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(72) Inventor: **Rovaris, Marco**
20052 Monza (Milano) (IT)

(74) Representative: **Rapisardi, Mariacristina**
Ufficio Brevetti Rapisardi S.r.l.,
Via Serbelloni, 12
20122 Milano (IT)

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(71) Applicant: **A.G. Engineering S.r.l.**
20041 Agrate Brianza (Milano) (IT)

(54) **Device and process for positioning a product to be decorated in a silk-screen printer**

(57) A device (2) for positioning a product to be decorated (3) in a silk-screen printer (1) comprises a plurality of first supports (7), each of which carries optical sensing means (8) and first centring devices (9).

The first supports (7) are mobile, for the centring of the product to be decorated (3) through the first centring devices (9) in relation to an image taken by the optical sensing means (8).

The device (2) carries out a process which comprises a first stage of positioning of the optical sensing means (8) in correspondence with a profile of an image to be printed engraved onto a frame (10) of the silk-screen printer, and a second stage of positioning at least of the first centring devices (9) of the product to be decorated (3) relative to a position taken up by the optical sensing means (8).

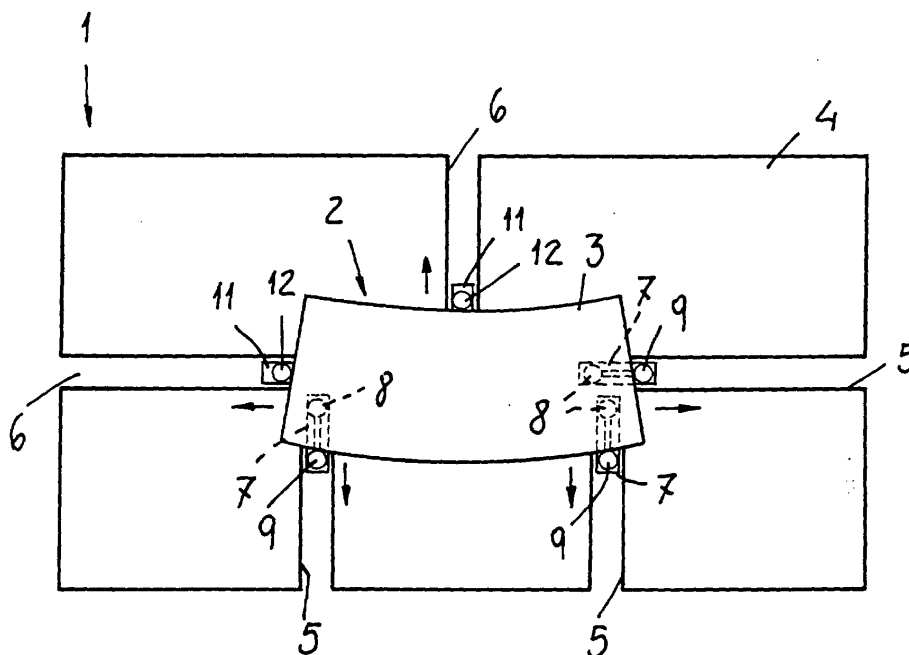


FIG. 2

Description

[0001] The present invention refers to a device and to a process for positioning a product to be decorated in a silk-screen printer.

[0002] As is commonly known silk-screen printers allow images to be printed onto products of various types, e.g. sheets of glass.

[0003] In their basic structure silk-screen printers are made up of a frame, adapted for holding the ink to be transferred to the product to be decorated, and a printing plate, adapted to support the product to be decorated during machining.

[0004] Silk-screen printers also include a device adapted for positioning the product to be decorated in a central position and with the edges lined up in relation to the image to be printed.

[0005] Traditional positioning devices usually foresee two video cameras fixed to the printing plate and orientated towards the frame.

[0006] The frame, in turn, shows two first objectives which are separated by the same distance as the two video cameras.

[0007] The device is completed by a monitor which shows the first objectives taken by the video cameras and also shows two second objectives which are indicative of the position of the video cameras.

[0008] When the machine is used the frame is moved manually in two perpendicular directions, so as to line up the video cameras with the first objectives and, therefore, superimpose the first and second objectives on the monitor.

[0009] Corrections can also be made using a computer which controls the movements of the frame so that its position is corrected automatically.

[0010] Nevertheless, traditional positioning devices are very complex since they are made up of manual and motorised components for moving and controlling the position of the frame.

[0011] Moreover, possible angular corrections are extremely difficult and imprecise to carry out, particularly when large sizes are being used because they are printed upon tilting one of the frame's supports and thereby causing slight rotations of the frame itself.

[0012] When the product to be decorated cannot be centred in the printing plate it is also necessary to organise a controlled axle for the transportation of the glass onto the printing plate.

