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(54) **Automatic opening device at the paper end for thermal printer**

(57) The device consists of a paper end sensor (4) connected to an electric motor (5). Said paper end sensor (4) starts the electric motor (5) reversed its direction of rotation in comparison with the direction of rotation had during the printing step.

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Description

[0001] The invention refers to an automatic opening device at the end of the paper in the thermal printers. Currently, in many thermal printers, the approach of paper end is reported by one or more lines of different colours on the final part of the paper roll. To appear of the beginning of the coloured lines, often, the roll is changed with waste of the no used thermal paper. This repeated preventive substitution, for example in a supermarket, depending on the cash desk operativeness and for the number of cash desks in operation, determines a high thermal paper waste. Other systems are known to signal the paper end via warning light onto the printer and/or signalling to monitor. To notice the warning light or the signalling to monitor may be difficult and may increase the times of thermal paper change. In fact, in identifying which printer is out of paper, having often connected with the monitor over to the printer for cash voucher also printers for credit card payments, POS or other kind of cart or printers for fiscal aims, and to open the cover to place the thermal paper roll, determines a further operation with lost of time for the operator that increases the time wait at the cash desks for the clients. Moreover, with the known systems, it is possible that, ended the paper and with the printer still in working, the thermal head comes in direct contact with the under rubber printing roll. In this situation, the crawling of the thermal head onto the rubber printing roll generates a wear and tear of the same head. Aim of the present invention is to avoid the above cited drawbacks. The invention, in fact, shows in clear and prompt way in which printer the paper is ended. Moreover, such as the printing roll is generally placed onto the cover of the container of the thermal paper roll, to open automatically said cover it is avoided that the head crawls onto the rubber roll without the paper present between them. Other advantage is related to the determination of the printer out of thermal paper and the prompt introduction of the thermal paper such as the printer cover is already opened with thermal paper roll changing time quick. These and others aims and advantages of the invention are better understood to the description of a preferred but not exclusive embodiment as follows and to the enclosed drawings of sheets 1, 2, 3 and 4. In particular in sheet 1 figure 1 is perspective lateral view of a printer in which the invented device is mounted and without the outside protection covering. Figure 2 is perspective other side view of a printer in which the invented device is mounted. In sheet 2 - figure 3 is perspective view of a printer with the invented device. Figure 4 is view of the parts which generate the unfastening. In sheet 3 figure 5 is perspective view with section parts of the main rotating devices in the step of fastened cover. Figure 6 is perspective view with section part of the main rotating devices in the step of unfastening cover. In sheet 4 figure 7 is perspective view of a printer with the invented device in step of automatic opening of the cover at the thermal paper end. The figure 8 is perspective view of a paper with the invented device with the cover opened so to fit in a new thermal paper roll. The printer consists of a printing roll 1 inserted into a cover 2 equipped with and automatic opening device 3 that determines the cover opening at the paper end. In an embodiment said automatic opening device 3 consists of a paper end sensor 4 connected to an electric motor 5. The paper end sensor 4 starts the electric motor reversed its direction of rotation in comparison with the direction of rotation had during the printing step. The electric motor 5 is equipped with a gear wheel 6 placed onto a drive shaft. The gear wheel 6 is connected to a timing belt 7. The timing belt 7 drags a further gear wheel 8. Onto the same rotation pin 9 and integral with the further gear wheel 8 a third gear wheel 10 is provided. This third gear wheel 10 engages onto an other gear wheel 11 integral with to the outside protruding part 12 of the printing roll 13. At the other end of the printing roll 13 is present an other gear wheel 14. Said gear wheel 14, so placed onto the other side of the thermal printer, is placed onto a pin 15. Coaxially to the pin 15, and puts between the gear wheel 14, a radial bearing 16 is present that gives the angular motion only in a direction of rotation. Said radial bearing 16 in the normal step of printing lets free the gear wheel 14 but, when the printing roll 13 rotates in the opposite direction in comparison to the direction of rotation had during the printing, comes to move the gear wheel 14 that puts in rotation an other gear wheel 17. On the same axis, but on parallel vertical plane, is present an other gear wheel 18 that engages onto a further gear wheel 19. On the same shaft and integral with the gear wheel 19 a cam 20 is provided. Said cam 20 is in touch with the pin 21 of the unfastening teeth 22 that open/close the cover 2. The unfastening teeth 22 are inserted in the manual unfastening levers 23 to help the lifting of the cover 2. Then, the cover 2 has hinges 24 with coil springs 25. In working, ending the paper of the roll present inside the printer, the end paper sensor 4 comes to activate. The end paper sensor 4 gives, by normal connections and parts, the impulse to the electric motor 5. The impulse given to the sensor 4 starts the inversion of the rotation motion of the electric motor 5 normally used for the rotation of the printing roll. The motion inversion determines, by the rotation given to the printing roll 13 to the gear wheel 14, the rotation of the gear wheels 17, 18 and 19 with rotation of the cam 20. Said cam 20 rotating moves the pin 21 and actuates the unfastening of the unfastening teeth 22 connected with the unfastening levers 23. So the cover 2 comes to unfasten and it is put in opening by the springs 25. With the cover in opening, with the same actuated in automatic way, it is put in evidence to the operator the lack of thermal paper inside the printer. So it is immediate and quick the withdrawal of the paper support and the fitting up of a new thermal paper roll inside the printer. In this way the thermal paper is used in whole and such us the cover 2, that contains the printing roll 1, immediately raises when the paper is ended, it is not possible the friction of the thermal head onto the printing roll 1 so

