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(54) Title: ROTOGRAVURE PRINTING APPARATUS

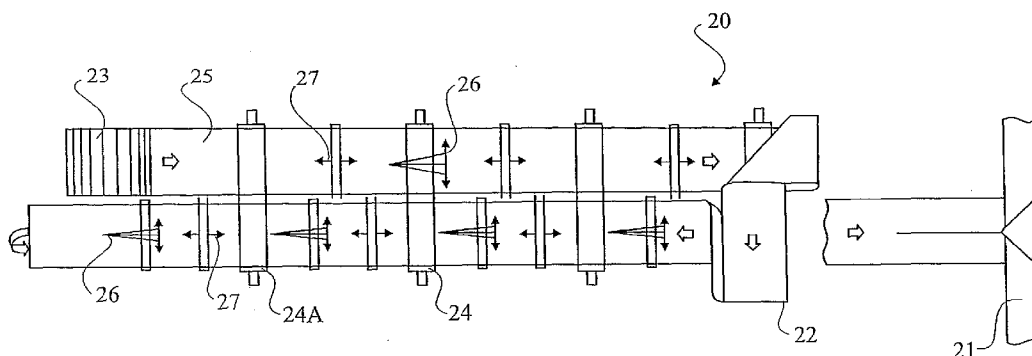


Fig. 3

(57) Abstract: A rotogravure printing apparatus (1, 20) comprising an unwinder (5), at least four printing units (3) each having a printing cylinder (8), a continuous paper web path (9) and a folding device (2, 21). The apparatus is a "Double Ender" rotogravure printing apparatus (1, 20) having two special parts (25), which extends substantially parallel to each other, each printing unit (3, 24a, 24) extending each over a portion of said printing part (25a, b) of said web path (25), each part is provided to print on laterally different sides of each printing cylinder. The cylinder (8) is engraved by means of at least one direct laser engraving device (Direct Engraving laser), i.e., a device which produces at least two rotogravure printing cylinders per hour.

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## ROTOGRAVURE PRINTING APPARATUS

### TECHNICAL FIELD

- 5 The present invention is related to a double ender rotogravure printing apparatus according to the pre-characterizing portion of claim 1.

### BACKGROUND OF THE INVENTION

10 There are on the world market two rotogravure engraving technologies, on one hand, a mechanical engraving apparatus available from the firm Hell Gravure Systems, and, on the other hand, a laser engraving apparatus available from the firm Max Daetwyler AG, see also EP 1 333 976 B1, JP2001105166. Furthermore, there are two rotogravure printing apparatus manufacturers, viz., on one hand, KBA AG and, on the other hand, OMG Cerutti SpA. The known engraving apparatuses are used in conjunction with the

15 current standard eight unit publication rotogravure apparatuses of various widths from the above mentioned manufacturers. Since the middle of the 1990's, standard eight unit publication rotogravure apparatus have been automated and with much higher speeds than before, and the apparatuses from these two companies have similar performance. In 2007, the situation has developed so that due to the long production schedules of

20 producing eight cylinders (each such cylinder is to be mounted in each one of the units of the printing apparatus) the minimum average achievable print run and number of pages have increased substantially since the beginning of the 1990's, leaving the market for smaller and medium print runs to competing printing technologies. The above mentioned apparatuses can not, due to economical and technical constraints, be used for short runs.

25

### OBJECT OF THE INVENTION

The object of the invention is to provide a solution overcoming the drawback of the known gravure printing technology in printing short runs and with signatures containing

30 16 to 64 pages and to decrease the average minimum print runs with signatures containing 16 up to 64 pages which are technically and economically feasible to achieve when using the rotogravure printing method.

Another object of the invention is to provide a solution which is highly automated as to its function which minimizes the need for staffing.

35

Furthermore, the solution must be reliable, cost efficient and easy to use in order to minimize the above mentioned constraints.

