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### (54) PRINTING PLATE TENSION BANDS

(57) A tension band (1, 30) for a printing plate (10) is provided. The tension band has mounting means (2, 3) configured to securely engage with a cylinder (20) of a rotating press. The tension band also has plate connection means (4) having a connection element (5, 6) configured to form a non-permanent slotted relationship

with a complementary connection element (15) provided, in use, by a printing plate (10). Furthermore the mounting means (2, 3) and the plate connection means (4) are attached together by way of an elasticated strap (7). A printing plate (10) having one or more tension bands (1, 30) is also provided.

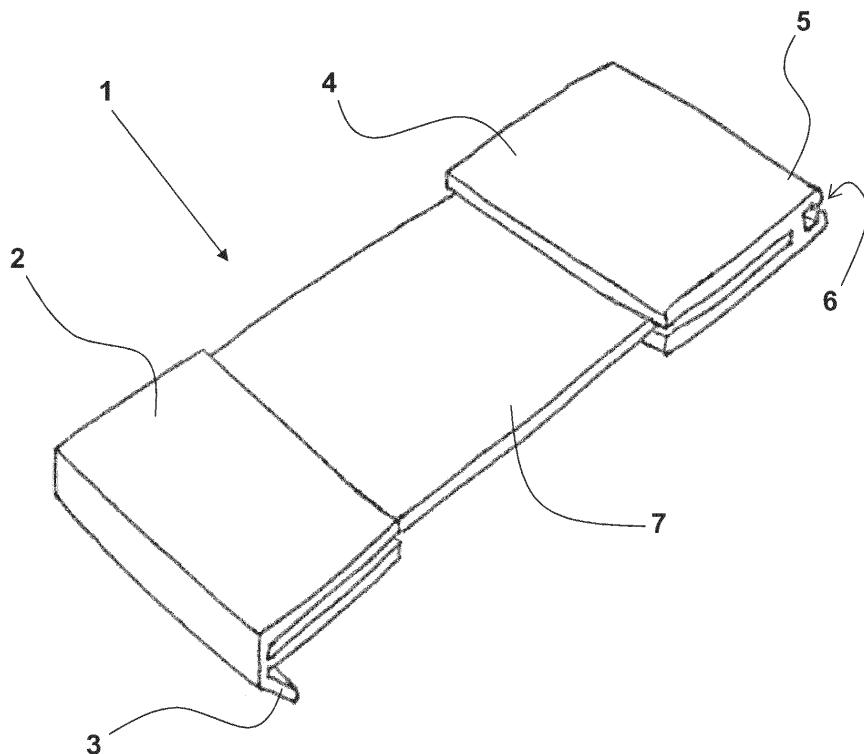


Fig. 1

**Description****Field of the Invention**

**[0001]** The present invention relates to the field of flexographic printing and in particular to tension bands used to securely mount flexographic plates on to a rotating press.

**Background of the Invention**

**[0002]** Flexography is a printing process which utilizes a flexible relief plate. The flexible relief plate is provided with a print image which is to be transferred to a target medium.

**[0003]** Flexography is commonly used for the high speed printing of multiple items, such as packaging for example. Each flexible relief plate is provided with mounting means that engage with and secure the plate to the cylinder of a rotating press. The mounting means are typically formed as a separate component to the plate and must therefore be securely attached to the plate, for example by adhesive, stitching or a combination thereof.

**[0004]** Due to the rotational speeds at which the cylinders of rotating presses operate it is crucial that printing plates are securely mounted to the cylinder such that the printing plate cannot bulge or ruck up during use. Bulging can not only affect the consistency of the print image being produced but introduce the possibility of the plate snagging during printing.

**[0005]** In view of this, print plates are typically fixed to the cylinder at one of their edges using mounting means that are complementary to the receiving mechanism provided on a particular cylinder. At the opposite edge of the printing plate are typically provided a plurality of tension bands.

**[0006]** These tension bands, which are also provided with mounting means that are complementary to the receiving mechanism provided on a particular cylinder, are threaded through holes/opening provided along the edge of the printing plate.

**[0007]** Tension bands can be stretched by the print operator to facilitate mounting of the print plate on a print cylinder without needing to stretch the printing plate itself.

**[0008]** Although important, the process of fitting tension bands to a printing plate can be time consuming, particularly in situations where a large number of tension bands are required as they need to be fitted individually.

**Summary of the Invention**

**[0009]** The present invention provides an improved system for mounting printing plates to a cylinder of rotating printing press. To this end the present invention provides a tension band for a printing plate comprising: mounting means configured to securely engage with a cylinder of a rotating press; plate connection means having an connection element configured to form a non-per-

manent slotted relationship with a complementary connection element provided, in use, by a printing plate; and wherein the mounting means and the plate connection means are attached together by way of an elasticated strap.

