



(11)

EP 1 661 836 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.05.2006 Bulletin 2006/22

(51) Int Cl.:
B65H 29/14 (2006.01) B65H 43/06 (2006.01)

(21) Application number: **04106081.5**

(22) Date of filing: **25.11.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK YU

(72) Inventor: **Hooghiemstra, Ferdinand M.H.F.**
5663 GB Geldrop (NL)

(74) Representative: **Vanoppen, Ronny R.J. et al**
Océ-Technologies B.V.
Corporate Patents, Postbus 101
5900 MA Venlo (NL)

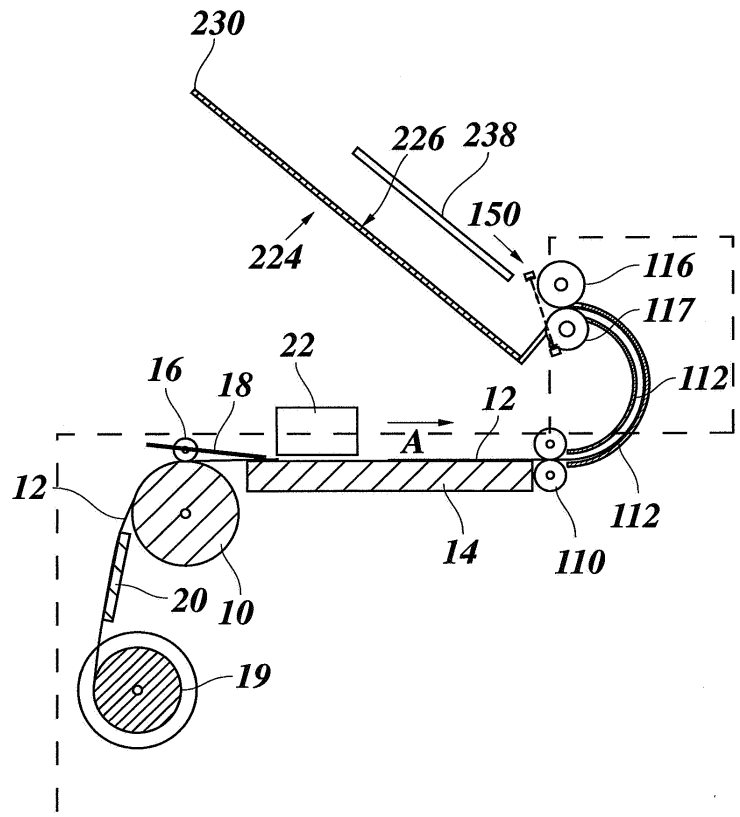
(71) Applicant: **Océ-Technologies B.V.**
5914 CC Venlo (NL)

(54) Sheet discharge system

(57) A discharge system for printed media sheets (12); and a printer with the discharge system. The discharge system comprises: a tray (224) having a surface (226) for supporting the media sheets (12); and transport elements (116; 117) adapted to discharge the sheets (12) onto the tray (224) through a discharge nip (114), wherein

a light barrier (150) is arranged adjacent to the discharge nip (114), said light barrier (150) being arranged to be sensitive to a sheet (12) that is being discharged from the discharge nip (114) and to be sensitive to a stack of sheets (12) on the tray (224) that has reached a certain height.

Fig. 1



Description

[0001] The invention relates to a discharge system for printed media sheets, comprising: a tray having a surface for supporting the media sheets; and transport elements adapted to discharge the sheets onto the tray through a discharge nip.

[0002] In printers and copiers, printed media sheets are frequently collected on one or more trays. In order to assure a proper sheet flow, it is known to provide a discharge sensor near the discharge nip, the discharge sensor having an arm that is pivotable about an axis. When a leading edge of a sheet has been discharged from the discharge nip, the sheet exerts a force onto the arm and pivots the arm. Thereby, the discharge sensor detects the leading edge of the sheet. When the sheet has been completely discharged from the discharge nip, the arm returns to its original position due to a restoring force, for example gravitation. Thereby, also the trailing edge of the sheet is detected by the discharge sensor.

[0003] Because of a limited capacity of the tray, a tray-full sensor is also required and is, for example, of a similar design comprising an arm that is pivotably mounted above the tray. The arm rests on top of the stack of sheets that is collected on the tray and is pivoted with increasing height of the stack.

