Apparatus for Curved Laminating Booklet Labels on Self-Adhesive Web with Adjustable Curvature Radius

Abstract: Apparatus for curved laminating booklet labels on self adhesive web with adjustable curvature radius made of a device to insert label with more than one page (G), comprising a fixed roller (E) and a movable roller (H) where lamination of the booklet on a self adhesive base (A,B) is made on the top with an adhesive film (D) between fixed (E) and movable (H) rollers, and, further, comprising a device (Q) with an idler roller (R) located after fixed (E) and movable (H) rollers that during lamination idler roller (R) pushes the laminated web on the fixed roller (E) and binds it with a curvature angle corresponding to the curvature angle of the product on which the label will be applied where the idler roller (R) is rotating with cranks around an axis.
Apparatus for curved laminating booklet labels on self-adhesive web with adjustable curvature radius.

Summary

An apparatus suitable for the application of a pre-printed adhesive web of labels, composed of folded booklets of numerous pages, linked between themselves, by over-imposing and positioning them in correspondence with reference tags present on the webs and the successive lamination of an adhesive film of transparent plastic material with a curvature radius that can be regulated.

Fig.2.

Technical field of the invention

The present invention concerns an apparatus suitable for applying and fixing onto self-adhesive webs of folded booklets of numerous pages in such a way that they can successively be applied onto curved surfaces, ensuring that all the pages remain well spread between them, despite having diverse radii of curvature according to the thickness of the individual pages.

State of the Art

At present, this type of device is in use for applications onto flat surfaces. An example of an apparatus for the application of labels composed of numerous pages, suitable to be applied onto flat surfaces is EP0324764. One of the difficulties in the application of labels composed of numerous pages is that of generating the exact curvature of the booklets corresponding to that of the application onto the final product, before they are fixed onto the self-adhesive web by over-imposing the adhesive fixing film.

Advantages of the invention

The principal aim of the present invention is that of overcoming the difficulties present in the state of the art, pre-imposing the curvature of the booklets in a correspondent manner to that of the objects onto which they are successively applied.

Said principal aim is arrived at through an apparatus which is suitable for applying booklets composed of numerous pages onto a self-adhesive web by adhesive lamination with a radius of curvature that can be regulated, composed of an apparatus for inserting the booklets of numerous pages (G), of a fixed roller (E) and of a movable roller (H), in which the lamination of the booklet onto a self-adhesive base (A,B) is carried out on top by a self-adhesive film (D) between the fixed (E) and mobile (H) rollers, which also comprises a device (Q) with an idler roller (R), set after the fixed (E) and movable (H) rollers, and which pushes on the fixed roller (E), binding it with an angle of curvature corresponding to the angle of curvature of the product onto which the label will be applied, characterized by the fact that the neutral roller (R) is rotated around an axis by handles.
Another characteristic is given by the fact that the handles that sustain the roller are commanded by a driving gear on which the curvatures are indicated.

Another characteristic is given by the fact that the driving gear is constituted by a reducer with a helical wheel and a non-reversible endless screw, controlled by a hand-wheel for the manual control of the same, with a rotating shaft mounted on the slow output of the gear box reducer.

Another characteristic is given by the fact that the driving gear consists of an electric motor with an encoder, mounted on the rotating shaft, to determine the angle at which the cranks that sustain the roller must rotate.

The present invention contemporarily creates a method for applying labels composed of numerous pages onto a self-adhesive web by adhesive lamination with a curvature that can be regulated, in which the labels are laminated between a base web and a fixing web and in which, during the lamination, the web is curved with a radius of curvature equal to the same radius of curvature of the products onto which the labels will be applied.

Furthermore, at the end of the lamination, for each label, the length of the fixing web (L1) will be equal to the length of the base web (L2), increased by a length equal to the increase of the length of the most external layer due to the curvature and of two segments necessary to cover the edges of the label (L3, L4).

Other characteristics and advantages of the invention appear clear from the description included here of some methods of constructing the invention, given as non-limiting examples, in the figures 1, 2, 3 and 4a and 4b.

