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(54) SCRAPER DEVICE FOR AN INK UNIT OF A FLEXOGRAPHIC PRINTER

(57) The device comprises a blade-holder body (1) defining a groove (2) at which sides two projecting blades (3, 4) are fixed having free edges to come into contact with a surface of an ink roller (5). An inlet (7) and an outlet (8) are included which can be connected to ink circulation means so that ink can be introduced into and released from an ink container (6) that is at least partially defined by said groove (2) in order to apply said ink to said ink roller (5). The blade-holder body (1) is positioned below a lower part of the ink roller (5) and said two blades (3, 4) are inclined in relation to the horizontal and in the direction of the groove (2). The groove (2) serves as a receptacle for gathering any excess ink or leaks from the ink applied to the ink roller (5).

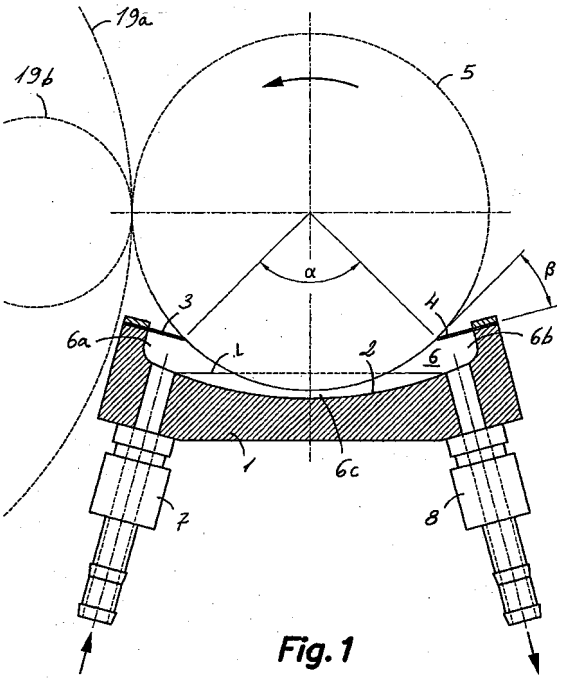

Fig. 1

EP 1 754 606 A2

Description

Field of the Invention

[0001] The present invention generally relates to a doctor blade device for an ink unit of a flexographic printer and more specifically to a doctor blade device adapted to be located below a lower part of an ink roller and designed to act as a receptacle for gathering any excess ink or leaks from the ink applied to the ink roller.

Prior art

[0002] Flexographic printer machines generally comprise a rotating support drum on which a material to be printed is supported and several printing groups arranged around the drum, provided for several colors to be printed. Each printing group comprises a stencil-carrying printing roller with the patterns to be printed arranged to come into contact with the surface of the material to be printed on the support drum, an ink roller arranged to come into contact with the stencil on the printing roller and a doctor blade device arranged to apply ink to the surface of the ink roller. The printing roller, the ink roller and the doctor blade device are assembled in the printer frame by means of mechanisms allowing regulation and separation movements for sleeve changes and maintenance tasks.

[0003] Document WO 96/34751 describes a doctor blade device for an ink mechanism of a printer of this type comprising a blade-holder body which defines a groove and which has two projecting blades fixed to the sides thereof such that the free edges thereof come into contact with a surface of an ink roller. The device incorporates at least an inlet and an outlet connected to ink circulation means so that ink can be introduced into and released from an ink container or chamber that is defined by said groove, the blades, a part of the outer surface of the ink roller and sealing means arranged at the ends such that the ink circulating through the chamber is applied to the ink roller.

[0004] The surface of the ink roller, also called "anilox roller", comprises microcells or honeycombs which must be filled with ink during the time in which they travel from one blade to another in contact with the ink in the doctor blade when the ink roller is turned. This time varies according to the turning speed of the ink roller, which is related to the printing speed. The higher the printing speed, the lesser the time in which a honeycomb will be in contact with the ink. The blades are normally separated as much as possible and/or the pressure and flow conditions of the ink circulation are increased in order to allow higher printing speeds. However, the former has limits imposed by the geometry of the machine and the latter demands greater tightness measures and may cause ink losses or leaks.

