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(54) **PROCESS AND DEVICE FOR CREASING PRINTING SUBSTRATES**

(57) The invention relates to a process for creasing printing substrates (1) and a device to perform said process, the process comprising the stages of supplying a printing substrate; and making contact with one longitudinal end of the printing substrate (1) on one face by means of a first surface (4), and a second surface (5), mutually angled, and on another face by means of a first extension (6) and a second extension (7), mutually angled, forming a crease (3) on the longitudinal end of the printing substrate (1).

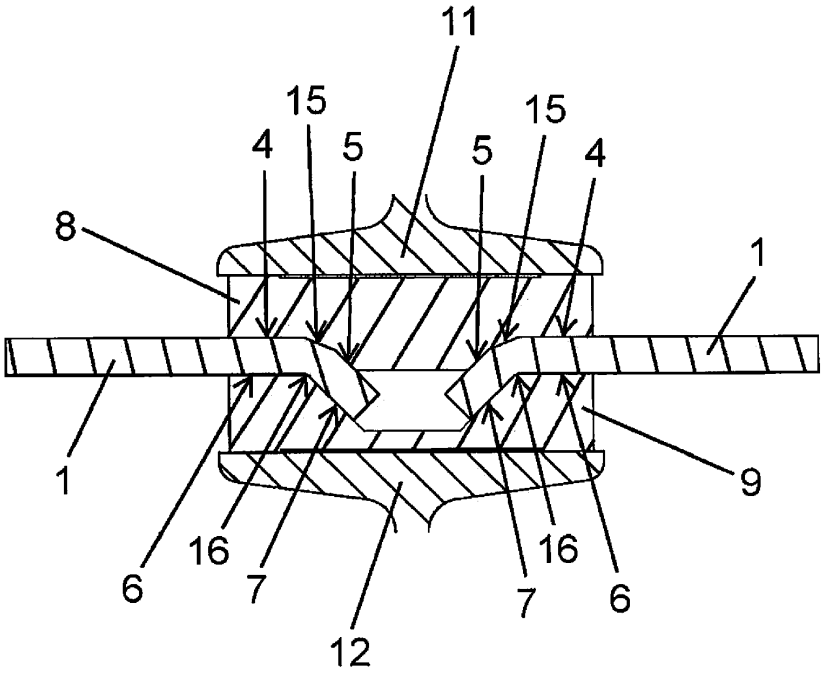

Fig. 7

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Description

Technical field

[0001] The present invention relates to the digital printing industry, related to digital printing on printing substrates that are supplied substantially flat.

State of the art

[0002] Currently, printing on printing substrates by means of digital printing machines in order to provide said substrates with a desired finish or outer appearance is widely known. These printing substrates are difficult to print on when, for example, they are made up of boards formed by two flat outer layers and at least one intermediate undulate layer.

[0003] Said printing substrates are subjected to stresses from the moment they are obtained due to the described configuration. These stresses develop into deformations of the substrates, being arranged according to a concave arrangement on a support table or surface for the printing thereof. This concave arrangement generally corresponds to a longitudinal curling according to the advance direction of the printing substrates, in other words, an initial portion and a final portion are distanced from the support table while resting on said table on the central portion of the same.

[0004] These deformations increase when a prior primer coat is applied to the printing substrates in order for a suitable ink droplet acceptance when the printing is carried out. These ink droplets are applied by means of inkjet technology on the primer coat such that a desired dimension of each of the ink droplets on the printing substrate is obtained.

[0005] Currently, in order to maintain the printing substrates according to a flat arrangement on the support tables for a suitable application or injection of ink droplets, that is, a suitable printing of said substrates, the technique of applying aspiration in order to create suction on the printing substrates resulting in a vacuum effect is known. However, the effectiveness of this solution is severely limited by the degree of deformation that can be caused to the substrates as a result of the configuration thereof and/or the application of the aforementioned primer coat.

[0006] In light of the described disadvantages of the currently existing solutions, it is clear that a solution is needed that enables the correct arrangement of the substrates for the printing thereof according to a flat arrangement.

