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(54) **Method for arranging on a carrier a flexible printing plate manufactured substantially from photopolymer, and device for applying such a method**

(57) The invention relates to a method and a device for arranging a flexible printing plate on a cylindrical carrier, wherein the method comprises the steps of placing the printing plate on a table, cutting through the printing plate a first time parallel to the axis of the carrier, moving toward each other and bringing the printing plate and the carrier into mutual contact, rotating the carrier over a first arcuate part, wherein due to adhesion of the printing plate

to the carrier the printing plate is wound onto the carrier and the printing plate is thereby displaced over the table, cutting through the printing plate, displaced on the table, a second time in the same direction, and rotating the carrier over a second arcuate part and thereby winding the printing plate further round the carrier, wherein the two cut edges of the printing plate arranged on the carrier make mutual contact.

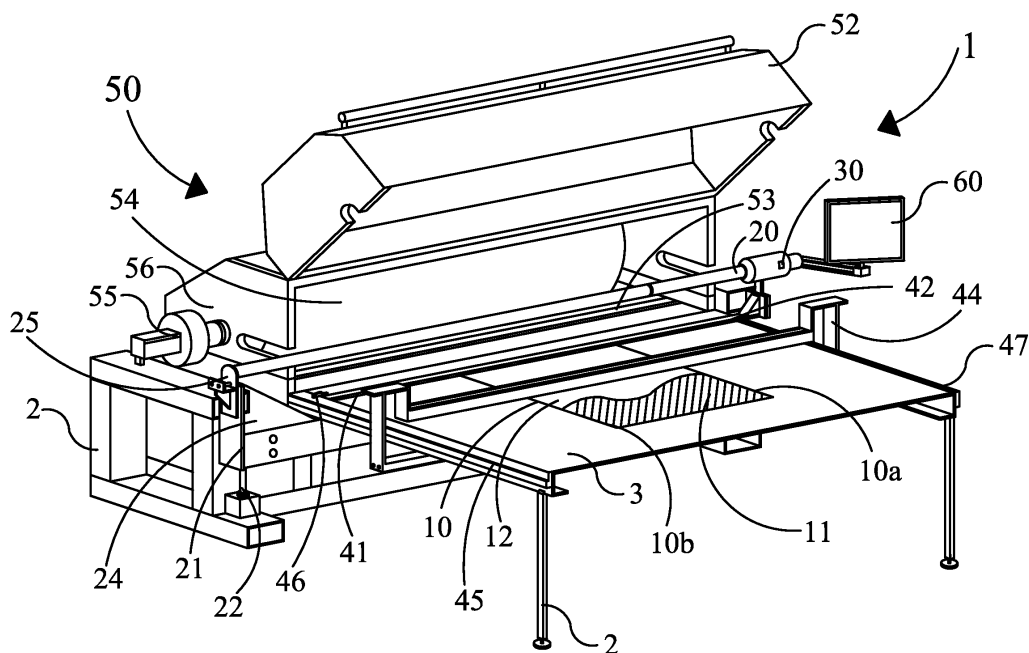


FIG. 1

Description

[0001] The present invention relates to a method and a device for arranging on a carrier a printing plate manufactured substantially from photopolymer.

[0002] Such printing plates are applied in so-called flexography, a form of relief printing, which is increasingly being applied. Through the action of light a relief is here arranged on the printing plate manufactured from a photopolymer, only the raised parts of this relief transferring the ink to the substrate for printing. The relief can be arranged by separately processing the usually limp plate manufactured from photopolymer and arranging the thus obtained plate on a printing cylinder, which must take place with the necessary accuracy, particularly in the case of multicolour printing. It is however also possible to already arrange the printing plate on a printing cylinder or on a cylindrical so-called sleeve before arranging the relief thereon. The relief is then arranged on the printing plate while it is already situated on the printing cylinder or on the sleeve.

[0003] The present invention relates to this latter, per se known method. The still flat, flexible printing plate is here arranged on a cylindrical carrier. Unevenness in the surface of the cylindrical printing plate, which was already in the surface or is the result of the printing plate being arranged on the cylindrical carrier, can however be seen immediately on the produced printed work.

[0004] In order to achieve the required flatness it is known to grind such a photopolymer layer arranged on a cylindrical carrier after it has been arranged. This relates particularly to the join where the two edges of the photopolymer plate wrapped round the cylindrical carrier make mutual contact.

[0005] The present invention has for its object to provide an improved method and an improved device for arranging a printing plate on a cylindrical carrier, wherein the flatness of the arranged photopolymer is sufficiently great to manufacture printing work of sufficient quality.

