



(51) International Patent Classification:

B41F 5/24 (2006.01) *B41F 23/00* (2006.01)
B41F 19/00 (2006.01)

(21) International Application Number:

PCT/IB2010/052075

(22) International Filing Date:

11 May 2010 (11.05.2010)

(25) Filing Language:

Italian

(26) Publication Language:

English

(30) Priority Data:

MO2009A000163 18 June 2009 (18.06.2009) IT

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

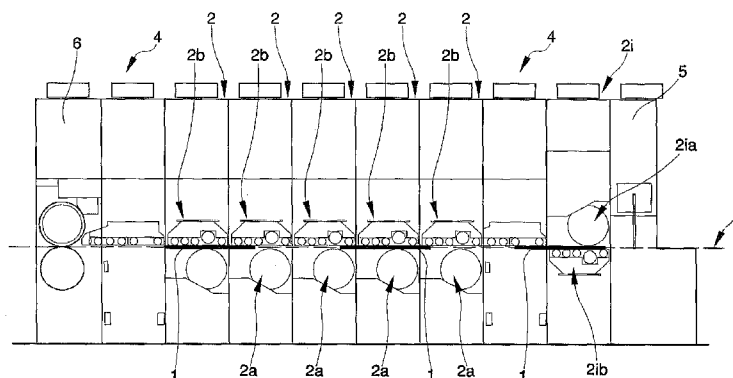
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: A MACHINE AND A METHOD FOR PRINTING ON RIGID SHEETS SUCH AS CARDBOARD AND THE LIKE

Fig. 1



(57) Abstract: The invention relates to a machine and a method for printing on rigid sheets (1) such as cardboard and the like. The machine comprises a plurality of printing stations (2) which are aligned side-by-side with one another, each of which in turn comprises: a printing group (2a) and a blocking group (2b) for the sheets (1), arranged on an opposite side from the printing group, between which a trajectory for the sheets (1) being printed on is defined. At least one of the printing stations is an inverted station (2i) in which the printing group (2ia) and the blocking group (2ib) are arranged on opposite sides, with respect to the straight trajectory of the sheets (1), from the printing groups (2a) and the blocking groups (2b) of remaining printing stations (2) of the machine. The method realised with the machine comprises a stage of introducing the sheets (1) and stages of printing on a surface of the sheets (1) not destined to be printed upon. In at least an inverted station (2i), the printing stage and the blocking stage are performed on a surface of the sheet which is opposite a surface thereof on which the printing stage and blocking stage are performed in the other stations (2).

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Description

A Machine and a Method for Printing on Rigid Sheets such as Cardboard and the Like.

Technical Field

The invention relates to a machine and a method for printing on rigid sheets such as cardboard and the like.

Reference is made in particular to printing operations to be made on rigid blank sheets of cardboard destined for die-cutting for making packaging
5 boxes and the like. The invention can however be applied to all sheet materials of a rigid type.

Background Art

In the production of packaging boxes realised with die-cut cardboard, the sheets of cardboard are normally inserted into a machine which includes
10 various printing stations that are flanked and together define a straight trajectory for the cardboard sheets, each of which stations prints a colour on the cardboard. These printing stations are normally provided with a true and proper printing group and a suction plane which holds the cardboard sheets in position while they are advanced, usually by rollers or conveyor
15 belts comprised in each printing station, along the various printing stations. In known machines the suction planes of the various stations are all reciprocally flanked such as to define a single sliding plane of the cardboard sheets which transit internally of the machine.

In brief, according to the various colours which are to be printed on a side
20 of the sheet, various printing stations are flanked to one another to realise a straight continuous trajectory for the sheets, which are retained by one side

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and conveyed along the printing trajectory in order to receive the relative colour on the other side, in each station.

The cardboard sheets used for die-cutting and the realisation of packaging are of various types and thicknesses.

- 5 At times, when the packaging has to exhibit limited moisture absorption properties, a waterproof coating is previously applied at least on a surface thereof; sometimes, due to special uses, cardboard sheets are used which have the two surfaces thereof differently coloured. For these special operations special pre-worked blank sheets are used which, obviously,
10 incur extra expense.

In this context, the aim of the present invention is to provide a machine and a method actuated by the machine which renders the operations of preparation and printing of the cardboard sheets destined to be die-cut for obtaining packages more rapid and less expensive.

- 15 An advantage of the present invention is to provide a machine and a method actuated by the machine which make the operations of printing the sheets destined for die-cutting more versatile, as well as limiting the need for use of special cardboard.

