(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 May 2003 (15.05.2003)

PCT

(10) International Publication Number
WO 03/039848 A1

(51) International Patent Classification[7]: B31B 3/46, 3/44

(21) International Application Number: PCT/ZA02/00167

(22) International Filing Date:
6 November 2002 (06.11.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2001/9149 6 November 2001 (06.11.2001) ZA
2002/2147 15 March 2002 (15.03.2002) ZA

(71) Applicant *(for all designated States except US)*: **FANATICS TRADING 9 (PTY) LIMITED** [ZA/ZA]; 143 Solomon Street, Rocky Drift, 1240 White River (ZA).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **DE BEER, Stephanus, Petrus** [ZA/ZA]; 8 Suiderkruis, Steildes, 1201 Nelspruit (ZA). **BORNMANN, Willem, Petrus, Johannes** [ZA/ZA]; Kloof Plaas, Schagen, 1200 District Nelspruit (ZA).

(74) Agent: **LE ROUX, Marius**; D M Kisch Inc, P.O. Box 781218, 2146 Sandton (ZA).

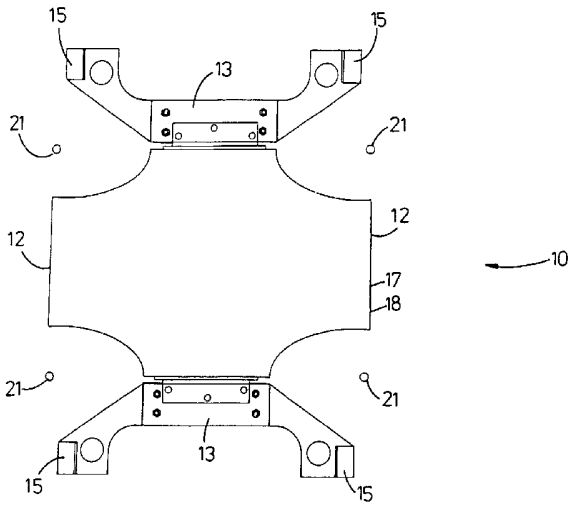
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: EQUIPMENT AND METHOD FOR PRODUCING A BOX



(57) Abstract: The invention relates to a mandrel (10) for use in machinery for producing a (1) box having folded corner pillars (5) from a pre-configured box blank (6), the mandrel (10) including a base plate (14), having a pair of opposed first sides (11) and a pair of opposed second sides (12), the sides located so as to correspond to sides of the box; a pair of flaps (13), each flap being hingedly connected to one of the first sides (11), so as to be movable between an extended position wherein the flap lies in substantially the same plane as the base plate, and an upright position wherein the flap (13) is substantially perpendicular to the base plate (12), and each flap being provided at each end thereof with a deflecting formation (15); and the mandrel further being provided with a plurality of folding arms (16), each folding arm being associated with a corner of the box and angularly displaceable between a receiving position and a finishing position. The invention also extends to a method for producing a box.

WO 03/039848 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

EQUIPMENT AND METHOD FOR PRODUCING A BOX

Technical Field

This invention relates to equipment and a method for producing a box and more particularly, but not exclusively, to equipment and a method for folding a cardboard box for packaging fruit, vegetables and the like.

Background Art

A known type of fruit box comprises a cardboard blank, folded so as to form a tray, having a rectangular base with upright side walls, and reinforced corner pillars at each corner to increase the top load resistance of the boxes, thus enhancing the stackability of the boxes. These corner pillars are formed by folding a series of pillar forming panels in the cardboard blank. Known machinery for producing such boxes includes a plurality of arms connected to longitudinally acting pneumatic cylinders.

Disadvantages of such known machinery include a requirement for space within the box, as certain of the folding steps require the longitudinally acting pneumatic cylinders to be positioned within the box. This disadvantage results in certain minimum size limitations for boxes of this type.

It is accordingly an object of this invention to provide equipment and a method for producing a box which seek to overcome or at least minimise the above disadvantage.

Disclosure of the Invention

According to a first aspect of the invention, there is provided a mandrel for use in machinery for producing a box having folded corner pillars from a pre-configured box blank, the mandrel including a base plate, having a pair of opposed first sides and a pair of opposed second sides, the sides located so as to correspond to sides of the box; a

pair of flaps, each flap being hingedly connected to one of the first sides, so as to be movable between an extended position wherein the flap lies in substantially the same plane as the base plate, and an upright position wherein the flap is substantially perpendicular to the base plate, and each flap being provided at each end thereof with a deflecting formation; and the mandrel further being provided with a plurality of folding arms, each folding arm being associated with a corner of the box and angularly displaceable between a receiving position and a finishing position.

The mandrel may include corner posts, each corresponding to a corner of the box, about which the corner pillars may be folded.

The mandrel may include an upper plate, to which the folding arms may be connected.

The angular movement of the folding arm may be achieved by pneumatic, hydraulic or other mechanical means.

Preferably, each of the folding arms is connected to an angularly acting pneumatic actuator. Each of the actuators may be fixed to the upper plate.

Alternatively, The mandrel may be provided with displacement means for causing the relative displacement of the base plate and the upper plate. The displacement means may be hydraulically or pneumatically activated. Each of the folding arms may be mounted on a shaft extending between the base plate and the upper plate. The shaft may be provided with a spiral cam-and-spigot arrangement, so as to achieve the angular displacement of the folding arms by mechanical translation of the movement between first position and the second position.

According to a second aspect of the invention, there is provided machinery for producing a box having folded corner pillars, the machinery including a mandrel as defined above, and an associated jig into which a box blank is pressed, so as to fold the blank to form a box.