#### SUMMARY OF THE INVENTION

5 The above objects are achieved by means of a double ender printing apparatus together with a direct laser engraving apparatus having the features of to the characterizing portion of claim 1.

10 Using standard engraving and printing apparatus in rotogravure, the minimum average print runs (for 32-48-64 pages) is above 500 000 copies. The invention makes it feasible to substantially reduce the minimum average print run (well below 100 000 copies of products containing 16-64 pages in A4 format), and make rotogravure printing competitive on such products and markets where such products are in demand. To economically produce such products (16-64 pages) with low average print runs has  
15 not been technically and economically feasible since the end of 1970's, when the previous manual etching methods were replaced by mechanical engraving. These methods were analogue and can not be used today when all data received from customers is digital for manufacture of engraved cylinders. In the future, when faster laser technology is available even shorter runs will be possible to print – technically as  
20 well as economically.

The cylinders of the double ender printing apparatus according to the invention has a width of 130-380 cm with four units allowing the production of products from 16 to 64 pages in four colours on each side of the printed paper substrate. Although the said  
25 direct laser engraved cylinders are preferred, allowing the lowest average print runs, alternatively also mechanical engraved cylinders may be used.

The said apparatus according to invention has the same performance as a standard eight  
30 unit rotogravure printing apparatus.

The sub claims define preferred embodiments of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in closer detail in the following by way of preferred  
35 embodiments thereof with reference to the annexed drawings.

Fig. 1 is a side view of a double ender rotogravure printing apparatus according to the invention, where several parts of the printing apparatus are deleted for clarity.

Fig. 2 is a sectional view of the double ender apparatus in Fig. 1 along the line II - II in Fig. 2.

5 Fig. 3 is a schematical top view of a second embodiment of a double ender apparatus according to the invention where further parts of the printing apparatus are deleted for more clarity.

Fig. 4 is a cross-sectional of the cavities in cylinders used in double ender apparatus in Fig. 1.

10

#### DESCRIPTION OF PREFERRED EMBODIMENTS

Figs. 1-2 illustrates a first embodiment of a double ender rotogravure printing apparatus 1 according to the invention.

15 The double ender printing apparatus 1 comprises a folder 2, printing units 3, a turning bar device 4, an unwinder 5, a main drive 6 for the printing units 3 and devices 7 for loading/unloading of cylinders 8 into the printing units 3.

In this embodiment, the double ender printing apparatus 1 consists of five units, but at  
20 least four must be used in such an apparatus, and uses a continuous paper web 9 having two main printing passes which are substantially parallel to each other and each extends over a part of each half of each cylinder 8. The cylinder 8 is used to print the recto side, then the web 9 is turned twice by means of the turning bars 4 to print the verso side (wiederdruck) on the other half of the cylinder 8. The proposed rotogravure printing  
25 apparatus 1 is designed only for double ender printing.

Fig. 3 shows a second embodiment of a double ender apparatus 20 according to the invention comprising a folder 21, four printing units (not shown), turning bars 22, an  
30 unwinder 23, a main drive (not shown) for the printing units and devices (not shown) for loading/unloading of cylinders 24a, 24 into the printing units.

The apparatus has an automated device for webbing up the web 25. The continuous paper web 25 starts at the unwinder 23 and runs to the folder 21 of the double ender apparatus 20 and passes through four printing units (print cylinder 24) to print the recto  
35 side 25a of the web 25; the web 25 is then turned twice 45 degrees at the turning bars 22. The web 25 is then turned upside down and goes thereafter back to the first cylinder

24a. Further, the web 25 passes through the four printing units (print cylinders 24, 24a) to print the verso side 25b “wiederdruck” of the paper web 25 and into the folder 21, to the right in Fig. 3. In order to obtain perfect colour register, the paper web 25 can be moved independently in lateral and longitudinal directions shown by means of arrows  
5 26 and 27, respectively, when passing through each printing unit in recto “schön” and verso “wieder”.