Object of the invention

[0007] In order to fulfill this aim and resolve the aforementioned technical problems to date, in addition to providing additional advantages that can be derived later, the present invention provides a process for creasing printing substrates and a device for creasing printing substrates in order to ensure a correct arrangement of the printing substrate while they are the object of ink droplet printing or injection. The process and the device are especially suitable to be used for digital printing machines.

[0008] The process for creasing printing substrates comprises the stages of supplying a printing substrate; and making contact with one longitudinal end of the printing substrate on one face by means of a first surface and a second surface, mutually angled, and on another face by means of a first extension and a second extension, mutually angled, forming a crease on the longitudinal end of the printing substrate.

[0009] Additionally, according to the creasing process of the invention, contact is simultaneously made with one longitudinal end of the printing substrate on one face by means of a first surface and another second surface, mutually angled, and on another face by means of a first extension and a second extension, mutually angled, forming a crease on the longitudinal end of the printing substrate.

[0010] The device for creasing printing substrates comprises a creaser that has the first surface and the second surface thereof mutually angled, the first surface and the second surface configured to make contact with a longitudinal end of a printing substrate on one face; and a counter creaser that has the first extension and the second extension thereof mutually angled, the first extension and the second extension being configured to make contact with the longitudinal end of the printing substrate on another face.

[0011] The creaser and counter creaser are arranged with respect to each other such that when they simultaneously make contact with the longitudinal end they are able to form a crease in the printing substrate though the joint action of the creaser and the counter creaser.

[0012] Preferably, the creaser has two first surfaces and two second surfaces, the second surfaces extending with respect to the first surfaces such that they mutually converge; and the counter creaser has two first extensions and two second extensions, the second extensions extending with respect to the first extensions such that they mutually converge. This way, two creases are formed by the joint action of the creaser and the counter creaser.

[0013] The creaser and the counter creaser are arranged extended along a first web and a second web, respectively. The first web is configured to be actuatable in rotation and/or the second web is configured to be actuatable in rotation.

[0014] The first surfaces and the second surfaces are mutually angled according to a first angle, and the first extensions and the second extensions are mutually angled according to a second angle, the first angle and the second angle being complementary such that together they equal 360°.

[0015] The first surfaces and the second surfaces are joined by a first intermediate section, preferably defined

by a first radius of curvature. The first extensions and the second extensions are joined by a second intermediate section, defined by a second radius of curvature. This way, the formation of the creases is done more smoothly. Thus, in order to maintain a consistent thickness of the printing substrates, the first radius of curvature is greater than the second radius of curvature.

[0016] This way, the invention proportions the printing substrates in a way so that they can receive a suction that arranges them according to a flat arrangement along the entire extension thereof.

Description of the figures

[0017]

Figure 1 shows a schematic view of printing substrates arranged according to the state of the art.

Figure 2 shows a schematic view of the printing substrates arranged according to the present invention.

Figure 3 shows a perspective view of a device for creasing printing substrates object of the present invention.

Figure 4 shows another perspective view of the device for creasing printing substrates object of the present invention.

Figure 5 shows a front view of the device for creasing printing substrates object of the present invention.

Figure 6 shows a schematic view of the device for creasing printing substrates object of the present invention.

Figure 7 shows another partial schematic view of the device for creasing printing substrates object of the present invention.

Detailed description of the invention

[0018] The invention relates to a process and a device for creasing printing substrates (1). The process and the device are especially suitable to be used on digital printing machines with printing heads. In accordance with the same, the invention allows for a suitable aspiration or suction of the printing substrates (1) to ensure the correct arrangement of said substrates (1) for the printing thereof according to a flat arrangement. Digital printing is directed at printing substrates (1) that are made up of boards, preferably cardboard, formed by two flat outer layers and at least one undulate intermediate layer.

