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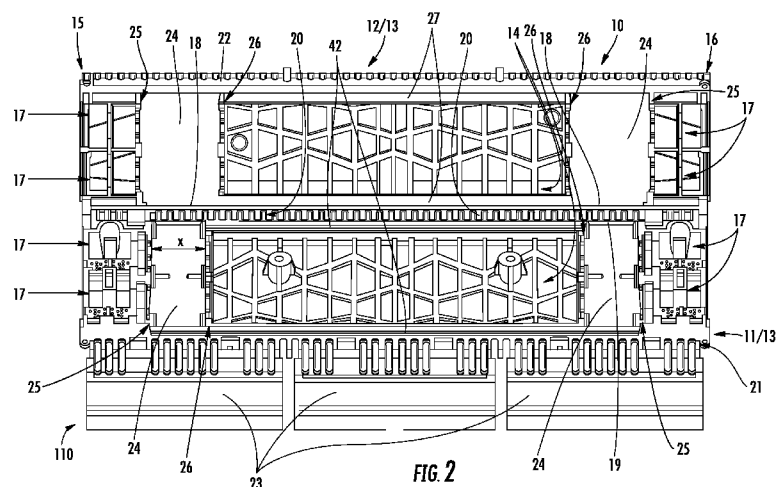
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(54) Title: CABLE STRAIN RELIEF DEVICE FOR CABLE CLOSURES AND CABLE CLOSURE HAVING AT LEAST ONE SUCH CABLE STRAIN RELIEF DEVICE



(57) Abstract: Cable strain relief device for a cable closure, having at least one cable guiding element, whereby a cable to be restrained can be fixed at a respective cable guiding element via a cable tie surrounding the cable to be restrained and the respective cable guiding element, whereby on both sides of the at least one cable guiding element there are positioned cable tie guiding elements providing guiding surfaces, whereby the guiding surface of a first cable tie guiding element being positioned at a first side of the cable guiding element, namely at the cable tie entry side of the same, has a smaller distance from the cable guiding element than the guiding surface of a second cable tie guiding element being positioned at a second side of the cable guiding element, namely at the cable tie exit side of the same.

Cable strain relief device for cable closures and cable closure having at least one such cable strain relief device

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This application claims the benefit of priority under 35 U.S.C. § 119 of European Patent Application Serial No. EP11164932 filed on May 5, 2011, the content of which is relied upon and incorporated herein by reference in its entirety.

10 The present patent application relates to a cable strain relief device for a cable closure in accordance with the preamble of claim 1 and to a cable closure in accordance with the preamble of claim 8.

Cable closures are used in telecommunications cable networks for protecting
15 spliced joints at connection points between two telecommunications cables and for protecting branch points or splitting points of telecommunications cables. In this case, the cable closures need to ensure the continuity of the telecommunications cables as though the telecommunications cables had not been interrupted.

20

The product catalog "Accessories for Fiber Optic Networks, Edition 1, page 75, Corning Cable Systems, 2001" discloses cable closures firstly in the form of inline cable closures and secondly in the form of dome cable closures, which all have a housing which defines an interior of the cable closure and seals off the
25 interior thereof from the outside. Conventionally, assemblies for connecting, namely for splicing, telecommunications conductors guided in telecommunications cables are arranged in the interior defined by the housing of the cable closure.

30 In the case of cable closures in the form of dome cable closures, the housing is formed by a dome-like covering body and a sealing body, the sealing body defining cable insertion regions, which are sealed off on one side of the dome-like

covering body and via which all of the cables can be inserted into the interior of the cable closure.

In the case of cable closures in the form of inline cable closures, cable insertion regions which are sealed off on two opposite sides of the covering body are formed for inserting cables into the interior of the cable closure, with the result that inline cable closures can be installed in one line with the cables.

DE 20 2010 006 582 U1 discloses an inline cable closure, having a housing, which delimits an interior of the cable closure and seals off the cable closure toward the outside, said housing comprising a covering body, said covering body comprises half-shells and provides on mutually opposite sides of the same cable insertion regions for inserting cables into said interior of the cable closure and/or for passing cables out of said interior of the cable closure, wherein compressible and/or deformable sealing elements are positioned at said mutually opposite sides of said covering body in the region of said half-shells. According to DE 20 2010 006 582 U1 the cable closure comprises on said mutually opposite sides of the covering body a cable strain relief device, each cable strain relief device having two cable guiding elements, whereby a cable to be restrained can be fixed at a respective cable guiding element via a cable tie surrounding the cable to be restrained and the respective cable guiding element.

Against this background, the present patent application provides a novel cable strain relief device for a cable closure having improved guiding properties for the cable ties.

This is accomplished by the feature that on both sides of the or each cable guiding element there are positioned cable tie guiding elements providing guiding surfaces, whereby the guiding surface of a first cable tie guiding element being positioned at a first side of the cable guiding element, namely at the cable tie entry side of the same, has a smaller distance from the cable guiding element than the guiding surface of a second cable tie guiding element being positioned

at a second side of the cable guiding element, namely at the cable tie exit side of the same..

These guiding surfaces provide an easy and reliable guiding for the cable tie when using the same to fix a cable to be restrained at the respective cable guiding element.

According to a preferred embodiment, on both sides of the or each cable guiding element there are positioned cable tie guiding elements having arc segmented guiding surfaces, whereby the arc segmented guiding surface of a first cable tie guiding element being positioned at the first side of the cable guiding element, namely at the cable tie entry side of the same, has a smaller radius than the arc segmented guiding surface of the second cable tie guiding element being positioned at the second side of the cable guiding element, namely at the cable tie exit side of the same. Preferably, a center point of the arc segmented guiding surface of a first cable tie guiding element and a center point of the arc segmented guiding surface of a first cable tie guiding element have a different distance from the respective cable guiding element. This provides a preferred guiding function for the cable tie.