In a double ender rotogravure printing apparatus with five units the fifth unit could be used for lacquer (printing covers for magazines), any special ink demanded or to  
10 produce very few pages (8-16 pages) for versioning/zoning editions (when the text cylinders for black text needs to be changed very quickly).

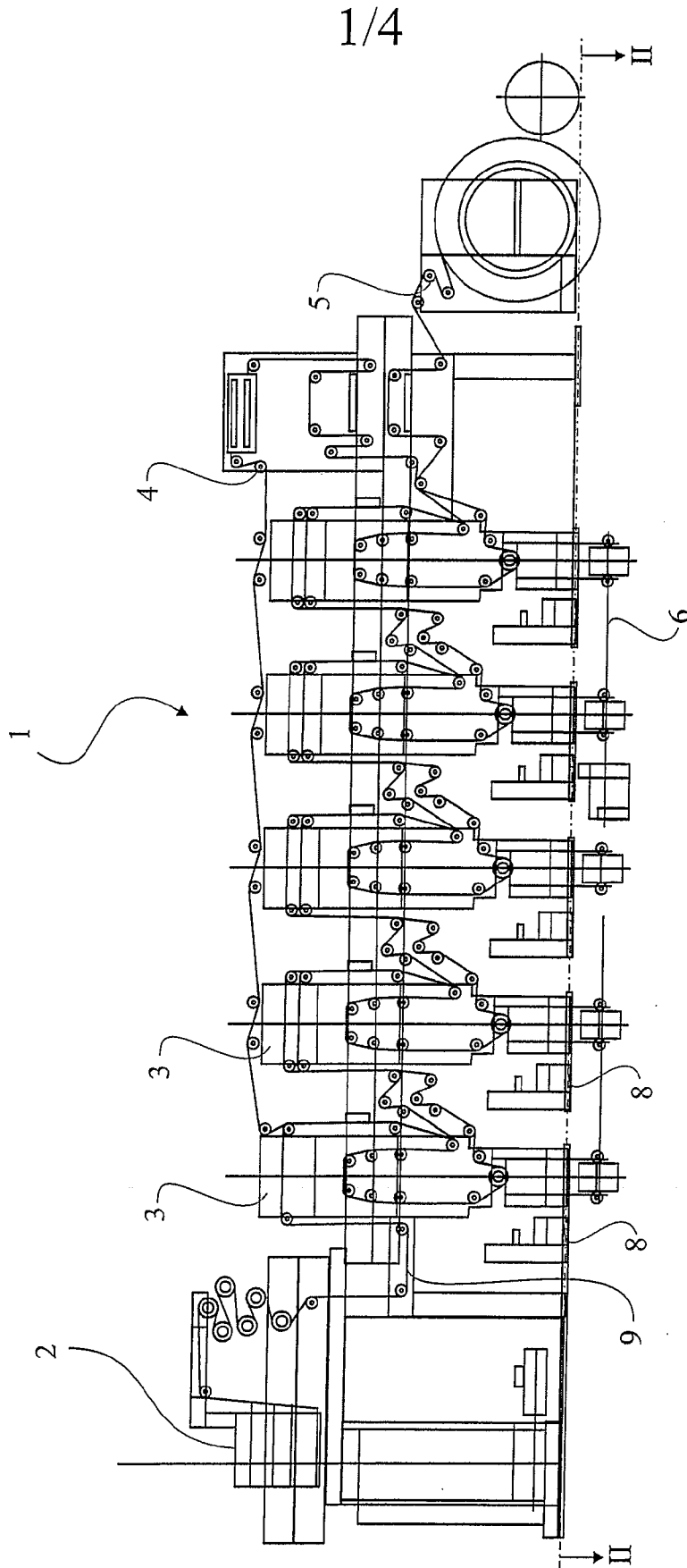
Figure 4 shows a metal surface 40 of cylinders 8 and 24a, 24 of the double ender rotogravure printing apparatuses 1 and 20, respectively. The metal surface 40 of  
15 cylinders 8, 24a, 24 is engraved in a laser engraving apparatus (not shown) with high speed and producing at least two rotogravure printing cylinders per hour. The laser engraving apparatus engraves cavities (cells) 41 which are generated on the metal surface 40 for rotogravure printing in the double ender printing apparatuses 1 and 20.