[0019] The printing substrates (1) are moved by a support table (2) to a printing area defined by the location of the heads of the digital printing machine. In figures 1 and 2, the direction and sense of the movement of the printing substrates (1) on the support table (2) are represented by horizontal arrows, while the direction and sense of the air suctioned by an aspiration assembly are represented by vertical arrows, with the aim of arranging the printing substrates (1) in contact with the support table (2) during the movement and printing of the same.

[0020] As can be seen in figure 1, it is known that the printing substrates (1), represented by dashed lines, on some occasions are arranged on the support table (2) according to a concave arrangement, with one initial portion and one final portion of the same (1), according to the direction and sense of movement thereof, distanced with respect to the support table (2), while the resting on a central portion. In this way, an effective suction effect is not achieved and, furthermore, the printing substrates (1) are not arranged completely flat for the printing thereof, which leads to an undesirable printing quality and/or limitations in the selection of printing areas on the printing substrates (1), and, furthermore, poses a risk to the printing machine.

[0021] Figure 2 shows the arrangement of the printing substrates (1), represented by dashed lines, on the support table (2), as a result of the invention. The printing substrates (1) obtained include creases (3) according to the advance direction of the printing substrates (1), one on one longitudinal end and another on another longitudinal end, in other words, one on the initial portion and another on the final portion. Said creases (3), specifically two for each one of the printing substrates (1), make it possible to carry out an efficient suction effect, involving a completely flat arrangement and thereby maximizing a contact area between the printing substrates (1) and the support table (2). Additionally, the fact of preventing part of the printing substrates (1) from being elevated or distanced with respect to the support table (2) prevents possible undesirable contact between the printing substrates (1) and elements or parts of the digital printing machine, such as the heads, susceptible of being damaged as a result of said contact.

[0022] The process comprises the supply of the printing substrates (1) in a continuous or consecutive way to the device for creasing printing substrates (1). The printing substrates (1) supplied are contacted on one of the longitudinal ends on one face by means of a first surface (4) and a second surface (5), mutually angled. Likewise, said longitudinal end of the printing substrates (1) is also contacted on one face by means of a first extension (6) and a second extension (7), mutually angled.

[0023] This way contact is established with the two outer layers from an outer part of the printing substrates (1). The first surface (4) and the second surface (5) are arranged with respect to the first extension (6) and the second extension (7) such that when all of them (4, 5, 6, 7) establish contact with the printing substrate (1), the crease (3) is formed on the corresponding longitudinal end.

[0024] The device for creasing printing substrates (1) comprises a creaser (8) that includes the first surface (4) and the second surface (5), and a counter creaser (9) that includes the first extension (6) and the second extension (7). Additionally, the device for creasing printing substrates (1) comprises lateral supports (10), a first web (11), a second web (12), a drive shaft (13) and rotational transmission means (14), such as a chain or belt.

[0025] The lateral supports (10) are arranged joined by means of the first web (11) and the second web (12). The drive shaft (13), by means of the rotational transmission means (14), transmits a rotation, preferably to the first web (11), and more preferably to the first web (11) and to the second web (12). The device for creasing printing substrates (1) is configured to be able to be synchronized with a feeder or supplier of printing substrates (1), as well as with the support table (2), and more specifically with the speed of the movement exerted on the printing substrates (1).

[0026] The creaser (8) extends along the first web (11) such that it covers the width of the support table (2), or at least the width of the printing substrates (1), so that by means of the first surface (4) and the second surface (5) the entire width of the printing substrates (1) is covered, according to the advance direction or movement. The counter creaser (9), in turn, extends along the second web (12) such that it covers the width of the support table (2), or at least of the printing substrates (1), so that by means of the first extension (6) and the second extension (7) the entire width of the printing substrates (1) is covered, according to the advance direction or movement.

[0027] The device for creasing printing substrates is configured to be arranged such that the printing substrates (1) fed by the feeder pass through the first web (11) and the second web (12) and therefore between the creaser (8) and the counter creaser (9), before being arranged on the support table (2). This can be clearly seen in figures 3 to 5, in which a portion of the printing substrate (1) is shown.

