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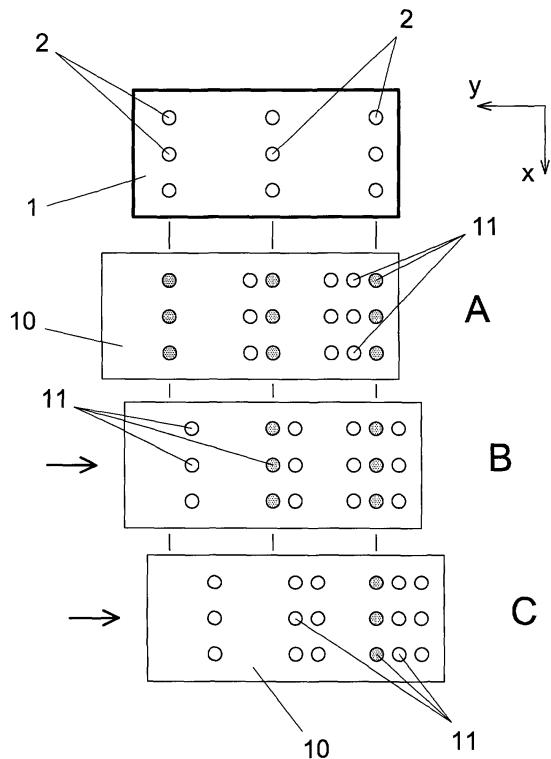
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EPC.

(54) A printzone vacuum adapter for a printing apparatus

(57) The printing apparatus comprises a vacuum system for holding down a medium on a printplaten (1) and comprising vacuum paths between a vacuum source and a plurality of holes (2) in the printplaten (1); the adapter comprises at least one sheet (10,10',20,20',30) provided with a predetermined pattern of openings (11,21,31) and movable between at least two positions for selectively closing at least one of said vacuum paths when the medium being printed does not cover all said holes (2) of the printplaten (1).

It allows to automatically adjust the width and length of the vacuum system to media of different sizes.

FIG. 1



Description

[0001] The present invention relates to an adapter for a printing apparatus, designed for adjusting the printzone vacuum system to the size of the medium being printed.

BACKGROUND OF THE INVENTION

[0002] Some known inkjet printing apparatus, e.g. plotters, are provided with a printplaten which supports the media being printed, said printplaten being provided with a plurality of holes connected to a vacuum source through a vacuum chamber, in order to hold down the media and prevent it from forming bubbles or wrinkles. In some cases, the system includes several vacuum chambers, each clustering a number of holes of the printplaten.

[0003] When the medium being printed does not cover all the printplaten, for example because it does not reach the maximum media size that can be printed, some of the holes in the printplaten remain uncovered and this causes high vacuum losses.

[0004] One solution developed for this problem has been providing active valves for each hole or group of holes of the printplaten; this leads to complex and expensive systems.

[0005] A further solution that has been developed is using airflow losses for sealing the holes that remain uncovered, as described in EP00118448 (unpublished) and EP-997302-A1. This solution also has drawbacks: for example, it produces audible levels of noise, especially with high levels of vacuum.

DESCRIPTION OF THE INVENTION

[0006] The present invention provides a printzone vacuum adapter for a printing apparatus, said printing apparatus comprising a vacuum system for holding down a medium being printed on a printplaten, said system comprising vacuum paths between a vacuum source and a plurality of holes in the printplaten, wherein said adapter comprises at least one sheet provided with a predetermined pattern of openings and movable between at least two positions for selectively closing at least one of said vacuum paths when the medium being printed does not cover all said holes of the printplaten.

[0007] The invention allows to adjust the size of the vacuum system depending on the media being printed; its structure allows to automate the switching operation between different sizes.

[0008] Since vacuum paths that are not needed for holding down the medium are closed off, the adapter avoids high noise.

[0009] In one embodiment, at least one sheet is arranged parallel and adjacent to the printplaten so as to selectively open and close holes of the printplaten.

[0010] In this case, the pattern of openings may be

such that for each hole of the printplaten the sheet has a number of openings aligned in the direction of displacement of the sheet, the number of aligned openings being, for each hole, equal to the number of positions of the sheet in which said hole must remain open.

[0011] In an alternative embodiment, said at least one sheet is arranged between a main vacuum chamber and intermediate vacuum chambers so as to selectively open and close vacuum passageways therebetween.

[0012] In this case, said pattern of openings may be such that for each vacuum passageway the sheet has a number of openings aligned in the direction of displacement of the sheet, the number of aligned openings being, for each vacuum passageway, equal to the number of positions of the sheet in which said vacuum passageway must remain open.

[0013] According to one embodiment, the adapter comprises a first movable sheet, provided with a first pattern of openings, appropriate for selectively closing

vacuum paths located along a first direction, thus limiting the size of the vacuum system in said first direction.

[0014] If e.g. said first direction is at right angles to the advance of the media, this first sheet operates to adjust the width of the vacuum system.

[0015] The adapter may further comprise a second movable sheet, provided with a second pattern of openings different from said first pattern of openings, appropriate for selectively closing vacuum paths located along a second direction, at right angles to said first direction, thus limiting the size of the vacuum system in said second direction.

[0016] This allows to adjust the width and length of the vacuum system with small displacements of the sheets.

[0017] In this embodiment with two sheets, said first and second sheets are preferably arranged overlapping each other.

[0018] Said first and second sheets may be displaceable in the same direction, preferably in a direction at right angles to that of advance of the media, or in directions at right angles to each other.

[0019] In another embodiment, the adapter comprises a single movable sheet provided with a predetermined pattern of openings, said sheet being appropriate for selectively closing both vacuum paths located along the direction of advance of the media and vacuum paths located along a direction at right angles to that of advance of the media, and thus to limit the size of the vacuum system in said two directions.