avoiding to damage the same head. Inserted the paper the cover 2 is closed again so that the pin 21 crawls onto the cam 20 making it rotates. In this way the printer turns in working while the automatic opening device 3 prepares itself for the subsequent opening when the paper will be ended again. In an other embodiment, always falls within the present inventive concept, the automatic opening device can be provided with electrical, mechanical or pneumatic components and motorized to be realized to the person skilled in the art on the base of the details described and illustrated and with the same aim, substituting the technical details with other equivalent and with the same functions.

Claims

1. Automatic opening device at the paper end for thermal printer **characterized** to the fact to consist of an end paper sensor (4) connected to an electric motor (5), with the end paper sensor (4) that starts the electric motor (5) reversed its direction of rotation in comparison with the direction of rotation had during the printing step.

2. Automatic opening device at the paper end for thermal printer, as to the previous claim, **characterized in that** the electric motor (5) is equipped with a gear wheel (6) placed onto a drive shaft and connected to a timing belt (7) that drags a further gear wheel (8), integral with and placed onto the same rotation pin (9) of a gear wheel (10) that engages with a gear wheel (11) integral with the outside protruding part (12) of the printing roll (13).

3. Automatic opening device at the paper end for thermal printer, as to the previous claims, **characterized in that** to the other end of the printing roll (13) an other gear wheel (14) is provided placed on a pin (15) and, coaxially to the pin (15) and puts between the gear wheel (14), a radial bearing (16) is provided that transmits the angular motion only in a direction of rotation, with the radial bearing (16) that in the normal printing lets free the gear wheel (14) but, when the printing roll (13) rotates in the opposite direction in comparison to the direction of rotation had during the printing, comes to move the gear wheel (14).

4. Automatic opening device at the paper end for thermal printer, as to the previous claims, **characterized in that** the gear wheel (14) puts in rotation a gear wheel (17), placed on the same axis but on parallel vertical plane of an other gear wheel (18) that engages onto a further gear wheel (19).

5. Automatic opening device at the paper end for thermal printer, as to the previous claims, **characterized in that** onto the same shaft and integral with the gear wheel (19) a cam (20) is provided that is in touch with a pin (21) of unfastening teeth (22) to open or to close the cover (2) of the printer, with the unfastening teeth (22) inserted in manual unfastening levers (23) of the cover (2) with hinges (24) having coil springs (25) for lifting the cover (2).

6. Automatic opening device at the paper end for thermal printer **characterized in that** the automatic opening device can be provided with electrical, mechanical or pneumatic components and motorized with equivalent components having the same functions.