**Brief description of the figures**

Figure 1 represents a view in section of an apparatus suitable for the application of flat booklets (current state of the art) a flat booklet.

Figure 2 represents a view in section of an apparatus object of the present invention.

Figure 3 represents a second view of an apparatus object of the present invention.

Figure 4a represents a diagram of application of a booklet composed of numerous flat pages.

Figure 4b represents a diagram of application of a booklet composed of numerous pages with a curvature.

**Detailed description of a method of constructing the invention**
With reference to Fig.1, which represents a view in section of an apparatus for the application of flat booklets, the various elements that compose the apparatus are designated thus:

A - silicone covered base support  
B - base printing support  
C- applied booklet  
D - adhesive fixing film  
E- base web entrance roller, printed support plus silicone covered support  
F-device for reading (photocell) position reference  
G - booklet insertion device  
H - laminating device, adhesive film entrance  
M - adhesive film un-winder  
N - adhesive film control device  
P - adhesive film silicone support re-winder

The booklet (C) already applied to the self-adhesive base (A,B) can be seen, laminated on top with a fixing adhesive film (D), in this case the individual pages that compose the booklet (C) are all over-imposed in a parallel manner among themselves. It is evident that when they are applied to a product with a curvature, not all the booklets can have the corresponding curvature of the product.

With reference to Fig. 2, the booklet (C) can be seen, already applied to the self-adhesive base (A,B) and laminated on top with an adhesive fixing film (D), in this case starting from the self-adhesive base (A,B) the single pages that compose the booklet (C) have a progressive curvature proportional to their thickness and to the curvature impressed at the moment of lamination, said curvature corresponds to the same of the object to which the label will be applied.

With reference to Figs. 2 and 3 the various components that make up the whole mechanism can be seen:

A - silicone support base  
B-print support base  
C- applied booklet  
D - adhesive fixing film
E - is the fixed roller that supports and permits the entrance of the self-adhesive base web onto which the references for the positioning of the booklets are printed.

F - is the photocell that takes the position of the references and transmits them to the devices used to insert the booklets.

G - is the device that predisposes and inserts the booklets in the correct position with respect to the references present on the base web.

H - is the movable roller in a vertical sense, that permits the entrance and lamination of the adhesive film that has the function of binding the booklet to the self-adhesive base web.

M - is the pneumatic mandrel, provided with a braking device that can be regulated, onto which the unwinding bobbin of adhesive film is inserted and managed, said roller is placed on vertical guides that allow the same to vary its position according to the continuous variations of thickness between single base webs and base webs plus a booklet, such oscillation is controlled by two pneumatic pistons.

N - is the device which permits the regulation of both the tension of the adhesive film and the pressure that the laminating roller must exercise on the booklet during lamination.

P - is the pneumatic mandrel provided with a torque motor that can be regulated, having the function of re-winding the silicone support of the adhesive film.

Q - is the principal device (object of the invention) which, by manual control of the regulation, generates the curvature and the fixing of the booklet, interposed between the base web and the adhesive film. The device (Q) is composed of an idle roller (R) mounted on cranks which, rotating around the centre of the cranks, determines the curvature of the booklet on the fixed roller (E), and reproducing the same curvature as that of the object onto which it is desired to be applied. The mechanism of functioning can be composed of a reducer with a helical wheel and a non-reversible endless screw, controlled by a hand-wheel for manual control of the same, of a graduated index situated on the front to view the angle of working imposed, of a rotating mortised shaft on the slow exit of the reducer to which two levers are applied, at the extremities of which is fixed the idle roller. The mechanism of functioning can be controlled by an electric motor with an encoder mounted on the rotating shaft to determine the angle at which the handles that sustain the roller must rotate. Varying its position, the roller varies the curvature.