[0006] The present invention provides for this purpose a method for arranging on a cylindrical carrier a flexible printing plate manufactured substantially from photopolymer, comprising the processing steps of placing the printing plate on a table, cutting through the printing plate a first time with a directional component parallel to the axis of the cylindrical carrier using a cutting device, moving toward each other and bringing the printing plate and the cylindrical carrier into mutual contact, rotating the cylindrical carrier over a known first arcuate part, wherein due to adhesion of the printing plate to the cylindrical carrier the printing plate is wound onto the cylindrical carrier and the printing plate is thereby displaced over the table, cutting through the printing plate, displaced on the table, a second time with the same directional component using a cutting device, and rotating the cylindrical carrier over a second arcuate part and thereby winding the printing plate further round the cylindrical carrier, wherein the two obtained cut edges of the printing plate thus arranged

on the cylindrical carrier make mutual contact.

[0007] By cutting through the printing plate twice, wherein the cutting lines are parallel and the plate has a correct length, the cut edges of the printing plate arranged on the cylindrical carrier are mutual abutting. Adjusting the first arcuate part and the position of the second cutting line relative to the printing plate guarantees that the printing plate has a length such that the cut edges are mutually abutting. In particular, the two cut edges are mutually abutting along their whole length. These measures have the advantage that the printing plate arranged on the cylindrical carrier has a more homogeneous surface. This results in a better printing quality.

[0008] The invention likewise provides a device for arranging on a cylindrical carrier a flexible printing plate manufactured substantially from photopolymer, comprising: a frame, a table connected to the frame for the purpose of carrying the printing plate to be arranged on the cylindrical carrier, bearing means connected to the frame for bearing-mounting of the cylindrical carrier, wherein the table and the bearing means are mutually displaceable, a cutting device connected to the frame for cutting through the printing plate placed on the table with a directional component parallel to the axis of a cylindrical carrier placed on the bearing means, first drive means for driving the cylindrical carrier in rotation, second drive means for driving the mutual displacement of the bearing means and the table. The bearing means here comprise a shaft, for instance when the cylindrical carrier is a hollow sleeve, and they can be formed by a shaft bearing when the cylindrical carrier is a printing cylinder. The cylindrical carrier and the table are displaceable relative to each other particularly in vertical direction.

[0009] For an accurate length of the printing plate it is essential that the positions relative to the printing plate are precisely known for the purpose of cutting through the printing plate a first and second time. The invention provides the measure of adjusting to each other the degree of rotation of the cylindrical carrier and the positions relative to the printing plate for the purpose of cutting through the printing plate a first and second time in that the device comprises control means which are adapted to input the diameter of the cylindrical carrier and to control the drive means.

[0010] Prior to making the first cut, it is possible to bring the printing plate into abutment with a first stop placed on the table and having a directional component substantially perpendicularly of the axis of the cylindrical carrier. In particular, the stop extends perpendicularly of the axis of the cylindrical carrier.

[0011] In addition to the position of the printing plate on the table hereby being better determined and the orientation of the printing plate being better maintained during winding of the printing plate onto the cylindrical carrier, no displacement of the edge of the printing plate arranged on the cylindrical carrier occurs either. This latter results in a material-saving. By placing the printing plate against a stop extending perpendicularly of the axis

of the cylindrical carrier, the position of the printing plate relative to the cylindrical carrier is also determined. This has advantages for the further use of the printing plate. The same advantages are found in a device wherein the device comprises a first stop connected to the frame and extending substantially perpendicularly of the cylindrical carrier for the purpose of determining the position of the printing plate in transverse direction relative to the cylindrical carrier.

[0012] In order to bring the printing plate and the cylindrical carrier into contact with each other, the printing plate can also be brought into abutment with a second stop placed on the table and having a directional component substantially parallel to the axis of the cylindrical carrier, wherein the cutting device cuts through the printing plate at a position which is fixed relative to the table. In particular, the second stop here extends parallel to the axis of the cylindrical carrier. Owing to this measure the position of the cut edge relative to the cylindrical carrier is known, whereby only the first arcuate part over which the cylindrical carrier rotates, and thereby displaces the printing plate over the table, determines the eventual length of the printing plate. This simplifies the method considerably, whereby the process of arranging the printing plate on the cylindrical carrier takes place not only more quickly but also more accurately. This embodiment is also manifest in the measure that the device also comprises a second stop connected to the frame and extending substantially parallel to the cylindrical carrier for the purpose of determining the position of the printing plate in length direction relative to the cylindrical carrier, and that the cutting device is connected rigidly to the frame and is adapted to cut through the printing plate along a straight cutting line substantially parallel to the cylindrical carrier. The second stop extends in particular parallel to the axis of the cylindrical carrier, which results in a material-saving, and the second stop is connected movably to the table, whereby further operations can take place easily without having to displace the printing plate.