[0020] This single-sheet embodiment has a lower cost and simplifies assembly and operation.

[0021] According to one aspect of the invention, the adapter comprises control means for the movement of said at least one sheet in response to the readings of sensor means arranged to detect the size of a medium being printed.

[0022] The sensors are already built-up in many printing apparatus, and the automation of the operation is

thus simple.

[0023] The movement of said at least one sheet may be carried out by means of a rotary motor or by means of a linear actuator, preferably a solenoid.

[0024] The adapter according to the invention may comprise supporting and guiding means for said at least one sheet, preferably comprising a foam spring on which said at least one sheet slides and is supported.

[0025] The foam spring allows smooth movement of the sheets and at the same time allows vacuum to be transmitted. It further provides a good seal between sheets and with the printplaten.

[0026] The present invention also provides a printing apparatus comprising a printzone vacuum adapter as described above.

[0027] According to another aspect, the invention provides a method for adjusting the size of a vacuum system for holding down a medium being printed in a printing apparatus, wherein said vacuum system comprises vacuum paths, said method comprising the steps of:

providing at least one sheet with a predetermined pattern of holes;
detecting the position of at least one edge of the medium being printed; and
moving said sheet for selectively opening or closing at least one vacuum path of said vacuum system depending on the detected position.

[0028] This method can be automated and a printer can thus function to adjust the vacuum system to the size of the media being printed while operating unattended.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] A particular embodiment of the present invention will be described in the following, only by way of nonlimiting example, with reference to the appended drawings, in which:

figure 1 shows an example of a printzone width vacuum adapter according to the invention, in its different operating positions;
figure 2 is similar to figure 1, for a printzone length vacuum adapter;
figure 3 shows different operating positions of an adapter that can adjust with one single sheet both the width and length of the vacuum system; and
figure 4 is an exploded perspective view showing an adapter according to an embodiment of the invention installed in a printing apparatus.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0030] In figure 1, reference numeral 1 indicates a printplaten of an inkjet printing apparatus, provided with a plurality of holes 2.

[0031] The layout of the holes 2 on the printplaten varies depending on the type of printer; the figure shows a simplified printplaten arrangement, with three rows of holes having three holes each, for better clarity.

5 **[0032]** The printplaten 1 is arranged in the printzone of the printer, under the printing head.

[0033] The medium being printed (not shown) advances on the printplaten 1 in the direction of the x-axis shown in figure 1, and is held down flat on the printplaten 10 by supplying vacuum through holes 2.

[0034] The vacuum is supplied from a vacuum source and through vacuum paths towards the holes 2 of the printplaten. Each vacuum path may include a main vacuum chamber and one hole of the printplaten, or may 15 include further passageways such as intermediate vacuum chambers, conduits or the like; several vacuum paths will have a part in common, e.g. all the paths have a main vacuum chamber in common.

[0035] In conventional printers, when the medium being printed is wide enough to cover all the holes 2 in the printhead, no vacuum adjustment is needed; however, when a narrower medium is printed at least one row of holes 2 remains uncovered, thus causing undesirable vacuum losses.

25 **[0036]** The medium is placed towards the right hand side (figure 1) of the printplaten; the left row of holes, or the left and central rows of holes, will remain uncovered when small size media are being printed.

[0037] Figure 1 shows the structure and operation of 30 a width adapter 10 according to an embodiment of the present invention, designed to solve the problem of vacuum losses when printing on narrow media and, in this case, allowing to adjust the vacuum system to three different media widths.

35 **[0038]** In this embodiment the adapter comprises one thin metal sheet 10 placed just under the printplaten 1 and displaceable in the scan direction of the printer (the y-axis shown in figure 1). The sheet 10 is provided with a predetermined pattern of openings 11 and can adopt 40 the three different positions A,B,C shown in the figure.

[0039] For better clarity, in the figures the real size and distance of the openings and holes have not been respected; in practice, the openings and holes are much smaller. The openings in the sheets of the adapter may 45 be of any shape, not necessarily matching that of the holes in the printhead.

[0040] The pattern of openings in the sheet 10 is such that, depending on the position of the sheet, some of the holes 2 of the printplaten 1 are in correspondence with 50 openings 11 of the sheet 10 and therefore remain open, while some holes 2 are not in correspondence with openings 11 of the sheet 10 and therefore are closed by the sheet itself.

[0041] More particularly, in this case the pattern of 55 openings 11 is as follows: in the region of the sheet 10 under the right row of holes of the printplaten there are three parallel rows of openings 11 in the sheet 10; in the region of the central row of holes of the printplaten there

are two parallel rows of openings in the sheet; and in the region of the left row of holes of the printplaten there is only one row of openings in the sheet.

[0042] Thus, the row of holes on the right of the printplaten 1 will be always open, regardless of the position A,B,C of the sheet 10; the central row of holes will remain open when the sheet is in positions A and B; and the left row will remain open only when the sheet is in position A.

[0043] For each position of the sheet, the openings 11 of the sheet which are in correspondence with holes 2 of the printplaten, and through which vacuum is therefore transmitted, are shown in grey.

[0044] As can be seen, the position A of the sheet is appropriate for large media which cover all the printplaten, while positions B and C are appropriate for intermediate and narrow media, respectively.

[0045] For example, the positions could be adequate for standard A2, A3 and A4 paper widths.

[0046] Figure 2 shows an example of how the vacuum system can be adapted to the length of the media being printed, i.e. how the vacuum system can be limited in the direction of the x-axis shown in the figure. This adjustment of the size of the vacuum system is useful for example at the beginning of the printing operation, when the medium does not yet cover all the printplaten.

[0047] A length adapter 20 similar to the width adapter 10 of figure 1 is shown in figure 2 in three operating positions.

[0048] The adapter comprises one thin sheet 20 placed just under the printplaten 1 and displaceable in the scan direction of the printer (y-axis). The sheet 20 is provided with a predetermined pattern of openings 21 and can adopt the three different positions A,B,C shown in the figure.