**[0010]** The tension band of the present invention provides a much quicker, easier and therefore cheaper way of preparing and mounting a printing plate on to a print cylinder.

**[0011]** The interaction of the connection element of the tension band of the present invention with a complementary connection element mounted along an edge of a printing plate removes the need to form multiple holes in the printing plate to receive tension bands.

**[0012]** This avoids the possibility of weakening the structural strength of the printing plate. The alternative approach provided by the present invention also avoids the possibility that the holes might be incorrectly positioned, which could in the past have necessitated the preparation of a new printing plate.

**[0013]** A yet further advantage of the system of the present invention is that the number of tension bands applied to a printing plate, and their positioning, can be readily adjusted without having to repair or replace the printing plate.

**[0014]** It is appreciated that the connection formed between the print cylinder and the print plate via the tension bands must be strong in the direction that runs around the circumference of the cylinder; that is to say along the length of the tension bands.

**[0015]** It is therefore crucial that the tension bands cannot be pulled away from the print cylinder or the print plate in this direction.

**[0016]** However, it is envisaged that it is not crucial that the lateral movement of the tension bands relative to the print cylinder or the print plate be similarly restricted because, once in place upon a cylinder, the tension in the stretched tension bands serves to prevent lateral movement.

**[0017]** In view of this appreciation it was discovered that a non-permanent slotted connection could be used to attach the tension bands of the present invention to a complementary connection element provided on a printing plate.

**[0018]** Therefore, preferably, in use, one of said connection elements may be insertable into the other connection element along a path that is within or parallel to the plane of the printing plate when the plate is laid flat.

**[0019]** Preferably the mounting means and the plate connection means may be formed from plastic. It is envisioned that by using plastic, such as PVC, rather than metal, which is generally used, the likelihood of a printing press being damaged by a broken tension band getting caught in the workings is greatly reduced.

**[0020]** Preferably the mounting means, the plate connection means and the elasticated strap may provide an upper surface that is substantially flat such that, in use, it does not project beyond the printing plate. In this way

the image produced by the printing plate is not affected by the tension band.

**[0021]** Preferably the connection element of the plate connection means may comprise a slot or channel which, in use, securely receives the complementary connection element having a rib configuration. Alternatively the plate connection means may comprise a rib and the complementary connection element comprises a slot or channel.

**[0022]** Preferably the mounting means may be configured to receive an end of the elasticated strip between a pair of parallel walls.

**[0023]** Preferably the connection element may be separated from the rest of the plate connection means by a hinged region. In this way the plate connection means are able to flex slightly, thereby allowing the tension band to sit even more flush on the print cylinder.

**[0024]** Further preferably the hinged region may comprise a portion that is thinner than the rest of the plate connection means. In this way the plate connection means can be formed as a single unit, which might for example be manufactured using extrusion. It is envisaged, however, that the hinged region might also be provided by different means without departing from the general concept of the present invention.

**[0025]** Alternatively and/or additionally a hinged region may be provided on the mounting means.

**[0026]** Preferably the mounting means and the plate connection means may be formed from Polyvinyl chloride (PVC) and the elasticated strap is formed from Thermoplastic polyurethane (TPU). This combination of materials is considered particularly preferable because they are compatible with one another and form a strong bond when they are heat treated (e.g. by welding).

**[0027]** Further preferably the walls of the mounting means and the plate connection means may be ultrasonically welded to respective ends of the elasticated strip. It is also preferable that said parallel walls make direct contact with one another at one or more point on both the mounting means and the plate connection means respectively.

**[0028]** In this way the various components of the tension band are securely fixed together so that they can withstand the high forces applied during the printing process.

**[0029]** In another aspect of the present invention there is provided a printing plate assembly for a rotating printing press comprising: a printing plate comprising a connection element secured along an edge of the plate; one or more tension bands in accordance with the present invention; and wherein the connection element of the plate connection means of each tension band is non-permanently slotted into engagement with the connection element located along the edge of the printing plate.

**[0030]** Preferably, although not essentially, the connection element provided on the printing plate may be an elongate rib and the connection element provided by each tension band is a complementary channel. As stated above, this arrangement can be reversed without de-

parting from the scope of the present invention.

**[0031]** Preferably the printing plate connection element may extend along the entire length of the edge of the printing plate. In this way the tension bands can be positioned at any point along the entire width of the printing plate.

