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(54) **Printing device for scored cardboard sheets**

(57) Of the type of constituents with a base or mylar (7) constituting the support for a printing plate (8), between these elements supplements (12' - 13) are established, which produce linear protuberances (11) on the working surface of the plate (8). These are longitudinal and cross-sectional in correlation with the lines or scores created by the corrugator machine for the fragmentation of the continuous strip of cardboard. The lin-

ear protuberances (11) penetrate the scores of the cardboard resulting in a quality printing over the whole of the surface of the cardboard, in both the relatively flat and more sunken areas. The supplements (12' - 13) between the base (7) and plate (8) may also be established in the centre of the plate, more specifically establishing these complementary supplements (14) and (15) also in correlation with the linear protuberances (11) on the working surface of the plate (8).

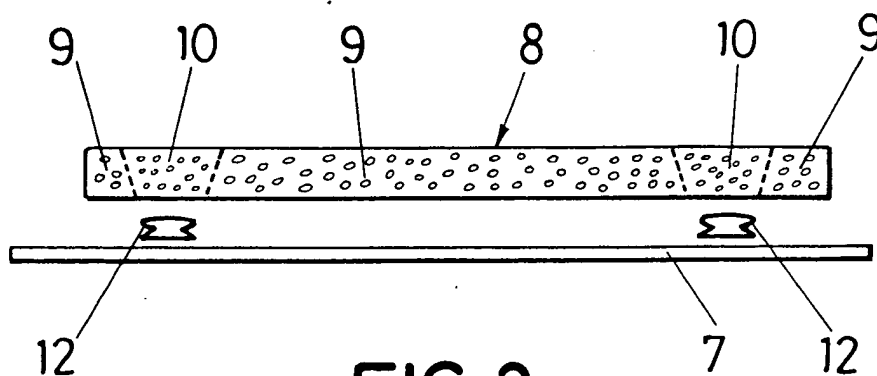


FIG.3

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Description

Object of the invention

[0001] The present invention refers to a device especially developed to print cardboard sheets, in particular corrugated cardboard sheets, and more specifically sheets with uneven edges resulting from the slitting operation.

[0002] The object of the invention is to achieve a complete printing of the surface of the cardboard sheet, in spite of the crushing that occurs on the edges of the sheet produced by the slitting both longitudinally (slitter) and laterally (transverse cutter) in the corrugator machine. The invention reduces trim on the cardboard sheet to a minimum and even eliminates it.

Background of the invention

[0003] Naturally the existence of scores in the cardboard sheets means that when the plate is mounted on the printing roller, the aforementioned scores are not printed or are printed inadequately as they are at a lower level than the rest of the surface of the sheet to be printed.

[0004] In order to solve this problem, one of the solutions consists in the following: firstly, obtain a sheet of flat cardboard, which neither has any marked lines nor simple, double or triple scores; introduce the cardboard sheet into a printing machine to print its surface; then introduce the cardboard sheet into a stamping machine, flatbed or rotary; and finally introduce the cardboard sheet into a machine to adhere it.

[0005] The cardboard sheet should have a larger raw material area, i.e. of corrugated cardboard, so it can be die-stamped afterwards, with a raw material trim. Also, the sheet should be slit in the stamping machine instead of in the corrugator machine. The means of obtaining these slits are considerably more expensive in a stamping machine than in a corrugator machine, with the resulting increase in costs in the whole process caused by this.

[0006] It is therefore more interesting in practice that the necessary longitudinal and cross-sectional slits are realised in the corrugator machine, which generates a continuous strip of corrugated cardboard. This results in corrugated cardboard sheets with the right dimensions to be able to obtain from each one of these, for example, one or more cardboard boxes. However, as previously stated, this solution gives rise to uneven edges on the cardboard sheets, with thickness decreasing markedly in these areas and edges therefore entering into contact with the plate during the subsequent printing of the cardboard.

[0007] So that the corrugated cardboard is already slit when it comes out of the corrugator machine and in order to solve problems outlined in the previous paragraph, two different solutions are currently being adopt-

ed:

[0008] One of these consists in having cardboard sheets with overlarge dimensions so they can be die-stamped afterwards, thereby obtaining perfect slits with no uneven material. This solution does however lead to a considerable loss of material as a result of such trimming and a rise in costs too.

[0009] The other solution consists in drastically reducing the speed of printing in order to cover the edges properly. However, this limits production speed and has a negative effect on the output of the equipment.