[0013] Using traditional devices, this requires that the operator is provided with the coordinates in relation to the centre-line of the product to be decorated which cannot always be worked out easily.

[0014] For example, in the case of curved glass it is usually very difficult to work out such data.

[0015] Moreover, to store data relative to objectives and/or coordinates of the centre-line of the product one must also be provided with a memory capable of storing a significant volume of data.

[0016] This naturally implies high costs both for purchasing and for managing the memories.

[0017] Moreover, in the case of automatic correction by computer, the correction to the position of the frame must necessarily be carried out through successive approximations.

[0018] Indeed, since the frame can only move in two perpendicular directions, every such movement includes angular modifications which must be corrected many times.

[0019] In practice automatic correction of errors in traditional machines presents considerable practical problems.

[0020] The technical task which the present invention proposes is, therefore, to eliminate the alleged technical drawbacks of the prior art, realising a device and a process for positioning a product to be decorated in a silk-screen printing machine which are very simple and, in particular, do not require movement of the frame.

[0021] Within the scope of this technical task one aim of the invention is to realise a device which allows angular corrections to be carried out precisely even when large sizes are being used.

[0022] Another aim of the invention is to realise a device which does not use coordinates relative to the product to be decorated.

[0023] A further aim of the invention is to realise a device which does not require significant memory capacity to memorise and work out data and coordinates relative to products to be decorated.

[0024] Another aim of the invention is to realise a device which can be automated without the need to make successive approximations to define the position of the product to be decorated in relation to the frame.

[0025] Another aim of the invention is to illustrate a process for positioning a product to be decorated in a silk-screen printer which can be carried out by the device.

[0026] Last but not least another aim of the invention is to illustrate a device and a process for positioning a product to be decorated in a silk-screen printer which are substantially cost-effective and reliable.

[0027] The technical task, as well as these and other aims, according to the present invention are achieved realising a device for positioning a product to be decorated in a silk-screen printer, characterised in that it comprises a plurality of first supports each of which carries at least optical sensing means and a first centring device, said first supports being mobile for centring of said product to be decorated through said first centring devices according to an image taken by said optical sensing means.

[0028] Advantageously, the device according to the invention carries out a process for positioning a product to be decorated in a silk-screen printer, characterised in that it comprises a first stage of positioning of optical sensing means in correspondence of a profile of an image to be printed engraved on a frame of said silk-screen

printer, and a second stage of positioning at least of first centring devices of said product to be decorated with respect to a position taken up by said optical sensing means.

[0029] Other characteristics of the present invention are defined, moreover, in the other claims.

[0030] Advantageously, the device according to the invention presents video cameras which directly read the profile of the image to be printed and the profile of the glass positioned on the printing plate.

[0031] Possible corrections can thus be completed directly observing the image which is to be printed.

[0032] Using the device according to the invention a product of any shape and without limits as to format (compatible with the characteristics of the machine) and without the need to carry out a precautionary work of memorisation of coordinates of products to be decorated; in particular curved glass can be handled.

[0033] Moreover, the device can also be easily fitted on to existing silk-screen printers.

[0034] Other characteristics and advantages of the invention will largely become clear from the description of a preferred but not exclusive embodiment of the device and of the process for positioning of a product to be decorated in a silk-screen printer according to the finding, illustrated indicatively and without any limiting purpose in the enclosed drawings, in which:

- figure 1 shows a plan schematic view of a printing plate which supports an object to be decorated, in a stage of positioning of optical sensing means in correspondence of a profile of an image to be printed;
- figure 2 shows a plan schematic view of the printing plate in figure 1, in a stage of positioning of centring devices of the product to be decorated with respect to a position assumed by said optical sensing means;
- figure 3 shows an enlarged and side view of a detail of a video camera and of a centring device shown in figure 1;
- figure 4 shows an overhead view of the detail shown in figure 3;
- figure 5 shows an enlarged and side view of a detail of a video camera and of a centring device shown in figure 2;
- figure 6 shows an overhead view of the detail shown in figure 4;
- figure 7 shows a plan schematic view of a device according to the invention with the centring taking place outside the printing plate;
- figure 8 shows a template connected with the centring devices; and
- figure 9 shows an enlarged and side view of a detail of a video camera and of a centring device in another format.

[0035] With reference to figures 1 to 6, a part of a silk-

screen printing machine 1, on to which a device 2 is fitted to position a product to be decorated 3 according to the invention, is shown.

[0036] Machine 1, which is of the type that centres the product to be decorated on the printing plate, comprises a printing plate 4 which presents three first guides 5 and two second guides 6.

[0037] Of such guides a first guide 5 and a second guide 6 extend longitudinally and are themselves coaxial, the other guides 5 and 6, however, extend transversally with the second guide 6 central and the first guides 5 lateral.