[0005] Each of the two blades is secured at one of its edges to the blade-holder body and has a projecting portion extending towards the other blade away from the blade-holder body. Looking for a graphic comparison, in the devices of the state of the art, the blades and their imaginary extensions have the shape of a roof over the groove of the blade-holder body.

[0006] The blades come into contact with the ink roller on the side thereof that is diametrically opposite to the line of contact between the ink roller and the printing roller, which means that the body of the doctor blade is in a substantially vertical position, with a blade in the upper part and another in the lower part. The inlet is generally arranged in the lower part of the body of the doctor blade and the outlet in the upper part. The blades are strips coming into contact with the surface of the ink roller preferably forming an angle of 30° to 35° with a plane tangent to the surface of the ink roller in the line of mutual contact. One of the blades, called the "negative" blade, works in the opposite direction and, in addition to cooperating in the closing of the chamber, its function is to scrape the surface of the roller with the purpose of leaving ink only inside the honeycombs. The other blade, called the "positive" blade, works in favor of the turning direction of the roller and its main function is to cooperate in closing the chamber at the lower part, while it allows the excess ink on the ink roller, i.e. the ink which has not been transferred from the ink roller to the printing roller, to return to the inside of the chamber.

[0007] The sealing means comprise parts of elastic material, such as polymer foam, rubber, nylon or felt, radially attacking against the ends of the ink roller. Given that the blades experience wearing, a mechanism moves the doctor blade assembly forward as the blades wear down and the sealing elastic parts are compressed while maintaining their tightness.

[0008] The tightness of the chamber in this type of doctor blade device can have several problems. On one hand, it is usual for the sealing elastic parts to not adjust well, thus causing leaks or drips in the sides of the body of the doctor blade and leaving ink in the ends of the ink roller that may cause splashes towards the operators and/or towards the material which is being printed. On the other hand, it may occur that the lower or "positive" strip does not allow the re-entrance of excess ink to the chamber, and that this ink falls along the doctor blade due to gravity. In some applications, the turning direction of the ink roller is reversed, and the positive blade is in the upper part. In this case, the excess ink that cannot return to the chamber accumulates forming a strand of ink along the blade which runs until it drips from the ends of the body of the doctor blade.

[0009] These ink leaks and losses make it necessary to place a gathering receptacle below the doctor blade device. However, the arrangement of the receptacle implies an added cost, a loss in vigilance and cleaning time and does not prevent a waste of ink.

Description of the Invention

[0010] The present invention contributes to solving the previous drawbacks by supplying a doctor blade device for an ink unit of a flexographic machine, of the type comprising a blade-holder body which defines a groove and which has two projecting blades fixed to the sides thereof such that the free edges thereof come into contact with a surface of the ink roller. The device further incorporates at least an inlet and an outlet connected to ink circulation means so that ink can be introduced into and released from an ink container that is at least partially defined by said groove in order to apply said ink to said ink roller. The device of the present invention is characterized in that said blade-holder body is positioned below a lower part of the ink roller and in that said two blades are inclined in relation to the horizontal and in the direction of the groove which serves as a receptacle for gathering any excess ink or leaks from the ink applied to the ink roller.

[0011] The part of the surface of the ink roller extending between the lines of contact with the two blades and which is opposite to the groove preferably includes a sector α representing 70° to 110° of the circumference of the surface of the ink roller, while each of the two blades forms an angle β of 20° to 40° with a plane tangent to the surface of the ink roller in the line of mutual contact. This geometric arrangement provides a greater relative separation between the two blades, which means a greater time of contact of the surface of the ink roller with the ink in the container, greater printing speeds being admissible.

[0012] Furthermore, with the groove acting as a receptacle, the side sealing of the blade-holder body is not essential. For example, by making the groove longer than the sectioned surface of the ink roller and incorporating end walls delimiting an ink container together with the bottom of the groove. In this case, the bottom of the groove is preferably concave and said inlet and said outlet have openings located in positions such that they ensure a suitable ink level in said ink container so that at least one portion of the ink roller is submersed for the purpose of wetting its surface. Thus, the container can be open to the atmosphere and, if necessary, small screens could be arranged at the ends of the device to prevent splashes.