[0049] Like in the previous embodiment, the pattern of openings in the sheet 20 is such that, depending on the position of the sheet, some of the holes 2 of the printplaten 1 remain open, while others are closed by the sheet 20.

[0050] More particularly, in this case the pattern of openings 21 is as follows: in the region of the sheet 20 under each row of holes of the printplaten there are three parallel rows of openings 21 in the sheet 20: a first row has three openings, a second row at the left of the first only has the two upper openings, and the third row, at the left of the second, only has the upper opening.

[0051] Thus, the upper hole of each row of the printplaten 1 will be always open, regardless of the position A,B,C of the sheet 20; the central hole of each row will remain open when the sheet is in positions A and B; and the lower hole of each row will remain open only when the sheet is in position A.

[0052] For each position of the sheet, the openings 21 of the sheet which are in correspondence with holes 2 of the printplaten, and through which vacuum is therefore transmitted, are shown in grey.

[0053] Therefore, position A is appropriate for media

that cover all the printplaten, while positions B and C are appropriate at the beginning of the printing operation, when the medium has not yet covered all the holes.

[0054] An adapter device useful for adjusting both the width and length of the vacuum system can be provided with two sheets, a width adjusting sheet 10 and a length adjusting sheet 20, as described above, overlapped to each other and each capable of being displaced independently from the other.

[0055] However, an adapter device able to adjust width and length simultaneously can also be embodied with an adequate pattern of openings 31 in a single sheet 30, as shown in figure 3.

[0056] As can be seen in this figure, the pattern of openings is here a combination of the patterns of sheets 10 and 20 above: like in sheet 10, there are three groups of openings for the row of holes 2 on the right, two groups for the central row of holes 2, and one group for the left row; and each group of openings has the configuration of the groups in sheet 20.

[0057] With the embodiment of figure 3, there are 9 possible positions of the sheet 30, for matching three different media widths and three different lengths. Of these 9 positions, only 6 have been shown in the drawings.

[0058] In position A, the vacuum system is at its maximum size: all the holes 2 of the printplaten 1 remain open. In position B, the width (y-axis) is maximum, but the length (x-axis) has been reduced, since only two holes 2 of each row are open; in position C, the length of the vacuum system is minimum, only the upper hole of each row remaining open.

[0059] In position D, the length is maximum (three holes per row open), but the row of holes 2 on the left of the figure is all closed: the width of the vacuum system is thus reduced. Positions E and F produce a vacuum system with the same width as in position D, but reducing its length.

[0060] The three additional positions of the sheet 30, not shown in figure 3, would produce a vacuum system of minimum width, with three different lengths.

[0061] In the described embodiments, the pattern of openings is formed as follows: for each hole of the printplaten, the sheet has a number of openings aligned in the direction of the sheet displacement; the number of aligned openings is, for each hole, equal to the number of positions of the sheet in which said hole must remain open.

[0062] For example, in figure 1, the right holes 2 must stay open in three positions of the sheet 10, and the sheet has, for each of said holes, three openings 11 aligned along the y-axis; for each central hole there are two aligned openings, and they must remain open in two positions of the sheet; and for each left hole there is a single opening, since this hole must remain open only in one position of the sheet.

[0063] In the case of sheet 30 (figure 3) the openings follow the same pattern, but since the same sheet ad-

justs width and length there are spaces between some of the aligned openings.

[0064] One way of referring to the performance of the sheets in the adjustment of the printer vacuum system is by saying that the sheets 10,20,30 have a coded pattern of openings, and function to codify different media sizes; a perforated sheet may perform a width codification and/or a length codification.

[0065] It has to be noted that the invention could also be embodied with perforated sheets displaceable along the x-axis instead of the y-axis as shown; in this case, the layout of the openings on the sheets would be of course different from that of figures 1,2 and 3.

[0066] Another possibility is providing one sheet for the width adjustment, displaceable in the direction of the y-axis and another sheet for the length adjustment, displaceable along the x-axis.

[0067] Figures 1 to 3 show a printplaten 1 with only three rows of holes 2; in practice, the number of holes is larger, and the sheets 10,20 and 30 will therefore have more openings: if e.g. the vacuum has to be adjusted to three different media widths, but there are 16 rows of holes 2 in the printplaten, obviously the pattern of openings 11 for each row of holes shown in figure 1 will be repeated for several consecutive rows of holes; the number of times each pattern of openings is repeated depends on the actual sizes desired for the vacuum system. An example of such an arrangement will be given below, with reference to figure 4.

[0068] According to another embodiment, the adjusting sheets may have a size to cover only the holes of the printplaten that need to be selectively closed, i.e. it may not reach some holes that are always left open.

[0069] Regarding the selection of one single sheet such as 30 or two sheets such as 10 and 20 for adjusting both width and length of the vacuum system, it has to be pointed out that both embodiments have advantages: two sheets allow to reduce the sliding travel in the y-axis, and allows to adjust a larger number of positions, because less openings are needed in each sheet; on the contrary, the embodiment in a single sheet has a lower cost and simplifies the assembly and operation of the device.

[0070] Figure 4 shows how the adapter according to the invention, in this case with two adjusting sheets similar to sheets 10 and 20 described above, can be assembled on an inkjet printer.

[0071] In the figure, reference numeral 40 indicates a main vacuum chamber which distributes vacuum from a vacuum source (not shown) to the holes 2 of a printplaten 1'. The vacuum system adapter is placed between the vacuum chamber 40 and the printplaten 1', as described below.

[0072] The vacuum chamber 40 is provided with two side supports 41, on which rests a perforated sheet base 50.

[0073] On this base 50 is arranged a foam block 60, acting as a spring means, and on the foam block 60 are

arranged the width-adjusting sheet 10' and the length-adjusting sheet 20'.