[0038] Inside each of the first guides 5 slides a first support 7 which carries at one end optical sensing means 8 defined by a video camera, and at the other end a first centring device 9.

[0039] Video cameras 8 are substantially mounted vertically and are orientated towards a printing frame 10.

[0040] Moreover, video cameras 8 are contained inside guides 5 in such a way as not to protrude from these; indeed in this way the video cameras 8 can move together with the supports 7 taking themselves below the products to be decorated 3.

[0041] The centring devices 9 comprise rolls fitted idle on pivots at substantially vertical axes fixed to the supports 7.

[0042] Advantageously, the diameter of the centring devices 9 is proportional to (in any case smaller than) the diameter of the images taken by the video cameras 8 and, suitably, such two diameters are equal (or rather the proportionality coefficient is substantially equal to 1).

[0043] In a preferred example the diameter of the image taken by the video camera 8 is defined by a circular objective of the video camera 8 and, thus, it is this objective that presents a diameter equal to that of the centring devices 9.

[0044] Inside the second guides 6 slide second supports 11 which carry second centring devices 12 identical to the first centring devices 9.

[0045] The first and/or second centring devices 9 and 12 are radially disposed, so that at least two of the first centring devices may be associated with a first side of the product to be decorated 3, and at least a third of the first centring devices 9 may be associated with a second side of the product to be decorated 3 adjacent to the first side.

[0046] The first supports 7 and the second supports 11 are all connected to an actuation group (not shown) that controls their movements inside guides 5 and 6.

[0047] The device 2 carries out a process which is also an object of the present invention which is about to be described.

[0048] In the following passage we shall refer to a product to be decorated 3 consisting of a sheet of glass and we will suppose that the device 2 is initially in a state of rest, with the supports 7 and 10 at the ends of guides 5 and 6.

[0049] In a first stage of the procedure the first sup-

ports 7 move forward and carry the video cameras 8 in correspondence with a profile of an image to be printed engraved on the frame 10 and in a second stage, the first centring devices 9 take up a predetermined position in respect to the video cameras 8.

[0050] In practice, after the positioning of the video cameras 9, the supports 7 again move and carry the centring devices 10 to occupy the position previously occupied by the video cameras 8.

[0051] In a third stage, the centring devices 9 are moved towards one end of the guides 5 and are thus distanced from the image to be printed engraved on the frame 10, of a (predetermined) distance proportional to the foreseen distance between the edge of the printed image and the edge of the sheet of glass 3.

[0052] In such a stage the first supports 7 slide inside the guides 5 towards the edges of the printing plate 4 by the aforementioned (predetermined) distance between the edge of the printed image and the edge of the sheet of glass 3.

[0053] At this point the sheet of glass 3 is positioned in contact with the centring devices 9 and, successively, the supports 7 are again made to move to carry the video cameras 8 to occupy the position of centring devices 9.

[0054] In a fourth stage, following on from the third, the supports 7 can again be moved by an operator, who corrects its position, checking by looking at the monitor (not shown) with the images taken by the video cameras 8 which show the edge of the sheet of glass 3 and the image to be printed engraved on the frame 10.

[0055] Finally, the supports 7 move again carrying the centring devices 9 to occupy the position occupied by the video cameras 8 and, thus, even the second centring devices 12 are associated with the sheet of glass, which is now ready for printing.

[0056] In a different embodiment, not shown, the supports 7 present a rotatable part which allows the position of the video cameras 8 to be exchanged with that of the centring device 9 positioning them alternatively in the same position.

[0057] Using the rotatable part it is possible to reciprocally exchange the position of the video camera 8 and the centring device 9 without needing to move the supports 7.

[0058] The device 2 according to the invention can also be used associated to machines of the type that centres the product to be decorated externally to the printing plate 4.

[0059] In the following section a machine of this type is described, with reference to figures 7-9, where the same or similar elements are indicated with the same reference numbers as before.

[0060] The machine 1 with the centring taking place externally to the printing plate comprises the printing plate 4 connected via a conveyor 20 to a centring zone 21 where the centring operations and the movement of the centring devices take place.

[0061] The conveyor 20 presents the guides 5 and 6

in which the supports 7 and 11 glide.

[0062] The supports 7 have a part 22 which can be rotated by ninety degrees, which holds video camera 8 and the centring device 9.

5 **[0063]** The supports 11, however, carry exclusively the centring devices 12.

[0064] A conveyor 20 also presents two pins 23 positioned along its centre-line, in which templates 24 or sheets of transparent material, usually plexiglass, are adapted to be engaged, as will later become clear.

10 **[0065]** The machine 1 in such an embodiment carries out a process similar to the previous one which is also object of the present invention.

15 **[0066]** Preventatively, the frame 10 on the machine 1 are blocked and the centring devices 9 and 12 are opened to the maximum foreseen height.