[0013] In order to simplify the process further, the printing plate is brought into abutment with the second stop below the axis of the cylindrical carrier. The cylindrical carrier is now brought into contact with the printing plate by simply moving only the cylindrical carrier and the table toward each other in vertical direction. The printing plate can also be wound round the cylindrical carrier, wherein the cylindrical carrier need only be rotated in one direction of rotation. This simplifies both the control and the movements, and thereby also the accuracy of arrangement of the cylinder.

[0014] When the printing plate is arranged on the cylindrical carrier, there usually occurs at the join where the two cut edges of the printing plate make mutual contact - when the cut extends perpendicularly of the table - a V-shaped groove which, even after possible further machining, can result in an unevenness in the arranged printing plate. In order to obviate this drawback a preferred embodiment proposes that the printing plate is cut

along a plane extending at an angle other than 90° to the table. The abutting cut edges of the printing plate arranged on the cylindrical carrier hereby overlap each other, whereby a more homogenous transition is obtained between the cut edges. This preferred embodiment also provides the measure that the cutting device is provided with a knife and that the knife extends at an angle other than 90° to the table.

[0015] The cutting of the printing plate must take place under controlled conditions in order to limit the risks for the user of the device as far as possible. In a subsequent embodiment the cutting device is therefore provided with a drive device for driving the knife of the cutting device under the control of the control means. Because use is made of control means, the user is not only at a distance from the area in which the printing plate is cut, but the cutting also takes place in a predictable and reliable manner.

[0016] It will be apparent that the printing plate must be properly attached to the cylindrical carrier. There are different options for attaching the printing plate to the cylindrical carrier. Use is usually made of double-sided adhesive foil, which is arranged on the carrier and wherein the cover film is removed from this double-sided adhesive foil before the printing plate is arranged. It is however also possible to provide the printing plate in advance with adhesive means in the form of an adhesive layer. In order that the printing plate can be handled prior to the adhesion to the cylinder, a removable film is placed on this adhesive layer. This film must be removed prior to placing of this adhesive layer on the cylindrical carrier. A preferred embodiment therefore provides the measure that the printing plate is provided on a first side with an adhesive layer covered by a first film and that the first film is at least partially removed prior to the adhesion of the printing plate to the cylindrical carrier.

[0017] Another option in principle lies in heating of the cylindrical carrier prior to arranging the printing plate. When the printing plate manufactured substantially from polymer contacts the heated cylinder, it will become slightly viscous and adhere to the cylindrical carrier. Another embodiment therefore provides the measure of heating the cylindrical carrier prior to adhering the printing plate to the cylindrical carrier. The device preferably comprises a heat source for the purpose of heating the cylindrical carrier.

[0018] It is advantageous to heat the cylindrical carrier over at least the width of the printing plate to be arranged. In yet another preferred embodiment the heat source therefore extends over at least the width of the printing plate to be arranged on the cylindrical carrier. A better adhesion is hereby obtained between the cylindrical carrier and the printing plate.

[0019] In yet another preferred embodiment the heat source comprises an infrared lamp. Such a heat source provides for a homogeneous heating of the cylindrical carrier, this enhancing the adhesion of the printing plate to the cylindrical carrier.

[0020] During the various operations involving the printing plate to be arranged on the cylindrical carrier this plate can be damaged. Scratches may thus for instance occur on the surface of the printing plate by placing and displacing the printing plate on the table. Another preferred embodiment therefore provides the measure that the printing plate is provided with a second film on a second side opposite the first side, and that the second film is at least partially removed after the printing plate has been arranged on the cylindrical carrier. This second side of the printing plate arranged on the cylindrical carrier faces away from the cylindrical carrier.

[0021] It is desirable to give the printing plate arranged on the cylindrical carrier a surface treatment in order to obtain a more homogenous surface. This can be realized in practical manner by heating the whole obtained after arranging the printing plate on the cylindrical carrier. The polymer will become slightly viscous and start to flow due to the heating. Particularly at the transition of the cut edges a more homogenous surface is hereby obtained, wherein any unevenness still possibly present is removed.

[0022] The smoothness can be improved still further when the whole obtained after arranging the printing plate on the cylindrical carrier is calendered. This preferred embodiment also provides the measure that the device comprises a calender movable relative to the table for the purpose of calendering the printing plate arranged on the cylindrical carrier. The calender is particularly placed close to the heat source.