[0074] The foam block 60 is porous and permeable to air, and it may also be provided with adequate openings, 5 or it can be non-porous and be provided with adequate openings. Thus it allows the displacement of the sheets 10' and 20' and at the same time it allows the vacuum to be transmitted therethrough; the base 50 may have perforations in correspondence with the holes 2 of the printplaten 1', or any other kind of larger holes that guarantee the transmission of vacuum.

[0075] The sheets 10' and 20' slide with respect to the printplaten and the foam block 60, and with respect to each other.

[0076] The sheets 10' and 20' are similar to sheets 10 and 20, but are adapted to a printplaten 1' having several rows of holes 2, and not just three rows like in the previous examples.

[0077] More particularly, in the sheet 10' of figure 4 20 can be distinguished three different areas: in the right area of the sheet, corresponding to the six first rows of the printplaten 1', there are three rows of openings 11 for each row of holes 2; in the central area of the sheet (corresponding to the next six rows of the printplaten) 25 there are two rows of openings 11 for each row of holes 2; and finally, in the left area of the sheet (corresponding to the last four rows of the printplaten) there is only one row of openings 11 for each row of holes 2.

[0078] In consequence, one displacement of the sheet 10' towards the right in figure 4 will cause the closure of the first four rows of holes 2 on the left of the figure, and a subsequent displacement will cause the closure of the subsequent six rows of holes 2 of the printplaten.

[0079] Sheet 20' is similarly modified with respect to sheet 20; in this case, two of the six holes 2 of each row are closed in each displacement of the sheet 20' towards the right.

[0080] The assembly of the adapter device on the 40 printer may of course be different from the embodiment of figure 4; for example, solutions with different supporting and guiding means for the sheets may be implemented.

[0081] The displacement of the sheets may be effected by means of a small rotary motor, e.g. a step motor; for those applications in which more speed in operation may be required, a linear actuator such as a solenoid could be used.

[0082] The sheets may be very thin, and their inertia 50 is very small, and therefore the switching operation between positions could be performed in the range of milliseconds.

[0083] The adapter device can be automatically actuated by the printer, with no need of manual intervention 55 to adapt the size of the vacuum system to the media being printed, simply by providing sensors able to detect the size of the media. Such sensors are already available in several types of printers.

[0084] In fact, a method for adjusting the size of the vacuum system in a printer can be performed by providing one or two sheets such as 10, 20 or 30, detecting the position of a lateral edge and/or of the leading edge of a medium being printed, and moving the sheet or sheets accordingly to close the openings of the printplaten that remain uncovered.

[0085] Throughout the specification, reference has been made to an adapter that works to selectively close the holes 2 of the printplaten by means of a perforated sheet arranged underlying said platen.

[0086] However, the printer may be provided with several intermediate vacuum chambers, each clustering a plurality of holes of the printplaten and each having a passageway open in a common main vacuum chamber connected to the vacuum source.

[0087] In this case, it is also possible to selectively close the passageways of the different intermediate chambers, e.g. by providing a displaceable perforated sheet between the main vacuum chamber and the intermediate chambers.

[0088] This solution is simpler, because there are less holes to close, but allows to adjust only to a limited number of widths/lengths, because each passageway commands a plurality of holes of the printplaten.

Claims

1. A printzone vacuum adapter for a printing apparatus, said printing apparatus comprising a vacuum system for holding down a medium being printed on a printplaten (1), said system comprising vacuum paths between a vacuum source and a plurality of holes (2) in the printplaten (1), wherein said adapter comprises at least one sheet (10,10',20,20',30) provided with a predetermined pattern of openings (11,21,31) and movable between at least two positions for selectively closing at least one of said vacuum paths when the medium being printed does not cover all said holes (2) of the printplaten (1).
2. An adapter as claimed in claim 1, wherein said at least one sheet (10,10',20,20',30) is arranged parallel and adjacent to the printplaten (1) so as to selectively open and close holes (2) of the printplaten (1).
3. An adapter as claimed in claim 2, wherein said pattern of openings (11,21,31) is such that for each hole (2) of the printplaten (1) the sheet (10,10',20,20',30) has a number of openings (11,21,31) aligned in the direction of displacement of the sheet, the number of aligned openings being, for each hole (2), equal to the number of positions of the sheet in which said hole (2) must remain open.
4. An adapter as claimed in claim 1, wherein said at

least one sheet (10,20,30) is arranged between a main vacuum chamber (40) and intermediate vacuum chambers so as to selectively open and close vacuum passageways therebetween.