According to a third aspect of the invention, there is provided a method of producing a box having folded corner pillars, the method including the steps of locating a box blank, having a base, side panels and pillar forming panels, over a jig; depressing the blank into a recess in the jig, so as to fold the side panels of the blank perpendicular to the base of the blank; folding pillar forming panels about corner posts; and angularly displacing folding arms from a receiving position to a finishing position, wherein the folding arms press against the pillar forming panels, urging them against the sides of the box.

Brief Description of the Drawings

This invention will now be described by way of non-limiting example only with reference to the accompanying figures wherein

Figure 1 shows a box of the type produced by machinery and a method in accordance with the invention;

Figure 2 shows a cardboard blank for producing the box shown in figure 1;

Figure 3 shows a layout of a base plate of a mandrel in accordance with the invention, showing flaps in an extended position;

Figure 4 shows the layout shown in figure 3 with the flaps in an upright position;

Figure 5 is an side view of the mandrel shown in figure 2, showing the flaps in an extended position and the folding arms in a receiving position;

Figure 6 is an side view of the mandrel shown in figure 2, showing the flaps in an upright position and the folding arms in a finishing position;

Figure 7 is a perspective view of the mandrel shown in figure 2, showing the operation of a flap;

Figure 8 shows a layout of a base plate of a mandrel in accordance with an alternative embodiment of the invention, showing flaps in an extended position and folding arms in a receiving position;

Figure 9 shows the layout shown in figure 8 with the flaps in an upright position and the folding arms in a finishing position;

Figure 10 is an end view of the mandrel shown in figure 8, showing the flaps in the extended position and the folding arms in the receiving position; and

Figure 11 is an end view of the mandrel shown in figure 8, showing the flaps in the upright position and the folding arms in the finishing position.

Modes of Carrying out the Invention

A box (1), as shown in figure 1 has a base (2), a pair of first, longitudinal sides (3), and a pair of second, transverse sides (4). The box (1) has corner pillars (5) at each corner thereof, so as to increase the top-load resistance thereof.

The box (1) is formed by folding a cardboard box blank (6), such as the one shown in figure 2. The blank (6) is provided with a series of pillar forming panels (7) at each corner.

Machinery in accordance with a preferred embodiment of the invention includes a mandrel (10), as shown in figures 3 to 7. The mandrel (10) has a base plate (14) with a pair of opposed first sides (11) and a pair of opposed second sides (12), corresponding to the sides of a box to be produced. The mandrel is provided with a pair of flaps (13), each being hingedly connected to one of the first sides (11), so as to be movable between an extended position, as shown in figures 3 and 5, wherein the flap (13) lies in substantially the same plane as the base plate (14), and an upright position, as shown in figures 4 and 6, wherein the flap (13) is substantially perpendicular to the base plate (14). Each of the flaps (13) is provided at each end thereof with a deflecting formation (15).

The mandrel (10) includes an upper plate (20), having corners substantially corresponding to the corners of the box, and having at each corner a corner post (21).

Affixed to the upper plate (20) are four angularly acting pneumatic actuators (30), each of which is provided with a folding arm (16), angularly displaceable between a receiving position and a finishing position, as shown in figure 5 and figure 6 respectively.

The mandrel (10) is located in machinery including a jig (not shown), having a recess corresponding to the plan of a box.

In operation, glue is applied to attachment points on the blank (6), which is then located in position on the jig.

The mandrel (10) is depressed onto the blank (6), forcing the base (2) thereof into the recess. As a result of the shape of the jig, the sides (3 and 4) of the blank are folded upwards. The jig is configured so as to cause the sides (4) with the pillar forming panels (7) to fold upwardly inside the first sides (3).

The hinged flaps (13) are deflected from their extended position into their upright position by the first sides (3) of the box, and the deflecting formations (15) engage the

pillar forming panels (7), deflecting them inwards. The inward motion of the pillar forming panels (7) is partially restrained by the corner posts (21), as shown in figure 7.

The folding arm (16) engages the inwardly deflected pillar forming panels (7) and continues to its finishing position pressing them against a side (4) of the box to form the corner pillar (5).

The folding arm (16) is then displaced back to its receiving position, and the mandrel (10) withdrawn.

The finished box (1) is removed from the jig and the cycle repeated with a new blank.

A mandrel (50), in accordance with an alternative embodiment of the invention, as shown in figures 8 to 11, includes four folding arms (51) which each move angularly about an axis perpendicular to the base plate (52).

The mandrel (50) includes an upper plate (53), having corners substantially corresponding to the corners of the box, and having at each corner a corner post (54). The upper plate (53) is displaceable between a first position, shown in figure 10, and a second position, shown in figure 11, the second position being closer to the base plate (52) than the first position. The mandrel (50) is provided with pneumatically activated displacement means (not shown) for displacing the upper plate (53) between the first position and the second position.

At each corner of the mandrel (50) there is a folding arm (51), angularly displaceable between a receiving position and a finishing position, as shown in figure 8 and figure 9 respectively. Each of the folding arms (51) is connected to a sleeve (55) mounted on a shaft (56) extending between the base plate (52) and the upper plate (53). The sleeve (55) and shaft (56) are provided with a spiral cam-and-spigot arrangement (57), mechanically translating movement of the upper plate (53) between its first and second positions into angular movement of the folding arm (51).

It will be appreciated that numerous embodiments of the invention may be made without departing from the scope of the invention as claimed hereinbelow.