[0028] In accordance with the same, when the printing substrates (1) are supplied between the creaser (8) and the counter creaser (9), at least the first web (11) is actuated for the rotation thereof, such that the first surface (4) and the second surface (5) make contact by one of the faces with the longitudinal end of the corresponding printing substrate (1). As a result, the first extension (6) and the second extension (7) make contact by another one of the faces with said longitudinal end. Thus, the crease (3) is formed, transversely running along the printing substrate (1) in correspondence with the longitudinal end on which contact has been established by means of the creaser (8) and the counter creaser (9).

[0029] Preferably there are two first surfaces (4) and two second surfaces (5) that the creaser (8) has, as shown in figure 7. Likewise, there are two first extensions (6) and two second extensions (7) that the counter creaser (9) has. According to the same, each one of the second surfaces (5) extends with respect to one of the first surfaces (4) such that both second surfaces (5) converge. Likewise, each one of the second extensions (7) extends with respect to one of the first extensions (6), such that both second extensions (7) converge.

[0030] This makes it possible for the creases (3) to be formed in pairs, one crease (3) being formed on the final portion of one of the printing substrates (1) supplied and another on the initial portion of another one of the printing substrates (1) supplied immediately afterwards, that is, forming simultaneously, one in correspondence with the longitudinal end of one of the printing substrates (1) and another in correspondence with the longitudinal end of another one of the printing substrates (1).

[0031] The creaser (8) and the counter creaser (9) are arranged separated from one another according to a separation distance that respects the thickness of the printing substrates (1), in other words, the distance of separation is defined such that in the formation of the creases (3) the thickness is kept consistent.

[0032] With this same object, the angles between the first surfaces (4) and the second surfaces (5), as well as between the first extensions (6) and the second extensions (7), are defined such that by means of the subsequent suction on the support table (2), the printing substrates (1) can recover the flat arrangement thereof, meaning they can undo the creases (3). Said angles therefore do not deform or break the undulate structure of the at least one undulate intermediate layer.

[0033] The first surfaces (4) and the second surfaces (5) are mutually angled according to a first angle, and the first extensions (6) and the second extensions (7) are mutually angled according to a second angle. Preferably, for the purpose of facilitating that the thickness of the printing substrates (1) remains unaltered with the creases (3), the first angle and the second angle are complementary. The first angle gives rise to a concavity, while the second angle gives rise to a convexity.

[0034] The first angle and the second angle are selected such that the creases (3) formed provide a structural reinforcement on the printing substrates (1), apart from allowing a suction also on the longitudinal ends on the support table (2), that is, not only on the central part of the same, the crease (3) being reversible such that the printing substrates (1) recover the completely flat configuration or arrangement thereof, without creases (3), for the appropriate movement and printing thereof. This way, the first angle on the part to be arranged facing the counter creaser (9) is between 120° and 150°, and the second angle on the part to be arranged facing the creaser (8) is between 240° and 210°, such that together they equal 360°.

[0035] With the aim of minimizing the force transmitted to the printing substrates (1) when making the creases (3), the first surfaces (4) and the second surfaces (5) are joined by a first intermediate section (15), defined according to a first radius of curvature. Likewise, the first extensions (6) and the second extensions (7) are joined by a second intermediate section (16), defined according to a second radius of curvature. With the aim of optimizing the creases (3), the first radius of curvature is greater than the second radius of curvature.

[0036] Additionally, the device for creasing printing substrates is configured such that the creases (3) are formed at less than 5 millimeters from the edge of the corresponding longitudinal end, and more preferably, at

less than 4 millimeters. This way, the possibilities of receiving the digital impression on the portions that receive the creases (3) are minimized. This improves the total quality of the digital printing, and furthermore conditions it in the smallest degree possible.

Claims

1. A process for creasing printing substrates (1) **characterized in that** it comprises the stages of:

   - supplying a printing substrate (1);
   - making contact with one longitudinal end of the printing substrate (1), on one face by means of a first surface (4) and a second surface (5) of a creaser (8), mutually angled, and on another face of the longitudinal end of the printing substrate (1) by means of a first extension (6) and a second extension (7) of a counter creaser (9), mutually angled, forming a crease (3) by the joint action of the creaser (8) and the counter creaser (9).