[0013] Given that the two blades are inclined towards the groove, i.e., their respective free edges are located at a lower level than their edges secured to the blade-holder body, the drip due to gravity of the excess ink along the "positive" blade is prevented, and the drip of the possible strand of ink at the ends of the blades is gathered by the groove itself. On the other hand, although it is not essential, the groove and the two blades are arranged symmetrically with respect to a central vertical plane of the ink roller, such that the two blades are operative in the two directions of the ink roller, acting without distinction as "positive" blade and "negative" blade.

[0014] However, the device according to the present invention can also incorporate sealing means at the ends of the groove to hermetically seal the ink container forming a chamber defined, in a manner similar to the manner known in the state of the art, by the groove, the two blades, a part corresponding to the surface of the ink roller, and said sealing means. The ink container or chamber preferably comprises an ink entrance area communicated with said inlet and an ink exit area connected to said outlet, said ink entrance and exit areas being communicated through a narrowing defined by an area of maximum proximity between the bottom of the groove and the surface of the ink roller. This causes a pressure increase of the ink in the chamber entrance area favoring the filling of the honeycombs.

[0015] The mentioned sealing elastic elements can be arranged to come into dynamic contact in a radial direction against the sectioned cylindrical surface, as in the devices of the state of the art. However, and according to the special geometric configuration of the device of the present invention, the sealing means can advantageously comprise elastic elements arranged in dynamic contact with surfaces at the ends of the ink roller different from said sectioned cylindrical surface, either in a radial contact direction, for example on a cylindrical surface at a small distance from the sectioned surface, or an axial contact direction.

Brief Description of the Drawings

[0016] The previous and other advantages and features will become more apparent from the following detailed description of several embodiments with reference to the attached drawings, in which:

Figure 1 is cross-sectional view of a doctor blade device for an ink unit of a flexographic machine according to an embodiment of the present invention;
Figure 2 is a longitudinal sectional view of the doctor blade device of Figure 1;
Figure 3 is a longitudinal sectional view of a doctor blade device for an ink unit of a flexographic machine according to another embodiment of the present invention;
Figure 4 is a longitudinal sectional view of a doctor blade device for an ink unit of a flexographic machine according to yet another embodiment of the present invention;
Figure 5 is a longitudinal sectional view of a doctor blade device for an ink unit of a flexographic machine according to another additional embodiment of the present invention.

Detailed Description of Several Embodiments

[0017] Referring firstly to the embodiment shown in Figures 1 and 2, these show the doctor blade device integrated in an ink unit of a flexographic machine further comprising an ink roller 5 and a stencil-carrying printing

roller shown with dashed lines. By way of orientation, the reference numbers 19a and 19b designate printing rollers with the maximum diameter admissible and the minimum diameter admissible respectively. The device comprises a blade-holder body 1 defining a groove 2 in its middle part. There are two projecting blades 3, 4 fixed to the sides of said groove 2, which blades are arranged to come into contact with their free edges against a surface of an ink roller 5. The blade-holder body 1 is positioned below a lower part of said ink roller 5 and said two blades 3, 4 are inclined in relation to the horizontal and in the direction of said groove 2. In other words, the blades 3, 4 have respective free edges located at a lower level than other opposite edges secured to the blade-holder body 1, in contrast to the roof shape of the devices of the state of the art.

[0018] In the blade-holder body 1, there are incorporated at least an inlet 7 and an outlet 8 communicating with the groove 2 and which are adapted to be connected by ink circulation means so that ink can be introduced into and released from an ink container 6 that is at least partially defined delimited by the groove 2 in order to apply said ink to said ink roller 5. Thanks to this arrangement, the groove 2 acts as a receptacle for gathering any excess ink or leaks from the ink applied to the ink roller 5.

[0019] In the device of the present invention, the separation between the two blades 3, 4 is greater than normal in the devices of the state of the art. For example, the part of the sectioned cylindrical surface of the ink roller 5 extending between the lines of contact with the two blades 3, 4, and opposite to the groove 2, includes a sector α representing 70° to 110° of the circumference of the ink roller 5. Thanks to this, the two blades 3, 4 are inclined in the direction of the groove 2 despite the fact that each one forms, as is usual in the devices of the state of the art, an angle of 20° to 40° with a plane tangent to the surface of the ink roller 5 in the line of mutual contact, considered to be optimal for the good performance of the doctor blades.