[0023] The present invention will be further elucidated on the basis of the non-limitative exemplary embodiments shown in the following figures. Herein:

figure 1 shows a perspective, partly cut-away view of a device according to the present invention for arranging a printing plate on a cylindrical carrier, wherein a printing plate is placed on a flat carrier;
figure 2a shows a schematic cross-sectional view of the device wherein the printing plate is cut through a first time;

figure 2b shows a view corresponding to figure 2a wherein the printing plate is brought into abutment with the first stop;

figure 2c shows a view corresponding to figure 2a wherein the cylindrical carrier and the printing plate have just been brought into contact with each other;

figure 2d shows a view corresponding to figure 2c wherein the cylindrical carrier is rotated through a first arcuate part;

figure 2e is a view corresponding to figures 2c and 2d wherein the printing plate is cut through a second time; and

figure 2f shows a view corresponding to figures 2c, 2d and 2e wherein the printing plate is wound wholly round the cylindrical carrier and a protective film is removed.

[0024] Figure 1 shows a device 1 for arranging a flexible printing plate 10 on a cylindrical carrier 20. Printing plate 10 is provided with adhesive means in the form of an adhesive layer 11 on side 10a, and is also provided with a film 12 on side 10a over adhesive means 11 and a protective film 13 (not visible in figure 1) on the side 10b of printing plate 10 opposite side 10a.

[0025] Device 1 comprises a frame 2 to which a horizontally extending table 3 is connected. Beneath table 3 a beam 21 extending parallel to a cylindrical carrier 20 is fixed to frame 2 by means of vertically extending screw spindles 22. An electric motor 23 (not shown) is connected to screw spindles 22 for the purpose of moving beam 21 in vertical direction. Two uprights 24 extending in vertical direction are also fixed to both outer ends of beam 21. A shaft 25 is placed between uprights 24 by means of bearings (not shown). Cylindrical carrier 20 is connected to this shaft 25. An electric motor 30 which is coupled for driving to shaft 25 is mounted on one of the uprights in line with shaft 25.

[0026] Table 3 comprises a slot 41 extending parallel to shaft 25. Situated beneath table 3 is a cutting device connected rigidly to table 3 and provided with a knife 42 which is displaceable through slot 41, wherein knife 42 extends in the direction of table 3 at an angle varying from the perpendicular. Further placed above table 3 is a protective cover 44 which can be displaced perpendicularly relative to shaft 25 by means of guide rails 45. A first stop 46 extending parallel to shaft 25 is connected rotatably to table 3 close to slot 41. Connected rigidly to table 3 on the top side close to an edge 3a of table 3 is a second stop 47 which extends in a direction perpendicularly of shaft 25.

[0027] A partially opened hood 50 is connected movably to frame 2 by means of horizontally extending guide rails (not shown). Hood 50 comprises a first hood part 51 and a second hood part 52 connected hingedly to this first hood part 51. Placed inside hood 50 is an elongate infrared lamp 53 which extends over the full width of hood 50. A calender 54 is also mounted inside hood 50 by means of bearings (not shown). An electric motor 55 drives the calender, and is coupled for this purpose to a shaft 56 of calender 54.

[0028] A control device in the form of a computer 60 is connected to frame 2, which computer 60 is connected to electric motor 23, knife 42, electric motor 30 and infrared lamp 53.

[0029] The operation of the device will now be elucidated. The diameter of cylindrical carrier 20 is first inputted into control device 60. After placing printing plate 10 on table 3 against second stop 47 and placing protective cover 44 over slot 41 and with light bias against printing plate 10, control device 60 controls knife 42 such that printing plate 10 is cut through. This situation is shown in figure 2a.

[0030] After printing plate 10 has been cut through, protective cover 44 is displaced over guide rails 45. The severed part of printing plate 10 is now removed. Printing

plate 10 is displaced along second stop 47 over table 3 such that the obtained cut edge lies against first stop 46, as indicated by arrow P1. The part of film 12 of the side 10a of printing plate 10 located beneath cylindrical carrier 20 is now removed, as shown in figure 2b.

[0031] After optional heating by the infrared lamp 53 placed inside hood 50, first stop 46 is rotated in a direction away from the printing plate, after which cylindrical carrier 20 is moved downward by means of driving the electric motor 23 and cylindrical carrier 20 makes contact with a light bias with printing plate 10. Printing plate 10 will here adhere to cylindrical carrier 20. This situation is shown in figure 2c.

[0032] Electric motor 30 will then rotate cylindrical carrier 20 through a first angle as according to arrow P2, wherein cylindrical carrier 20 displaces printing plate 10 over table 3 in the direction of the cylindrical carrier as according to arrow P3. This situation is shown in figure 2d.