#### Brief Description of the Drawings

**[0032]** The present invention will be described with reference to the preferred embodiments shown in the drawings, wherein:

Figure 1 shows a preferred embodiment of the tension band of the present invention;  
 Figure 2 shows a side view of the embodiment of Figure 1;  
 Figure 3 shows a printing plate assembly in accordance with the present invention; and  
 Figure 4 shows the printing plate assembly of Figure 3 mounted on the cylinder of a rotating printing press;  
 Figure 5 shows a side view of an alternative embodiment of the plate connection means; and  
 Figure 6 shows a variant of the tension band of the present invention with the plate connection means of Figure 5.

#### Detailed Description of the Present Invention

**[0033]** The present invention relates to tension bands that are used to mount printing plates (such as flexographic printing plates) to rotating print cylinders. Tension bands provide a key role in the mounting process because they help retain a printing plate on a cylinder under tension. This helps to prevent the plate rucking up, which can lead to uneven printing and even damage to either the plate or the printer should the plate get caught during a printing run.

**[0034]** Another advantage of the tension band of the present invention is that it is particularly suitable for construction from plastics materials rather than metals. By avoiding the use of metals it is possible to greatly reduce the possibility of the printer being damaged by a tension band if it fails during a print run when the cylinder may be rotating at very high speeds.

**[0035]** A preferred embodiment of a tension band 1 of the present invention is shown in Figures 1 and 2. The tension band 1 is formed from printing cylinder mounting means 2 and plate connection means 4 which are linked to one another via a flexible, elasticated strip 7.

**[0036]** Preferably the printing cylinder mounting means 2 and the plate connection means 4 are formed from PVC and the elasticated strip 7 is formed from TPU. It is envisaged that the printing cylinder mounting means 2 and the plate connection means 4 are bonded to the elasticated strip 7 by ultrasonic welding.

**[0037]** Further detail of the connection formed between the printing cylinder mounting means 2/plate connection

means 4 and the elasticated strip 7 will be appreciated from Figure 2, which shows a side view of the tension band 1 of preferred embodiment.

**[0038]** The printing cylinder mounting means 2 is provided with a pair of parallel walls 2a that are spaced apart to provide a slot in to which the elasticated strip 7 can be received. During the manufacture of the tension band 1 the elasticated strip is slid into the slot between the walls 2a and then the overlapping region is subjected to ultrasonic welding to bond the walls 2a and the strip 7 together.

**[0039]** Preferably, although not shown, the bonding process may advantageously involve squeezing the walls 2a together at one or more locations so as to 'pinch' the strip 7 and further strengthen the structural link formed between the printing cylinder mounting means 2 and the elasticated strip 7.

**[0040]** It will be appreciated that a similar approach to that described above is also appropriate for bonding the plate connection means 4 and the elasticated strip 7. To this end the plate connection means is provided with parallel walls 4a.

**[0041]** At the opposite end of the mounting means 2 to the parallel walls 2a is provided a lip 3. The lip 3 is shaped so as to be receivable in a corresponding recess or slot in the printing cylinder (see Figure 4). It is envisaged that although the lip 3 shown is angled, alternative configurations might be adopted to accommodate different cylinder designs without departing from the general scope of the present invention.

**[0042]** At the opposite end of the plate connection means 4 to the parallel walls 4a is provided a connection element 5 with a slot 6 that is capable of securely receiving a complementary rib portion 15 provided on a printing plate 10 (see Figure 3).

**[0043]** The interaction between the slot 6 of the connection element and the rib 15 of the printing plate 10 is such that they can only be slid apart from one another. It is an essential aspect of the present invention that this interaction forms a connection that is structurally strong when pulled in a direction that is parallel to direction of rotation of print cylinder. In this way the tension band of the present invention ensures that the printing plate remains securely mounted on the cylinder.

**[0044]** Whilst the interaction is strong in one direction the slotted arrangement of the interaction between the connection element 5 and the rib portion 15 ensures that it is relatively quick and easy to disengage them by sliding them apart from one another when mounting and dismounting a printing plate from a cylinder.

**[0045]** It is this ease of use that is one of the key features of the present invention as it is appreciated that the tension bands of the prior art involve more complicated, and therefore more time consuming, mechanisms for connecting the tension band to a printing plate (e.g. by threading the tension band through an opening in the printing plate itself).

**[0046]** Another aspect of the present invention relates

to a printing plate assembly formed using the tension bands of the present invention. A preferred embodiment of a printing plate assembly in accordance with the present invention is shown in Figure 3.

**[0047]** A printing plate 10 is provided with a main substrate 11 on to which a printing relief (not shown) is provided. In the shown example the substrate is a flexographic printing plate.

**[0048]** Along one edge of the substrate 11 is secured means for mounting the plate to a printing cylinder 12. It is appreciated that the mounting means 12 may have a similar configuration to the lip 3 shown in Figures 1 and 2, however this is not necessarily the case. The mounting means are preferably secured along the edge of the substrate using stitching, although the skilled person will appreciate that other fixing means might be adopted without departing from the present invention.