[0067] Thus, the template 24 in plexiglass is positioned on the conveyor 20 whilst the same conveyor 20 is in the centring zone 21.

20 **[0068]** The centring devices 9 and 12 are moved towards the template 24 and the conveyor 20 moves onto the printing plate 4.

[0069] The part 22 is rotated taking the video cameras in a reading position and the template 24 is printed.

25 **[0070]** Thus, the conveyor 20 moves, again going to the centring zone 21 where the video cameras 8 are moved towards the profile printed on the template 24.

30 **[0071]** Thus, the part 22, having just been rotated taking the centring devices 9 into working position, and the supports 7 are moved away from the drawing by a predefined distance indicated on the drawing.

[0072] In this way the centring devices 9 stay lined up with the image to be printed but not with the external profile of the glass 3.

35 **[0073]** At this point the sheet of glass 3 is positioned in contact with the centring devices 9.

[0074] Finally, possible corrections can be carried out by taking back the glass 3 already printed upon in the centring zone 21, checking the printing with the video cameras 8 and adjusting the position of the same video cameras 8 (and thus of the centring devices 9 after the rotation of the parts 22).

40 **[0075]** In further embodiments of the device according to the invention for machines of the type that centre the product to be decorated externally to the printing plate, the supports cannot rotate but only move or else the supports cannot move but only rotate.

[0076] The device 2 has proved to be particularly suitable for small scale productions since it requires greatly reduced preparation times.

50 **[0077]** In practice we have stated how the device and the process for positioning a product to be decorated in a silk-screen printer according to the invention prove particularly advantageous because they allow the elimination of the manual or motorised complex system of movement and control of the frame and they make the silk-screen printer essentially simple both in structure and in use.

[0078] Moreover, the device and the process according to the invention allow the achievement of excellent results in terms of quality, accuracy of the reproduction of the images and productivity.

[0079] The device and the process for positioning a product to be decorated in a silk-screen printer as conceived are susceptible to numerous modifications and variations, all falling within the scope of the inventive idea, moreover all the details can be replaced by technically equivalent elements.

[0080] In practice the materials used, as well as the dimensions, are variable according to requirements and the state of the art.

Claims

1. Device (2) for positioning a product to be decorated (3) in a silk-screen printer (1), **characterised in that** it comprises a plurality of first supports (7) each of which carries at least optical sensing means (8) and a first centring device (9), said first supports (7) being mobile for centring of said product to be decorated (3) through said first centring devices (9) according to an image taken by said optical sensing means (8).
2. Device (2) according to claim 1, **characterised in that** each of said first centring devices (9) presents a diameter substantially proportional to an image taken by said optical sensing devices (8).
3. Device (2) according to one or more of the preceding claims, **characterised in that** said first centring devices present a diameter substantially equal to a diameter of said image taken by said optical sensing means (8).
4. Device (2) according to one or more of the preceding claims, **characterised in that** said diameter of said image taken by optical sensing means (8) is defined by an objective of the same optical sensing means (8).
5. Device (2) according to one or more of the preceding claims, **characterised in that** it also comprises second supports (11) which carry second centring devices (12), said second supports being mobile to engage said second supports with said product to be decorated (3).
6. Device (2) according to one or more of the preceding claims, **characterised in that** said first and said second supports (7, 11) are slideably connected to a printing plate (4) of said silk-screen printer (1).
7. Device (2) according to one or more of the preceding claims, **characterised in that** at least two of the

first centring devices (9) can be associated to a first side of said product to be decorated (3), and at least a third of the first centring devices (9) can be associated to a second side of the product to be decorated (3) adjacent to the first.

8. Device (2) according to one or more of the preceding claims, **characterised in that** said optical sensing means (8) are contained inside the first guides (5), in such a way as not to protrude from these.
9. Device (2) according to one or more of the preceding claims, **characterised in that** said first supports (7) comprise a rotatable part (22) which supports said optical sensing means (8) and said centring devices (9), said rotatable part (22) being adapted for positioning alternatively said optical sensing means (8) or said centring devices (9) in the same position.
10. Device (2) according to one or more of the preceding claims, **characterised in that** said first and said second supports (7, 11) are slideably connected with a conveyor (20) adapted for moving a sheet (24) and/or said product to be decorated (3) from a centring zone (21) to said printing plate (4) and vice versa.
11. Process for positioning a product to be decorated (3) in a silk-screen printer (1), **characterised in that** it comprises a first stage of positioning of optical sensing means (8) in correspondence with a profile of an image to be printed engraved on a frame (10) of said silk-screen printer (1), and a second stage of positioning at least of first centring devices (9) of said product to be decorated (3) with respect to a position taken up by said optical sensing means (8).
12. Process according to claim 11, **characterised in that**, during said second stage, said first centring devices (9) take up a position previously taken up by said optical sensing means (8) or vice versa.
13. Process according to one or more of the claims 11 and thereafter, **characterised in that** it comprises a third stage, following on from said second stage, in which said first centring devices (9) are moved by a distance proportional to the foreseen distance between an edge of a printed image on said product and an edge of said product itself.
14. Process according to one or more of the claims 11 and thereafter, **characterised in that** it comprises a fourth stage, following on from said third stage, of correction of said position of said centring devices (9) by an operator.
15. Process according to one or more of the claims 11 and thereafter, **characterised in that** during said