[0033] When cylindrical carrier 20 has been rotated through a predetermined angle, protective cover 44 is once again placed over slot 41 and with light bias on printing plate 10, and control 60 will again actuate knife 42 so that printing plate 10 is cut through a second time at a desired accurate position. This situation is shown in figure 2e.

[0034] After printing plate 10 has been cut through a second time, protective cover 44 is displaced once again. After the removal of film 12 the electric motor 30 will rotate cylindrical carrier 20 through a second angle as according to arrow P2. Printing plate 10 will here adhere over an increasing length to cylindrical carrier 20 and, after a sufficiently great rotation, will be adhered along its full length to cylindrical carrier 20. After printing plate 10 has been placed over its full length on the cylindrical carrier, the protective film 13 (not shown) present on side 10b can be removed. This situation is shown in figure 2f.

[0035] Hood 50 can then be displaced in the direction of cylindrical carrier 20 provided with printing plate 10 and hood part 52 can subsequently be rotated in the direction of hood part 51 so that hood 50 is closed. Control device 60 will control infrared lamp 53 such that printing plate 10 is heated for a desired period of time at the desired temperature. During this process electric motor 30 will also rotate the cylindrical carrier 20 provided with printing plate 10 so that infrared lamp 53 can heat the whole surface of the printing plate. As a result of this heating an at least partial melting of the photopolymer takes place, whereby particularly the join between the two cut edges of printing plate 10 fuses and becomes smooth. Printing plate 10 can further be subjected to a calendering process by calender 54, whereby printing plate 10 can be given an even smoother finish.

[0036] It will be apparent that within the scope of the invention it is possible to depart from the above described construction.

Claims

1. Method for arranging on a cylindrical carrier a flexible printing plate manufactured substantially from photopolymer, comprising the processing steps of:

- placing the printing plate on a table;
- cutting through the printing plate a first time with a directional component parallel to the axis of the cylindrical carrier using a cutting device;
- moving toward each other and bringing the printing plate and the cylindrical carrier into mutual contact;
- rotating the cylindrical carrier over a known first arcuate part, wherein due to adhesion of the printing plate to the cylindrical carrier the printing plate is wound onto the cylindrical carrier and the printing plate is thereby displaced over the table;
- cutting through the printing plate, displaced on the table, a second time with the same directional component using a cutting device; and
- rotating the cylindrical carrier over a second arcuate part and thereby winding the printing plate further round the cylindrical carrier,

wherein the two obtained cut edges of the printing plate thus arranged on the cylindrical carrier make mutual contact.

2. Method as claimed in claim 1, **characterized in that** prior to making the first cut, the printing plate is brought into abutment with a first stop placed on the table and having a directional component extending substantially perpendicularly of the axis of the cylindrical carrier.

3. Method as claimed in claims 1-2, **characterized in that** in order to bring the printing plate and the cylindrical carrier into contact with each other, the printing plate is brought into abutment with a second stop placed on the table and having a directional component substantially parallel to the axis of the cylindrical carrier, and that the cutting device cuts through the printing plate at a position which is fixed relative to the table.

4. Method as claimed in claim 3, **characterized in that** the printing plate is brought into abutment with the second stop under the axis of the cylindrical carrier.

5. Method as claimed in any of the foregoing claims, **characterized in that** the printing plate is cut along a plane extending at an angle other than 90° to the table.

6. Method as claimed in any of the foregoing claims, **characterized in that** the printing plate is provided

on a first side with an adhesive layer covered by a first film and that the first film is at least partially removed prior to the adhesion of the printing plate to the cylindrical carrier.

7. Method as claimed in any of the foregoing claims, **characterized by** the step of heating the cylindrical carrier prior to adhering the printing plate to the cylindrical carrier.
8. Method as claimed in any of the foregoing claims, **characterized in that** the printing plate is provided with a second film on a second side opposite the first side, and that the film is at least partially removed after the printing plate has been arranged on the cylindrical carrier.
9. Device for arranging on a cylindrical carrier a flexible printing plate manufactured substantially from photopolymer, comprising:

- a frame;
- a table connected to the frame for the purpose of carrying the printing plate to be arranged on the cylindrical carrier;
- bearing means connected to the frame for bearing-mounting of the cylindrical carrier;
- wherein the table and the bearing means are mutually displaceable;
- a cutting device connected to the frame for cutting through the printing plate placed on the table with a directional component parallel to the axis of a cylindrical carrier placed on the bearing means;
- first drive means for driving the cylindrical carrier in rotation; and
- second drive means for driving the mutual displacement of the bearing means and the table.