Description of the invention

[0010] The printing device the invention proposes takes shape in the form of a plate with special characteristics, which satisfactorily solve the problems previously outlined, enabling the raw material to be fully exploited, i.e. the corrugated cardboard, assuring a complete printing and without having to reduce the speed of production, in fact increasing it if desired.

[0011] For such purposes, this plate starts out as a basic conventional plate structure with either polyester or mylar forming part of the base, commonly known as "subassembly," upon which a constituent metal sheet of the plate is mounted. This is made from a base of polymer resins with 24° Shore A real hardness, or lesser hardness, once the resin has polymerised or solidified. Central to the invention is the fact that between the base and the plate, specifically in the areas of the array where the cardboard sheet scores are, a supplement is established producing on the working surface of the plate a boss or protuberance that is able to penetrate the line or score of the cardboard thereby assuring its printing.

[0012] The aforementioned supplement may either have a rectangular, semicircular or polygonal section, or even double, so that in each case the uneven shape on the surface of the plate printing is suited to the type of groove or score found in the cardboard sheet.

[0013] Not only may the aforementioned supplements have different sections, single or multiple, but may also be in the form of cavities, solid masses or fillings with flexible materials such as wires or metal or non-metal malleable rods. The hardness of the constituent raw material of the plate, i.e. the photopolymer resins will be different in the areas where supplements are planned, i.e. lesser in those areas. This is to enable a better adaptation of the rollers that provide the plate with ink, as well as an adequate absorption of ink in various different areas so the subsequent printing is uniform across the whole surface of the cardboard.

[0014] This lesser hardness of the plate in the aforementioned supplement areas also guarantees that during the printing phase no damage is produced in the channel or score of the cardboard sheet thereby preventing the cardboard from losing any of its properties of resistance.

[0015] If, as a result of the slitting operation carried

out, the cross-sectional edges of the cardboard sheets also suffered loss of shape similar to that previously mentioned, then naturally the plate should also be equipped with similar supplements to the previous ones, in cross-sectional arrangement at the centre of the same.

[0016] In any case, the dimensions of the plate for printing should be sufficiently larger than the dimensions of the cardboard sheet in order to cater for the increase in space to be printed because of the loss of shape, which tends to be curved on the edges of the cardboard sheet.

Description of the drawings

[0017] To complement this description and in order to provide a better understanding of the characteristics of the invention, in line with a special example of its practical embodiment, a set of drawings with illustrative rather than limiting characteristics is enclosed as an integral part of this description:

- Figure 1 Shows a schematic illustration of a continuous strip of corrugated cardboard at the corrugator machine's outlet.
- Figure 2 Shows a profile of the continuous strip from the previous figure.
- Figure 3 Shows a schematic, exploded, cross-sectional, elevational view of a plate in accordance with the object of the invention in which different sectors corresponding to different levels of hardness of the constituent raw material are specified.
- Figure 4 Shows an illustration similar to the previous figure but in which the components of the plate appear duly assembled.
- Figure 5 Shows an illustration similar to figure 4 of a variant of the practical embodiment of the plate, with different types of supplements.

Preferred embodiment of the invention

[0018] Looking at the figures described, in particular figure 1, one can see how at the corrugator machine's outlet a continuous strip (1) of corrugated cardboard is produced. The machine provides longitudinal and marginal slits for the trimming of the continuous strip (1), specifically to eliminate from the same a narrow marginal strip (3), whose rim is usually imperfect as a result of the workings of the corrugator machine itself. On the continuous strip (1) there will be a plurality of longitudinal slits (4), as well as cross-sectional slits (5), as many formats as necessary, leading to the creation of the cardboard sheets (6) each used to obtain one or more corrugated cardboard boxes. With regard to those that need to be die-stamped the entire perimeter will need to be trimmed off as additional waste by a stamping machine, already added in when the measures of the sheet

were made.

[0019] The device or plate of the invention is structured, as is conventional, from a base (7) known as "mylar" or "subassembly," which constitutes the support of the plate (8) that will, after its inking, lead to the printing of the continuous strip (1) of cardboard.

[0020] Areas with different characteristics are established on this plate (8), in particular a main area (9) where for example real hardness is less than 24° Shore A and narrow strips (10) where the level of hardness is even less, with the peculiarity that these areas or strips (10) of lesser hardness are numerical and coincide from a positional point of view with the scores (2) and (5) of the continuous strip (1) of cardboard.