2. The process for creasing printing substrates (1) according to claim 1, **characterized in that** contact is simultaneously made with one longitudinal end of the other printing substrate (1), on one face by means of another first surface (4) and another second surface (5) of a creaser (8), mutually angled, and on another face of the longitudinal end of the other printing substrate (1) by means of another first extension (6) and another second extension (7) of the counter creaser (9), mutually angled, forming another crease (3) on the longitudinal end of another impression substrate (1) by the joint action of the creaser (8) and the counter creaser (9).

3. A device for creasing printing substrates (1), **characterized in that** it comprises:

   - a creaser (8) that has:

     o a first surface (4) and a second surface (5) mutually angled, the first surface (4) and the second surface (5) being configured to make contact with a longitudinal end of an impression substrate (1) on one face;

   - a counter creaser (9) that has:

     o a first extension (6) and a second extension (7) mutually angled, the first extension (6) and the second extension (7) being configured to make contact with the longitudinal end of the impression substrate (1) on another face;

   such that the creaser (8) and counter creaser (9) are arranged with respect to each other, such that when they simultaneously make contact with the longitudinal end, a crease (3) can to be formed in the printing substrate (1) though the joint action of the creaser (8) and the counter creaser (9).

4. The device for creasing printing substrates according to claim 3, **characterized in that** the creaser has (8) two first surfaces (4) and two second surfaces (5) that the second surfaces (5) extending with respect to the first surfaces (4) such that they mutually converge, and **in that** the counter creaser (9) has two first extensions (6) and two second extensions (7) that, the second extensions (7) extending with respect to the first extensions (6) such that they mutually converge; such that two creases (3) can be formed by the joint action of the creaser (8) and the counter creaser (9).

5. The device for creasing printing substrates according to claim 3 or 4, **characterized in that** the creaser (8) and the counter creaser (9) are arranged extended along a first web (11) and a second web (12), respectively.

6. The device for creasing printing substrates according to claim 5, **characterized in that** the first web (11) is configured to be actuatable in rotation.

7. The device for creasing printing substrates according to claim 6, **characterized in that** the second web (12) is configured to be actuatable in rotation.

8. The device for creasing printing substrates according to any one of the preceding claims, **characterized in that** the first surfaces (4) and the second surfaces (5) are mutually angled according to a first angle and the first extensions (6) and the second extensions (7) are mutually angled according to a second angle, the first angle and the second angle being complementary such that together they equal 360°.

9. The device for creasing printing substrates according to any one of the preceding claims, **characterized in that** the first surfaces (4) and the second surfaces (5) are joined by a first intermediate section (15), defined by a first radius of curvature.

10. The device for creasing printing substrates according to any one of the preceding claims, **characterized in that** the first extensions (6) and the second extensions (7) are joined by a second intermediate section (16), defined by a second radius of curvature.