The cable closure in accordance with the present application is defined in claim 8.

Exemplary embodiments of the invention will be explained in more detail, without any restriction being imposed, with reference to the drawing, in which:

- Figure 1 shows a perspective view of a preferred exemplary embodiment of an inline cable closure in a closed status of the same;
- Figure 2 shows a perspective view of the inline cable closure shown in figure 1 in an opened status of the same;
- Figure 3 shows a detail of a first, lower half-shell of the inline cable closure;

Figure 4 shows another detail of the first, lower half-shell of the inline cable closure;

Figure 5 shows an alternative detail;

Figure 6 shows a detail of a first, lower half-shell of the inline cable closure together with an adapter piece positioned in one of the cable insertion region;

Figure 7 a first perspective view of the adapter piece; and

Figure 8 a second perspective view of the adapter piece.

10 Figures 1 and 2 each show a cable closure in the form of an inline cable closure 10, which in the embodiment shown comprises a housing which is formed by a covering body 13 composed of two half-shells 11 and 12. In the exemplary embodiment shown, the half-shell 11 is a so-called lower shell and the half-shell 12 is a so-called upper shell of the covering body 13, which together define an interior 14 of the cable closure 10.

Cable insertion regions 17 are formed on mutually opposite sides 15 and 16 of the inline cable closure 10 or the covering body 13, with it being possible for cables to be inserted into the interior 14 of the inline cable closure 10 or passed out of said interior.

In the exemplary embodiment shown, in each case two cable insertion regions 17 for inserting in each case one cable into the interior 14 of the inline cable closure 10 are formed on both mutually opposite sides 15 and 16 of the covering body 13.

In the shown embodiment, the two half-shells 11 and 12 are hinged together at first longitudinal sides 18, 19 of the same. The half-shells 11 and 12 can be pivoted with respect to each other around a hinge 20 by which said two half-shells 11 and 12 are fixed to each other at said first longitudinal sides 18, 19 of the same. When the inline cable closure 10 is closed, the other second longitudinal sides 21, 22 of the two half-shells 11 and 12 can be secured to each other by a

closing mechanism 23, which is in the shown embodiment assigned to the half-shell 11.

5 In order to ensure that the cables to be inserted into the interior 14 of the inline cable closure 10 via the cable insertion shows a detail of a first, lower half-shell of the inline cable closure s 17 are sealed off, compressible and/or deformable sealing elements 24, which are each arranged between barrier walls 25 and 26, are positioned in the region of both mutually opposite sides 15 and 16 of the covering body 13 of the inline cable closure 10 on which the cable insertion re-
10 gions 17 are formed, both in the region of the lower half-shell 11 and in the region of the upper half-shell 12.

A first barrier wall 25 is in each case, namely on both mutually opposite sides 15 and 16 in the region of the lower half-shell 11 and in the region of the upper
15 half-shell 12, remote from the interior 14 of the inline cable closure 10 while a second barrier walls 26 is in each case facing the interior 14 of the cable closure 10.

As shown in Figure 2, the compressible and/or deformable sealing elements 24
20 of the upper half-shell 12, which are associated with the cable insertion regions 17, are coupled via compressible and/or deformable sealing elements 27, which run parallel to longitudinal edges of the upper half-shell 12. As a result, an annular, closed sealing region is formed by the sealing elements 24 and 27 in the region of the upper half-shell 12. Possibly, an analogous sealing region can also
25 be formed in the region of the lower half-shell 11.

The compressible and/or deformable sealing elements 24 and possibly 27 are preferably gel-like sealing elements, for example polyurethane gels or silicone gels. Such gel-like sealing elements are deformable and can be compressible.

30

It is also possible to use sealing elements 24 which are partially composed of different materials, for example from a deformable, gel-like sealing material and from a foam-like compressible sealing material.

5 Each of said barrier walls 25 and 26, namely both the barrier walls 25 remote from the interior 14 and the barrier walls 26 facing the interior 14, extends transversely with respect to an insertion direction of the cable insertion regions 17.

10 The cable closure in the form of an inline cable closure 10 shown in figures 1 and 2 comprises on both of said mutually opposite sides 15 and 16 a cable strain relief device 28 being an integral part of the lower half-shells 11 of the covering body 13 of the cable closure 10. Each cable strain relief device 28 is positioned completely inside the interior 14 of the covering body 13.

15

For each of said cable insertion regions 17 provided at said mutually opposite sides 15 and 16 the respective cable strain relief device 28 provides one cable guiding element 29, whereby a cable (not shown) to be restrained can be fixed at a respective cable guiding element 29 via a cable tie (not shown) surrounding
20 the cable to be restrained and the respective cable guiding element 29.

Each cable guiding element 29 comprises projections 30, 31 which engage in a cable sheath of the respective cable to be restrained at the respective cable guiding element 29 when the same is fixed at the cable guiding element 29 by
25 using a cable tie. First projections 30 are spiky and second projections 31 are stripy.

As can be best seen in Figure 4, on both sides of the or each cable guiding element 29 there are positioned cable tie guiding elements 32, 33 providing
30 guiding surfaces 34, 35, whereby the guiding surface 34 of a first cable tie guiding element 32 being positioned at a first side of the cable guiding element, namely at the cable tie entry side of the same, has a smaller distance from the

cable guiding element 29 than the guiding surface 35 of a second cable tie guiding element 33 being positioned at a second side of the cable guiding element, namely at the cable tie exit side of the same. Arrows 36 show the guiding direction of a cable tie at the cable tie entry side.