- These aims and advantages are substantially attained by the present
20 invention, comprising the technical characteristics set out in one or more of the accompanying claims.

Disclosure of Invention

- Further characteristics and advantages of the present invention will better emerge from the following non-limiting description of the various stages of
25 the method, and of a preferred but not exclusive embodiment of a machine for printing rigid sheets, illustrated in figure 1 of the drawings, which shows a schematic lateral view of the machine of the invention.

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For realising packaging boxes and the like, rigid sheets are used, normally cardboard, which in order to give the packaging its final appearance are inserted in a machine which prints the decorations on the cardboard sheet; thereafter the cardboard sheets are die-cut then to be folded to make the
5 packaging.

For performing the printing operations, machines are known which are provided with printing stations 2 that are flanked to one another in order to define a straight trajectory 3 along which the cardboard sheets to be printed on move in an advancement direction. These machines are assemblable and
10 are normally composed of a number of printing stations which coincides with the number of colours with which the cardboard sheets are to be decorated; once the number of printing stations has been set up, the machines are normally completed by an infeed station 5, which is located at the start of the machine and inserts the sheets therein, and a cutting station
15 6, which is located at the end of the machine and performs the die-cutting of the printed sheets.

The printing stations, which are of known type and to which the present invention makes specific reference, each comprise a tract of trajectory for the cardboard sheets, a printing group 2a and a blocking group 2b of the
20 sheet, which are arranged on opposite sides with respect to the tract of trajectory; the printing group is realised with a flexographic roller while the blocking group is pneumatic and is realised by a plane provided with numerous holes through which air is aspirated in order to create, when a cardboard sheet is transiting, a depression between the hole and the sheet
25 which enables the sheet to be blocked, with lifting and lateral movements blocked with respect to the advancement direction of the sheet itself. In order to enable advancing of the sheets along the straight trajectory 3, which is defined by the joining of the tracts of trajectory of the various

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flanked printing stations, small conveyor belts are positioned on each tract of trajectory, which belts act on the cardboard sheets in order to move them advancingly along the trajectory and to enable them to pass from one station to another.

- 5 Differently to what happens in known machines, in which all the printing groups are on the same side of the straight trajectory, and therefore all the blocking groups are on the other side, in the machine of the present invention at least one of the printing stations 2 is an inverted station 2i which exhibits the printing group 2ia and the blocking group 2ib located on
10 the opposite side, with respect to the straight trajectory, to the printing groups 2a and the blocking groups 2b of the remaining printing stations 2 of the machine. The inverted printing station 2i exhibits the same printing groups and blocking groups as the remaining stations, with the only difference that the two groups are upturned with respect to the straight
15 trajectory.

In the machine of the invention the blocking groups 2ib of the inverted stations 2i define a blocking plane which is parallel to a blocking plane defined by the blocking groups 2b of the remaining printing stations 2 and which is distanced from the latter blocking plane by a distance which is
20 about the same as the thickness of the cardboard sheet being processed (observe that in the figure the thickness of the sheet has been illustrated with greater than usual dimensions in order for it to be more easily identified). Thus there is no discontinuity in the straight trajectory as the cardboard sheets blocked by the blocking groups 2ib of the inverted
25 stations (for example on the upper surface) are not subject to a change of level as they pass to a blocking group 2b of the printing stations 2 but are simply blocked by one of their surfaces, in this case the lower surface.

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The machine preferably comprises an inverted station 2i which is arranged, with reference to the movement direction of the cardboard sheets, before the remaining printing stations 2; the inverted station 2i is therefore the first printing station that the cardboard sheets encounter when they transit along
5 the straight trajectory.

Also preferably comprised, after the inverted station 2i, is a drying station 4, which is of known type.

Naturally it is possible to provide, according to needs, two or more of the inverted stations 2i to be combined to two or more of the stations 2.

10 It is also worth noting that similar drying stations can also be provided, as often happens in machines of known type, after each printing station or after the final printing station.

By introducing the sheets into the machine and performing only one passage on the straight trajectory, the machine enables actuation of a
15 method for printing cardboard sheets and the like which, beyond performing a stage of printing on a surface of the sheet by the printing stations 2, also enables, using the inverted stations 2i, a stage of printing on the opposite surface of the sheet from the one on which the preceding printing stages are performed. Obviously, as happens also in known
20 machines, during the stage of printing the sheets in transit on the straight trajectory, they remain blocked, with reference to different movements from the movement which is in the advancement direction of the straight trajectory, by means of blocking groups present in the various stations.