[0020] Figure 2 shows how, according to this embodiment, the groove 2 is longer than the sectioned surface of the ink roller 5, and walls 9, 10 located at the ends of the groove 2 define said ink container 6. Furthermore, the bottom of the groove 2 is concave (see Figure 1 again) and in it there are openings of said inlet 7 and of said outlet 8, which are located in positions such that they ensure a suitable ink level L in said container 6 so that at least one portion of the sectioned surface of the ink roller 5 is submersed for the purpose of wetting its surface.

[0021] According to another embodiment shown in Figure 3, the device comprises sealing means 11, 12 located at the ends of the groove 2 groove to hermetically seal said ink container 6. The mentioned sealing means 11, 12 comprise elements of elastic material, such as polymer foam, arranged radially and in dynamic contact with the ends of the sectioned cylindrical surface of the ink roller 5. The elastic elements 11, 12 are fixed to the blade-holder body 1 by means of outer covers 13, 14. Thus, the container adopts the shape of a closed chamber defined delimited by the groove 2, the two blades 3, 4, a corresponding part of the surface of the ink roller 5, and said sealing means 11, 12.

[0022] According to another embodiment shown in Figure 4, the sealing means 11, 12 comprise elastic elements arranged radially and in dynamic contact with cylindrical surfaces 15, located at the ends of the ink roller 5, different from the sectioned cylindrical surface. This provides a better tightness contact and reduces the wearing of the elastic elements 11, 12 because there are no honeycombs in the cylindrical surfaces 15. The elastic elements 11, 12 are also fixed here to the blade-holder body 1 by means of outer covers 13, 14, and the container forms a chamber defined by the groove 2, the two blades 3, 4, a corresponding part of the surface of the ink roller 5, and said sealing means 11, 12.

[0023] In an additional embodiment shown in Figure 5, the sealing means 11, 12 comprise elastic elements arranged axially and in dynamic contact with annular surfaces 16, located at the ends of the ink roller 5, different from the sectioned cylindrical surface. Here the elastic elements 11, 12 are assembled in outer covers 17, 18 fixed to the blade-holder body 1. The container forms a chamber defined by the groove 2, the two blades 3, 4, a corresponding part of the surface of the ink roller 5, and said sealing means 11, 12.

[0024] In the embodiments shown in Figures 3, 4 and 5, the arrangement of the blades 3, 4 and the groove 2 is similar to the one described in relation to Figures 1, 2. The ink container 6 preferably (Figure 1) comprises an ink entrance area 6a communicated with said inlet 7 and an ink exit area 6b communicated with said outlet 8. Both ink entrance and exit areas 6a, 6b are communicated with each other through a narrowing 6c defined by an area of maximum proximity between the bottom of the groove 2 and the surface of the ink roller 5. This causes a pressure increase in the ink entrance area 6a chamber favoring the entrance of ink into the honeycombs.

[0025] Figure 1 shows another advantageous feature of the device of the present invention. As can be observed, the groove 2 and the two blades 3, 4 are arranged symmetrically with respect to a central vertical plane of the ink roller 5. In this way, the two blades 3, 4 are operative to work in both turning directions of the ink roller 5, it only being necessary to reverse the inlet and outlet. However, this symmetry is not essential and according to another embodiment which is not shown, the groove 2 and the two blades 3, 4 are arranged asymmetrically with respect to a central vertical plane of the ink roller 5, and in this case, the two blades 3, 4 are adapted to be operative for a single turning direction of the ink roller 5.

[0026] A person skilled in the art will be able to introduce multiple variations in the described and shown embodiments without departing from the scope of the present invention as defined in the attached claims.

Claims

1. A doctor blade device for an ink unit of a flexographic machine of the type comprising a blade-holder body (1) which defines a groove (2) and which has two projecting blades (3, 4) fixed to the sides thereof such that the free edges thereof come into contact with a surface of an ink roller (5), there being incorporated at least an inlet (7) and an outlet (8) which can be connected to ink circulation means so that ink can be introduced into and released from an ink container (6) that is at least partially defined by said groove (2) in order to apply said ink to said ink roller (5), **characterized in that** said blade-holder body (1) is positioned below a lower part of said ink roller (5) and **in that** said two blades (3, 4) are inclined in relation to the horizontal and in the direction of the groove (2), said groove (2) serving as a receptacle for gathering any excess ink or leaks from the ink applied to the ink roller (5).