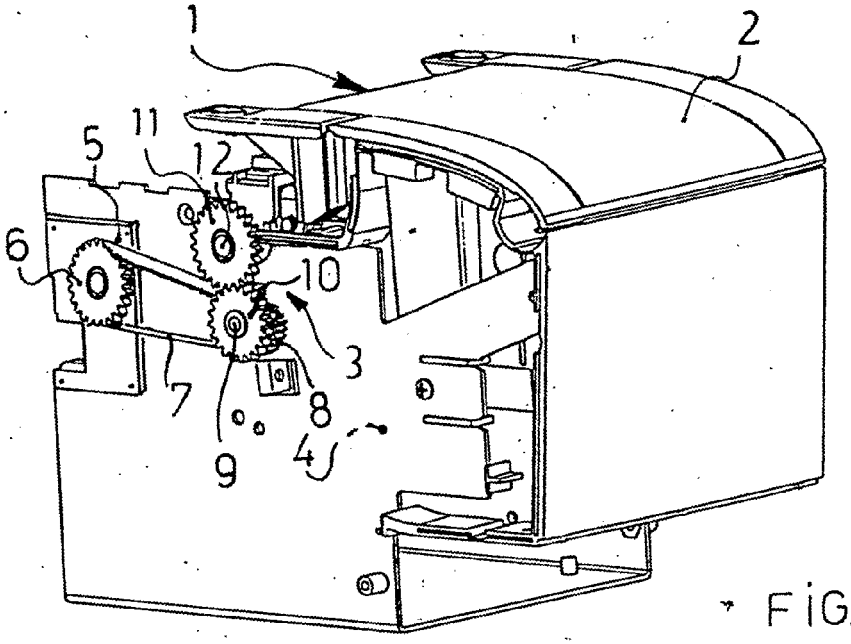

FIG.1

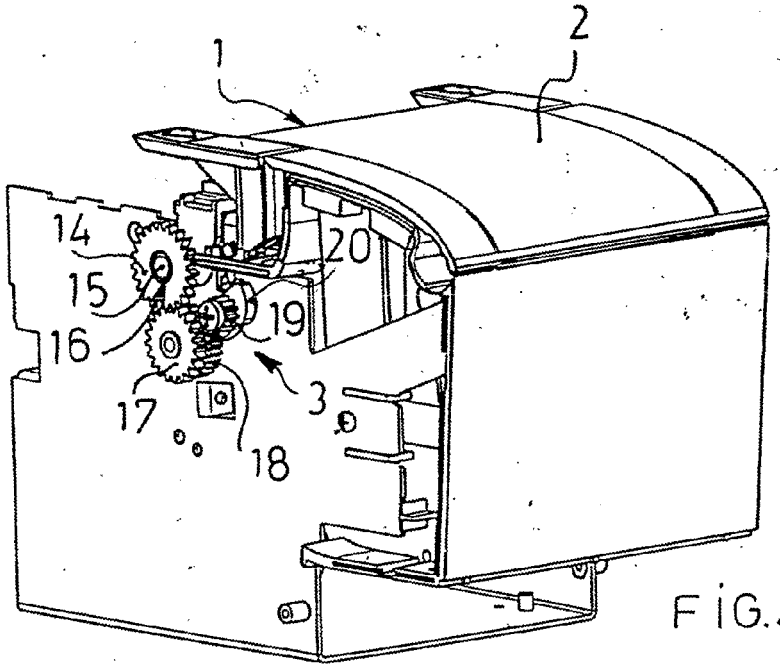

FIG.2

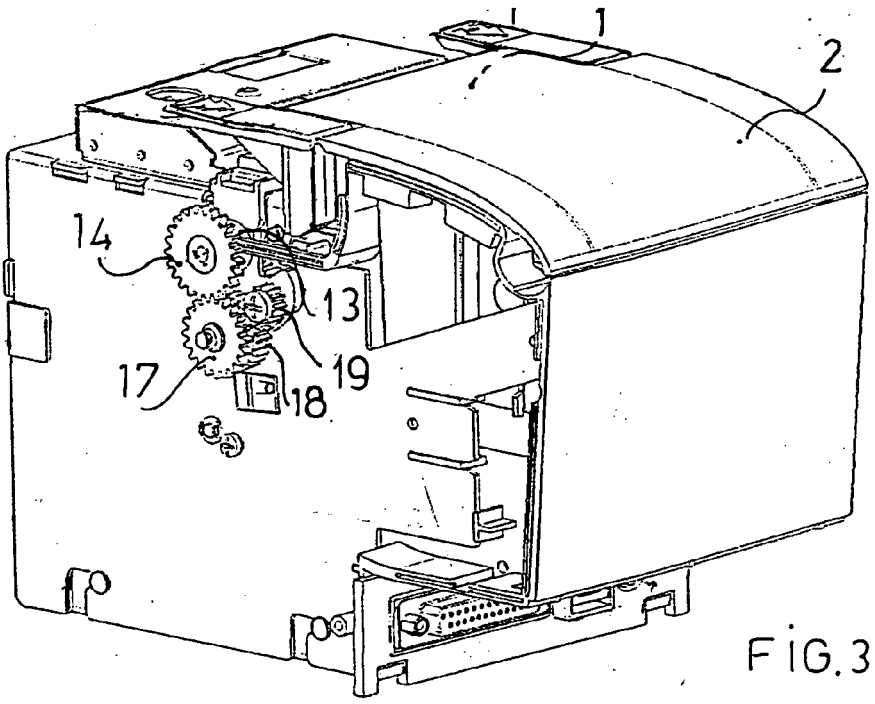

FIG.3

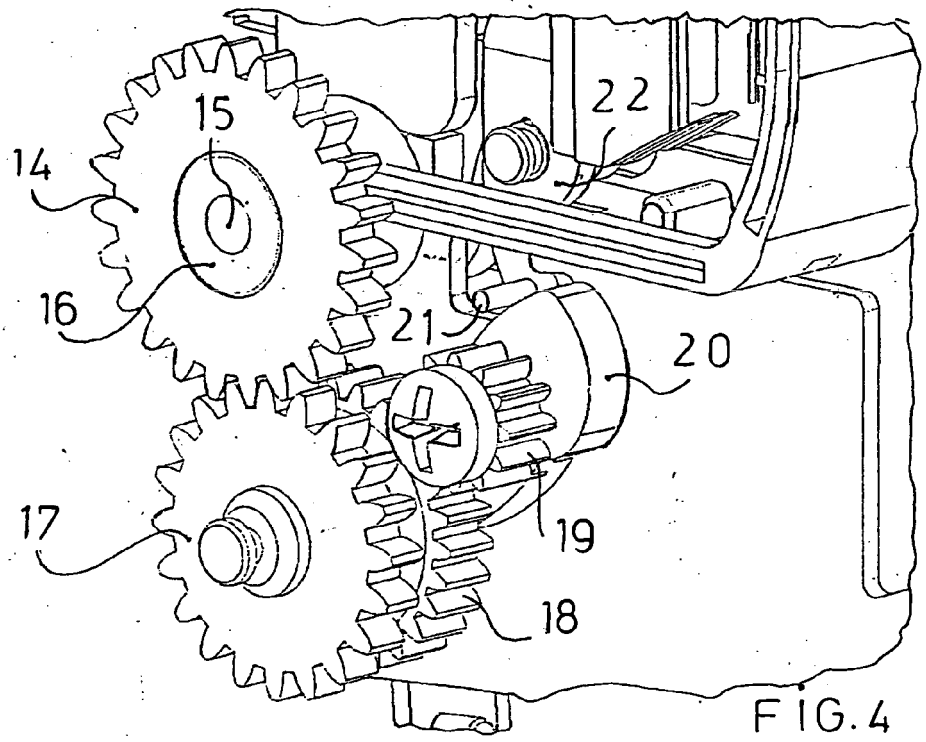

FIG.4