In the machine of the invention, the blocking of the sheets occurs on a
25 surface thereof in the stations 2 and on an opposite surface thereof in the inverted stations 2i.

Although they can be performed several times internally of the machine, the printing stage and the blocking stage of the inverted station are

preferably performed once only and before the printing and blocking stages performed in the remaining stations. After this printing stage has been performed by the inverted station 2i, a stage of drying is preferably performed. The drying stage is particularly useful when the whole surface
5 of the cardboard sheet is to be covered with a waterproofing material, or when the whole sheet is to be coloured with a particular colour. This enables normal sheets to be used to attain results which previously could only be obtained with the use of special cardboard (for example waterproofed or with surfaces of different colours). The result cannot be
10 achieved with the known machines as, very often, the surfaces of the sheets to be completely coloured or waterproofed are those not destined to be printed on with words or decorations.

More in general, with the machine and the method of the invention, with a single passage internally of the machine decorations or deposits of material
15 can be made on both surfaces of the cardboard. This was not previously possible with the known machines as they had flanked printing stations all arranged in the same way. Obviously with this type of machine it is not possible to provide a printing station which prints the sheets on both surfaces as the blocking action has to be exerted on one side thereof.

20 Finally, with the known methods and machines, it was necessary to perform a double-passage of the cardboard sheets internally of the machine, which clearly leads to longer working times and higher working costs.

Claims.

1. A machine for printing on rigid sheets (1) such as cardboard and the like, of a type comprising a plurality of printing stations (2) which are aligned side-by-side with one another such as to define a straight trajectory (3) along which the cardboard sheets (1) to be printed are made to move, each of which printing stations (2) in turn comprises: a tract of trajectory for the cardboard sheets (1); a printing group (2a) for printing on a surface of the sheets (1); a blocking group (2b) for the sheets (1), arranged on an opposite side from the printing group with respect to the trajectory of the sheets (1); characterised in that at least one of the printing stations is an inverted station (2i) in which the printing group (2ia) and the blocking group (2ib) are arranged on opposite sides, with respect to the straight trajectory, from the printing groups (2a) and the blocking groups (2b) of remaining printing stations (2) of the machine.
2. The machine of claim 1, characterised in that: the blocking groups (2ib) of the inverted stations (2i) define a blocking plane which is parallel to a blocking plane defined by the blocking groups (2b) of the remaining printing stations (2); the two blocking planes being arranged at a reciprocal distance which distance is about half a thickness of a cardboard sheet (1) being processed.
3. The machine of claim 1, characterised in that the blocking groups (2b, 2ib) are of a pneumatic type.
4. The machine of claim 1, characterised in that it comprises one of the inverted stations (2i) which is arranged, with reference to the direction of movement of the cardboard sheets (1), before the remaining printing

stations (2a).