[0004] However, the light-weight movable parts of the discharge sensor and the tray-full sensor are difficult to install and may be subject to wear and damage. This leads to increased manufacturing and service costs. It is also undesirable that a user has access to these movable parts when the user takes the printed sheets from the tray.

[0005] It is an object of the invention to provide a discharge system with a simple and reliable sensor system. It is also an object of the invention to provide a printer comprising such a discharge system.

[0006] According to the invention, this object is achieved by a discharge system of the type indicated above, wherein a light barrier is arranged adjacent to the discharge nip, said light barrier being arranged to be sensitive to a sheet that is being discharged from the discharge nip and to be sensitive to a stack of sheets on the tray that has reached a certain height.

[0007] For example, the light barrier may be interrupted when a sheet is present at a certain position. When the sheet is being discharged from the discharge nip, its leading edge interrupts the light barrier. Thus, the leading edge of the sheet is detected. When the sheet has been completely discharged from the discharge nip, the trailing edge of the sheet passes the light barrier, and the interruption of the light barrier ceases. Thus, the trailing edge of the sheet is also detected. By detecting the leading edge and the trailing edge of the sheet, the light barrier serves as a discharge sensor. As more sheets are discharged from the discharge nip and are collected on the tray, the resulting stack of sheets on the tray grows. When the stack has reached a certain height, for example, when

the tray is almost full, the trailing edges of the uppermost sheets of the stack eventually interrupt the light barrier. The light barrier is then permanently interrupted until the sheets are removed from the tray. Thus, the light barrier also serves as a tray-full sensor.

[0008] Alternatively, the light barrier may be of a reflection type where the sheet functions as a reflector. A light transmitter and a light receiver of the light barrier may be arranged such that a sheet that is present at a certain position directly or diffusely reflects light from a light transmitter to a light receiver. Said certain position may be chosen to enable the light barrier to detect a sheet that is being discharged from the discharge nip as well as to detect a top sheet of a stack of sheets on the tray when the stack has reached a certain height.

[0009] An advantage of the invention is that there are no movable parts needed for a discharge sensor and a tray-full sensor. Thus, service costs are reduced. Furthermore, one light barrier can operate as a discharge sensor and a tray-full sensor.

[0010] When the media sheets are supplied from a reel, they are often slightly curled. This effect becomes even more pronounced when the end of the reel is reached and the radius of curvature of the reel becomes smaller. When the printed media sheets are collected on the tray, an upwardly curled edge of a sheet may prevent subsequent sheets from being properly stacked and collected on the tray or might block the discharge nip. This situation can be regarded as a virtual tray-full situation. In such a virtual tray-full situation, the light barrier may also be useful to detect an upwardly curled trailing edge of a sheet on the tray.

[0011] The light barrier may use visible light or infrared light, for example, and may be adapted or adaptable to detect sheets of different material, for example, a paper sheet or a transparency.

[0012] Useful details of the invention are indicated in the dependent claims.

[0013] Preferably, the light barrier comprises at least two optical elements which are arranged to be on different sides of a sheet that is being discharged from the discharge nip and interrupts the light barrier. For example, the light barrier transversely intersects a sheet transport line. In one embodiment, a light transmitter is arranged on the first side of the sheet transport line, and a light receiver is arranged on the opposite side of the sheet transport line so that the transmitter and the receiver are separated by a sheet that is being discharged from the discharge nip. In another embodiment, one of the at least two optical elements is a reflective element for reflecting light from a light transmitter to a light receiver.

[0014] Preferably, the light barrier is laterally offset from at least one of the transport elements and intersects the cross section of said transport element. Thereby, the light barrier is arranged close to the discharge nip, and the leading edge of the sheet is reliably detected by the light barrier even it is not yet detached from said one transport element. Moreover, a compact design of the

discharge system is achieved.

[0015] Preferably, a stop extends substantially perpendicular to the tray surface from an edge of the tray adjacent to the discharge nip, and the light barrier is laterally offset from the stop and intersects the cross section of the stop. Due to the stop, the sheets may be neatly stacked on the tray while at the same time the light barrier operates as a tray-full sensor. Moreover, a compact design of the discharge system is achieved. Preferably, the stop and the light barrier intersect the cross section of at least one of the transport elements and are laterally offset from said transport element.