20 The structure of the metal surface 40 which is preferably used generates “Superhalfautotypical” cavities (cells) 42, which allows printing on many different paper substrates.

It should be noted that the double ender rotogravure printing apparatus 1 and 20  
25 according to the invention is not limited to the above described embodiments, but could be modified within the scope of the appended claims.

## CLAIMS

1. A rotogravure printing apparatus comprising an unwinder (5), at least four printing units (3) each having a cylinder (8), a continuous paper web path (9) and a folding device (2, 21),  
5 c h a r a c t e r i z e d in that the apparatus is a “Double Ender” rotogravure printing apparatus (1, 20) having two main printing parts (25), which extends substantially parallel to each other, each of said printing units (3, 24a, 24) extending over a portion of said printing parts (25 a, b) of said web path (25), each part being provided to print on laterally different sides of each  
10 printing cylinder, and that said printing cylinder (8) is engraved by means of direct laser engraving device with high speed (Direct Engraving laser), i.e., a device producing at least two rotogravure printing cylinders per hour.
2. Apparatus according to claim 1, c h a r a c t e r i z e d in that said cylinders  
15 each have a width of 130-380 cm, preferably about 250-270 cm.
3. Apparatus according to claim 1, c h a r a c t e r i z e d in that each part (25 a, b) of said printed web path (25) shall have a separate device to guide said web independently when printing in recto, “schön”, and verso, “wieder”.  
20
4. Apparatus according to claim 1, c h a r a c t e r i z e d in that having at least four printing units (3) or one or two extra printing units (3) for special products.
- 25 5. Apparatus according to claim 1, c h a r a c t e r i z e d in that each unit (3) has a device (7) for automated load/unloading of said rotogravure cylinders (8).
6. Apparatus according to claim 1, c h a r a c t e r i z e d in that said apparatus  
30 shall have an equipment for automatic webbing of the paper web (25).
7. Apparatus according to claim 1, c h a r a c t e r i z e d in that each printing cylinders (8) is engraved with cavities (cells) (41) provided in the metal surface (40).  
35



