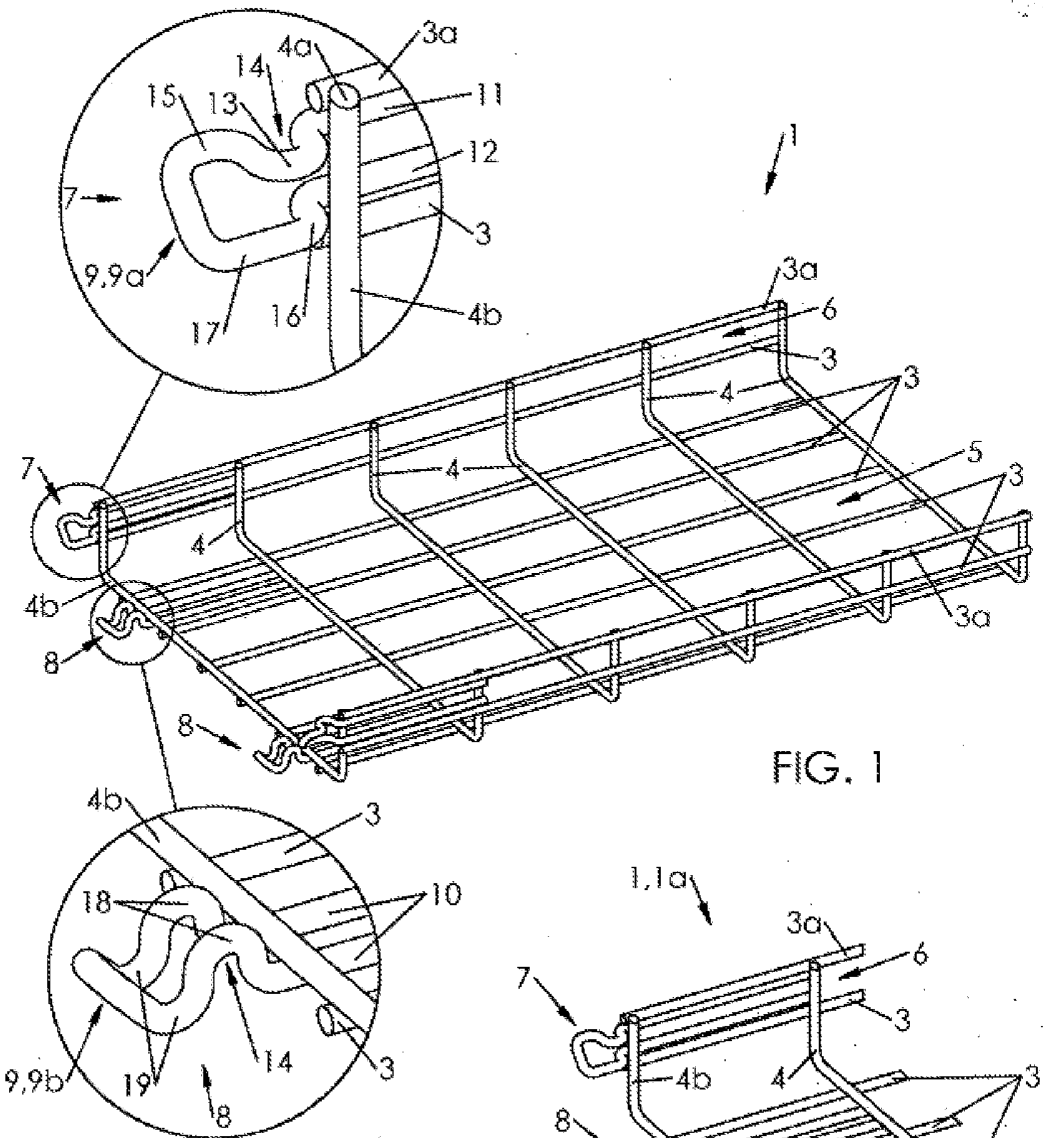
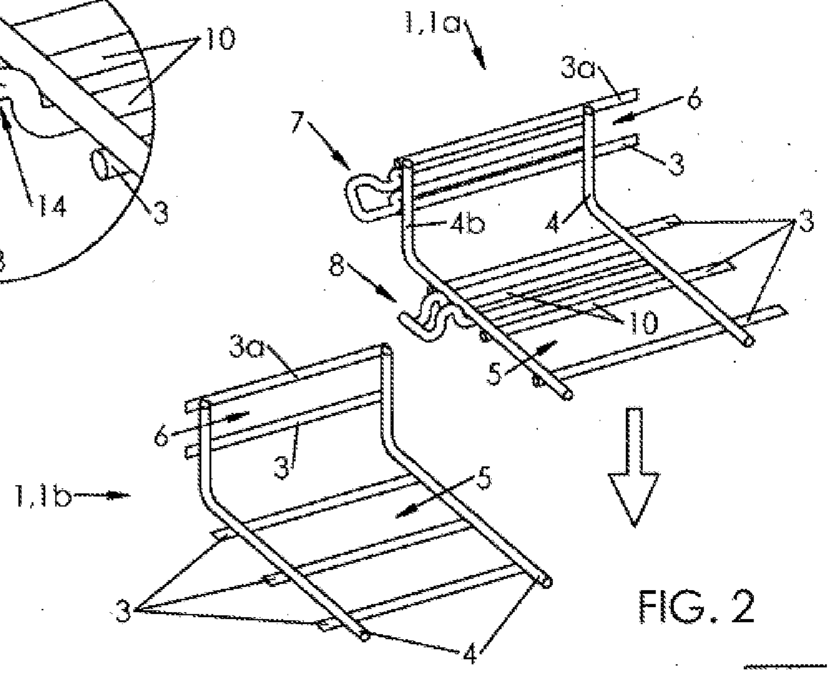