5

The cable tie guiding elements 32, 33 preferably have arc segmented guiding surfaces 34, 35, whereby the arc segmented guiding surface 34 of a first cable tie guiding element 32 being positioned at the first side of the cable guiding element 29, namely at the cable tie entry side of the same, has a smaller radius than the arc segmented guiding surface 35 of a second cable tie guiding element 33 being positioned at the second side of the cable guiding element 29, namely at the cable tie exit side of the same. These arc segmented guiding surfaces 34, 35 can be e.g. circular arced shaped or ellipsoid arced shaped guiding surfaces.

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A cable tie used to fix a cable to be restrained at a respective cable guiding element 29 first contacts the arc segmented guiding surface 34 of the first cable tie guiding element 32 and then after passing the same contacts the arc segmented guiding surface 35 of the second cable tie guiding element 33. The cable tie will always be guided in a defined direction approximately 180° around the respective cable guiding element 29 and the cable to be restrained allowing an easy and reliable handling of the cable tie.

15

Preferably, the center point of the arc segmented guiding surface 34 of the first cable tie guiding element 32 and the center point of the arc segmented guiding surface 35 of the second cable tie guiding element 34 have a different distance from the respective cable guiding element 29, whereby the center point of the arc segmented guiding surface 34 of the first cable tie guiding element 32 and the center point of the arc segmented guiding surface 35 of the second cable tie guiding element 33 have a different distance from the respective cable guiding element 29 in vertical direction and/or horizontal direction.

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In the shown embodiment, these center points are located on a common vertical axis and have a different distance from the respective cable guiding element 29 in vertical direction only.

- 5 It is also possible, that these center points have a different distance from the respective cable guiding element 29 in vertical direction and in horizontal direction.

According to Figure 4, the shown cable strain relief device 28 provides two cable guiding element 29. In the alternative of figure 5, the shown cable strain relief device 28 provides three cable guiding elements 29 each being positioned side by side, whereby on both sides of each cable guiding element 29 there are positioned said cable tie guiding elements 32, 33 having said arc segmented guiding surfaces 33, 34.

15

The cable insertion regions 17 and cable guiding elements 29 are matched to a defined diameter of cables to be inserted into the cable closure 10. When cables with smaller diameters are intended to be inserted into the inline cable closure 10, adapter pieces 37 can be positioned in the region of the cable insertion regions 17 in order to adapt the respective cable insertion region 17, via the respective adapter piece 37, to a smaller diameter of a cable to be inserted into the inline cable closure 10.

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These adapter pieces 37 can be inserted into the cable insertion regions 17 and accommodated in cable guiding elements 29, which are designed for the maximum diameter of a cable to be inserted. Such adapter pieces 37 can if necessary be used in the region of each cable insertion region 17.

25

Figure 6 shows that in one of the cable insertion regions 17 there is positioned an adapter piece 37 to adapt the respective cable insertion region 17 to a smaller diameter of a cable to be inserted into the inline cable closure 10.

30

The adapter piece 37 also comprises at an inner surface 38 spiky projections 30 which engage in a cable sheath of the respective cable to be restrained when the same is fixed at the adapter piece 37 being accommodated in cable guiding element 29. The adapter piece 37 may also comprise stripy projections 31.

5

An outer surface 39 of the adapter piece 37 corresponds to an inner surface of the cable guiding element 29 and cable insertion region 17 in which the adapter piece 37 may be accommodated.

10

List of reference numerals

	10	inline cable closure
	11	half-shell/lower half-shell
	12	half-shell/upper half-shell
15	13	covering body
	14	interior
	15	side
	16	side
	17	cable insertion region
20	18	longitudinal side
	19	longitudinal side
	20	hinge
	21	longitudinal side
	22	longitudinal side
25	23	closing mechanism
	24	sealing element
	25	barrier wall
	26	barrier wall
	27	sealing element
30	28	cable strain relief device
	29	cable guiding element
	30	projection

31	projection
32	cable tie guiding element
33	cable tie guiding element
34	guiding surface
5 35	guiding surface
36	guiding direction for cable tie
37	adapter piece
38	inner surface
39	outer surface