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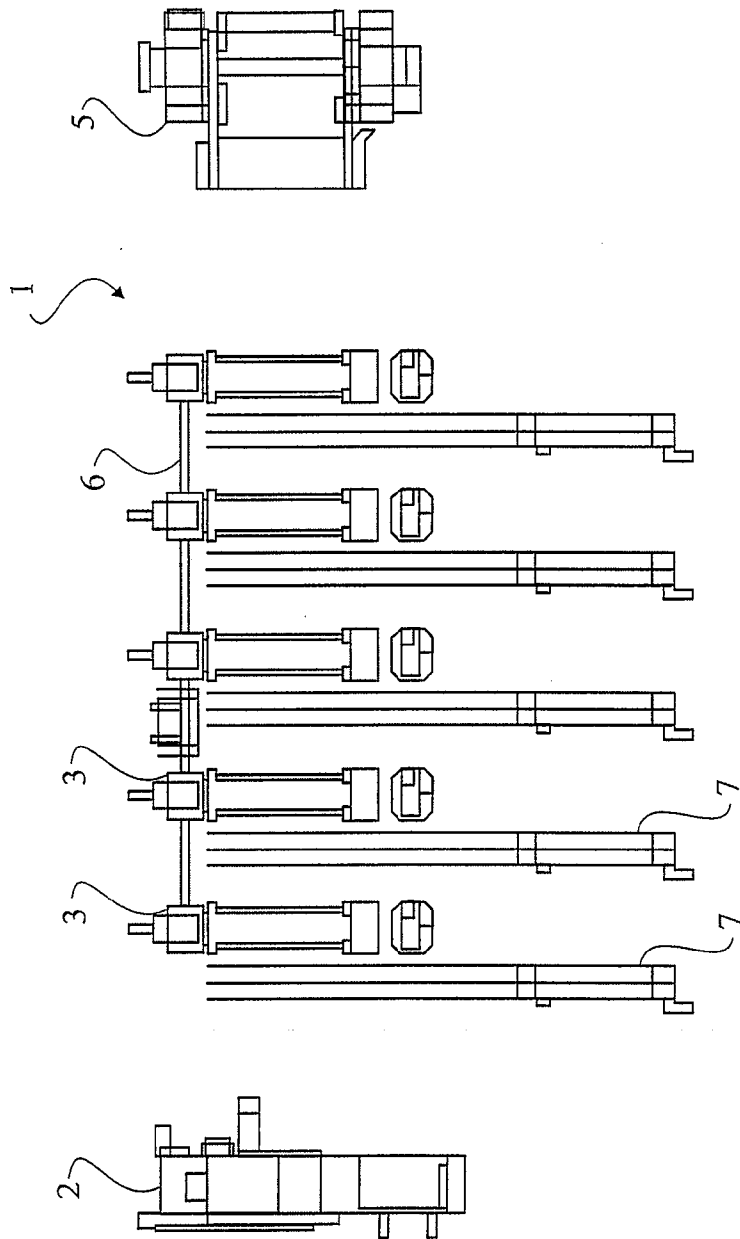