[0021] These strips of lesser hardness (10) are devised to generate linear and external protuberances (11) in the array of the plate, as can be seen in figures 4 and 5, and are intended to be attached to the bottom of the grooves or scores (2) and (5) in the continuous strip (1) of cardboard. In order to achieve this, supplements (12) are established in correlation with the strips (10) of lesser hardness between the mylar (7) and the plate (8). These supplements will give rise to unevenness in the adhesion between both elements as is also shown in figures (4) and (5).

[0022] These supplements (12) may take the shape shown in figure 3, a rectangular section as shown in figure 5, indicated by the reference (12') or a quadrangular, polygonal, semicircular, circular or any other type of section. In fact the supplement may be double as illustrated on the right-hand side of figure 5 and referenced with (13) etc.

[0023] All of this will depend on the type of graphics, type of support and type of corrugated cardboard to be printed. It will also be possible to add a supplement to the constituent raw material of the plate (8), for example those indicated with (14) and (15) in figure 5. Their morphology will also depend on the work that the plate in question has been designed for. These supplements (14, 15) may be levelled, circular, have cavities or fillings, comprised of flexible materials such as wires or metal or non-metal malleable rods. In any case, any one of these supplements, in combination or alone, will be used so that the plate can print the aforementioned curve or linear protuberance (11) in its area of adaptation to the sheet (6) in order to adjust to the unevenness produced in the latter during the slitting phase and so that a complete printing of the surface of the sheet (6) is guaranteed right up to the rim.

[0024] Therefore, a uniform printing is obtained on the whole box by means of just a single operation. This represents a significant gain and a quick printing is achieved since complicated processes currently being practised are avoided. A perfect printing is attained directly from the corrugator machine, which initially produced the scores in the box to be made up.

[0025] In comparison with conventional plates, the device of the invention has a series of advantages.

These advantages focus mainly on the following aspects:

- The printing goes right up to the edge of the cardboard sheet in contact with the printer and printing squashed or uneven edges by means of the longitudinal slit of the corrugator machine slitter.
- The same occurs with the lateral edges of the sheet, produced by the cross-sectional slit of the corrugator machine and/or pre-scored in the transformer.
- An optimum speed of printing and production is maintained.
- Trim is minimised and can be eliminated in cardboard sheets with the resulting maximum exploitation of the raw material that this entails.
- The cardboard's corrugation is not damaged.
- May reduce the weight in grams of the cardboard.

Claims

1. Printing device designed for scored cardboard sheets, specifically for the printing of corrugated cardboard sheets where the longitudinal and cross-sectional edges are uneven after the slitting of the both of these in the corrugator machine, a device planned with a polyester or similar type base (7) that supports a printing plate (8) through a base of photopolymer resins, **characterized in that** the aforementioned printing plate (8) incorporates, in correlation with the longitudinal scores (2) and cross-sectional ones (5) of the cardboard sheet (1), bands or strips (10) of lesser hardness than the rest (9) of the plate, in any case the hardness of various areas (9) and (10) of the plate being less than 24° Shore A, with this hardness depending on the characteristics of the paper, cardboard, the types of scores to be printed, the image and the design of the printing.
2. Printing device designed for scored cardboard sheets, as claimed in claim 1, **characterized in that** between the base (7) and the printing plate (8) in correlation with the aforementioned score lines (2) and (5) of the cardboard sheet (1), supplements (12), (12'), (13) of varying morphology are fixed as a result of unevenness (11) in the working surface of the plate (8), which is reliable and dimensionally adequate for an acceptable adaptation of the plate to the bottom of the uneven parts or scores produced in the cardboard sheet (1) during the previous slitting operation of the same.
3. Printing device designed for scored cardboard sheets, as claimed in the preceding claims, **characterized in that** the aforementioned supplements (12), (12'), (13) have a rectangular, semicircular, circular or polygonal section, adapted to the unevenness forecast in the corresponding marginal area of

the printing plate, these supplements (13) may also be double, laterally adjacent and with different degrees of distancing between them.

4. Printing device designed for scored cardboard sheets, as claimed in the preceding claims, **characterized in that** it also includes supplements (14), (15) established in the interior of the constituent raw material of the printing plate (8), these supplements may be flat (14), cylindrical (15), with cavities, solid masses, fillings with flexible materials such as wires or metal or non-metal malleable rods.