3a
4a
14
15
13
11
12
7
3
9,9a
17
16
4b
1
6
4
5
8
10
18
19

FIG. 1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6
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3
4b
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8
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1,1b

FIG. 2

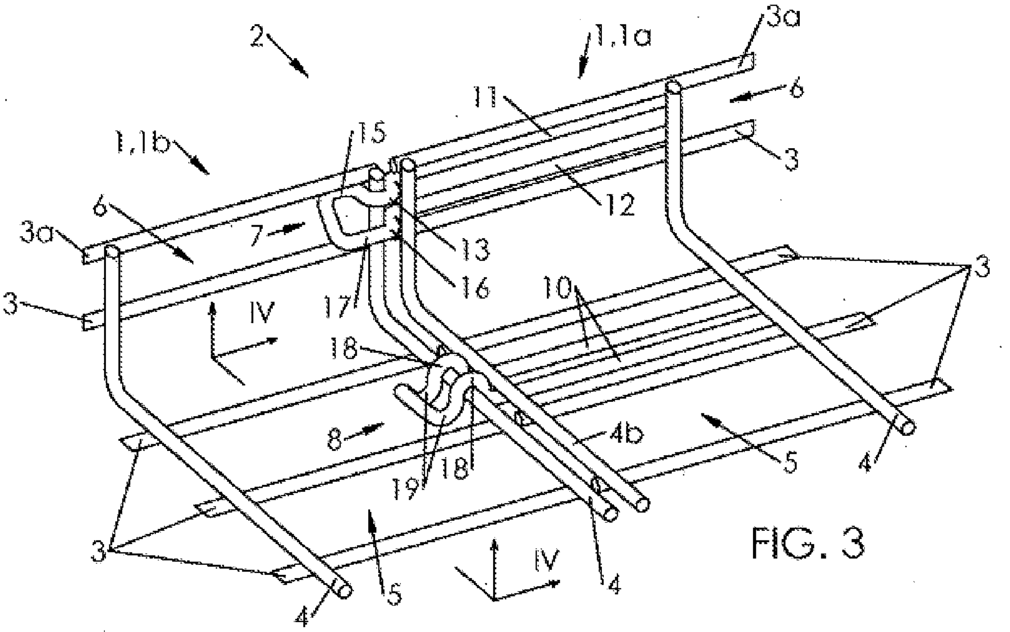


FIG. 3

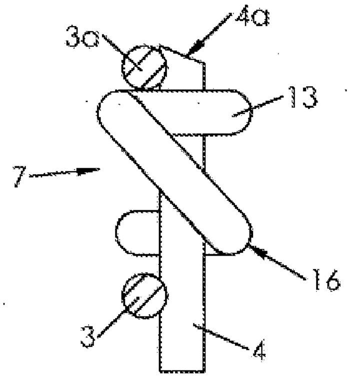


FIG. 5