CLAIMS

1. A mandrel for use in machinery for producing a box having folded corner pillars from a pre-configured box blank, the mandrel including a base plate, having a pair of opposed first sides and a pair of opposed second sides, the sides located so as to correspond to sides of the box; the mandrel being characterized by including a pair of flaps, each flap being hingedly connected to one of the first sides, so as to be movable between an extended position wherein the flap lies in substantially the same plane as the base plate, and an upright position wherein the flap is substantially perpendicular to the base plate, and each flap being provided at each end thereof with a deflecting formation; and a plurality of folding arms, each folding arm being associated with a corner of the box and angularly displaceable between a receiving position and a finishing position.

2. A mandrel as claimed in claim 1, characterized by including a plurality of corner posts, each corresponding to a corner of the box, about which the corner pillars may be folded.

3. A mandrel as claimed in claim 1, characterized by including an upper plate, to which the folding arms are be connected.

4. A mandrel as claimed in claim 3, characterised in that the angular movement of the folding arm is achieved by one of pneumatic and hydraulic means.

5. A mandrel as claimed in claim 4, characterized in that each of the folding arms is connected to an angularly acting pneumatic actuator.

6. A mandrel as claimed in claim 5, wherein each of the actuators is fixed to the upper plate.

7. A mandrel as claimed in claim 3, characterized by being provided with displacement means for causing the relative displacement of the base plate and the upper plate.

8. A mandrel as claimed in claim 7 wherein the displacement means are activated by one of a hydraulic and a pneumatic actuator.

9. A mandrel as claimed in claim 7, wherein each of the folding arms is mounted on a shaft extending between the base plate and the upper plate.

10. A mandrel as claimed in claim 9, wherein the shaft is provided with a spiral cam-and-spigot arrangement, so as to achieve the angular displacement of the folding arms by mechanical translation of the movement between first position and the second position.

11. A machine for producing a box having folded corner pillars from a pre-configured box blank, the machine including a jig dimensioned and configured so as to receive the blank therein, and being characterized by including a mandrel comprising a base plate, having a pair of opposed first sides and a pair of opposed second sides, the sides located so as to correspond to sides of the box; a pair of flaps, each flap being hingedly connected to one of the first sides, so as to be movable between an extended position wherein the flap lies in substantially the same plane as the base plate, and an upright position wherein the flap is substantially perpendicular to the base plate, and each flap being provided at each end thereof with a deflecting formation; and a plurality of folding arms, each folding arm being associated with a corner of the box and angularly displaceable between a receiving position and a finishing position.

12. A method of producing a box having folded corner pillars, the method being characterized by including the steps of locating a box blank, having a base, side panels and pillar forming panels, over a jig; depressing the blank into a recess in the jig, so as to fold the side panels of the blank perpendicular to the base of the blank; folding pillar

forming panels about corner posts; and angularly displacing folding arms from a receiving position to a finishing position, wherein the folding arms press against the pillar forming panels, urging them against the sides of the box.