[0016] A preferred embodiment of the invention will now be described in conjunction with the drawings in which:

- Fig. 1 is a schematic partial cross-sectional view of a printer;
 Fig. 2 shows a detail of a sheet discharge system of the printer shown in Fig. 1 while a leading edge of a sheet interrupts a light barrier; and
 Fig. 3 shows the sheet discharge system of Fig. 2 while a stack of sheets collected on a tray interrupts the light barrier.

[0017] As is shown in Fig. 1, an ink jet printer comprises a platen 10 which is intermittently driven to rotate in order to advance a sheet 12, e. g. a sheet of paper, in a direction indicated by an arrow A over the top surface of a sheet support plate 14. A number of transport rollers 16 are rotatably supported in a cover plate 18 and form a transport nip with the platen 10 so that the sheet 12, which is supplied from a reel 19 via a guide plate 20, is paid out through a gap formed between an edge of the cover plate 18 and the surface of the sheet support plate 14.

[0018] A carriage 22 which includes a number of ink jet print heads (not shown) is mounted above the sheet support plate 14 so as to reciprocate in a direction that is perpendicular to the plane of the drawing across the sheet 12. In each pass of the carriage 22, a number of pixel lines are printed on the sheet 12 by means of the print heads which eject droplets of ink onto the sheet in accordance with image information supplied to the print heads. For the sake of simplicity, guide and drive means for the carriage 22, ink supply lines and data supply lines for the print heads, and the like, have not been shown in the drawing.

[0019] The printed sheet 12 is cut by a cut-off mechanism (not shown) and is further transported by transport means formed by rollers 110 defining a transport nip that is positioned in the media transport line behind the sheet support plate 14. The rollers 110 advance the sheet 12 along curved guide members 112 that turn the sheet upside down and reverse the transport direction of the sheet 12.

[0020] As is shown in Fig. 1 and, in more detailed view, in Fig. 2, the sheet 12 is advanced to a discharge nip 114 formed between a plurality of upper discharge rollers 116

and lower discharge rollers 117, which are mounted on common axles 116a and 117a, respectively. Like the platen 10, the rollers 110 and the discharge rollers 116, 117 are intermittently driven in order to advance the sheet 12 stepwise.

[0021] A discharge sensor that is formed by a light barrier 150 is arranged near the discharge nip 114 to indicate when the leading edge 12a of the sheet 12 has been discharged from the discharge nip 114. The light barrier 150 comprises a light transmitter 152 and a light receiver 154. The light receiver 154 is arranged adjacent to upper discharge rollers 116. The light transmitter 152 is arranged in a gap in-between the lower discharge rollers 117, and in the side view of figure 2, the light ray of the light barrier 150 intersects the cross section of the lower discharge rollers 117.

[0022] When the leading edge 12a of the sheet has been discharged from the discharge nip 114, the sheet 12 interrupts the light barrier 150.

[0023] From the discharge nip 114, the sheet 12 is discharged onto a tray 224. The tray 224 has a top surface 226 for supporting the media sheets. The top surface 226 raises from a lower edge 228 near the discharge nip 114 and the light transmitter 152 to an upper edge 230 (Fig. 1). At the lower edge 228, finger-like stops 232 raise perpendicularly to the tray surface 226 towards the lower discharge rollers 117. In a direction perpendicular to the plane of the drawing in Fig. 2, the lower discharge rollers 117 and the stops 232 are arranged at intervals, and in the side view of Fig. 2, the stops 232 intersect the lower discharge rollers 117 which are arranged in gaps in-between the stops 232. The light barrier 150 is also arranged in a gap between the stops 232 and, in the side view of Fig. 2, intersects the stops 232.

[0024] In Fig. 2, there is already one sheet 12 lying on the tray 224. When further sheets 12 are discharged from the discharge nip 114, they are collected on the tray 224, their trailing edges 12b being arranged at the stop 232. A top frame member 238 of the tray 224 serves as an upper guide for the sheets 12.

[0025] In Fig. 3, a stack of sheets 12 has been collected on the tray 224. The stack of sheets 12 has reached a height in which the trailing edges 12b of the top most sheet 12 or sheets 12 interrupt the light barrier 150. Thus, the light barrier 150 serves as a tray-full sensor.