5. An adapter as claimed in claim 4, wherein said pattern of openings (11,21,31) is such that for each vacuum passageway the sheet (10,20,30) has a number of openings aligned in the direction of displacement of the sheet, the number of aligned openings (11,21,31) being, for each vacuum passageway, equal to the number of positions of the sheet (10,20,30) in which said vacuum passageway must remain open.
10. An adapter as claimed in any of claims 1 to 5, which comprises a first movable sheet (10,10';20,20'), provided with a first pattern of openings (11;21), appropriate for selectively closing vacuum paths located along a first direction (y;x), thus limiting the size of the vacuum system in said first direction.
15. An adapter as claimed in claim 6, further comprising a second movable sheet (20,20';10,10'), provided with a second pattern of openings (21;11) different from said first pattern of openings (11;21), appropriate for selectively closing vacuum paths located along a second direction (x;y), at right angles to said first direction (y;x), thus limiting the size of the vacuum system in said second direction.
20. An adapter as claimed in claim 7, wherein said first and second sheets (10,10';20,20') are arranged overlapping each other.
25. An adapter as claimed in claims 7 or 8, wherein said first and second sheets (10,10';20,20') are displaceable in the same direction.
30. An adapter as claimed in claim 9, wherein said first and second sheets (10,10';20,20') are displaceable in a direction (y) at right angles to that of advance of the media.
35. An adapter as claimed in claims 7 or 8, wherein said first and second sheets (10,10';20,20') are displaceable in directions (x,y) at right angles to each other.
40. An adapter as claimed in any of claims 1 to 5, which comprises a single movable sheet (30) provided with a predetermined pattern of openings (31), said sheet being appropriate for selectively closing both vacuum paths located along the direction of advance of the media (x) and vacuum paths located along a direction (y) at right angles to that of advance of the media, and thus to limit the size of the vacuum system in said two directions.
45. An adapter as claimed in any of claims 1 to 5, which comprises a single movable sheet (30) provided with a predetermined pattern of openings (31), said sheet being appropriate for selectively closing both vacuum paths located along the direction of advance of the media (x) and vacuum paths located along a direction (y) at right angles to that of advance of the media, and thus to limit the size of the vacuum system in said two directions.
50. An adapter as claimed in any of claims 1 to 5, which comprises a single movable sheet (30) provided with a predetermined pattern of openings (31), said sheet being appropriate for selectively closing both vacuum paths located along the direction of advance of the media (x) and vacuum paths located along a direction (y) at right angles to that of advance of the media, and thus to limit the size of the vacuum system in said two directions.
55. An adapter as claimed in any of claims 1 to 5, which comprises a single movable sheet (30) provided with a predetermined pattern of openings (31), said sheet being appropriate for selectively closing both vacuum paths located along the direction of advance of the media (x) and vacuum paths located along a direction (y) at right angles to that of advance of the media, and thus to limit the size of the vacuum system in said two directions.

13. An adapter as claimed in any of the previous claims, which comprises control means for the movement of said at least one sheet (10,10',20,20',30) in response to the readings of sensor means arranged to detect the size of a medium being printed. 5

14. An adapter as claimed in any of claims 1 to 13, wherein the movement of said at least one sheet (10,10',20,20',30) is carried out by means of a rotary motor. 10

15. An adapter as claimed in any of claims 1 to 13, wherein the movement of said at least one sheet (10,10',20,20',30) is carried out by means of a linear actuator, preferably a solenoid. 15

16. An adapter as claimed in any of the previous claims, which further comprises supporting and guiding means (40,41,50,60) for said at least one sheet (10,10',20,20',30). 20

17. An adapter as claimed in claim 16, wherein said supporting and guiding means comprise a foam spring (60) on which said at least one sheet (10,10',20,20',30) slides and is supported. 25

18. A printing apparatus comprising a printzone vacuum adapter as claimed in any of claims 1 to 17. 30

19. A method for adjusting the size of a vacuum system for holding down a medium being printed in a printing apparatus, wherein said vacuum system comprises vacuum paths, said method comprising the steps of: 35

providing at least one sheet (10,10',20,20',30) with a predetermined pattern of holes (11,21,31);
detecting the position of at least one edge of the medium being printed; and
moving said sheet (10,10',20,20',30) for selectively opening or closing at least one vacuum path of said vacuum system depending on the detected position. 40

uum paths when the medium being printed does not cover all said holes (2) of the printplaten (1), and wherein said pattern of openings (11,21,31) is such that for each vacuum path the sheet (10,10',20,20',30) has a number of openings (11,21,31) aligned in the direction of displacement of the sheet, the number of aligned openings being, for each vacuum path, equal to the number of positions of the sheet in which said vacuum path must remain open. 45

2. An adapter as claimed in claim 1, wherein said at least one sheet (10,10',20,20',30) is arranged parallel and adjacent to the printplaten (1) so as to selectively open and close holes (2) of the printplaten (1). 50

3. An adapter as claimed in claim 1, wherein said at least one sheet (10,20,30) is arranged between a main vacuum chamber (40) and intermediate vacuum chambers so as to selectively open and close vacuum passageways therebetween. 55

4. An adapter as claimed in any of claims 1 to 3, which comprises a first movable sheet (10,10'; 20,20'), provided with a first pattern of openings (11; 21), appropriate for selectively closing vacuum paths located along a first direction (y;x), thus limiting the size of the vacuum system in said first direction. 60

5. An adapter as claimed in claim 4, further comprising a second movable sheet (20,20';10,10'), provided with a second pattern of openings (21;11) different from said first pattern of openings (11;21), appropriate for selectively closing vacuum paths located along a second direction (x;y), at right angles to said first direction (y;x), thus limiting the size of the vacuum system in said second direction. 65

6. An adapter as claimed in claim 5, wherein said first and second sheets (10,10';20,20') are arranged overlapping each other. 70

7. An adapter as claimed in claims 5 or 6, wherein said first and second sheets (10,10';20,20') are displaceable in the same direction. 75

8. An adapter as claimed in claim 7, wherein said first and second sheets (10,10';20,20') are displaceable in a direction (y) at right angles to that of advance of the media. 80

9. An adapter as claimed in claims 5 or 6, wherein said first and second sheets (10,10';20,20') are displaceable in directions (x,y) at right angles to each other. 85

10. An adapter as claimed in any of claims 1 to 3, 90

Amended claims in accordance with Rule 86(2) EPC.

1. A printzone vacuum adapter for a printing apparatus, said printing apparatus comprising a vacuum system for holding down a medium being printed on a printplaten (1), said system comprising vacuum paths between a vacuum source and a plurality of holes (2) in the printplaten (1), wherein said adapter comprises at least one sheet (10,10',20,20',30) provided with a predetermined pattern of openings (11,21,31) and movable between at least two positions for selectively closing at least one of said vac-

which comprises a single movable sheet (30) provided with a predetermined pattern of openings (31), said sheet being appropriate for selectively closing both vacuum paths located along the direction of advance of the media (x) and vacuum paths located along a direction (y) at right angles to that of advance of the media, and thus to limit the size of the vacuum system in said two directions.