2. A device according to claim 1, **characterized in that** a part of said surface of the ink roller (5) extending between the lines of contact with the two blades (3, 4) and opposite to the groove (2) includes a sector (α) representing 50° a 150° of the circumference of the ink roller (5).

3. A device according to claim 2, **characterized in that** said sector (α) represents 70° to 110° of the circumference of the ink roller (5).

4. A device according to claim 2, **characterized in that** each of the two blades (3, 4) forms an angle (β) of 15° to 45° with a plane tangent to the surface of the ink roller (5) in the line of mutual contact.

5. A device according to claim 4, **characterized in that** said angle (β) is 20° to 40°.

6. A device according to any one of claims 1 a 5, **characterized in that** the blades (3, 4) have respective free edges located at a lower level than other opposite edges secured to the blade-holder body (1).

7. A device according to claim 1, **characterized in that** the groove (2) is longer than the surface of the ink roller (5) and end walls (9, 10) define said ink container (6).

8. A device according to claim 7, **characterized in that** there are openings of said inlet (7) and of said outlet (8) in the bottom of the groove (2), which openings are located in positions such that they ensure a suitable ink level (L) in said container (6) so that at least one portion of the ink roller (5) is submersed for the purpose of wetting its surface.

9. A device according to claim 8, **characterized in that** said bottom of the groove (2) is concave and said openings of the inlet (7) and of the outlet (8) are located on the sides of the ink roller (5).

10. A device according to claim 1, **characterized in that** it comprises sealing means (11, 12) at the ends of the groove (2) to hermetically seal said ink container (6), which is defined by the groove (2), the two blades (3, 4), a corresponding part of the surface of the ink roller (5), and said sealing means (11, 12).

11. A device according to claim 10, **characterized in that** the ink container (6) comprises an ink entrance area (6a) communicated with said inlet (7) and an ink exit area (6b) communicated with said outlet (8) communicated with each other through a narrowing (6c) defined by an area of maximum proximity between the bottom of the groove (2) and the surface of the ink roller (5).

12. A device according to any of claims 1 to 11, **characterized in that** said surface of the ink roller (5) is a sectioned cylindrical surface.

13. A device according to claim 12 when it depends on claim 10, **characterized in that** said sealing means (11, 12) comprise elastic elements arranged radially in dynamic contact with the ends of said sectioned cylindrical surface of the ink roller (5).

14. A device according to claim 12 when it depends on claim 10, **characterized in that** said sealing means (11, 12) comprise elastic elements arranged in dynamic contact with superficies at the ends of the ink roller (5) different from said sectioned cylindrical surface.

15. A device according to any of claims 1 to 11, **characterized in that** the groove (2) and the two blades (3, 4) are arranged symmetrically with respect to a central vertical plane of the ink roller (5), the two blades (3, 4) being operative for both turning directions of the ink roller (5).

16. A device according to any of claims 1 to 11, **characterized in that** the groove (2) and the two blades (3, 4) are arranged asymmetrically with respect to a central vertical plane of the ink roller (5), the two blades (3, 4) being operative for a single turning direction of the ink roller (5).