[0026] The light barrier 150 may also detect when a sheet 12 is curled upwards at its trailing edge 12c, as is indicated in dashed lines in Fig. 2. Thus, curled edges which might block the discharge nip 114 may be detected by the light barrier 150.

Claims

1. A discharge system for printed media sheets (12), comprising: a tray (224) having a surface (226) for supporting the media sheets (12); and transport elements (116; 117) adapted to discharge the sheets

(12) onto the tray (224) through a discharge nip (114), **characterized by** a light barrier (150) that is arranged adjacent to the discharge nip (114), said light barrier (150) being arranged to be sensitive to a sheet (12) that is being discharged from the discharge nip (114) and to be sensitive to a stack of sheets (12) on the tray (224) that has reached a certain height.

5

2. The discharge system of claim 1, wherein the light barrier (150) comprises at least two optical elements (152; 154) which are arranged to be on different sides of a sheet (12) that is being discharged from the discharge nip (114) and interrupts the light barrier (150). 10
3. The discharge system of any one of the preceding claims, wherein the light barrier (150) is laterally offset from at least one of the transport elements (117) and intersects the cross section of said transport element (117). 15 20
4. The discharge system of any one of the preceding claims, wherein a stop (232) extends substantially perpendicular to the tray surface (226) from an edge (228) of the tray (224) adjacent to the discharge nip (114), and the light barrier (150) is laterally offset from the stop (232) and intersects the cross-section of the stop (232). 25
5. A printer comprising a sheet discharge system according to one of the claims 1 to 4. 30