second stage said first centring devices (9) move to occupy a position previously occupied by said optical sensing means (8).

16. Process according to one or more of the claims 11 and thereafter, **characterised in that** it comprises a fifth stage, preceding said first stage, in which an image to be printed on a product to be decorated (3) is preventatively printed upon a sheet (24), so that the following first and second stages are carried out with reference to said image printed on said sheet (24). 5 10
17. Silk-screen printer (1), **characterised in that** it comprises a device (2) for positioning a product to be decorated (3) according to claim 1. 15
18. Device and process for positioning a product to be decorated in a silk-screen printer as substantially described and claimed. 20
The above as substantially described, illustrated, claimed and for the specified purposes.

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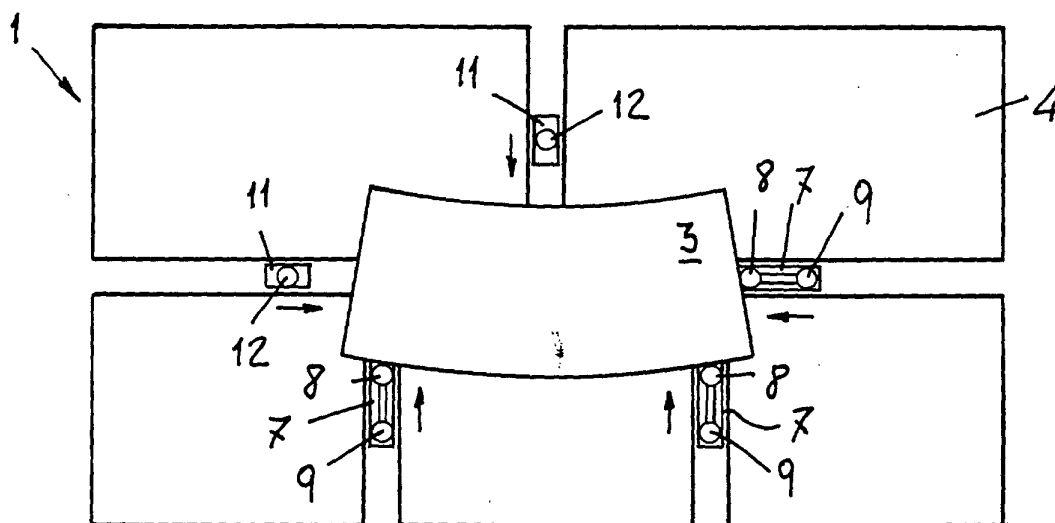