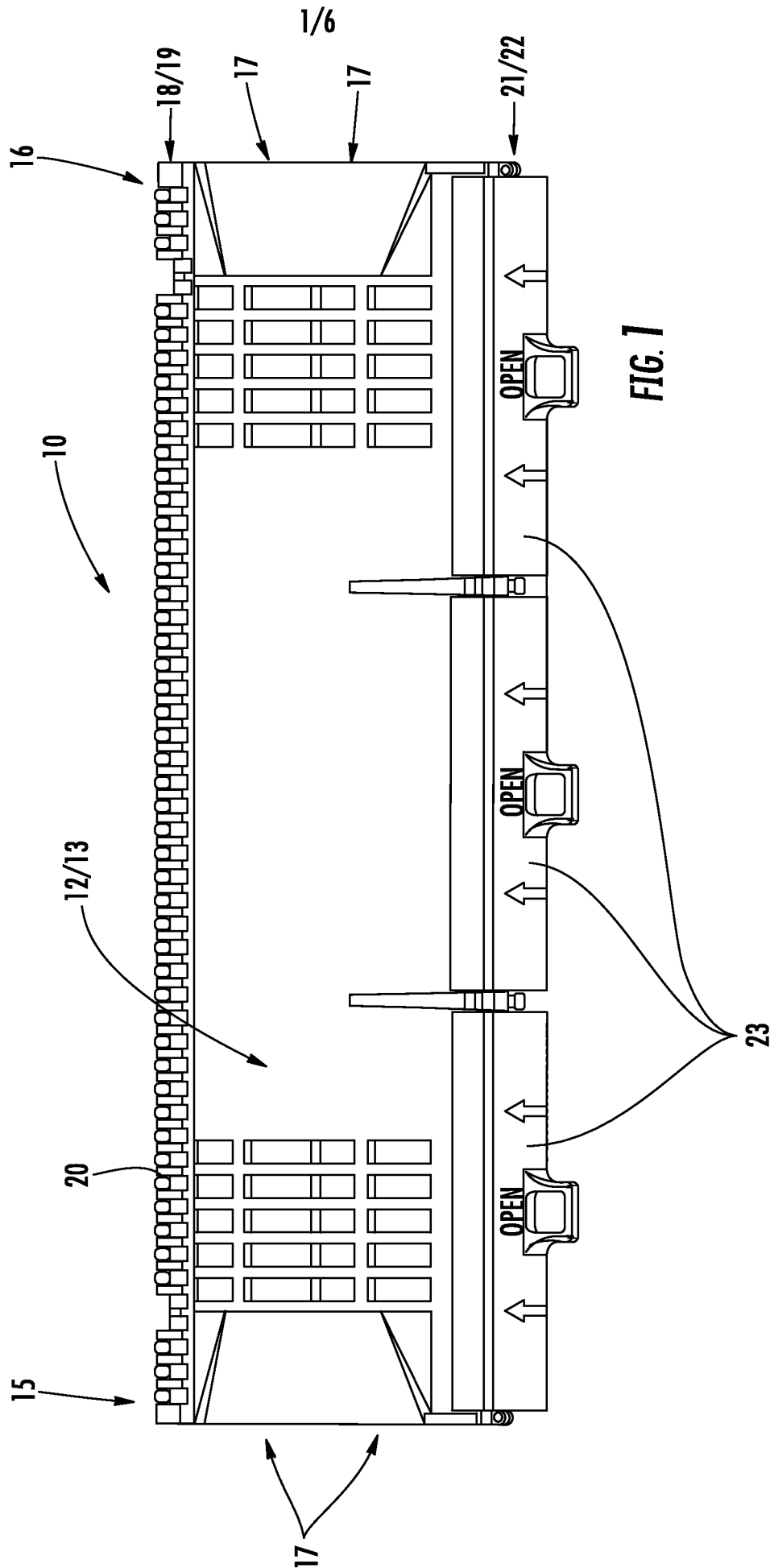
Claims

1. Cable strain relief device for a cable closure, having at least one cable guiding element (29), whereby a cable to be restrained can be fixed at a respective cable guiding element (29) via a cable tie surrounding the cable to be restrained and the respective cable guiding element (29), **characterized in that** on both sides of the or each cable guiding element (29) there are positioned cable tie guiding elements (32, 33) providing guiding surfaces (34, 35), whereby the guiding surface (34) of a first cable tie guiding element (32) being positioned at a first side of the cable guiding element, namely at the cable tie entry side of the same, has a smaller distance from the cable guiding element (29) than the guiding surface (35) of a second cable tie guiding element (33) being positioned at a second side of the cable guiding element, namely at the cable tie exit side of the same.
2. Cable strain relief device as claimed in claim 1, **characterized in that** on both sides of the or each cable guiding element (29) there are positioned cable tie guiding elements (32, 33) having arc segmented guiding surfaces (34, 35), whereby the arc segmented guiding surface (34) of a first cable tie guiding element (32) being positioned at the first side of the cable guiding element (29), namely at the cable tie entry side of the same, has a smaller radius than the arc segmented guiding surface (35) of the second cable tie guiding element (33) being positioned at the second side of the cable guiding element (29), namely at the cable tie exit side of the same.
3. Cable strain relief device as claimed in claim 2, **characterized in that** a center point of the arc segmented surface (34) of the first cable tie guiding element (32) and a center point of the arc segmented surface (35) of the second cable tie guiding element (33) have a different distance from the respective cable guiding element (29).