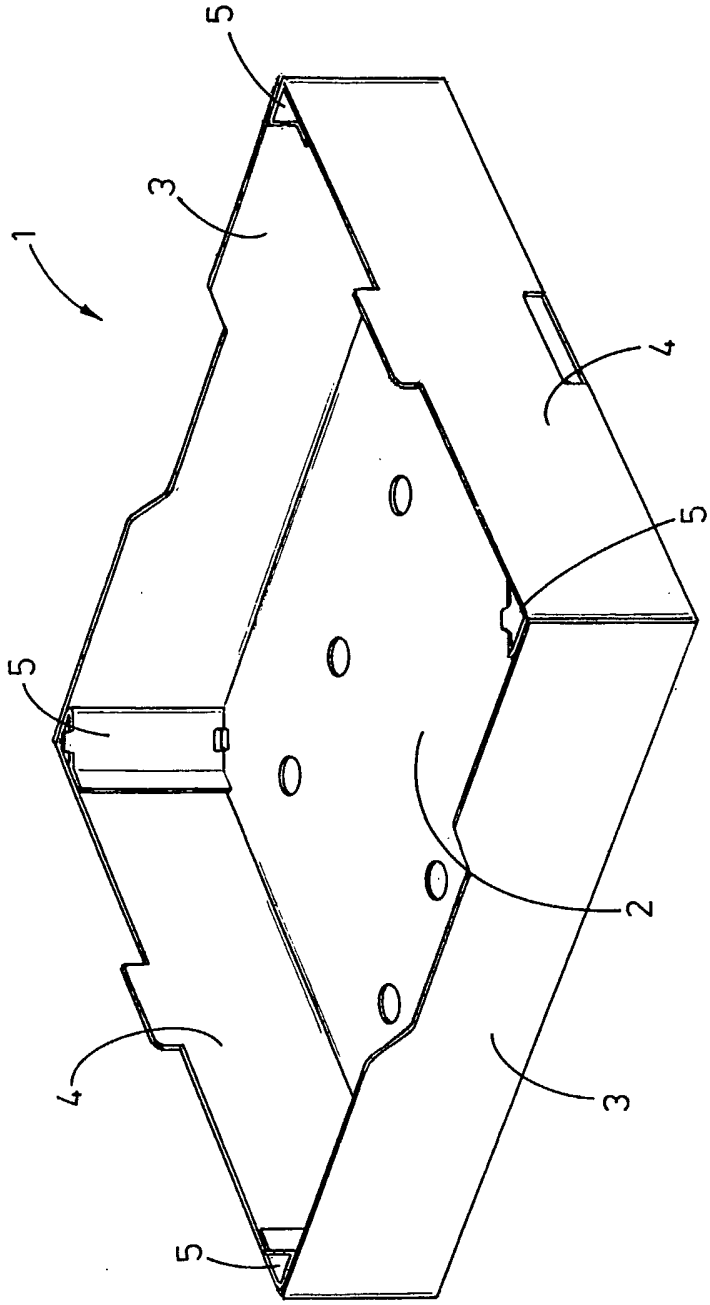


FIGURE 1

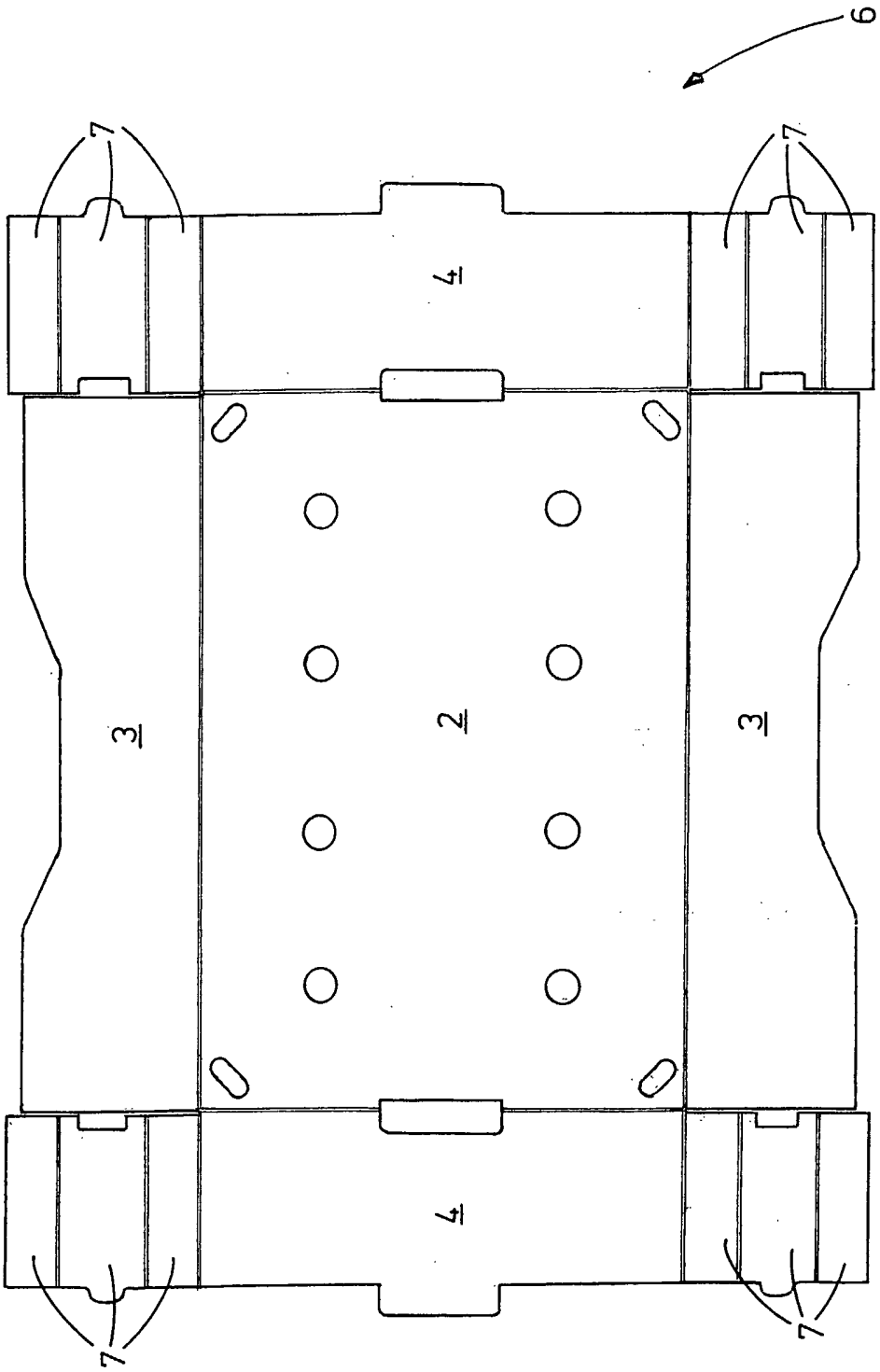


FIGURE 2

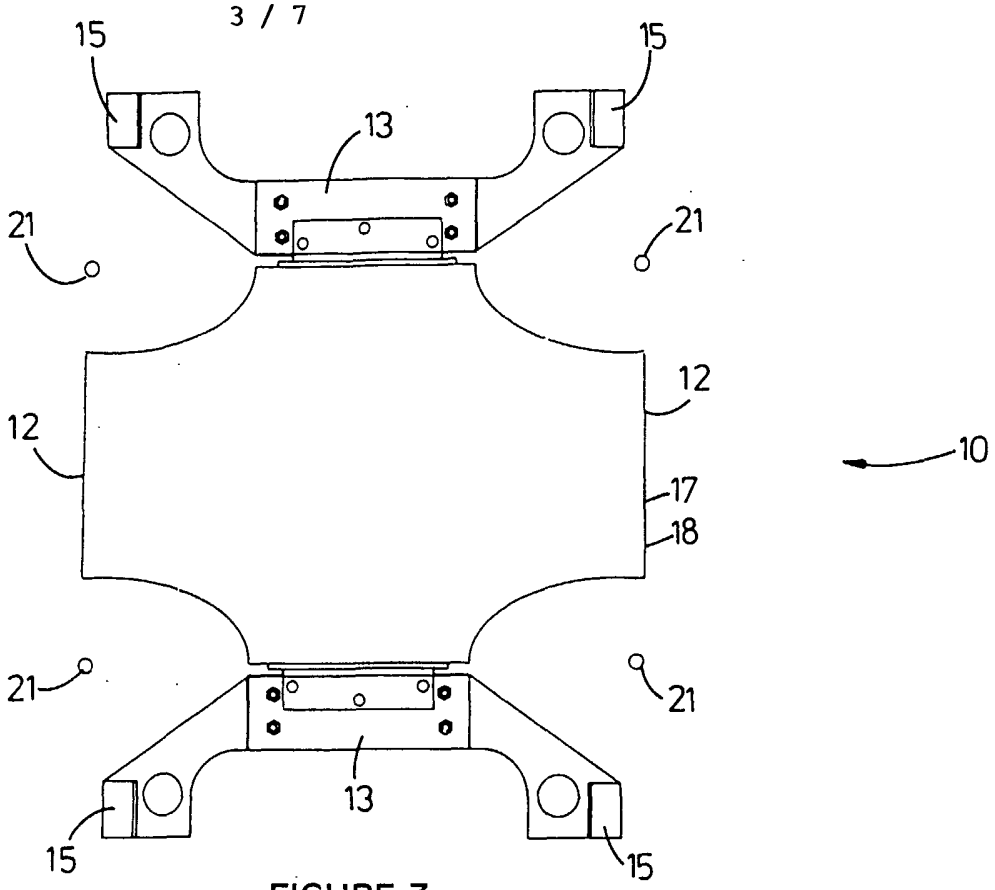


FIGURE 3

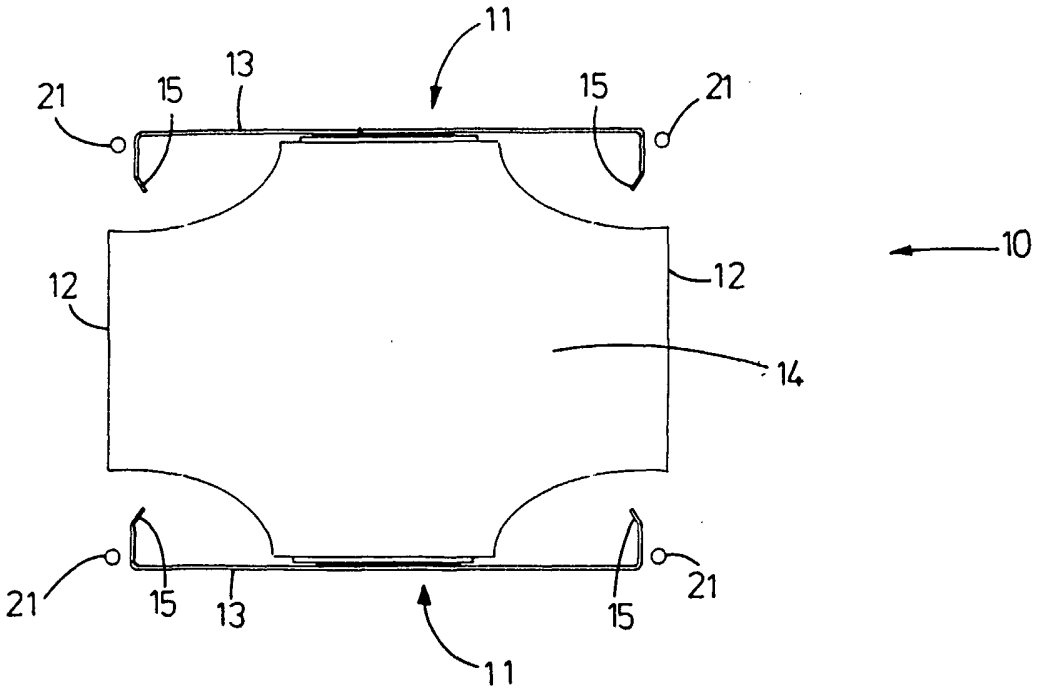


FIGURE 4

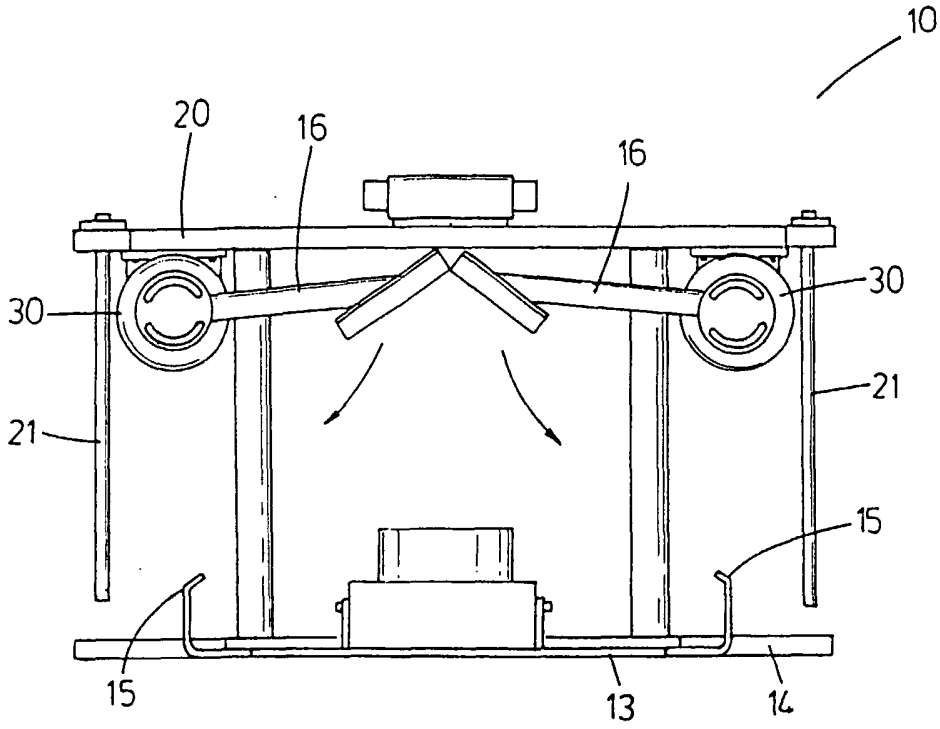


FIGURE 5