FIG. 1

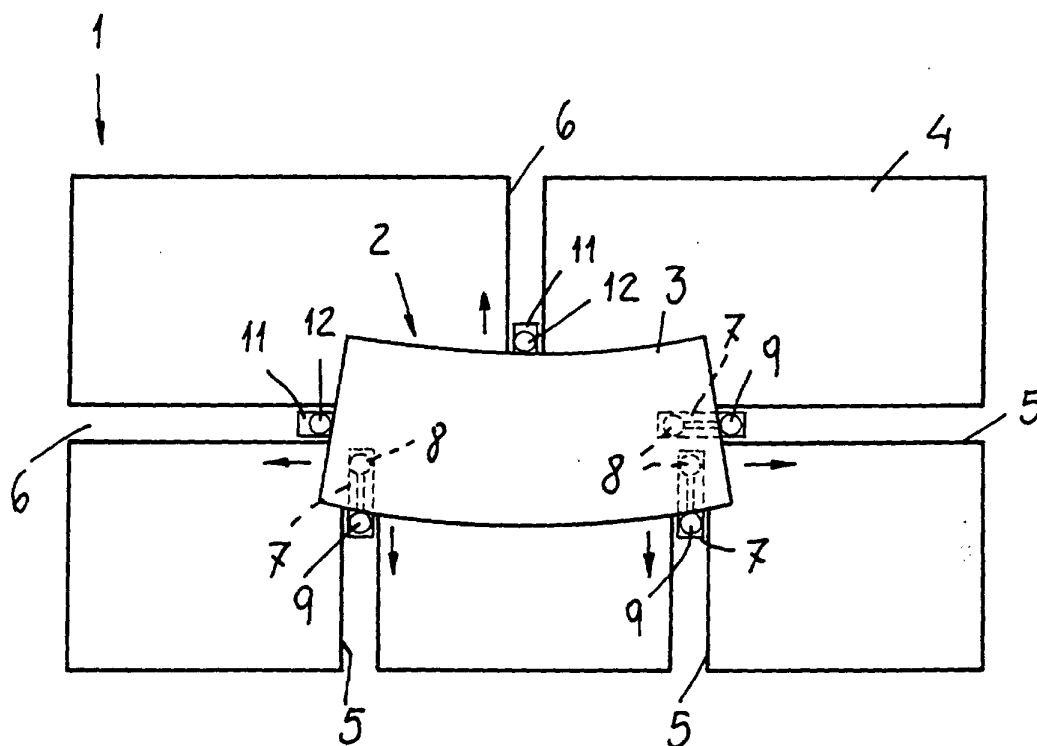
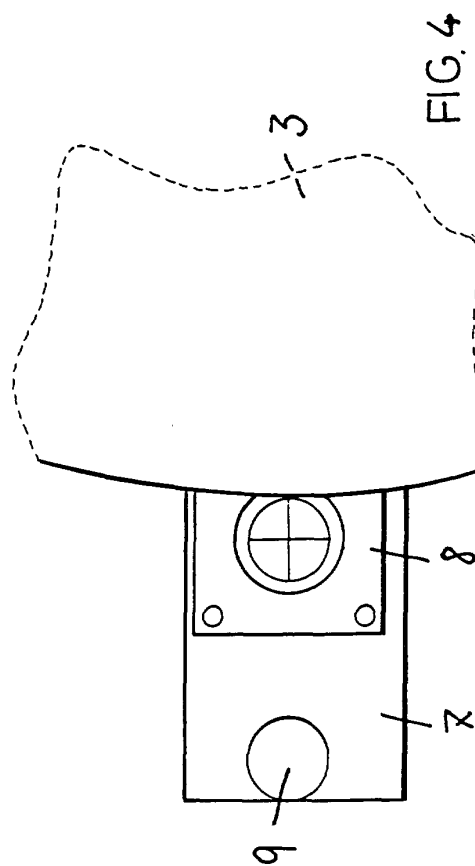
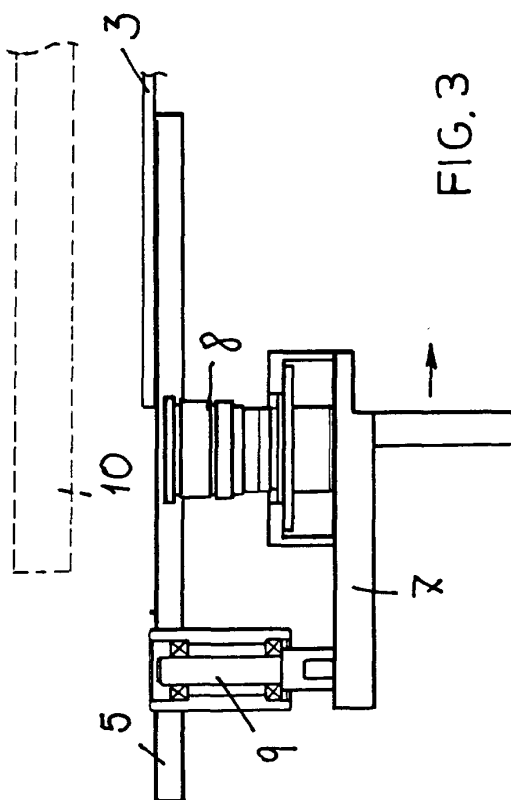
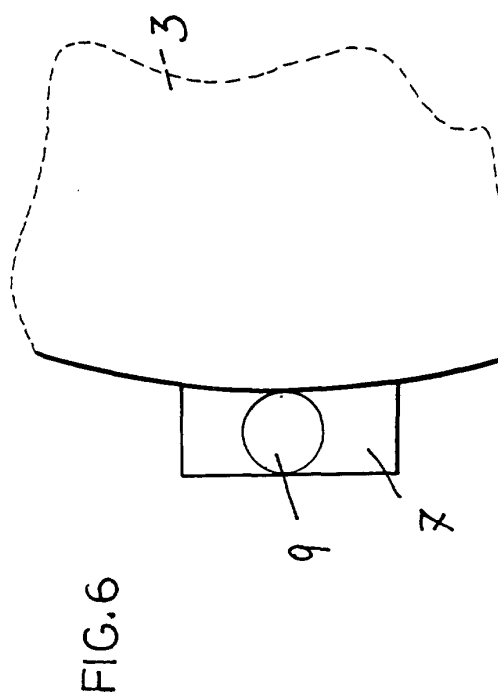
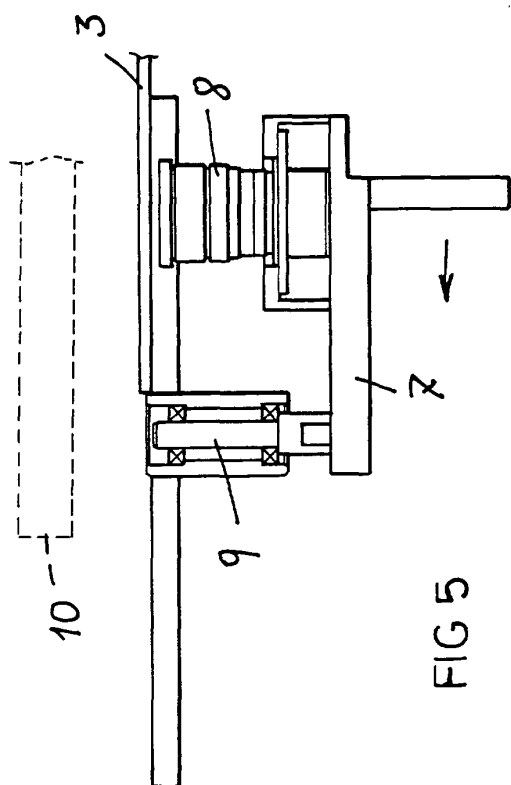