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11. An adapter as claimed in any of the previous claims, which comprises control means for the movement of said at least one sheet (10,10',20,20',30) in response to the readings of sensor means arranged to detect the size of a medium being printed.

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12. An adapter as claimed in any of claims 1 to 11, wherein the movement of said at least one sheet (10,10',20,20',30) is carried out by means of a rotary motor.

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13. An adapter as claimed in any of claims 1 to 11, wherein the movement of said at least one sheet (10,10',20,20',30) is carried out by means of a linear actuator, preferably a solenoid.

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14. An adapter as claimed in any or the previous claims, which further comprises supporting and guiding means (40,41,50,60) for said at least one sheet (10,10',20,20',30).

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15. An adapter as claimed in claim 14, wherein said supporting and guiding means comprise a foam spring (60) on which said at least one sheet (10,10',20,20',30) slides and is supported.

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16. A printing apparatus comprising a printzone vacuum adapter as claimed in any of claims 1 to 15.

17. A method for adjusting the size of a vacuum system for holding down a medium being printed in a printing apparatus, wherein said vacuum system comprises vacuum paths, said method comprising the steps of:

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providing at least one sheet (10,10',20,20',30) with a predetermined pattern of openings (11,21,31), wherein said pattern of openings (11,21,31) is such that for each vacuum path the sheet (10,10',20,20',30) has a number of openings (11,21,31) aligned in the direction of displacement of the sheet, the number of aligned openings being, for each vacuum path, equal to the number of positions of the sheet in which said vacuum path must remain open; detecting the position of at least one edge of the medium being printed; and moving said sheet (10,10',20,20',30) for selec-

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tively opening or closing at least one vacuum path of said vacuum system depending on the detected position.