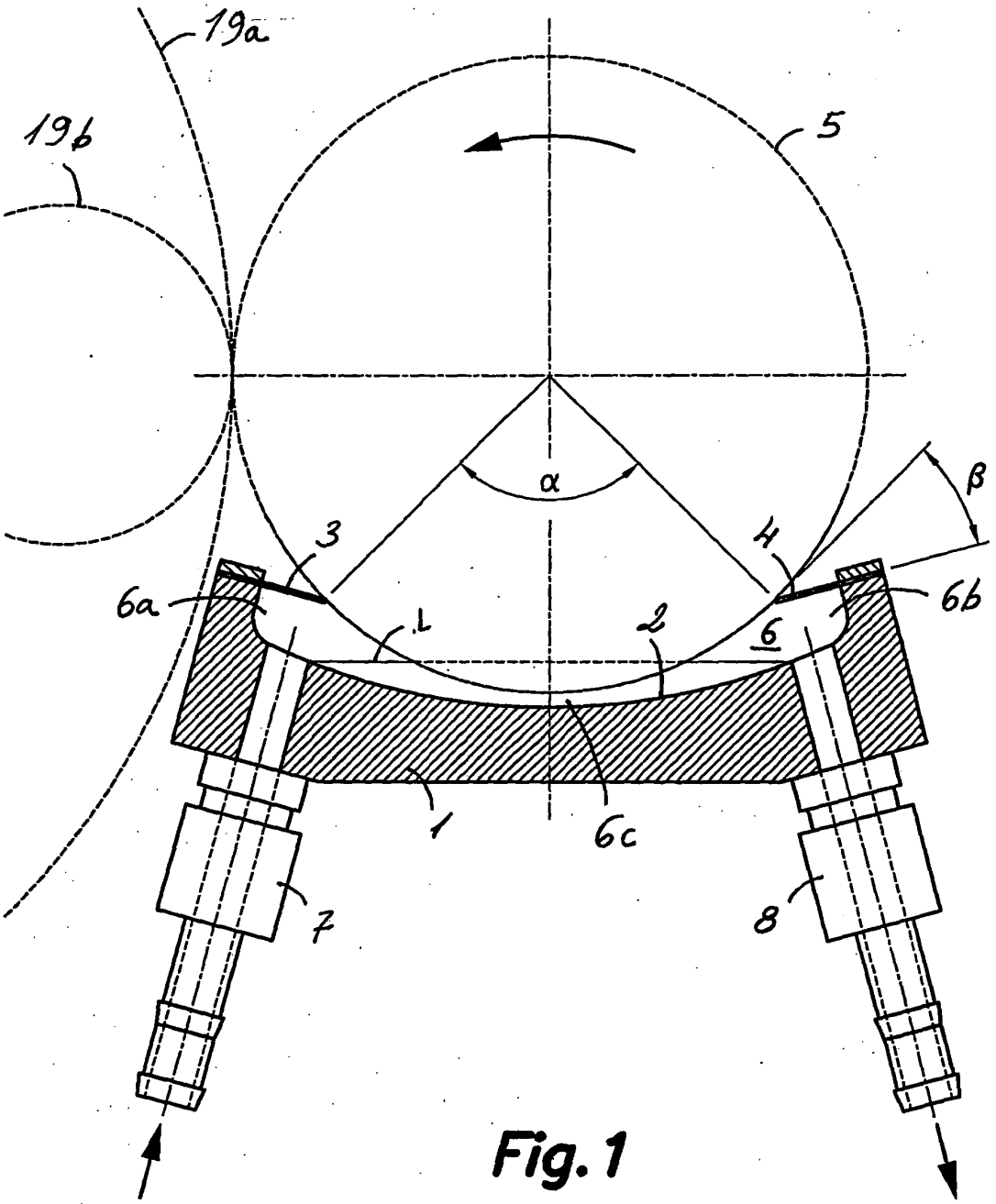

Fig. 1

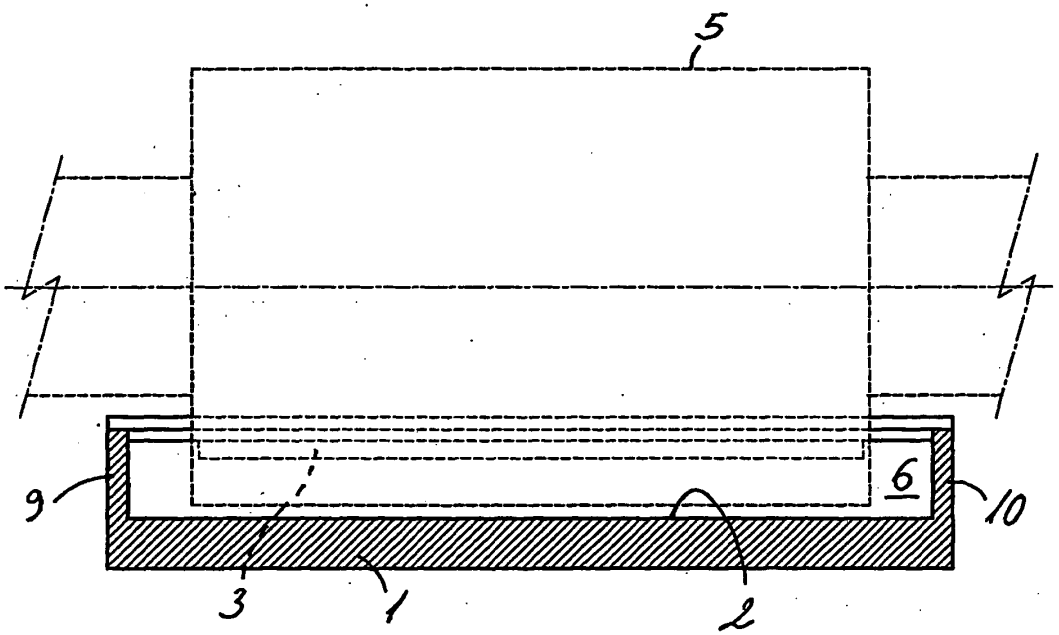

Fig.2