FIG. 2



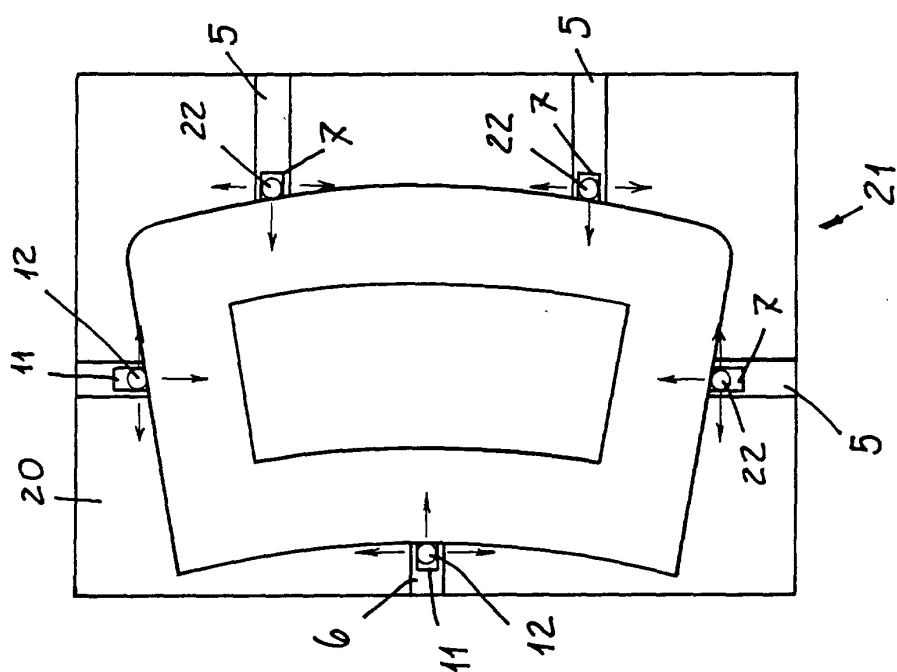
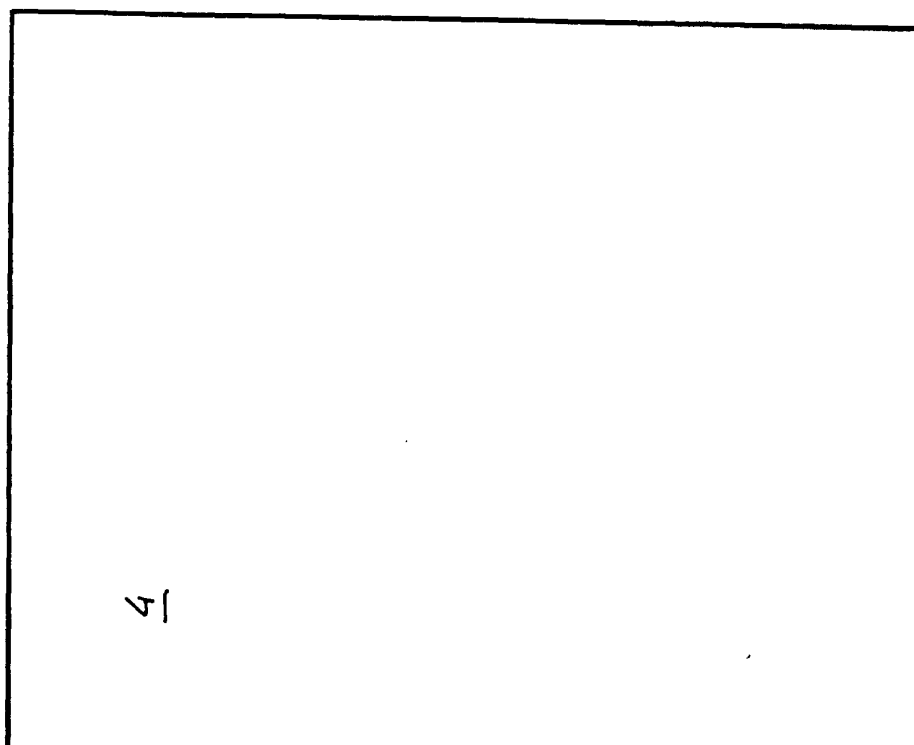