35

40

45

50

55

Fig. 1

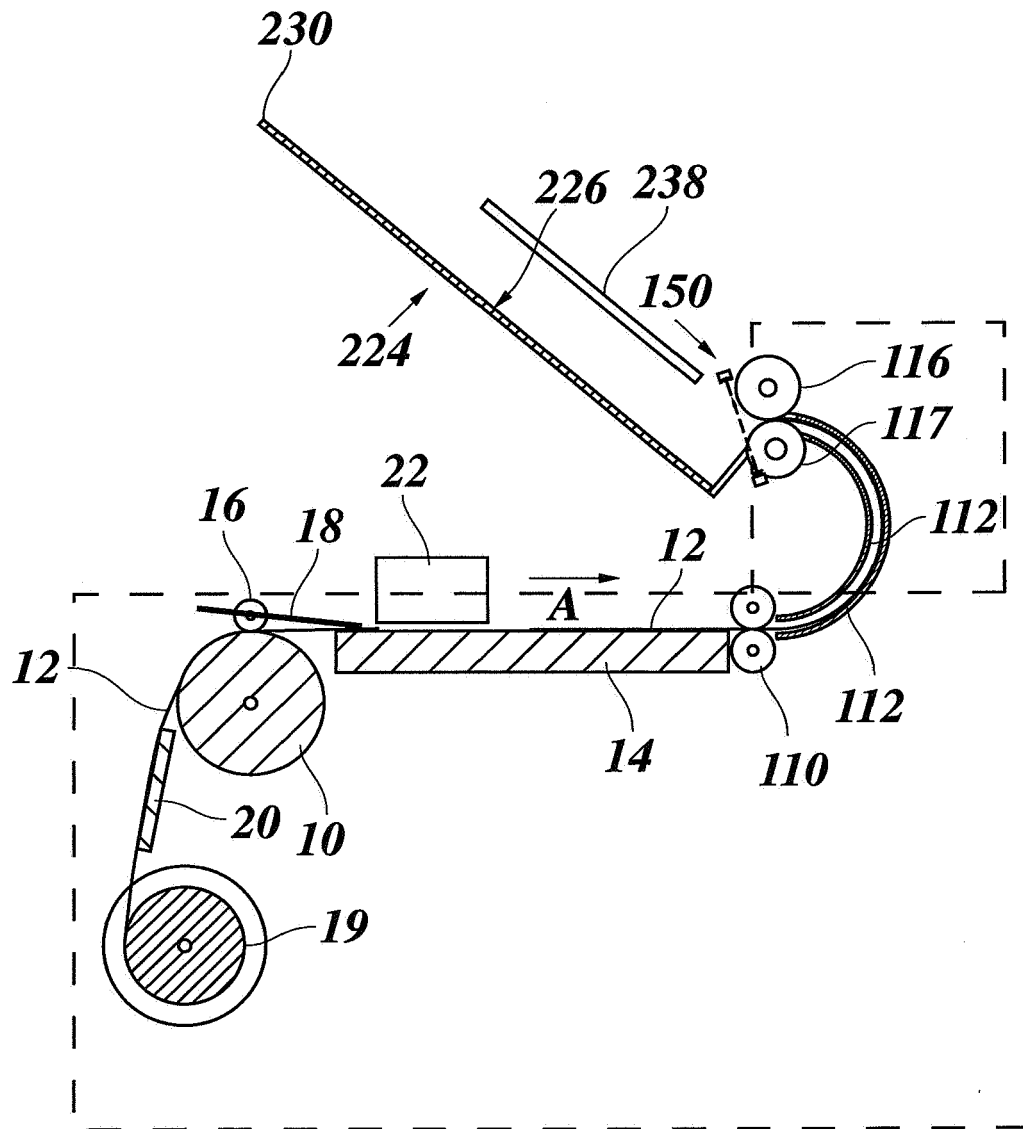


Fig. 2

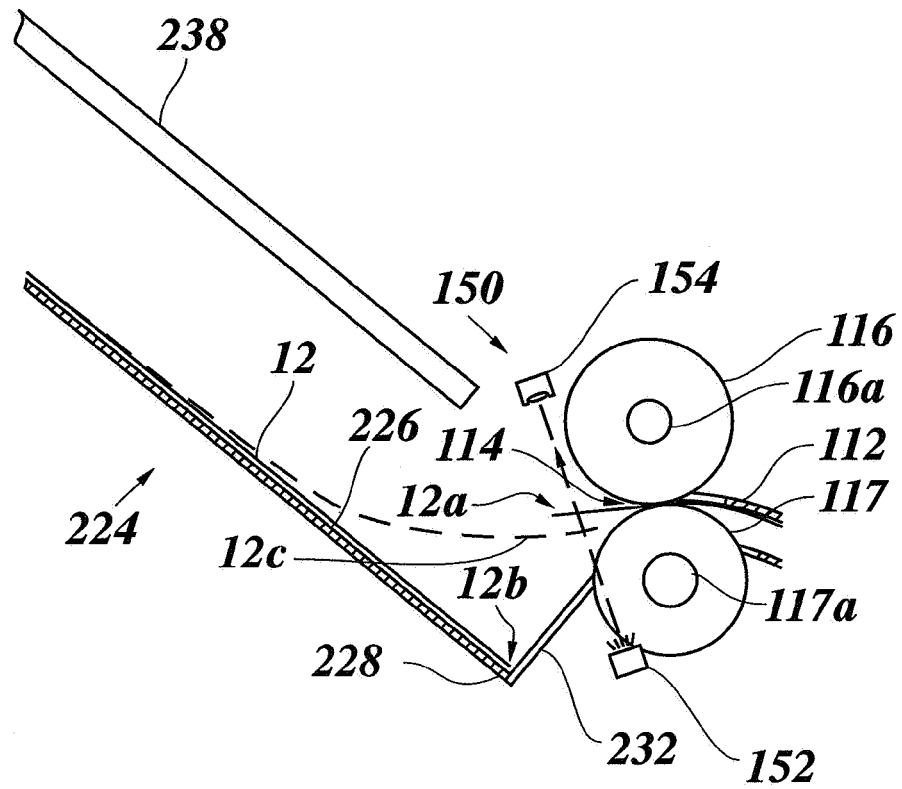
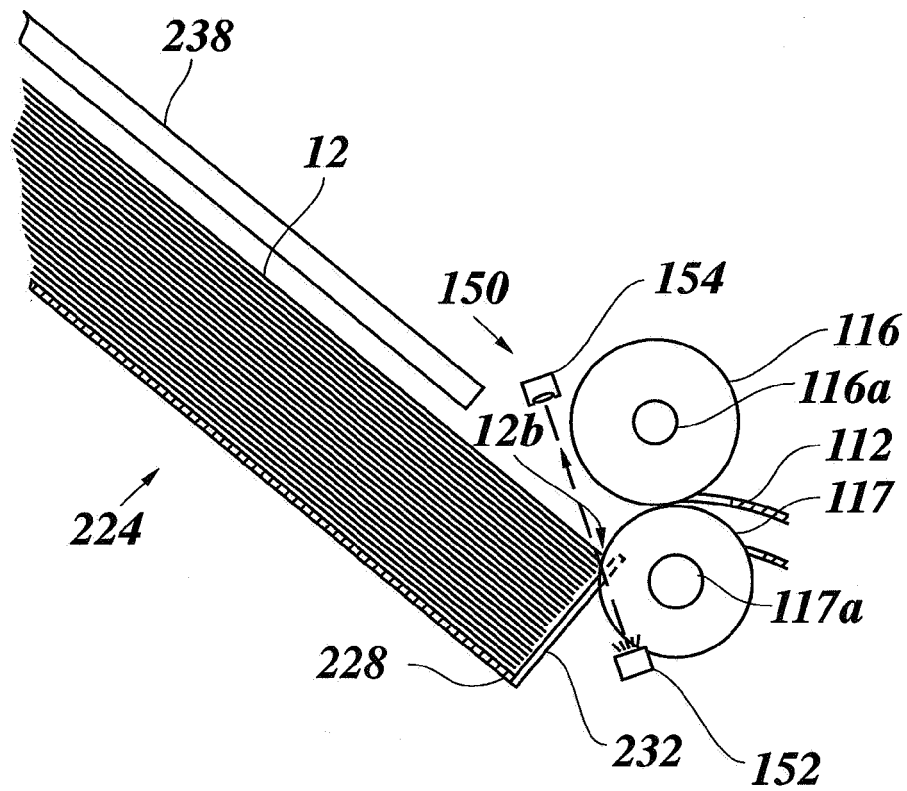