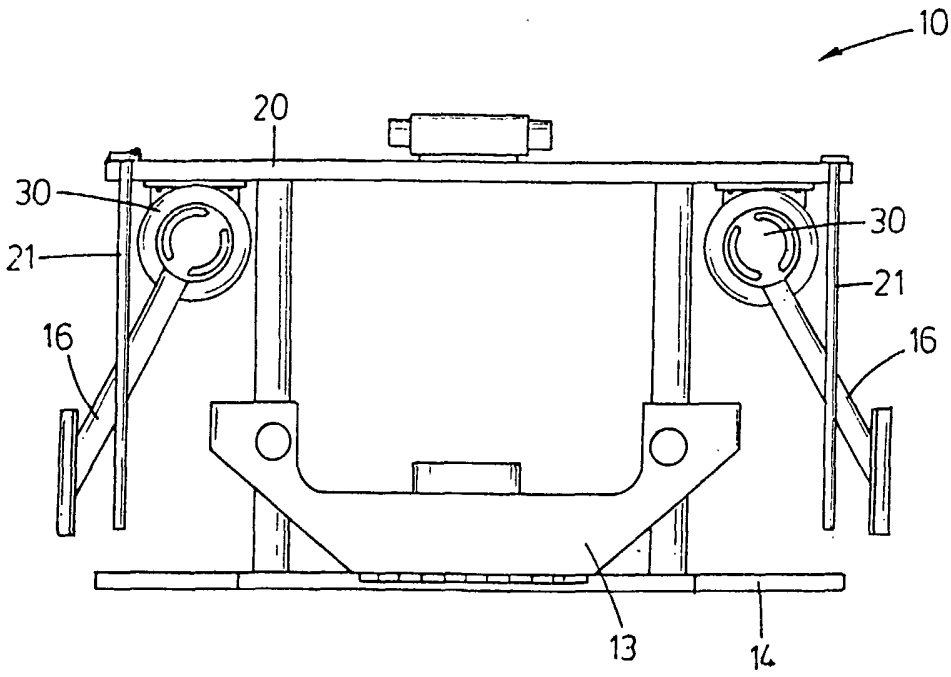


FIGURE 6

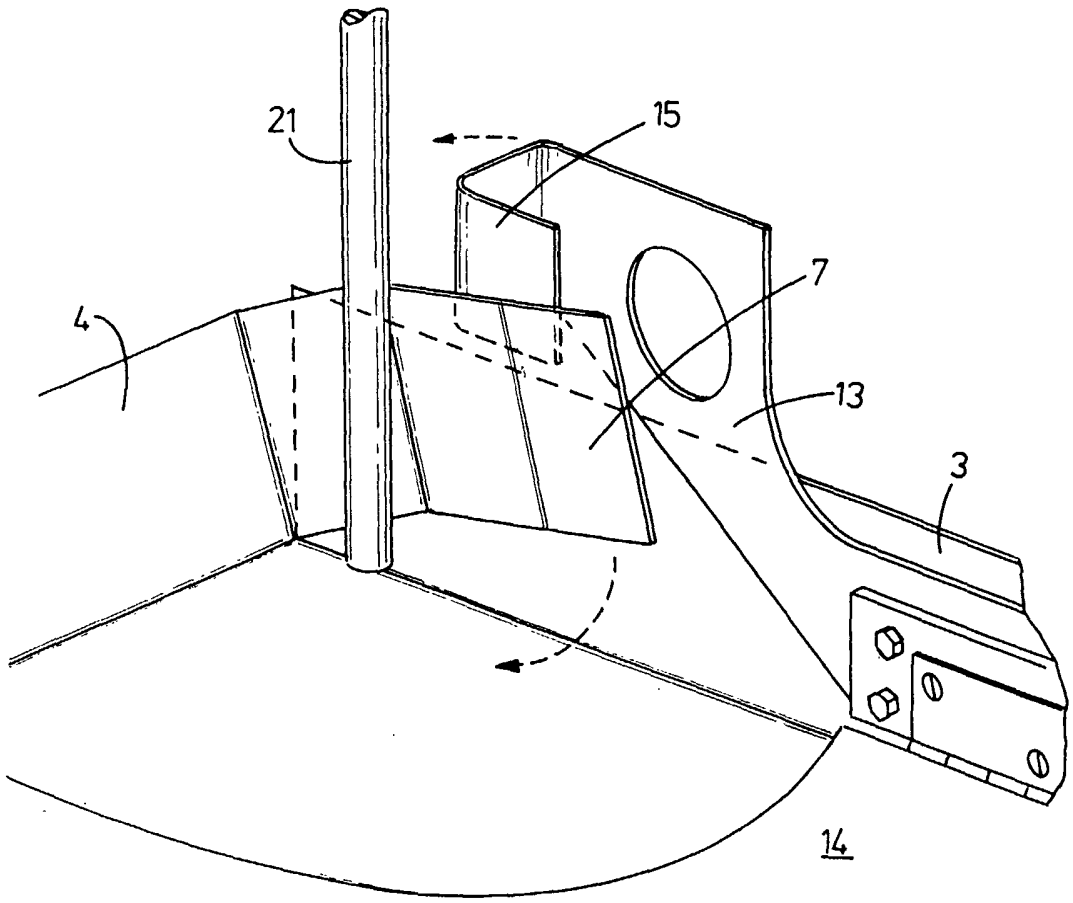


FIGURE 7

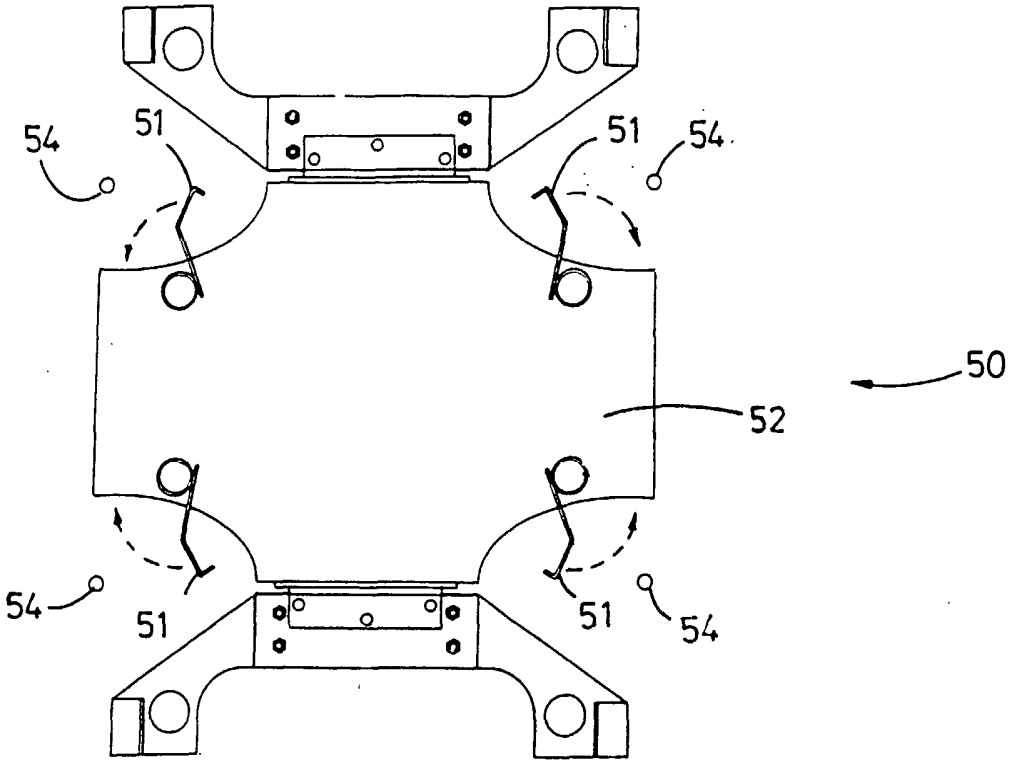


FIGURE 8

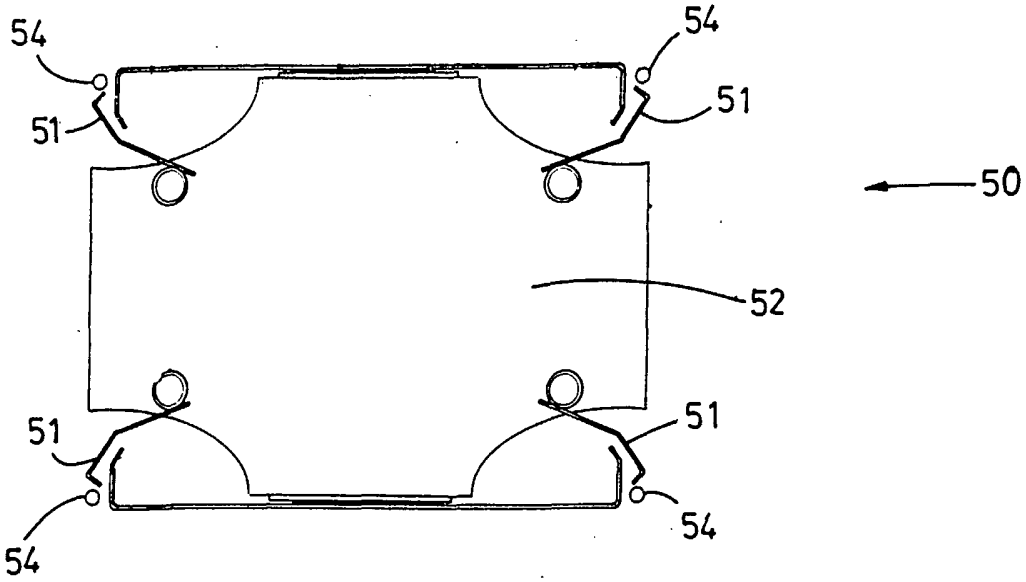


FIGURE 9

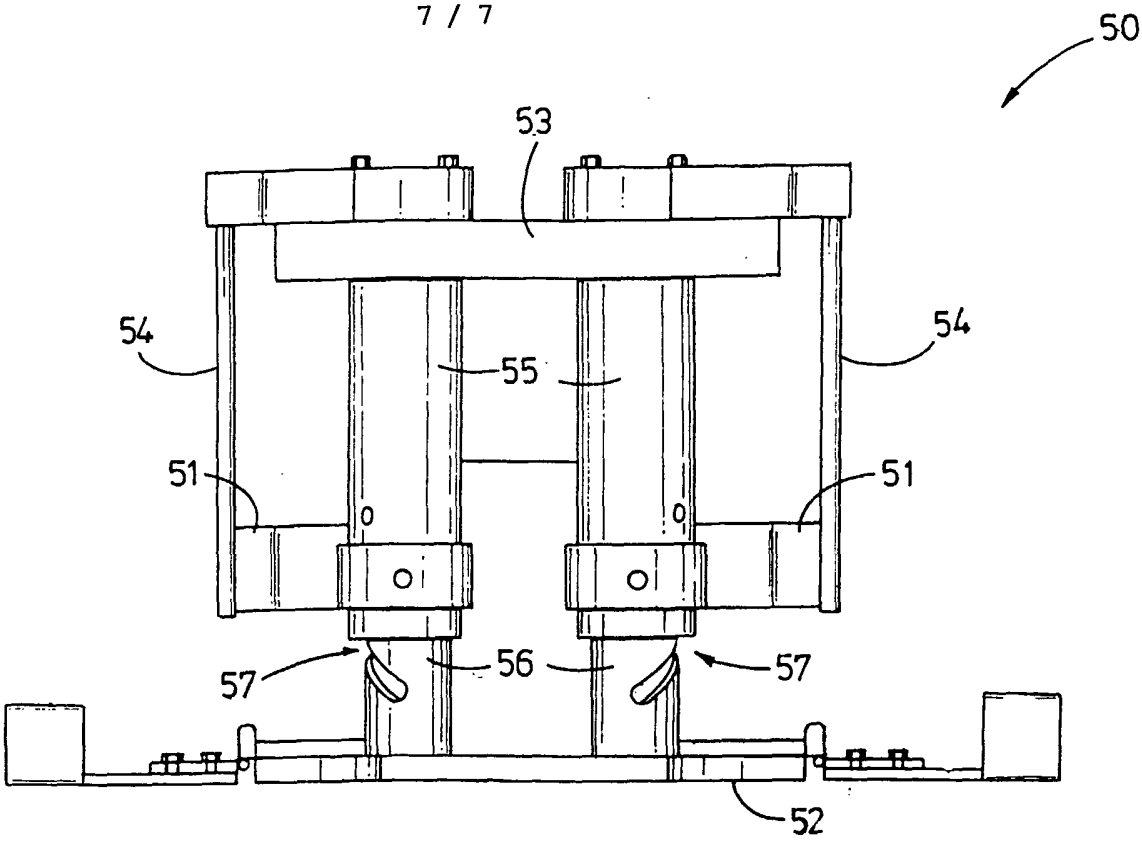


FIGURE 10