FIG. 1

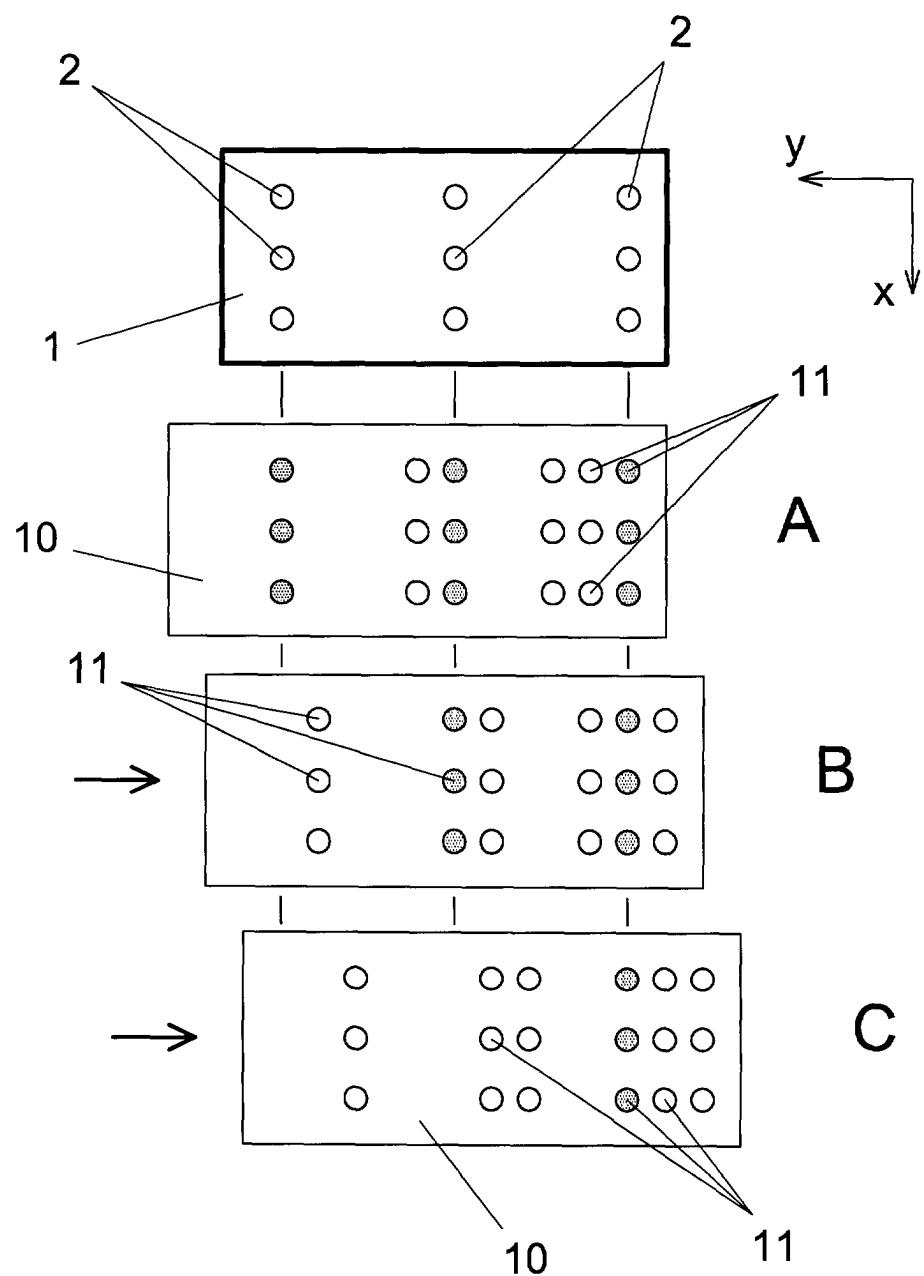


FIG. 2

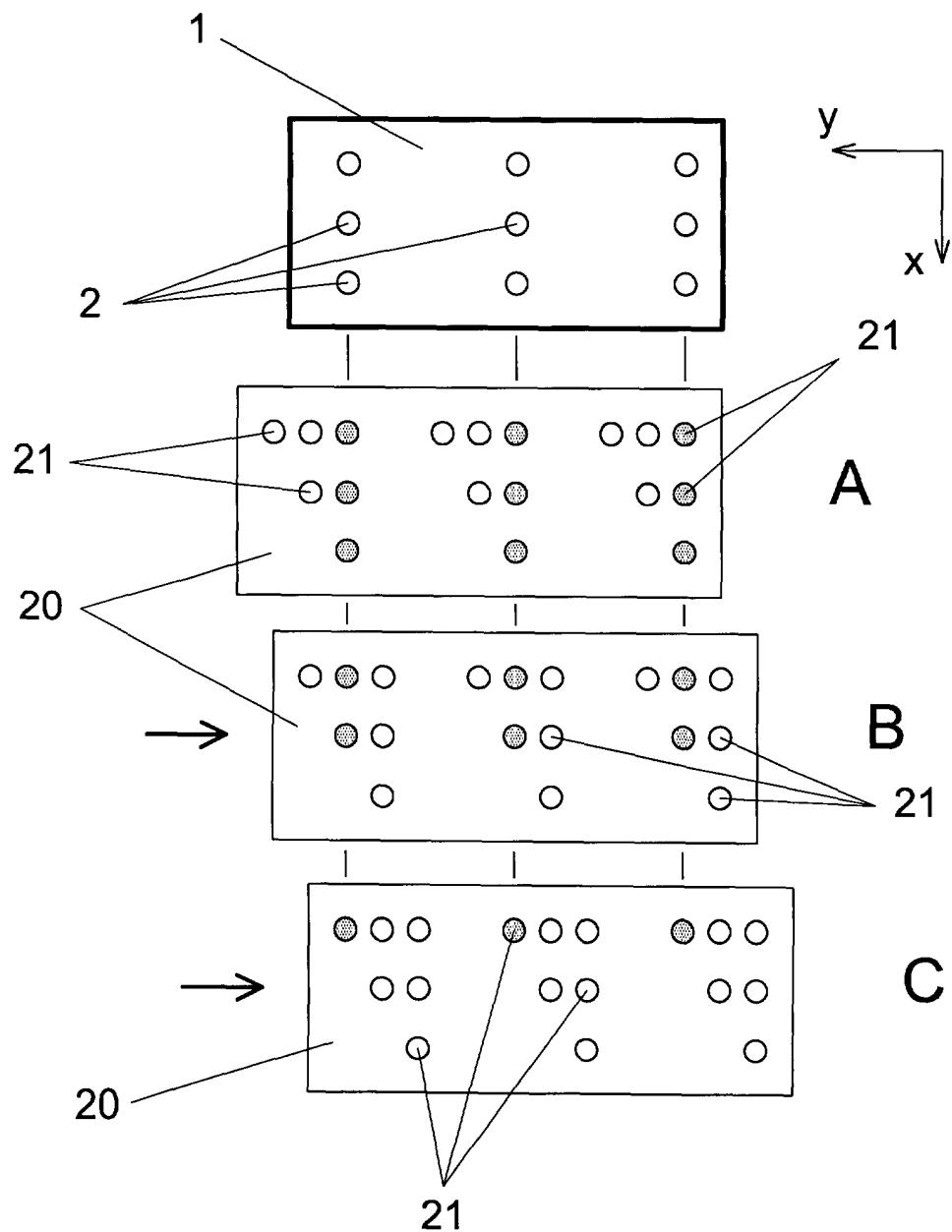


FIG. 3

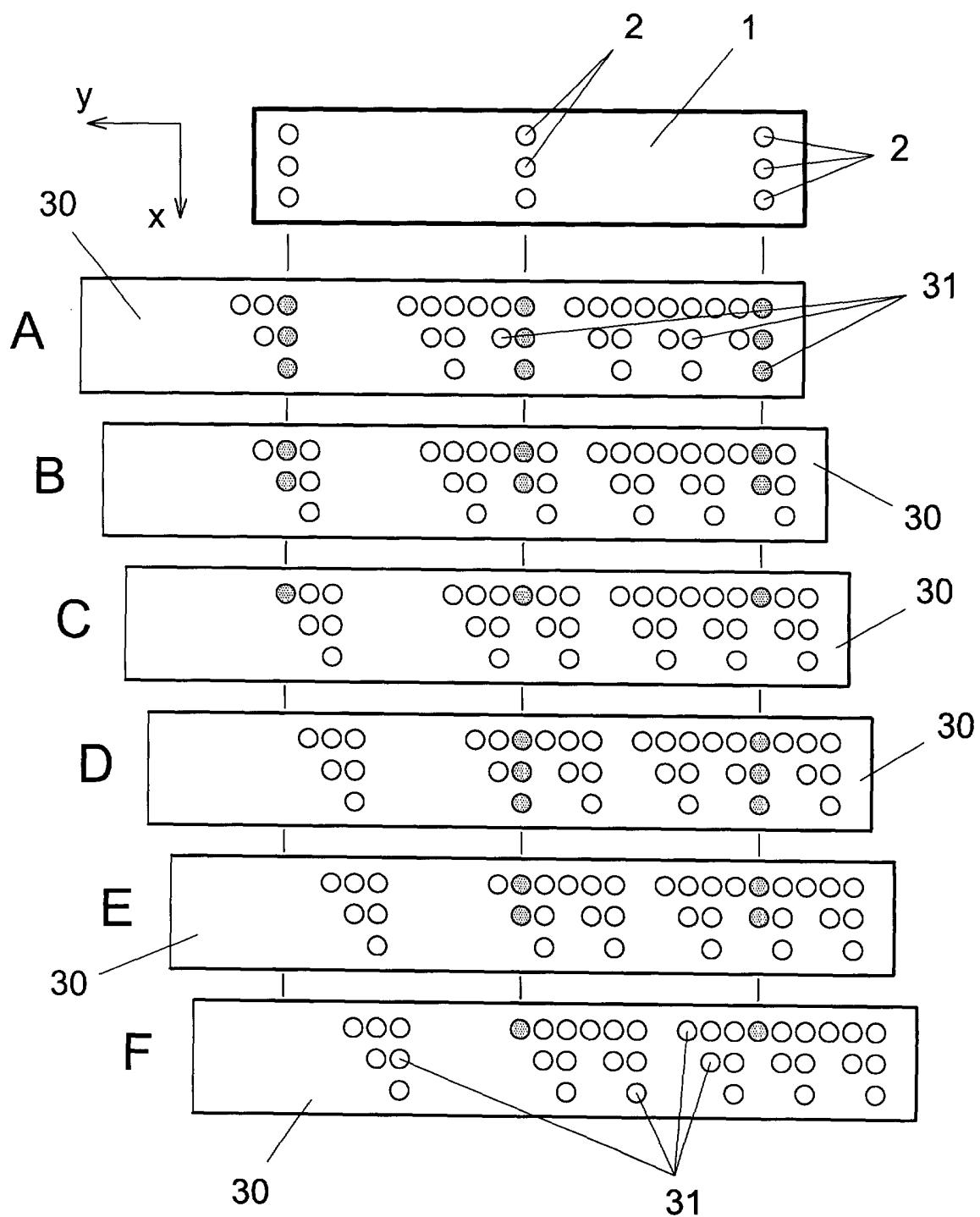
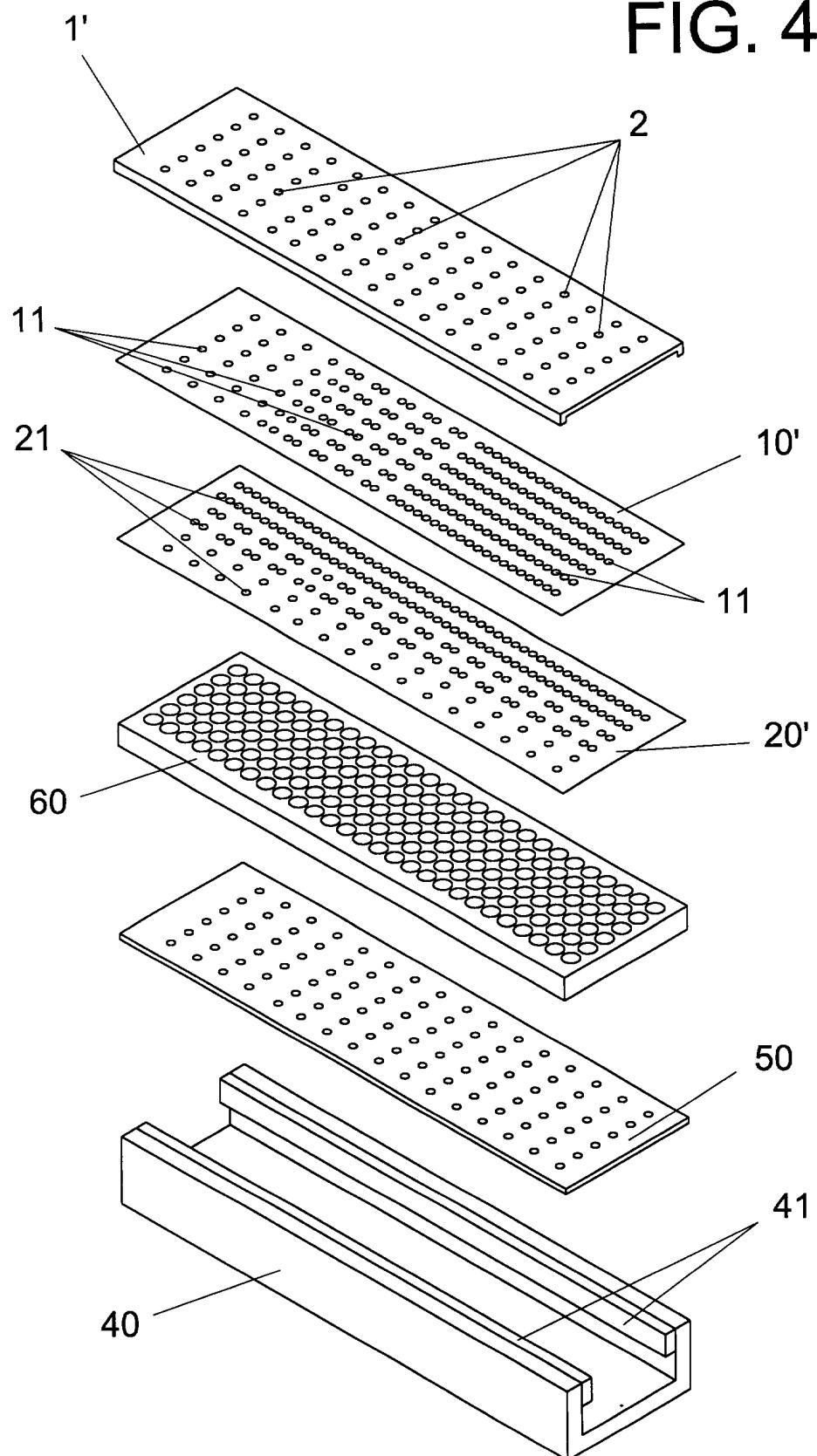


FIG. 4





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 01 12 5976

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X	US 6 209 867 B1 (DOWNING STEVEN P ET AL) 3 April 2001 (2001-04-03) * column 4, line 19 – column 5, line 32; figures 1A, 1B, 1C, 1D, 4 *	1,2,4,6, 12-16, 18,19	B41J11/06
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			B41J
<p>The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search		Examiner
THE HAGUE	27 March 2002		Wehr, W
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			
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27-03-2002

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