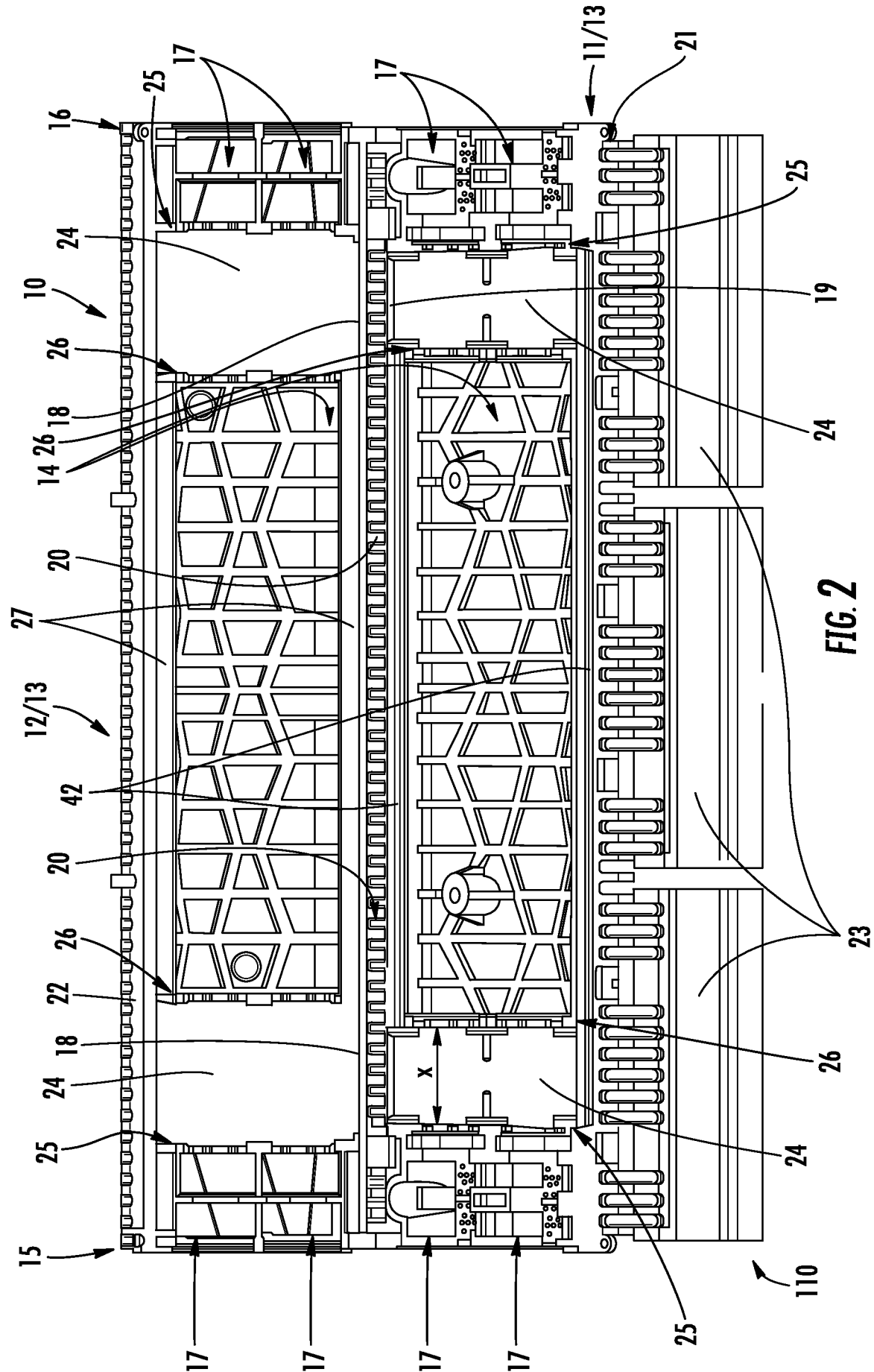
4. Cable strain relief device as claimed in claim 3, **characterized in that** the center point of the arc segmented surface (34) of the first cable tie guiding element (32) and the center point of the arc segmented surface (35) of the second cable tie guiding element (33) have a different distance from the respective cable guiding element (29) in vertical direction and/or horizontal direction.
5. Cable strain relief device as claimed in claim 4, **characterized in that** these center points are located on a common vertical axis and have a different distance from the respective cable guiding element (29) in vertical direction only.
6. Cable strain relief device as claimed in claim 1, **characterized in that** the or each cable guiding element (29) comprises projections (30, 31) which engage in the cable sheath of the respective cable to be restrained at the respective cable guiding element.
7. Cable strain relief device as claimed in claim 6, **characterized in that** the same comprises at least two cable guiding elements (29) being positioned side by side, whereby on both sides of each cable guiding element (29) there are positioned said cable tie guiding elements (32, 33) having said guiding surfaces (34, 35).
8. Cable closure, having a housing, which delimits an interior of the cable closure and seals off the cable closure toward the outside, said housing comprising a covering body (13) providing cable insertion regions (17) for inserting cables into said interior of the cable closure and/or for passing cables out of said interior of the cable closure, wherein compressible and/or deformable sealing elements (24) are positioned in the region of said cable insertion regions (17), **charac-**

terized by at least one cable strain relief device (28) as claimed in one of claims 1 to 7.