Fig. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 6081

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)
X	US 4 501 419 A (TAKAHASHI ET AL) 26 February 1985 (1985-02-26) * column 3, line 17 - line 22 * * column 6, line 4 - line 16; figures 1,7,8 *	1,2,4,5	B65H29/14 B65H43/06
X	US 5 963 754 A (ITOH ET AL) 5 October 1999 (1999-10-05) * column 15, line 23 - column 16, line 33; figures 6-9 *	1,5	
X	US 4 229 650 A (TAKAHASHI ET AL) 21 October 1980 (1980-10-21) * column 2, line 47 - line 53; figure 4 *	1,2,5	
X	US 4 520 263 A (KITAMURA ET AL) 28 May 1985 (1985-05-28) * column 7, line 67 - column 8, line 15; figures 9,10 *	1,2,5	
A	EP 0 369 378 A (CANON KABUSHIKI KAISHA) 23 May 1990 (1990-05-23) * column 5, line 2 - line 4; figure 3 *	1,2,4,5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 April 2005	Examiner Lemmen, R
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>& : member of the same patent family, corresponding document</p>			

1
EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 10 6081

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-04-2005

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 4501419	A	26-02-1985	JP	1646461 C	13-03-1992
			JP	2001044 B	10-01-1990
			JP	57042448 A	10-03-1982
			JP	57042449 A	10-03-1982
			JP	57042450 A	10-03-1982

US 5963754	A	05-10-1999	JP	11035226 A	09-02-1999

US 4229650	A	21-10-1980	JP	54083275 A	03-07-1979

US 4520263	A	28-05-1985	JP	1616015 C	30-08-1991
			JP	2040575 B	12-09-1990
			JP	57072570 A	06-05-1982
			JP	57072571 A	06-05-1982
			JP	57072572 A	06-05-1982
			JP	57107360 A	03-07-1982
			JP	57107361 A	03-07-1982
			JP	57112269 A	13-07-1982
			DE	3141615 A1	24-06-1982

EP 0369378	A	23-05-1990	JP	2081552 U	22-06-1990
			JP	7003420 Y2	30-01-1995
			JP	2081881 C	23-08-1996
			JP	2131271 A	21-05-1990
			JP	7122770 B	25-12-1995
			JP	2081882 C	23-08-1996
			JP	2131272 A	21-05-1990
			JP	7122771 B	25-12-1995
			DE	68918553 D1	03-11-1994
			DE	68918553 T2	16-02-1995
			EP	0369378 A1	23-05-1990
			US	5171145 A	15-12-1992