10. Device as claimed in claim 9, **characterized in that** the device also comprises a first stop connected to the frame and extending substantially perpendicularly of the cylindrical carrier for the purpose of determining the position of the printing plate in transverse direction relative to the cylindrical carrier.
11. Device as claimed in claim 9 or 10, **characterized in that** the device also comprises a second stop connected to the frame and extending substantially parallel to the cylindrical carrier for the purpose of determining the position of the printing plate in length direction relative to the cylindrical carrier, and that the cutting device is connected rigidly to the frame and is adapted to cut through the printing plate along a straight cutting line substantially parallel to the cylindrical carrier.

12. Device as claimed in claim 9, 10 or 11, **character-**

ized in that the cutting device is provided with a knife and that the knife extends at an angle other than 90° to the table.

- 5 13. Device as claimed in claim 12, **characterized in that** the cutting device is provided with a drive device for driving the knife of the cutting device under the control of the control means.
- 10 14. Device as claimed in any of the claims 9-13, **characterized by** a heat source adapted for the purpose of heating the cylindrical carrier.
- 15 15. Device as claimed in any of the claims 9-14, **characterized in that** the device comprises a calender movable relative to the table for the purpose of calendering the printing plate arranged on the cylindrical carrier.

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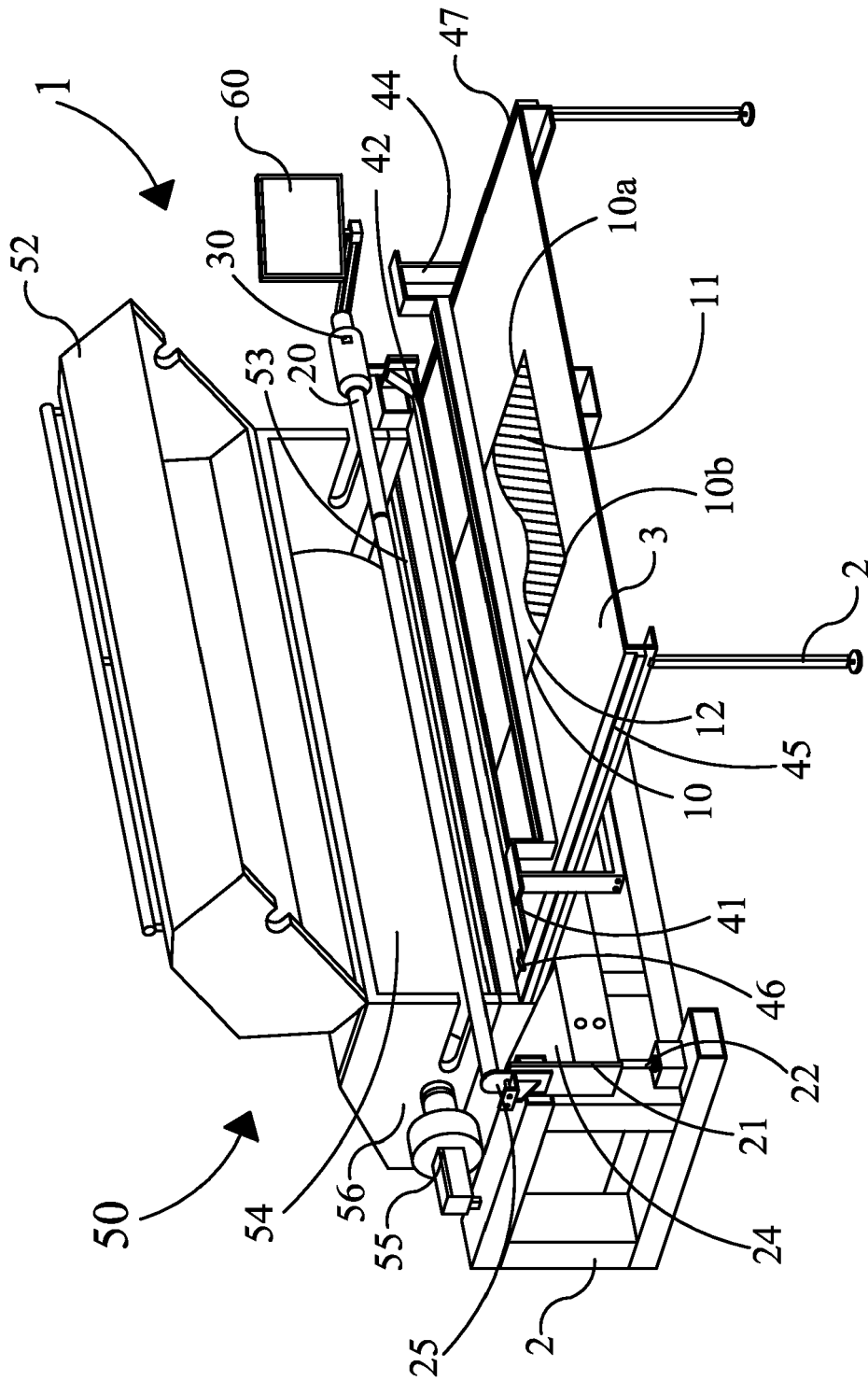
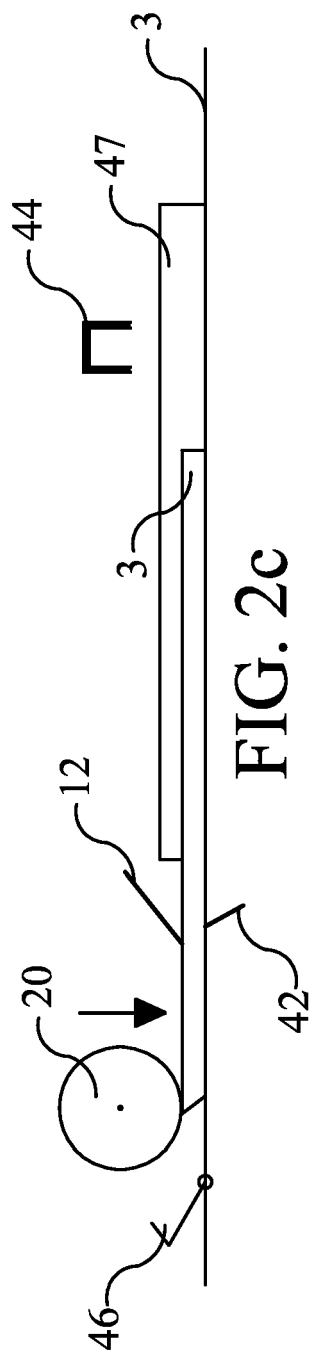
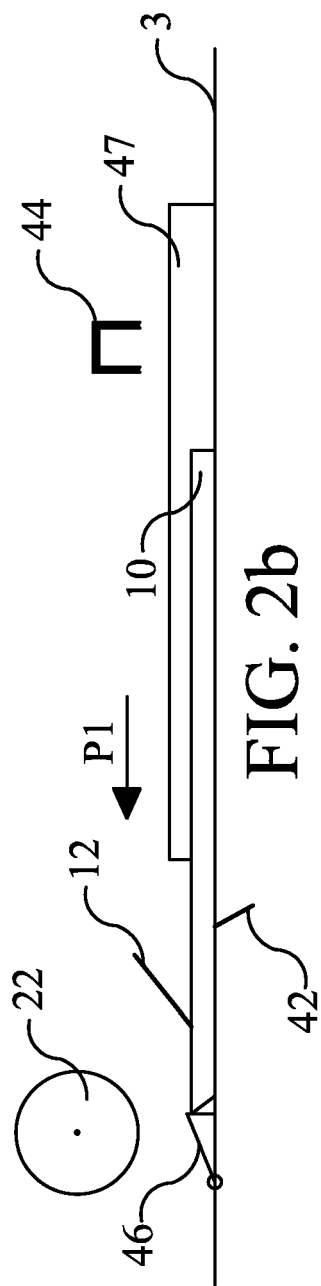
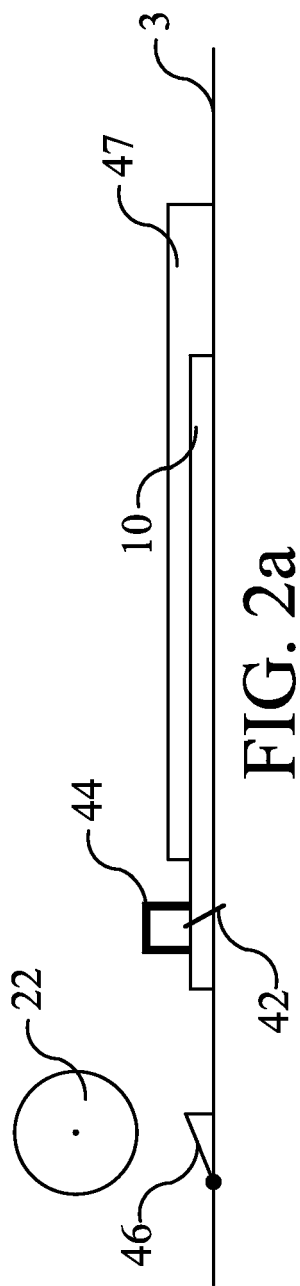
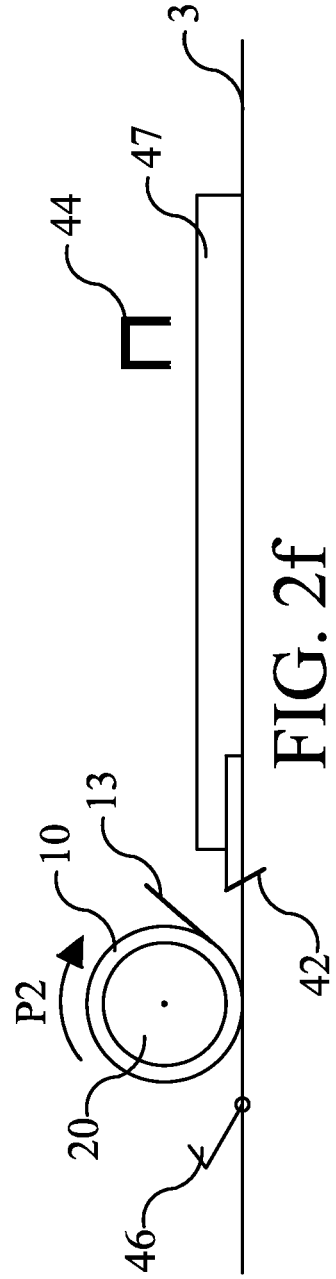
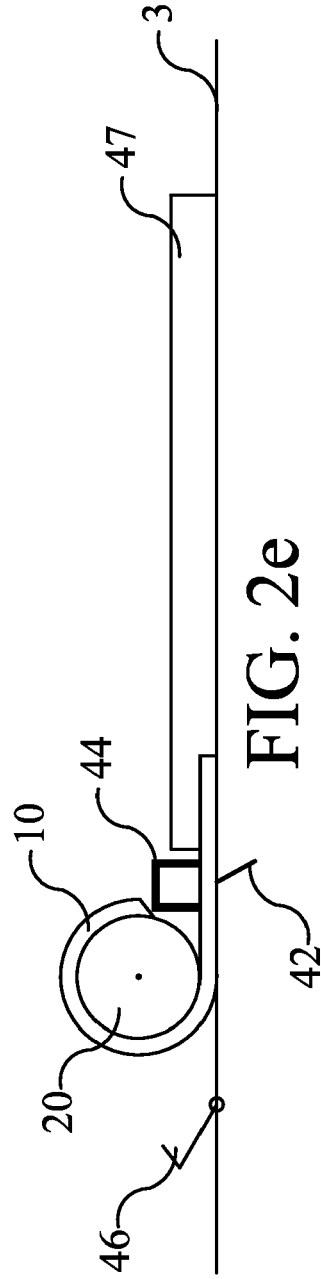
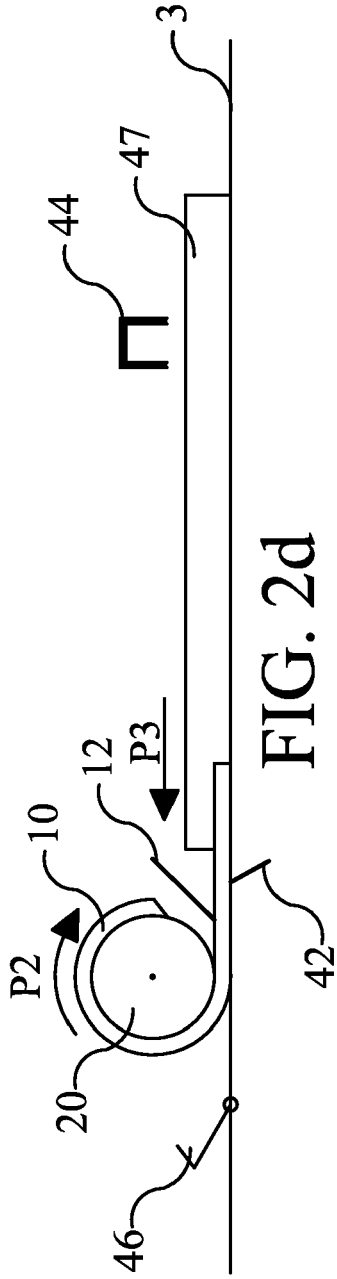


FIG. 1







EUROPEAN SEARCH REPORT

Application Number
EP 09 15 5404

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search The Hague		Date of completion of the search 7 October 2009	Examiner Haenisch, Ulrich
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 15 5404

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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