FIG.7

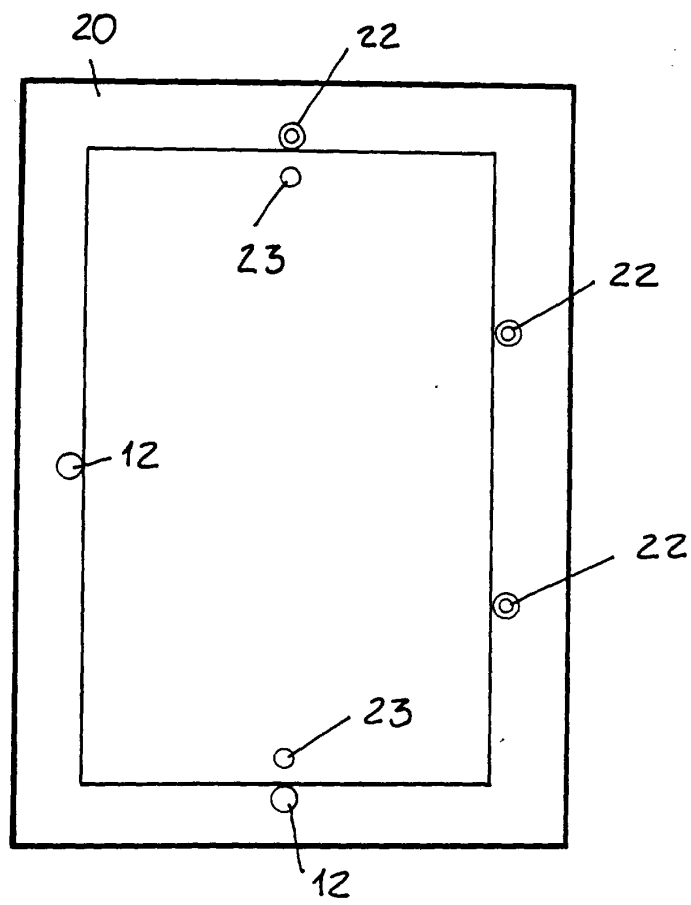


FIG. 8

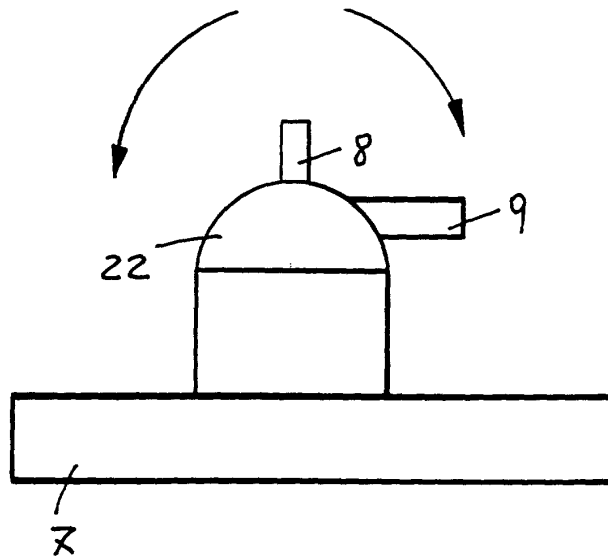


FIG. 9



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 01 12 1216

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
P, A	DE 199 36 553 A (THIEME GMBH & CO KG) 15 February 2001 (2001-02-15) * the whole document *	1	B41F15/26
A	US 5 718 057 A (GIETZ HANSPETER ET AL) 17 February 1998 (1998-02-17) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B41F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 January 2002	Examiner Madsen, P
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 01 12 1216

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 19936553	A	15-02-2001	DE	19936553 A1	15-02-2001
US 5718057	A	17-02-1998	EP	0708046 A1	24-04-1996

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