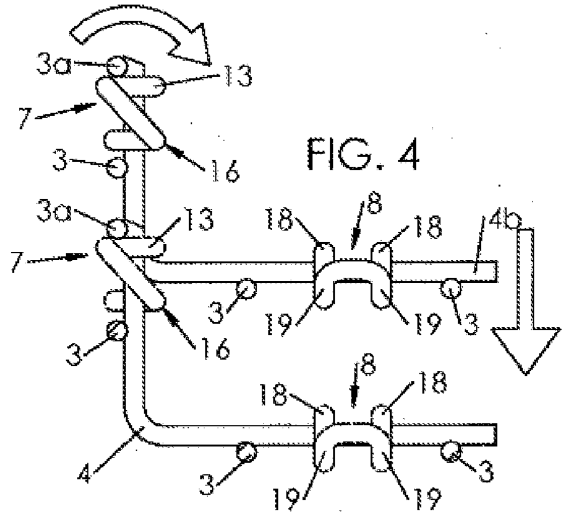


FIG. 4

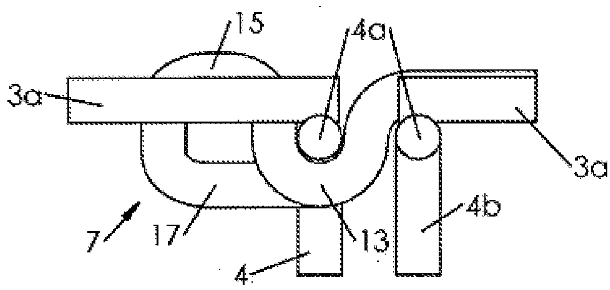


FIG. 6

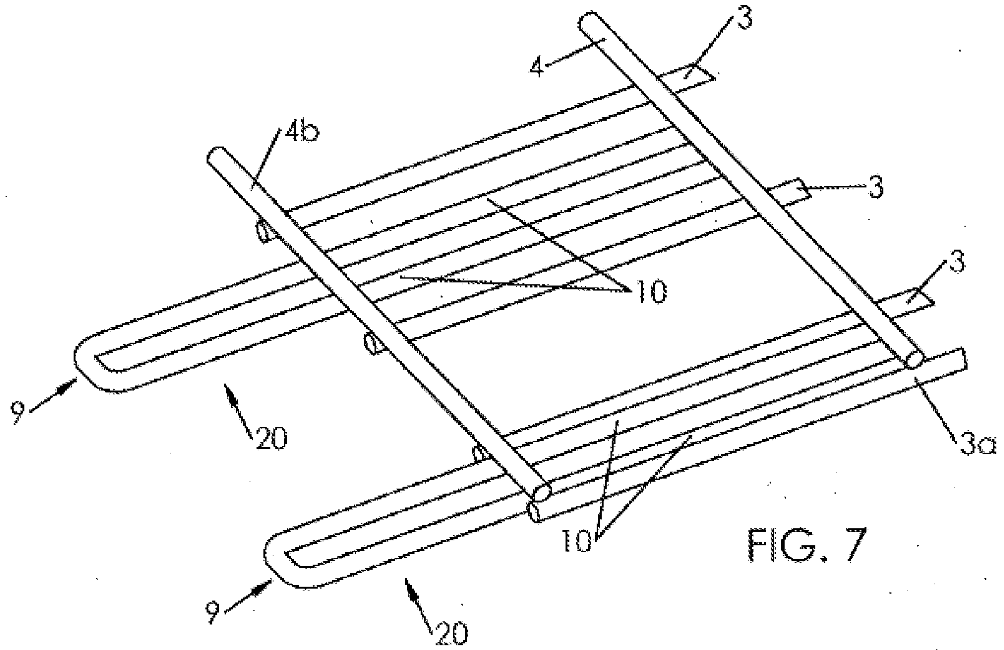
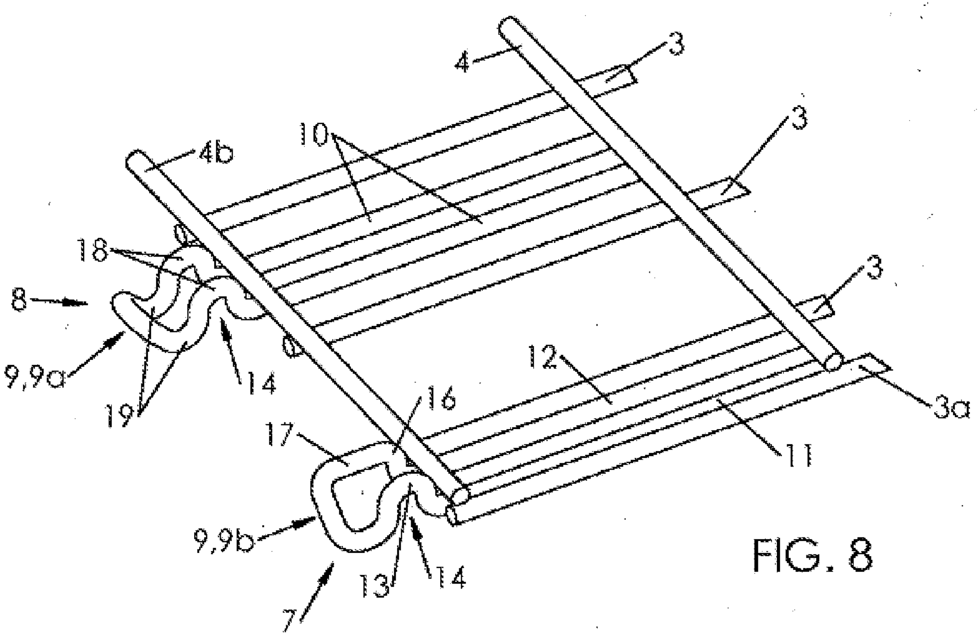

3
4
4b
3
3
10
9
20
3a
10
9
20

FIG. 7


3
4
4b
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3
18
3
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9,9a
14
12
19
16
3a
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11
9,9b
13
14
7

FIG. 8