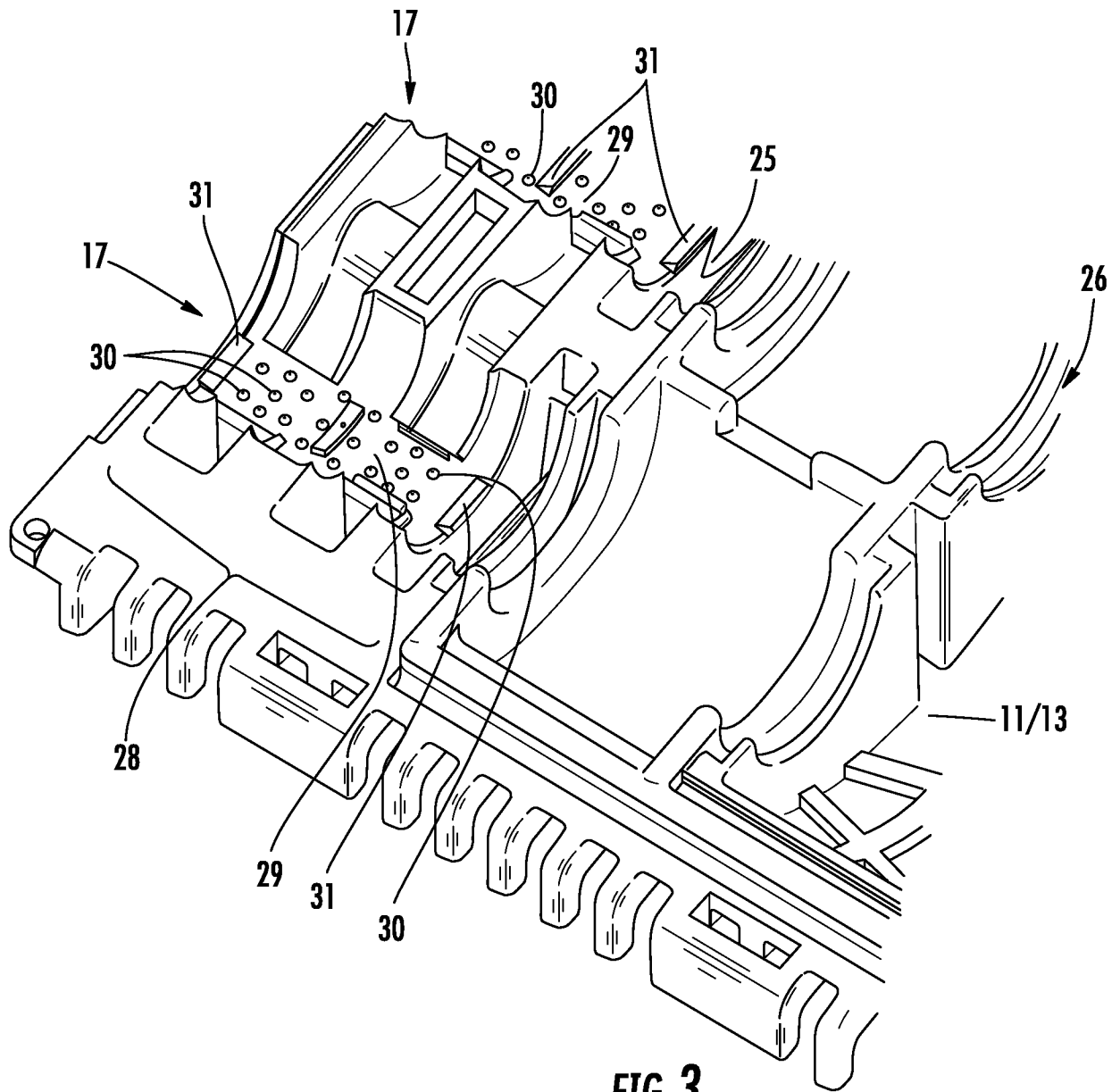
9. Cable closure as claimed in claim 8, **characterized in that** the same
5 is as inline cable closure, whereby said covering body (13) comprising half-shells (11, 12) and providing on mutually opposite sides (15, 16) of the same cable insertion regions (17) for inserting cables into said interior of the cable closure and/or for passing cables out of said interior of the cable closure, whereby one cable strain relief device
10 (28) is assigned to each of the mutually opposite sides (15, 16) of one of said half-shells (11, 12).
10. Cable closure as claimed in claim 9, **characterized in that** each cable strain relief device (28) is an integral part of the respective said
15 half-shells (11, 12).
11. Cable closure as claimed in claim 10, **characterized in that** each cable strain relief device (28) is positioned completely inside the interior of the covering body (13).



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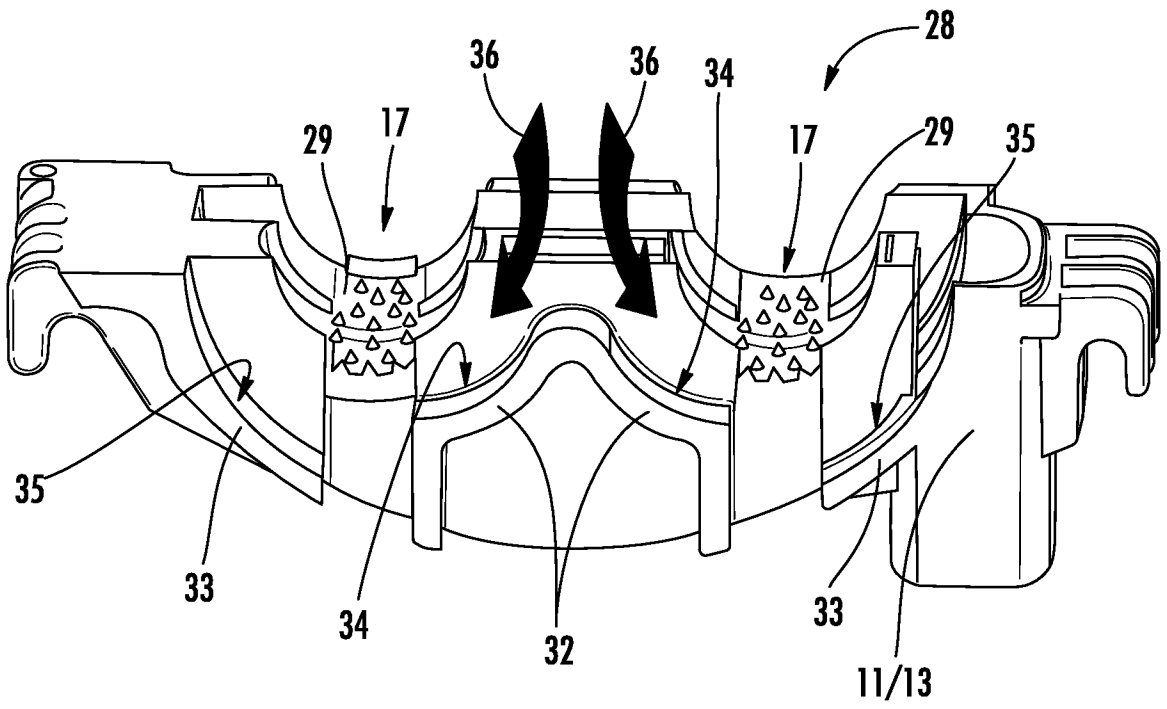