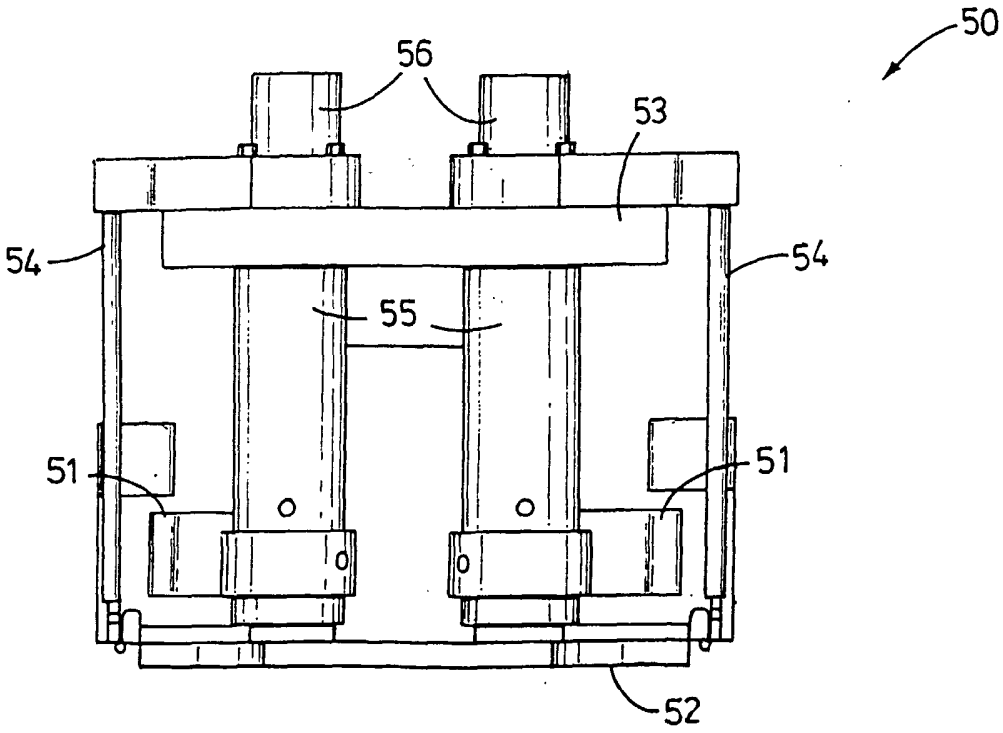


FIGURE 11

INTERNATIONAL SEARCH REPORT

Internat pplication No
PCT/EP 02/00167

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B31B3/46 B31B3/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B31B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 781 181 A (CREATION TECH) 21 January 2000 (2000-01-21)	12
A	page 8 -page 10; figures ---	1-11
A	FR 2 640 935 A (SIEMCO SA) 29 June 1990 (1990-06-29) -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 February 2003	26/02/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Pipping, L

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat pplication No
PCT/[illegible]02/00167

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2781181 A	21-01-2000	FR 2781181 A1	21-01-2000
FR 2640935 A	29-06-1990	FR 2640935 A1	29-06-1990