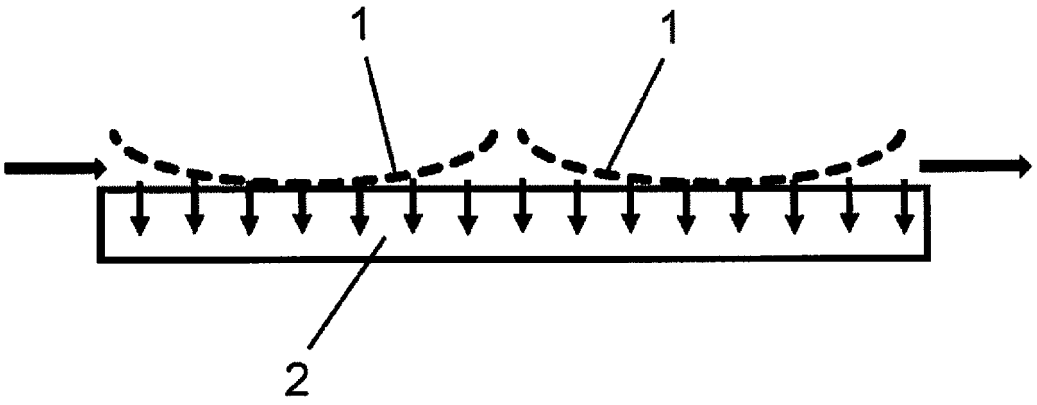

Fig. 1

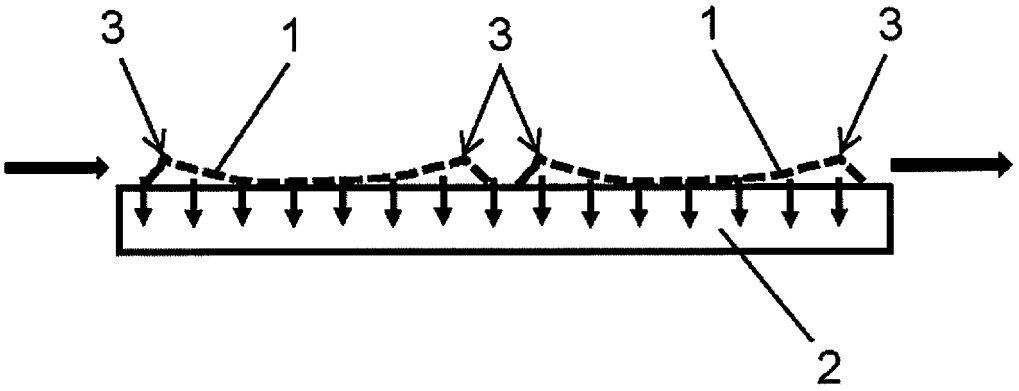

Fig. 2

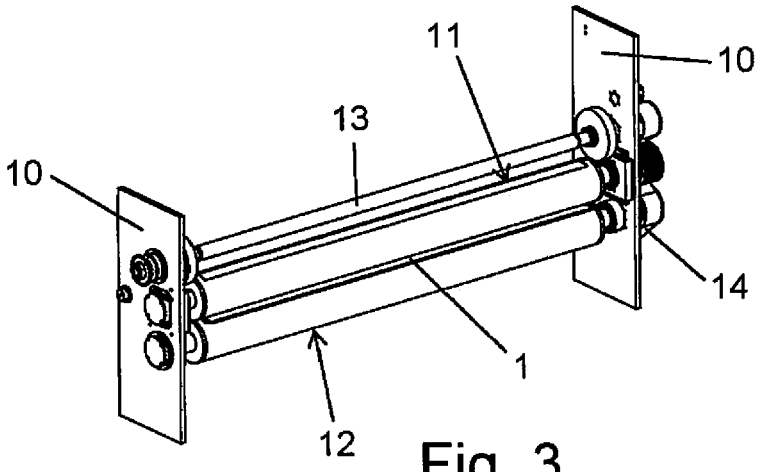

Fig. 3