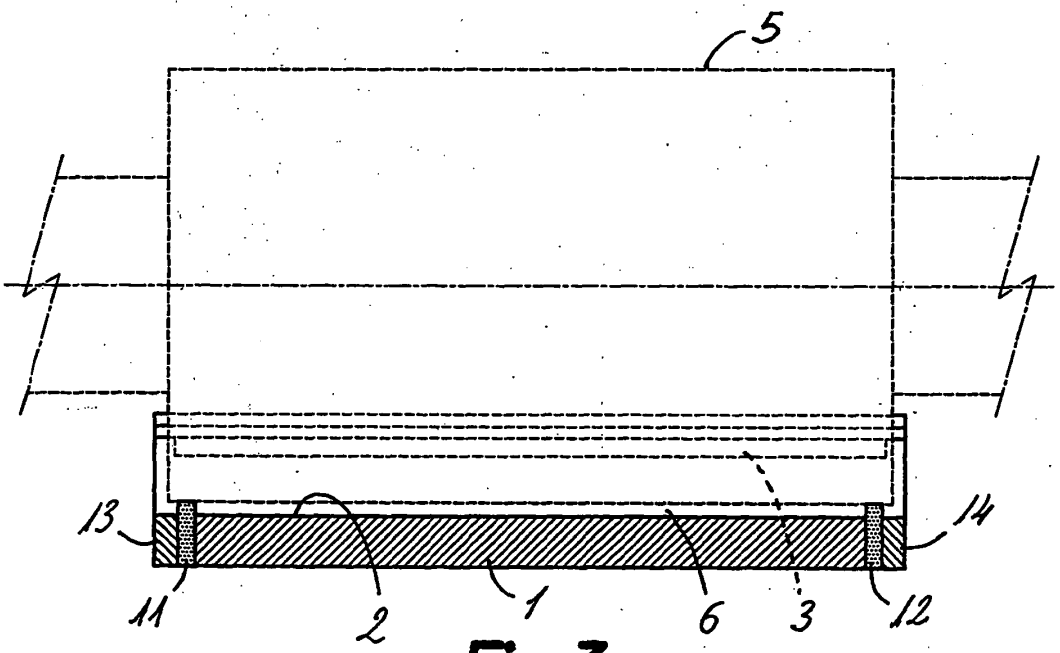

Fig.3

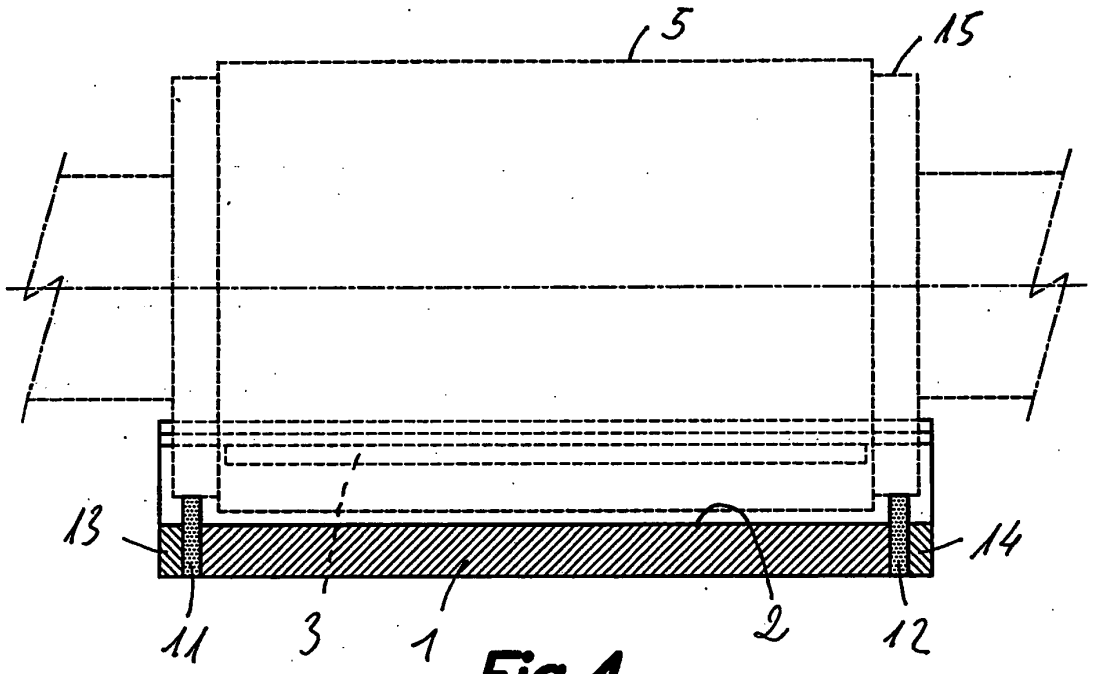

Fig.4

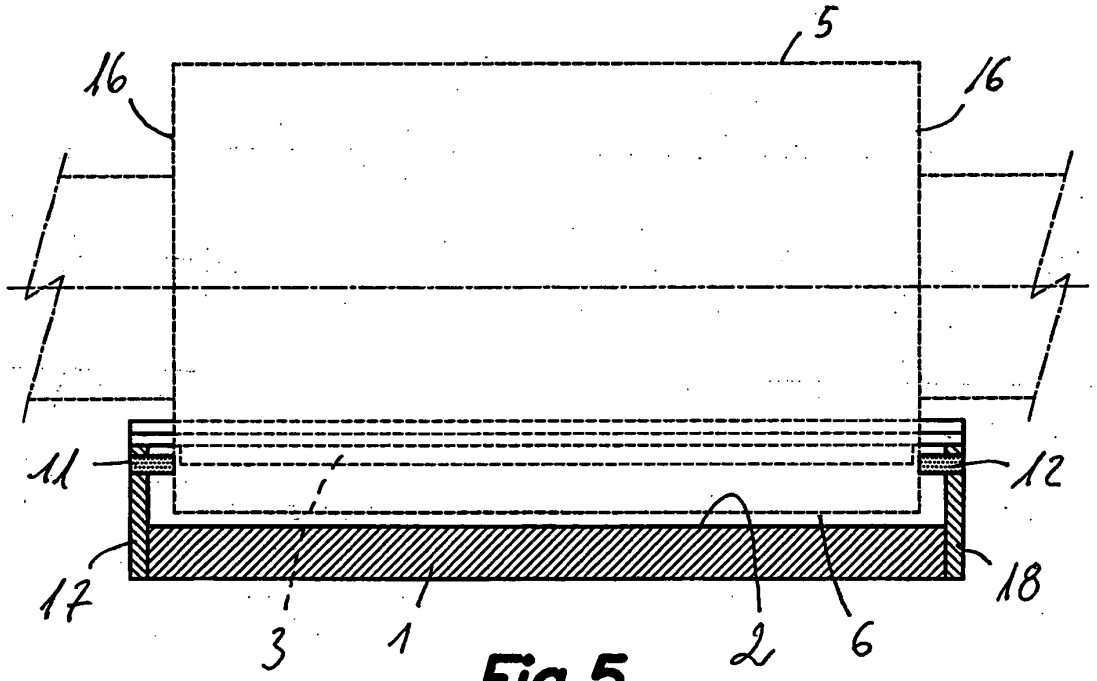

Fig.5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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