**[0049]** Along an opposite edge of the substrate 11 is secured the rib 15 which, in use, forms an interaction with one or more tension bands 1 by way of the slots 6 provided on the connection element 5 of each band 11. Again, although in the shown example the rib 15 is secured onto the substrate 11 by stitching 16, the skilled person will appreciate that other fixing means might be adopted without departing from the present invention.

**[0050]** Another advantage of the present invention that will be appreciated upon consideration of Figure 3 is that the nature of the interaction between the tension bands 1 and the printing plate allows for the number and position of the bands to be quickly and easily adjusted. It will be appreciated that any such adjustments would be more difficult (and in some cases impossible) to achieve if each tension band were passed through an opening/aperture in the printing plate.

**[0051]** The mounting of the printing plate 11 onto a printing cylinder 20 will be appreciated from Figure 4. In particular it will be seen that the printing plate 11 would be secured to the cylinder along a first edge, by the interaction of mounting means 12 with a recess 21 in the cylinder 20, and along a second edge, by the interaction between the tension bands 1 and a recess 22 in the cylinder 20.

**[0052]** It will be appreciated that as the tension bands 1 are secured between the printing plate and the cylinder under tension (i.e. the elasticated strip 7 is stretched) the printing plate is urged to lie flush with the circumference of the cylinder and not ruck up. This is crucial when the print cylinder and plate are being rotated at high speeds.

**[0053]** An alternative embodiment of the tension band 30 of the present invention is shown in Figure 6. Although the majority of the components remain the same as have already been described, the band 30 is provided with an alternative design of plate connection means 24.

**[0054]** As will be appreciated from Figure 5, which shows a side view of the plate connection means 24, once again a pair of parallel walls 24a are provided with a slot 25 being between them to receive the elasticated strip 7.

**[0055]** At the opposite end of the plate connection means 24 is once again provided the connection element 27 which forms a secure slotted connection with the rib 15 provided on printing plate 10, for instance.

**[0056]** Further detail of the connection element 27 will be appreciated in the form of the slot 28 and the opposing teeth 29 positioned at the opening to the slot 28. It will be appreciated that whilst the slot receives the main body of the rib 15 the opposing teeth 29 serve to prevent the rib 15 from being pulled out of the slot 28 via the opening, thereby providing the required structural strength in directions parallel to the direction of the rotation of the cylinder during a print run.

**[0057]** Advantageously the plate connection means 24 is further provided with a hinge portion 26, which is located between the connection element 27 and the parallel walls 24a. It is envisaged that the hinged portion gives the plate connection means 24 additional flexibility so that it can sit even more flush with the contours of the print cylinder. This feature, together with the generally flat configuration of the tension bands of the present invention, minimises the profile of the tension bands and thereby avoids such getting snagged or caught during the rotation of the cylinder.

**[0058]** Although the hinged portion 26 is provided by way of a thinner region of plastics material, it is appreciated that alternative hinging arrangements might be adopted without departing from the present invention.

**[0059]** Although not specifically shown it is envisaged that the alternative embodiment of the tension bars 30 shown in Figure 6 can also be used to produce a printing plate similar to that shown in Figure 3.

## Claims

### 1. A tension band for a printing plate comprising:

mounting means configured to securely engage with a cylinder of a rotating press;  
 plate connection means having an connection element configured to form a non-permanent slotted relationship with a complementary connection element provided, in use, by a printing plate; and  
 wherein the mounting means and the plate connection means are attached together by way of an elasticated strap.

**2.** The tension band of claim 1, wherein, in use, one of said connection elements is insertable into the other connection element along a path that is within or parallel to the plane of the printing plate when the plate is laid flat.

**3.** The tension band of claim 1 or 2, wherein the mounting means and the plate connection means are formed from plastic.

**4.** The tension band of claim 1, 2 or 3, wherein the mounting means, the plate connection means and the elasticated strap provide an upper surface that is substantially flat such that, in use, it does not project beyond the printing plate.

**5.** The tension band of any of claims 1 to 4, wherein the connection element of the plate connection means comprises a slot or channel which, in use, securely receives the complementary connection element having a rib configuration.

**6.** The tension band of any of the preceding claims, wherein the mounting means is configured to receive an end of the elasticated strip between a pair of parallel walls.

**7.** The tension band of any of the preceding claims, wherein the plate connection means is configured to receive an end of the elasticated strip between a pair of parallel walls.

**8.** The tension band of any of the preceding claims, wherein the connection element is separated from the rest of the plate connection means by a hinged region.