5. The machine of claim 4, characterised in that a drying station (4) is positioned after the inverted station (2i).

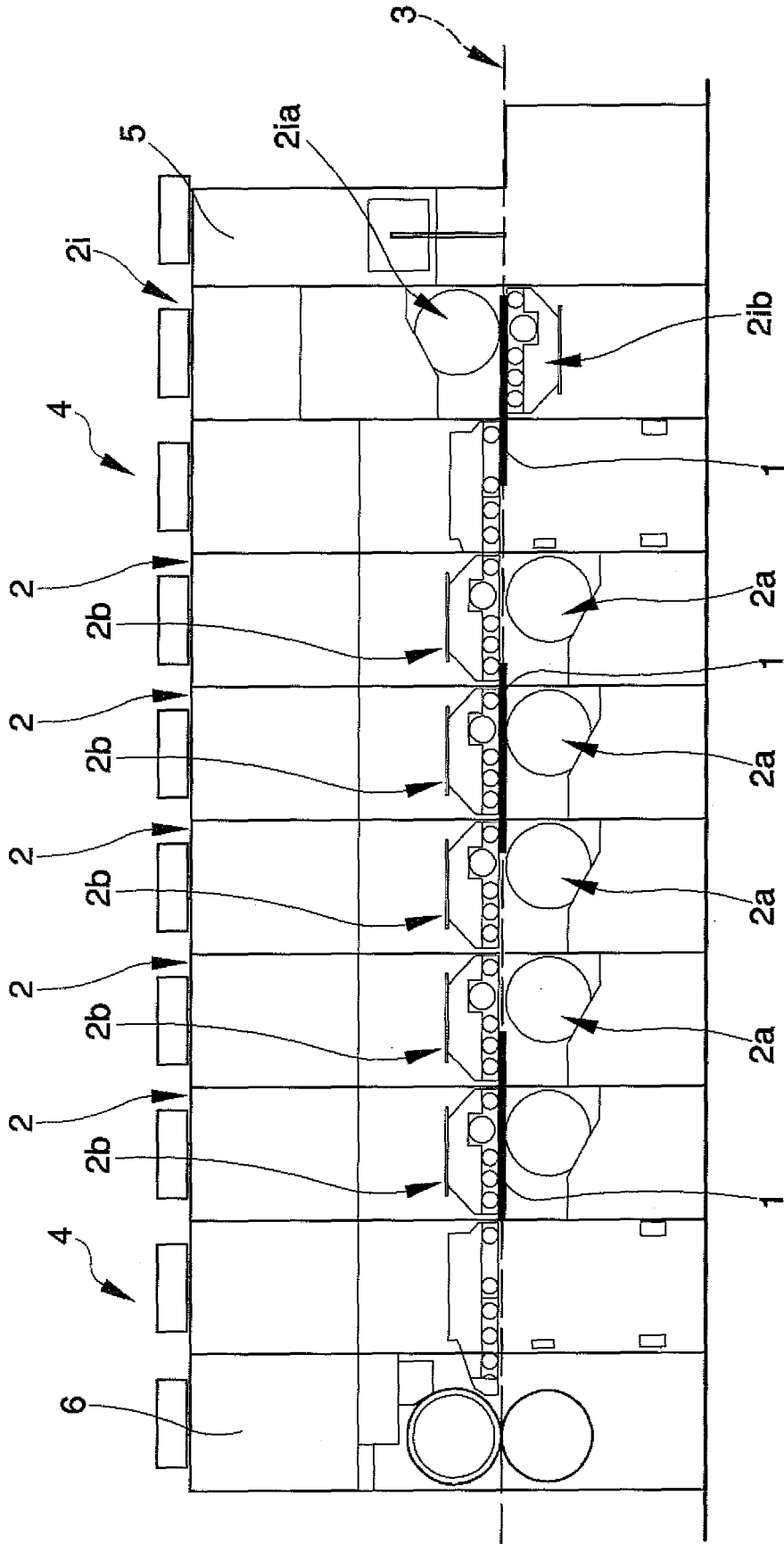
6. A method for printing rigid sheets such as cardboard and the like, of a type comprising a stage of introducing rigid sheets (1) on a straight trajectory along which a plurality of stations are located, each of which stations performs a stage of printing of a surface of the sheets (1) and a stage of blocking the sheets (1) on a surface thereof not destined to be printed upon, characterised in that there is at least a station which is inverted, in which station the printing stage and the blocking stage are performed on a surface of the sheet which is opposite a surface thereof on which the printing stage and blocking stage are performed in the other stations.

7. The method of claim 6, characterised in that a drying stage follows the printing stage and the blocking stage performed in the inverted station.

8. The method of claim 6, characterised in that the printing stage and the blocking stage of the inverted station are performed once only and before the printing stages and the blocking stages performed in the remaining stations.

9. The method of claim 6, characterised in that a waterproofing material for covering a whole surface of the cardboard sheet (1) is used in at least one of the printing stages performed in the inverted station.

Fig.1



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/052075

A. CLASSIFICATION OF SUBJECT MATTER INV. B41F5/24 B41F19/00 B41F23/00 ADD.		
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) B41F		
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.
A	US 2007/245916 A1 (BIRD JOHN W [US] ET AL) 25 October 2007 (2007-10-25) * abstract paragraphs [0002] - [0003], [0010], [0031], [0043], [0046] figure 1	1-9
A	US 4 939 992 A (BIRD JOHN W [US]) 10 July 1990 (1990-07-10) * abstract column 1, lines 41-53 column 2, lines 7-14, 55-56 column 4, lines 62-68 column 5, lines 3-6 column 7, lines 1-21 figure 1	1-9
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search	Date of mailing of the international search report	
7 July 2010	20/07/2010	
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2010/052075

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007245916 A1	25-10-2007	CA 2684622 A1 EP 2013022 A2 WO 2007126985 A2	08-11-2007 14-01-2009 08-11-2007
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