FIG. 4

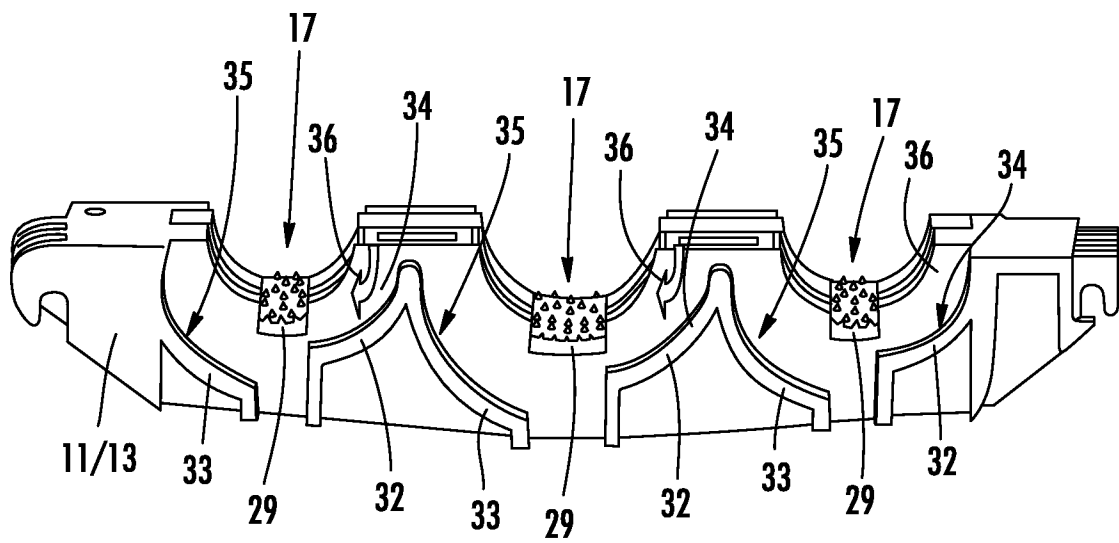
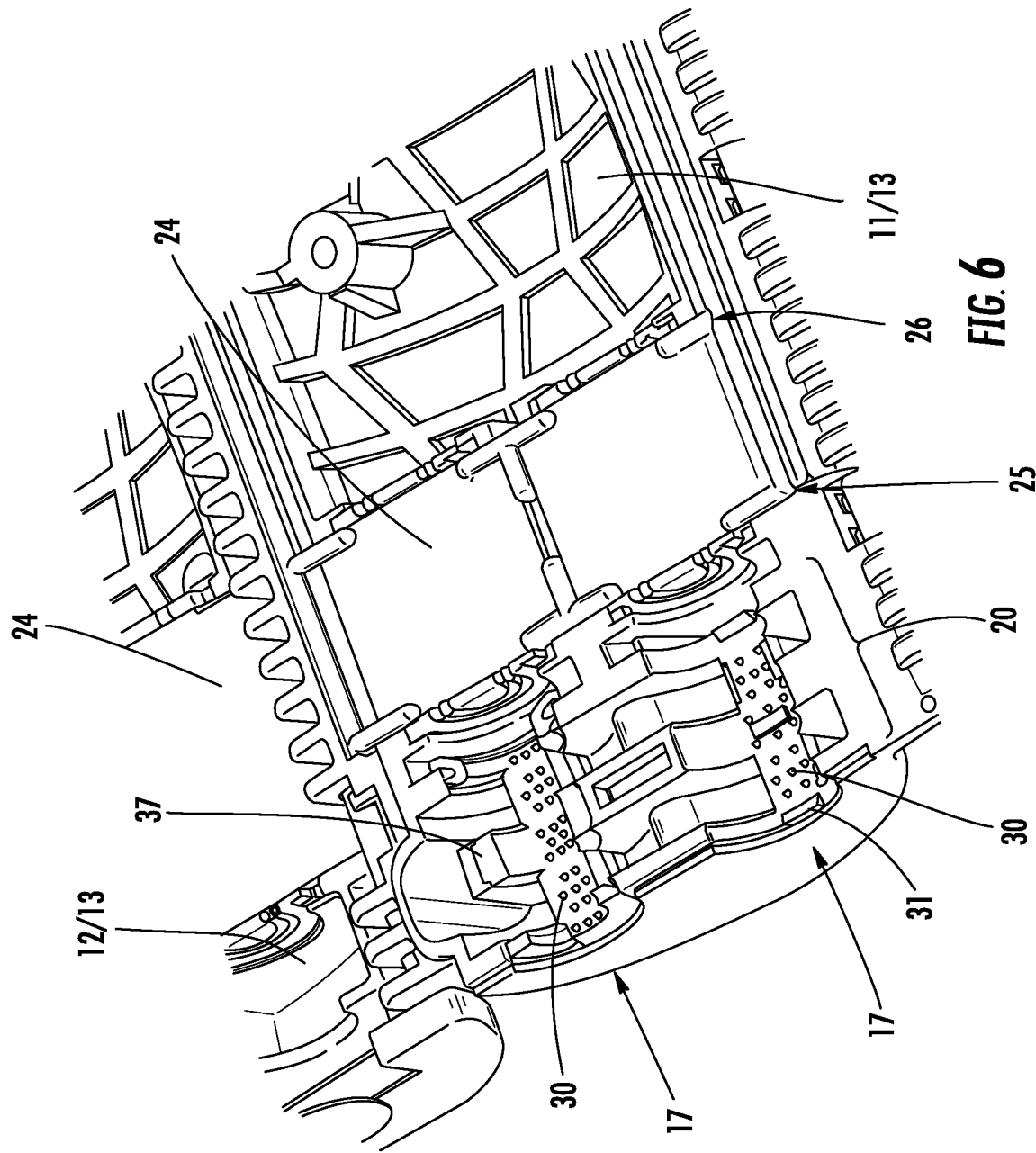
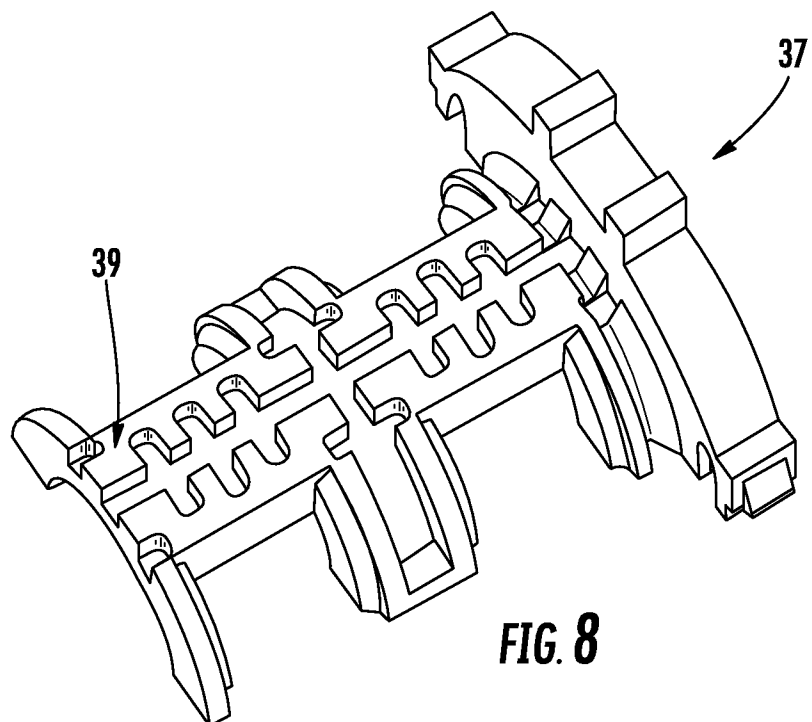
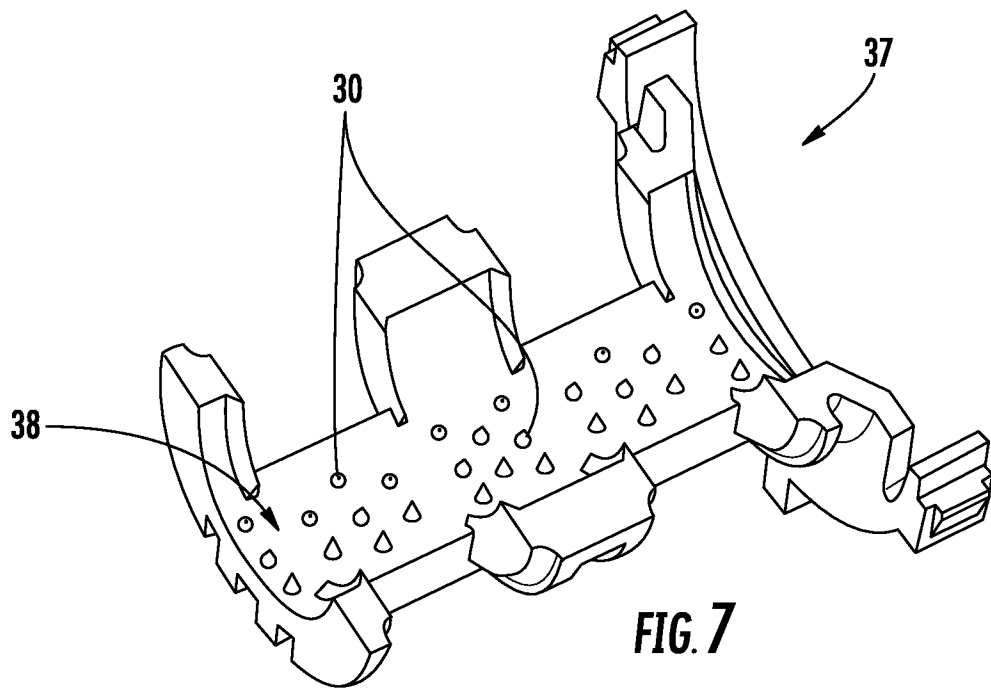


FIG. 5



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/036057

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G02B 6/44 (2012.01)

USPC - 385/135

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(8) - G02B 6/44; H02G 3/04 (2012.01)

USPC - D13/155; 174/68.1, 68.3; 248/49, 68.1; 385/134, 135, 136, 137, 147

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)

PatBase, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2010/0202745 A1 (SOKOLOWSKI et al) 12 August 2010 (12.08.2010) entire document	1-5, 8-11 ----- 6-7
Y	US 4,693,539 A (TIGHE, JR.) 15 September 1987 (15.09.1987) entire document	6-7
A	US 6,573,455 B1 (RADELET) 03 June 2003 (03.06.2003) entire document	1-11
A	US 6,215,939 B1 (CLOUD) 10 April 2001 (10.04.2001) entire document	1-11

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Date of the actual completion of the international search

02 July 2012

Date of mailing of the international search report

10 JUL 2012

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