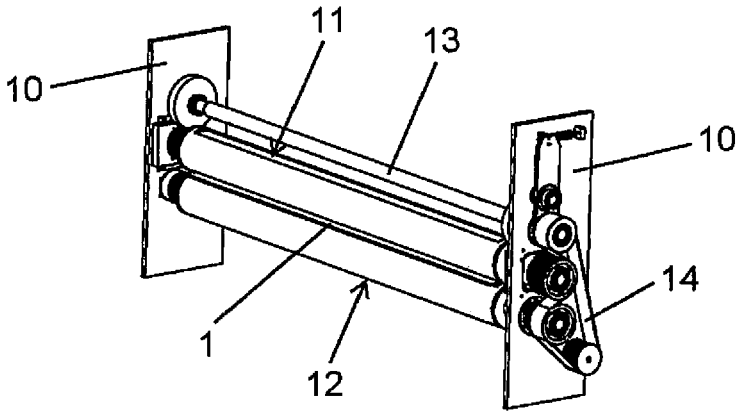

Fig. 4

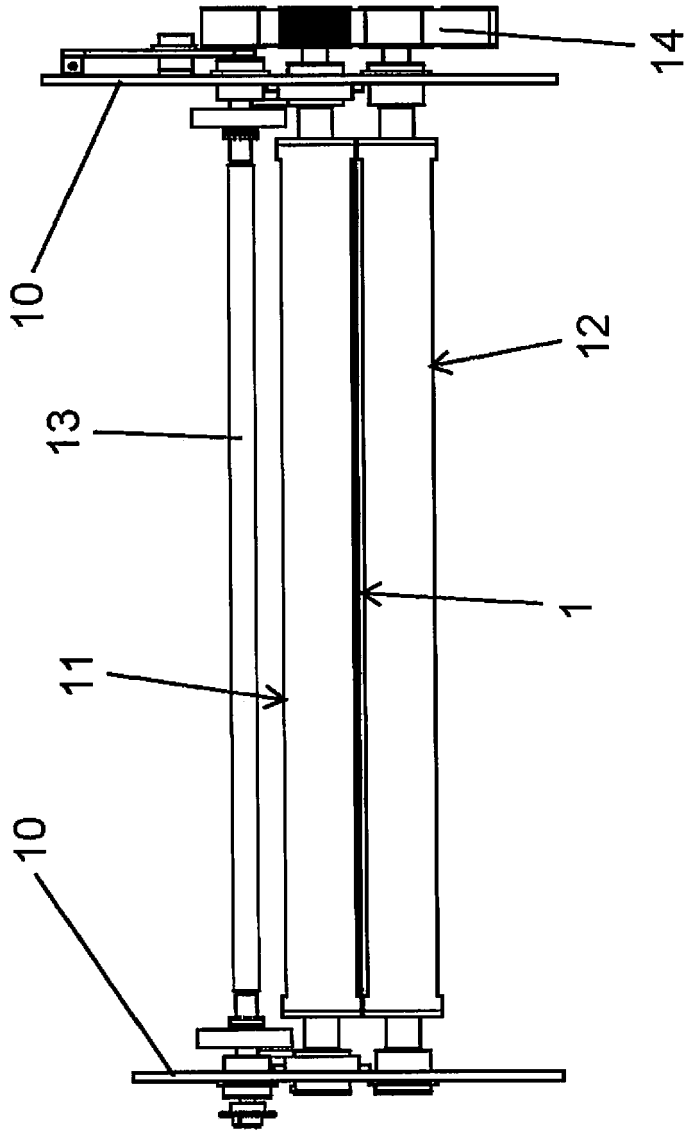

Fig. 5

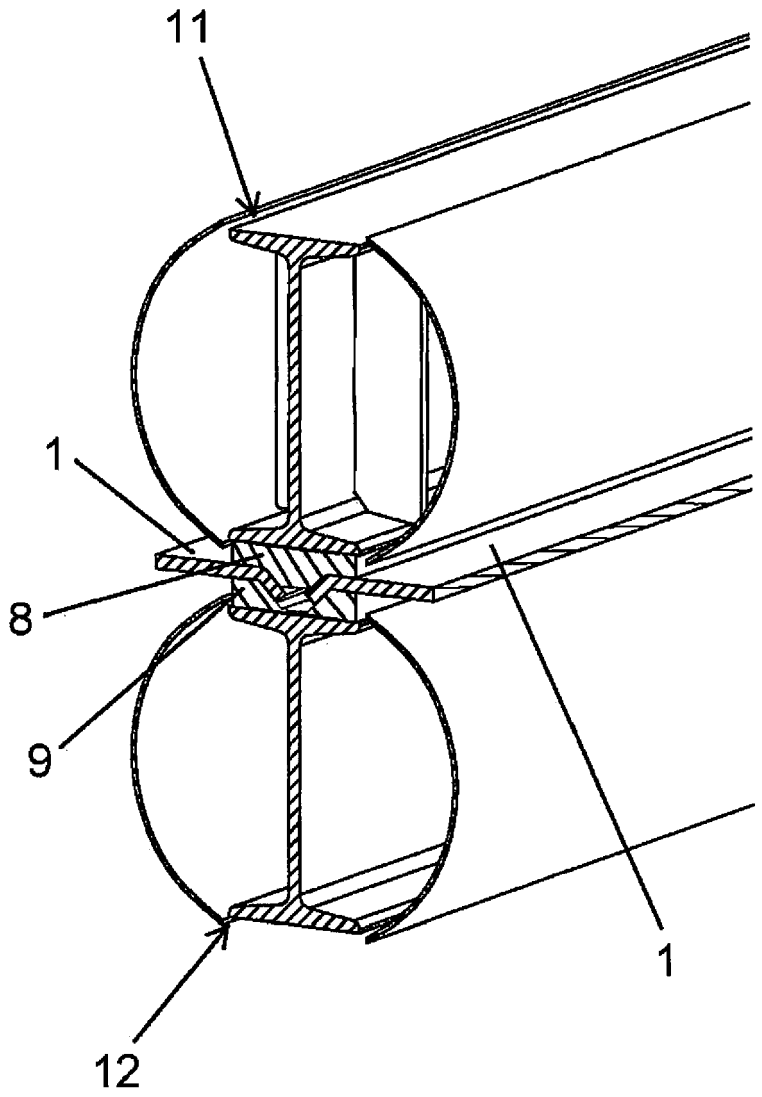

Fig. 6

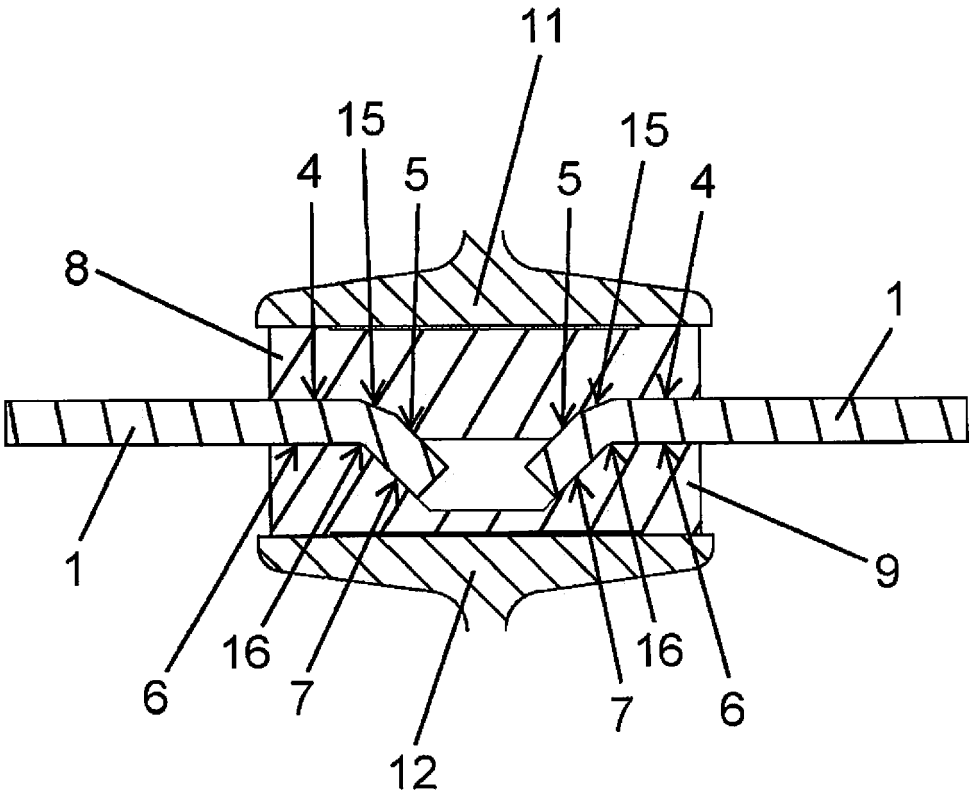

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 August 2018	Hajji, Mohamed-Karim

CATEGORY OF CITED DOCUMENTS

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