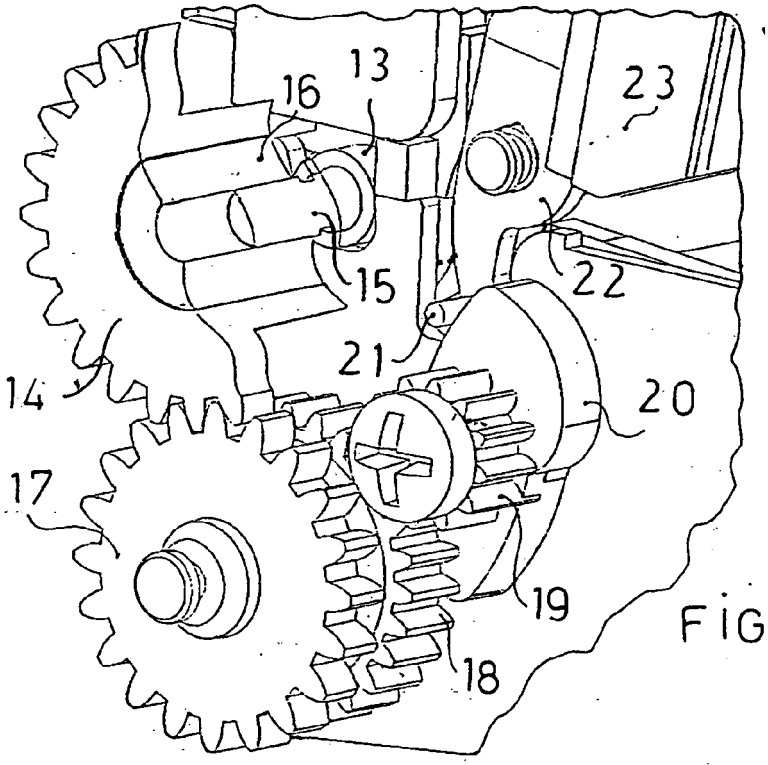

FIG. 5

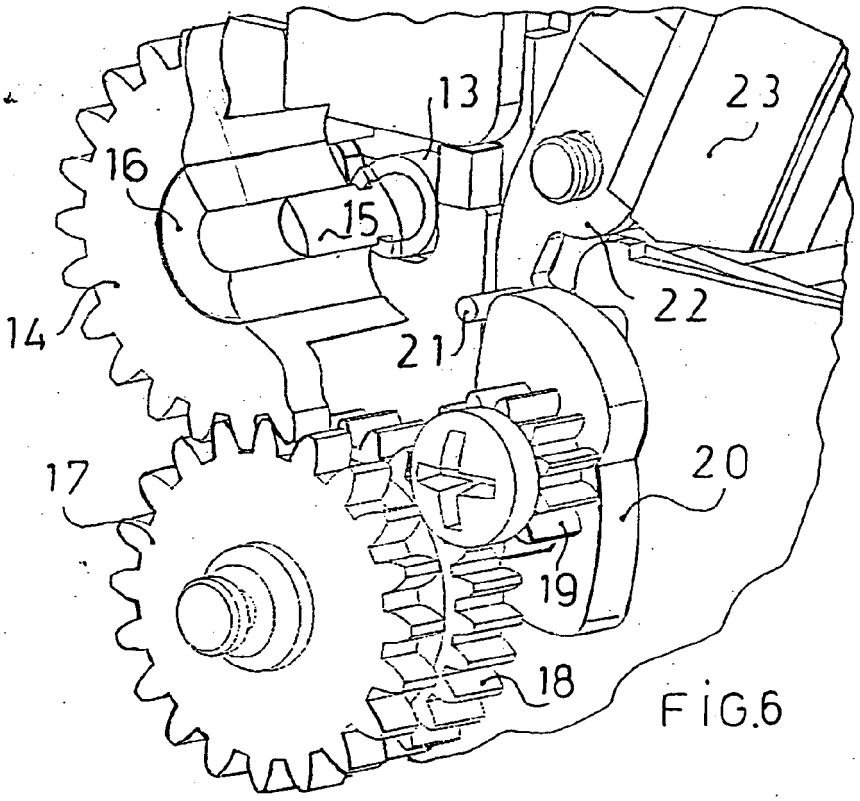

FIG.6

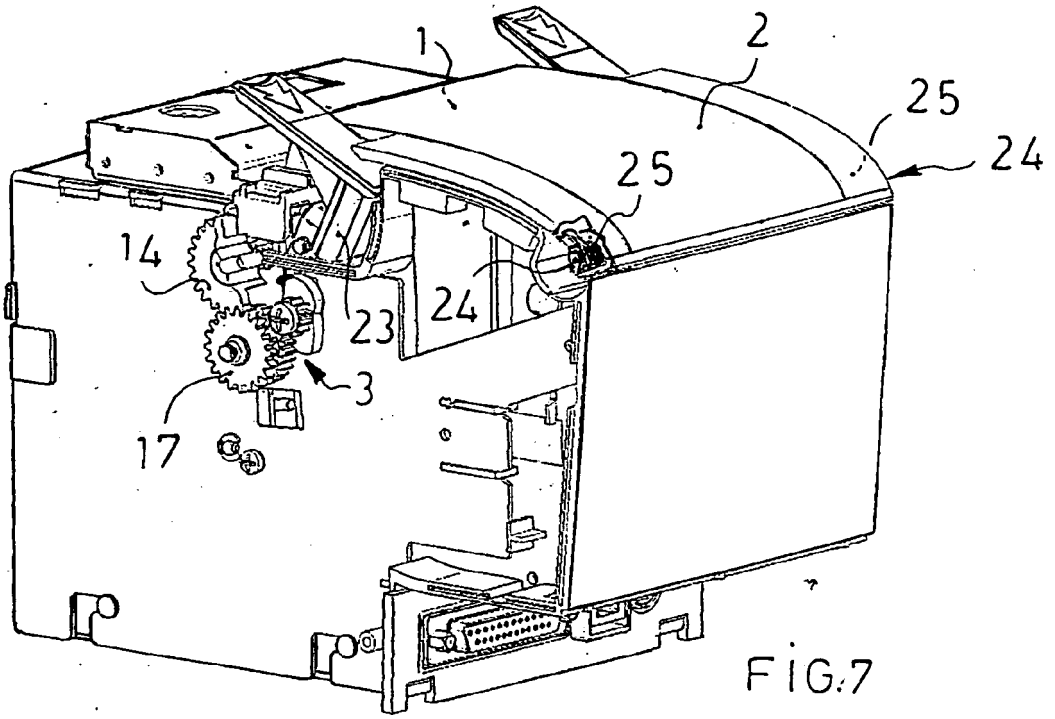

FIG.7

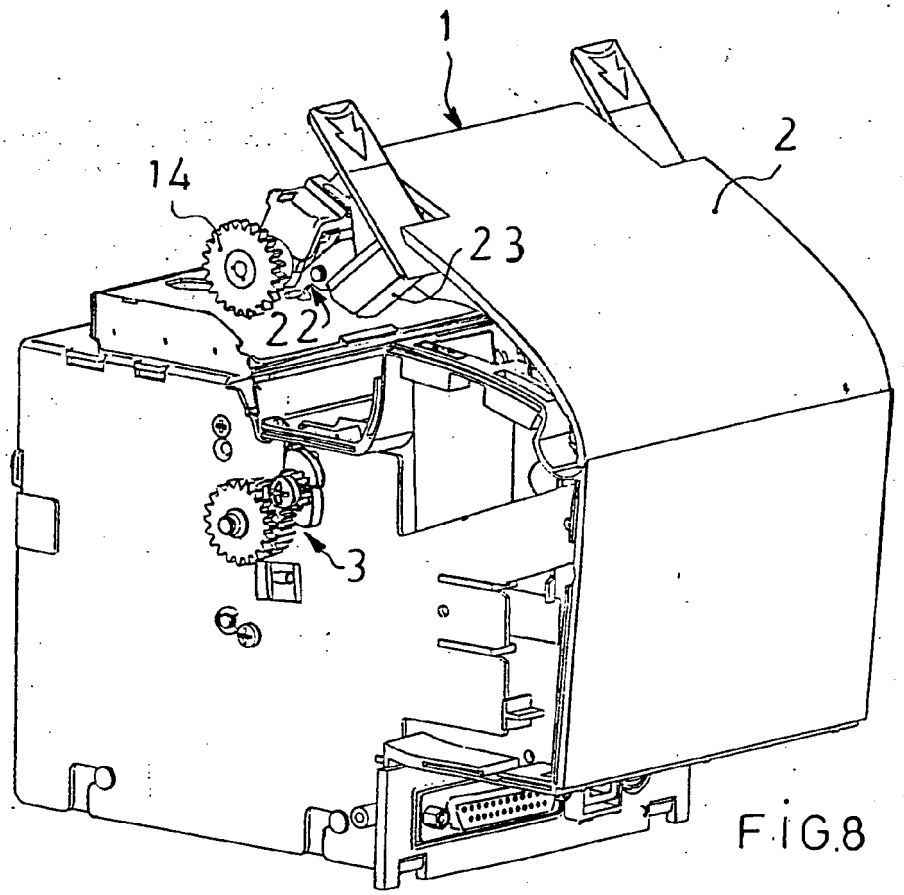

FIG.8

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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5046

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X	EP 1 810 834 A1 (CUSTOM ENGINEERING SPA [IT]) 25 July 2007 (2007-07-25) * column 2, line 23 - line 33; claims 1,2 *	1-6	INV. B41J29/00 B41J29/48
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 March 2010	Adam, Emmanuel

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82