Fig. 2

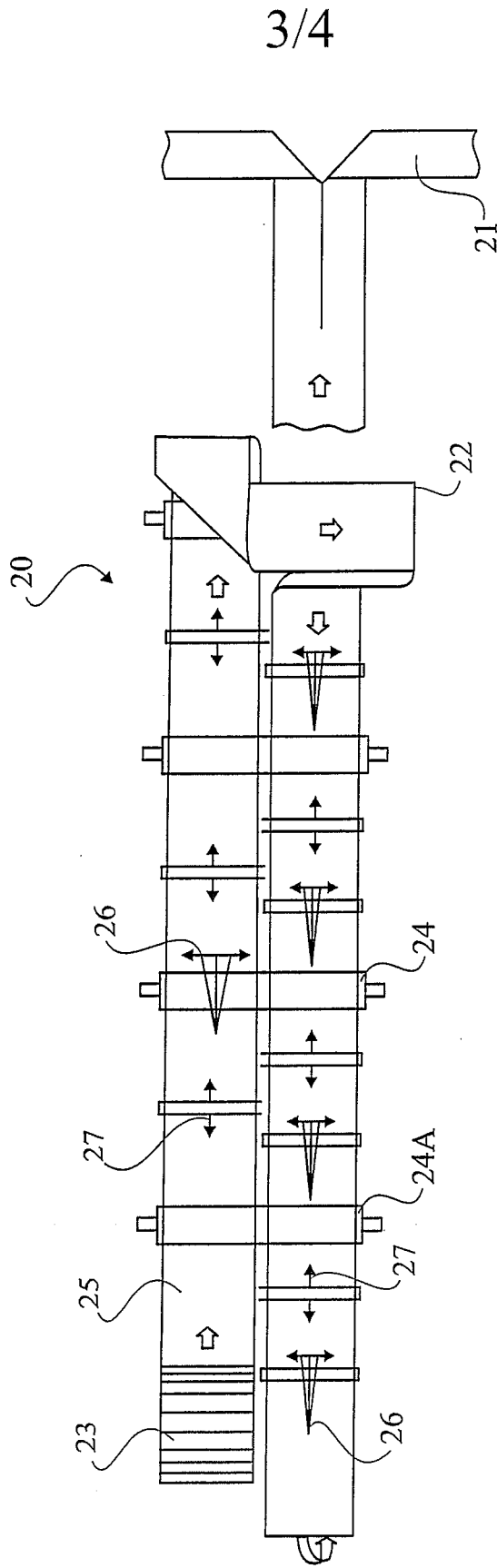
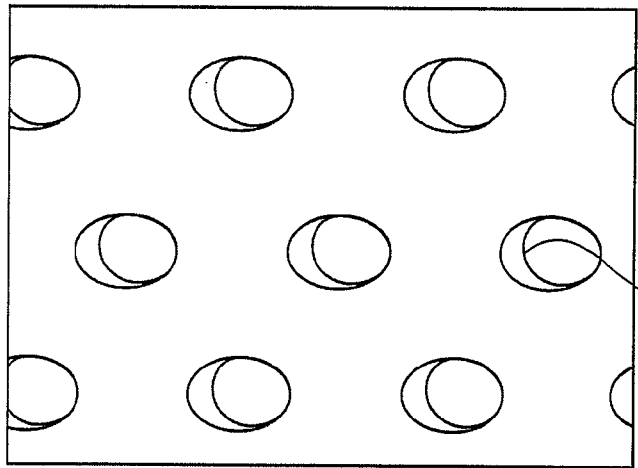
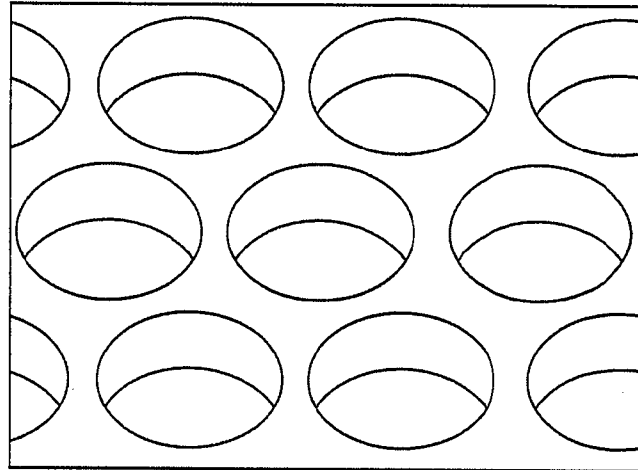
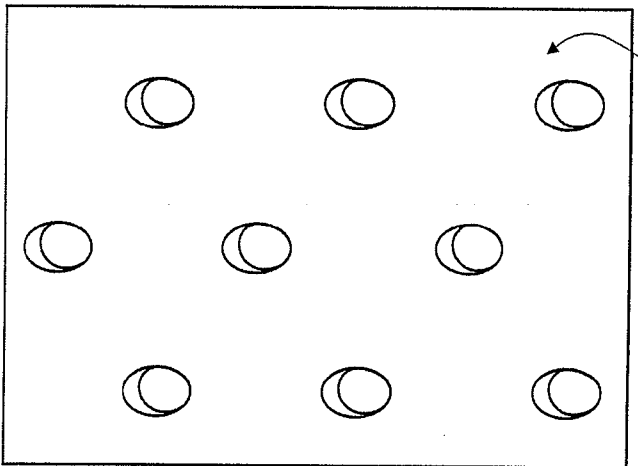


Fig. 3

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41



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Fig. 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2008/050349

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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: B41F, B41C, B23K

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 191021575 A (ALBERT WILLIAM MATHYS), 23 March 1911 (23.03.1911), A.D. 1910 --	1-7
A	US 5856648 A (FRAUCHIGER ET AL), 5 January 1999 (05.01.1999) --	1-7
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A	GB 191507755 A (ANTON OUDSHOORN, MANUFACTURER), 28 October 1915 (28.10.1915), A.D. 1915 -- -----	1-7

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*B41C 1/05* (2006.01)

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Cited literature, if any, will be enclosed in paper form.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

28/06/2008

International application No.

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