**9.** The tension band of claim 8, wherein the hinged region comprises a portion that is thinner than the rest of the plate connection means.

**10.** The tension band of any of the preceding claims, wherein the mounting means and the plate connection means are formed from PVC and the elasticated strap is formed from TPU.

**11.** The tension band of claim 10, wherein the walls of the mounting means and the plate connection means are ultrasonically welded to respective ends of the elasticated strap.

**12.** The tension band of claim 11, wherein said parallel walls make direct contact with one another at one or more point on both the mounting means and the plate connection means respectively.

**13.** A printing plate assembly for a rotating printing press comprising:

a printing plate comprising a connection element secured along an edge of the plate;  
 one or more tension bands in accordance with any of claims 1 to 12; and  
 wherein the connection element of the plate connection means of each tension band is non-permanently slotted into engagement with the connection element located along the edge of the printing plate.

14. The printing plate assembly of claim 14, wherein the connection element provided on the printing plate is an elongate rib and the connection element provided by each tension band is a complementary channel.

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15. The printing plate assembly of claim 13 or 14, wherein the printing plate connection element extend along the entire length of the edge of the printing plate.

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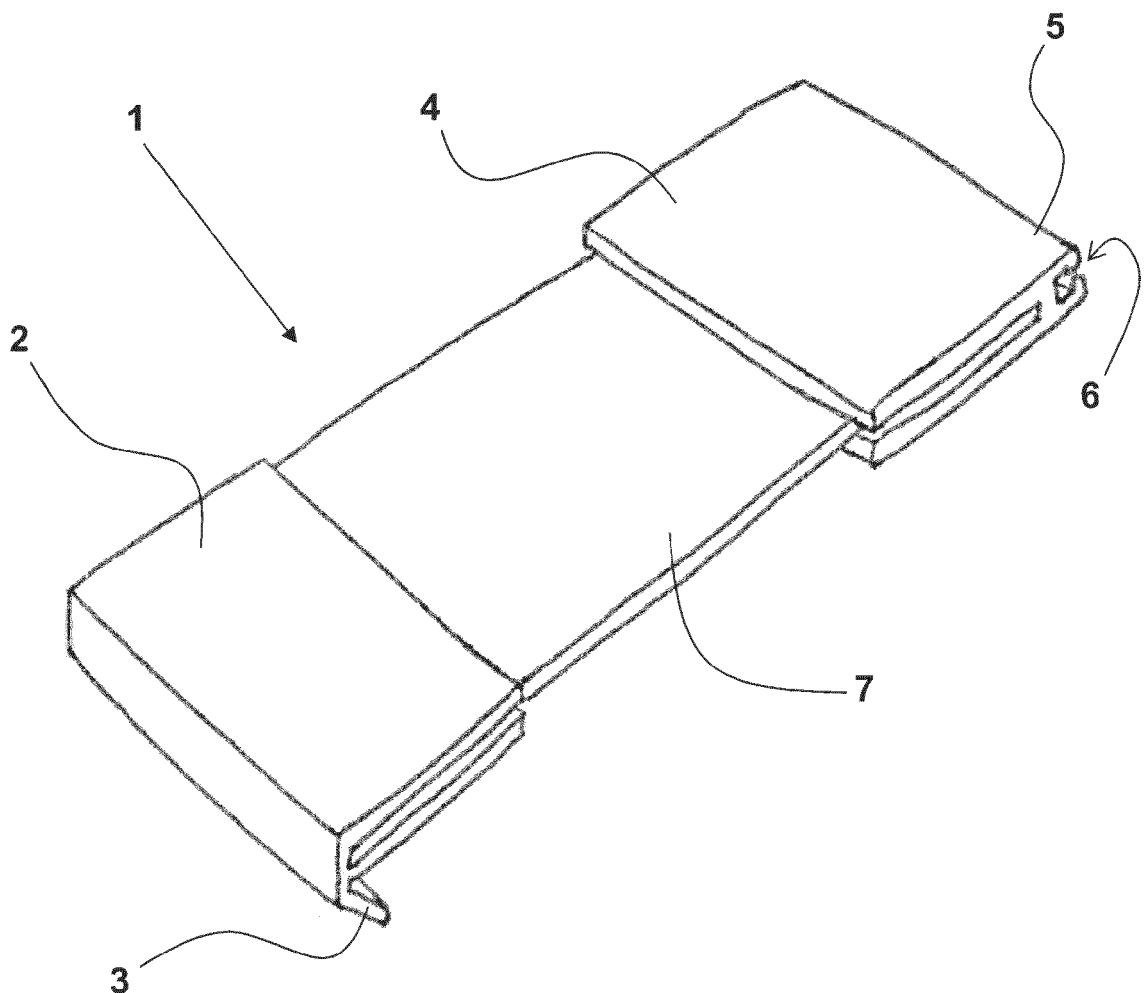


Fig. 1

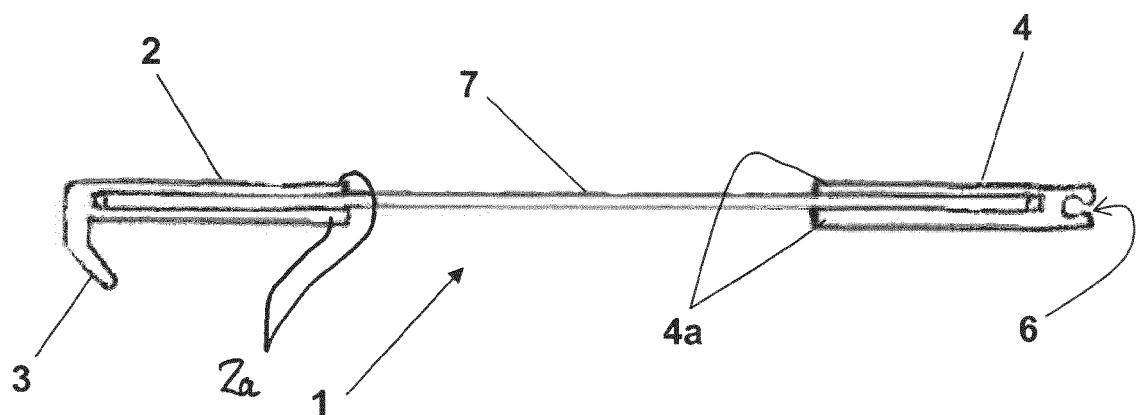


Fig. 2

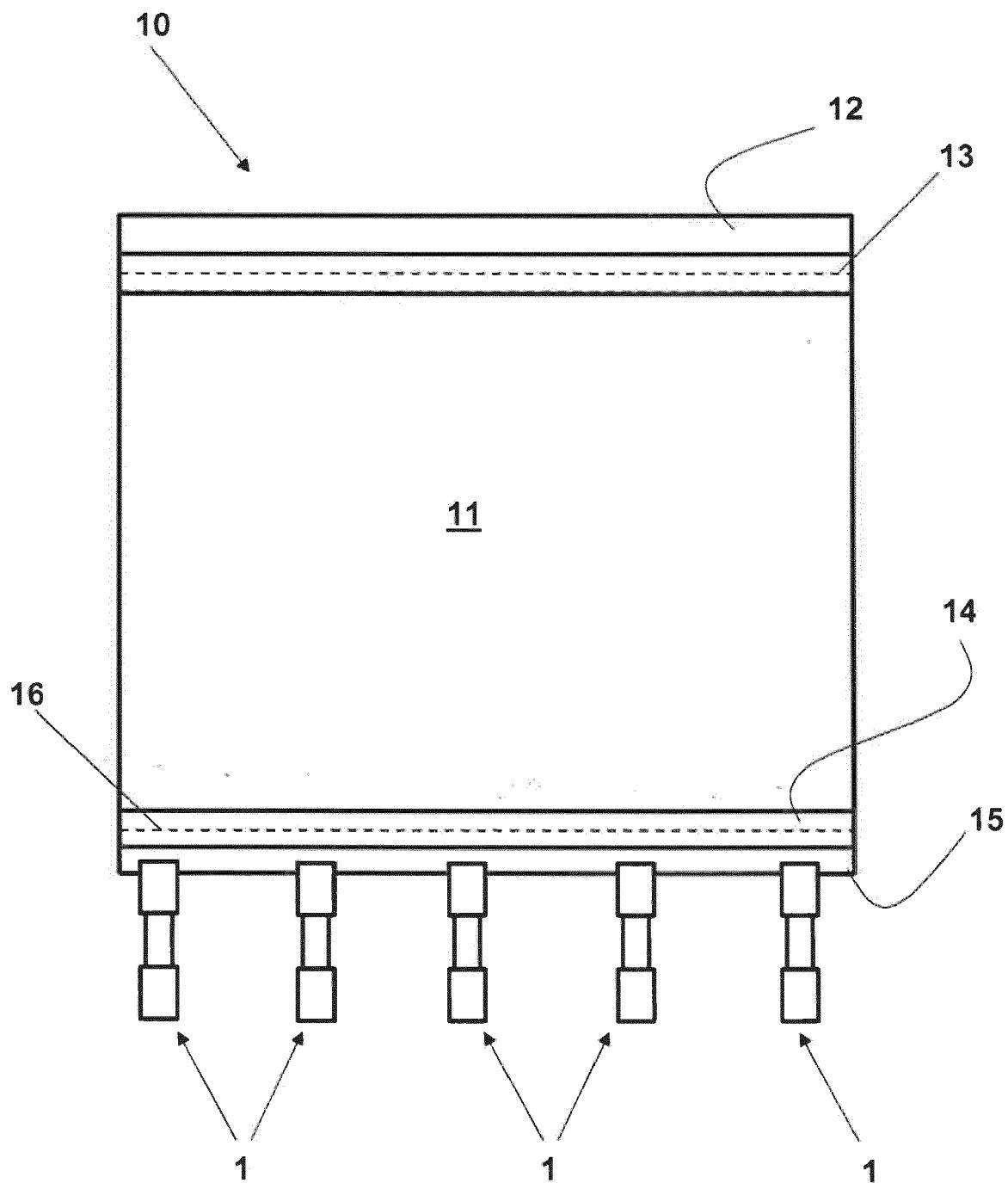


Fig. 3

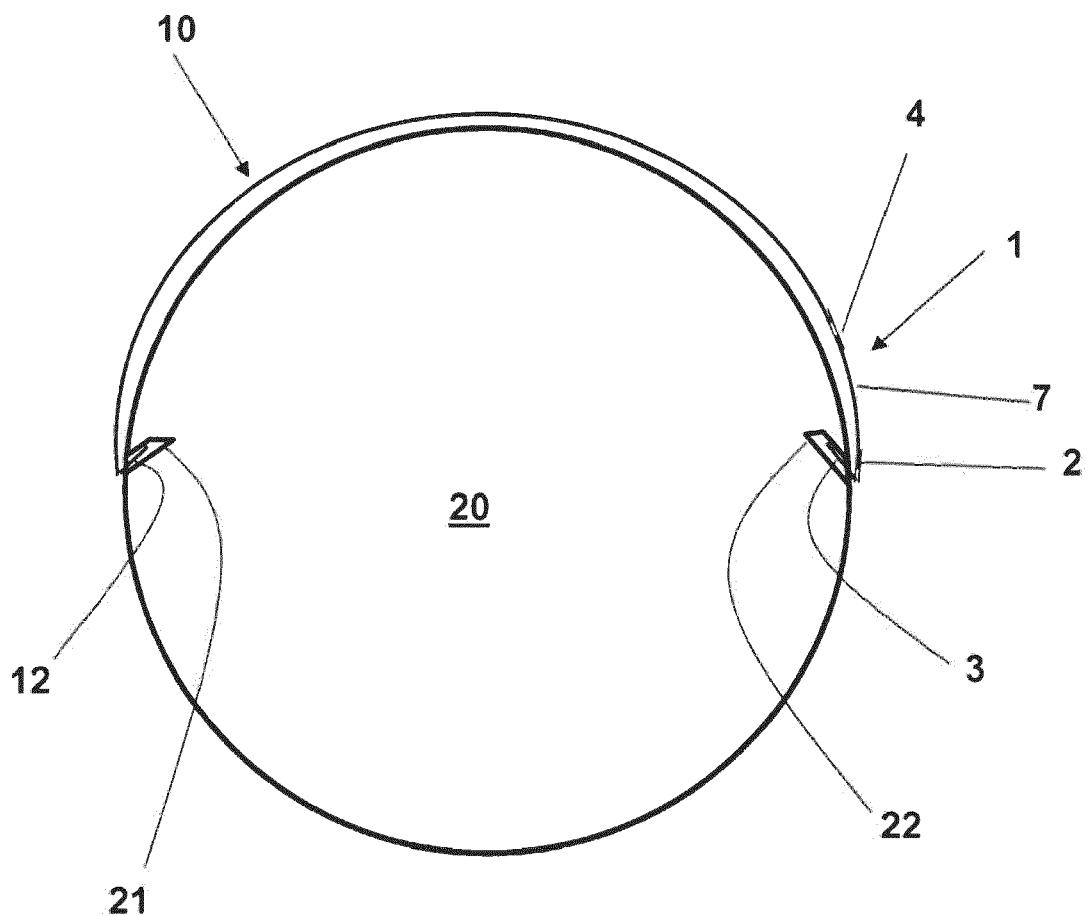
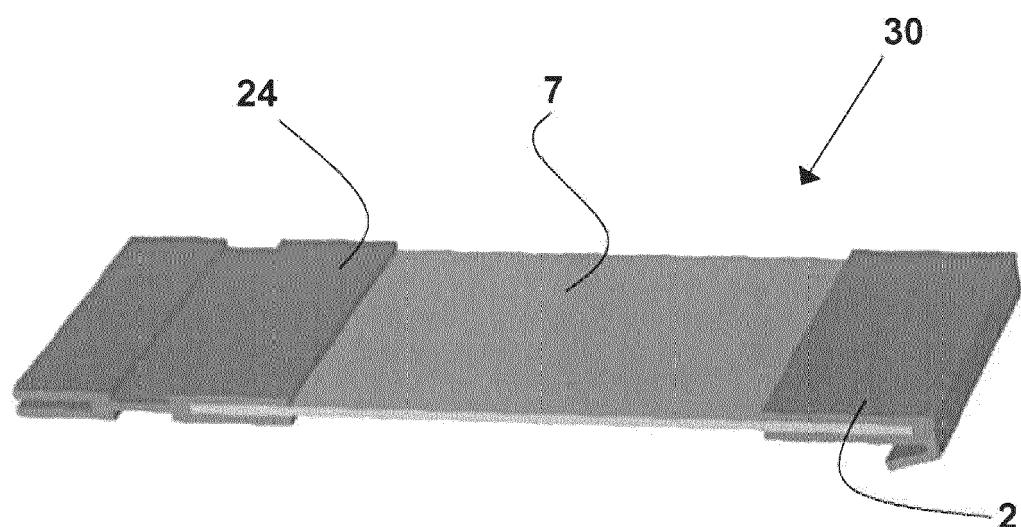
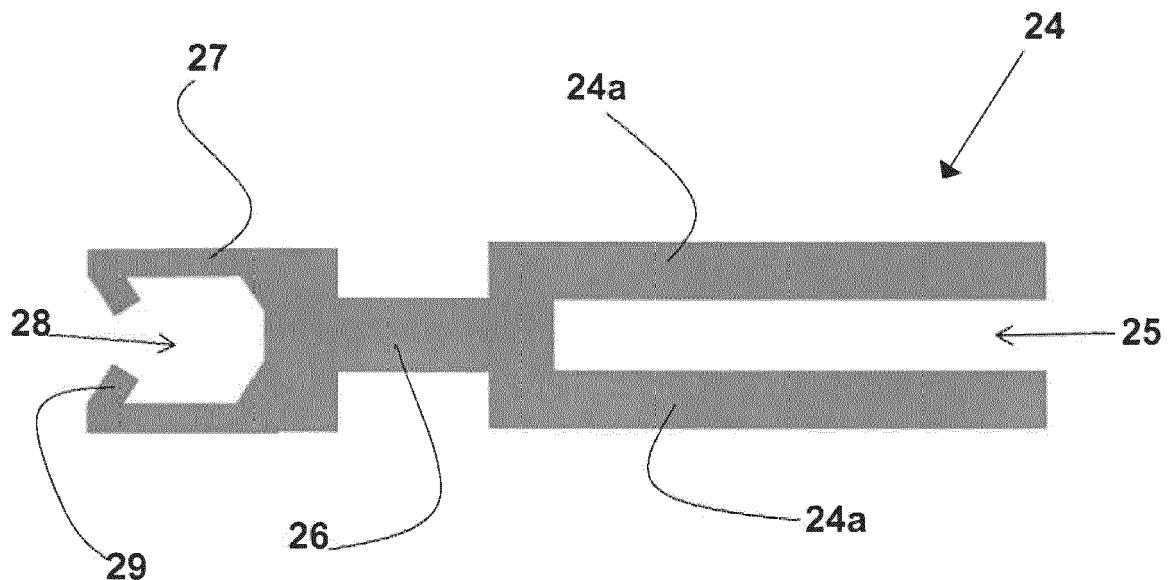


Fig. 4





## EUROPEAN SEARCH REPORT

Application Number  
EP 16 17 6971

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
10 X	US 4 408 530 A (YANO TADASHI [JP] ET AL) 11 October 1983 (1983-10-11) * figure 4 * * column 3, lines 61-66 * * column 6, lines 36-40 * -----	1-15	INV. B41F5/24 B41F27/12
15 X	CA 1 177 690 A (LONDON ARTHUR J) 13 November 1984 (1984-11-13) * figures 1-4 * * page 2, line 27 - page 4, line 6 * -----	1-15	
20 X	GB 1 458 870 A (ALLINACE BOX CO LTD) 15 December 1976 (1976-12-15) * figure 1 * * page 1, line 94 - page 2, line 36 * -----	1-15	
25 X	US 6 318 261 B1 (KOELSCH KEVIN W [US]) 20 November 2001 (2001-11-20) * figures 2-4 * * column 3, lines 24-54 * -----	1-15	
30			TECHNICAL FIELDS SEARCHED (IPC)
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50 1	The present search report has been drawn up for all claims		
55	Place of search Munich	Date of completion of the search 25 October 2016	Examiner Hajji, Mohamed-Karim
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10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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