With reference to Fig.2, this particular type of label is composed of various parts where the first (A) is a web with a layer of anti-adhesive silicone spread on it, above it is placed a paper or plastic web (B), which is the printing support, on the lower part of which an adhesive layer is spread, which adheres to the lower, silicone part, while the references for the successive positioning of the booklets are printed on the upper part, these two layers forming the principal base support.
The device (G) indicated in Fig. 3 provides for correctly inserting and positioning the particulars denominated as booklets (C) in this phase, even if the final product is composed of two or more parallel lines of booklets they are bound between themselves in such a manner that they result as a single example.

After correct positioning, the web of adhesive film (D) is applied above the particular denominated as a booklet by the spreading roller (H).

In the phase of insertion, the curvature corresponding to the same as that of the product to which it must later be applied is imposed, said curvature is obtained by varying the angle of binding of the web and relative booklet on the roller (E) by the regulation and relative change of position of the device (Q).

Contemporarily with the phase of curvature, the web of adhesive film (D), applied above the booklet (C), furnishes the anchorage of the same onto the base web (A).

With reference to Fig. 4a, the base support (A,B), the booklet (C) and the laminated adhesive (D) are passed between a fixed steel roller (E) and a roller of rubber (H), the pressure of which is regulated by means of two pistons. The roller (H) can move against these pneumatic pistons in a vertical direction, to adapt itself to any thickness of the material. The laminate is fed by an overlying roller (H) and is applied onto the upper surface of the booklet (C).

Given that the booklet (C) exits the laminator in a horizontal way, the length of the laminate (D) applied \( L_1 = \text{the length of the booklet} \ L_2 + L_3 + L_4 \).

\( L_3 + L_4 \) being the length of laminate necessary to fix the upper part of the booklet to the base label, this will vary only marginally and according to the thickness of the booklet applied.

If this construction is applied to a round container, the laminate will be held to be too short because of the thickness of the booklet (C) and the difference in circumference between the label and the upper part of the booklet, and the extremities will detach themselves from the container, forming wings.

With reference to Fig. 4b, the base support (A,B), the booklet (C) and the adhesive laminate (D) are passed between a fixed steel roller (E) and a roller of rubber (H), the pressure of which is regulated by means of two pistons. The roller (H) can move against these pneumatic pistons in a vertical direction, to adapt itself to any thickness of the material. The laminate is inserted at the point of contact with the underlying roller (E) and is then applied onto the upper surface of the booklet.

Because the booklet is now tightly wound around the lower roller (E) of the laminator and is held in contact with the roller by the positioning of the mobile roller H), the laminate results as having a length \( L_1 = s \times 2\pi \chi + L_2 + L_3 + L_4 \).
Where \( s \) = coefficient of winding on the roller (E) of the base support, expressed in decimal form (for example, 90 degrees = 0.25 of the circumference of the roller).

Consequently, the length of laminate (D) is above the base label (A,B) in a manner that is directly proportional to the thickness of the booklet and also to the degrees of winding around the roller (E).

By regulating the position of the roller (R), the degree of winding can be imposed, to adapt it to a determined diameter of the container of the product.

If this label is applied to a round container the laminate is found to be of the correct length, resulting from a perfect wear-ability of the label, which is therefore applied perfectly to the container without undergoing any "stress".

The discovery, it should be noted, is not limited to the representation given by the tables, but may be perfected and modified by those skilled in the art, without, however, exceeding the limits of patent.

The present invention permits numerous advantages, and to overcome difficulties that could not have been overcome with the systems currently on sale.
Claims

1. Apparatus for curved laminating booklet labels on self adhesive web with adjustable curvature radius made of a device to insert label with more than one page (G), comprising a fixed roller (E) and a movable roller (H) where lamination of the booklet on a self adhesive base (A,B) is made on the top with an adhesive film (D) between fixed (E) and movable (H) rollers, and, further, comprising a device (Q) with an idler roller (R) located after fixed (E) and movable (H) rollers that during lamination idler roller (R) pushes the laminated web on the fixed roller (E) and binds it with a curvature angle corresponding to the curvature angle of the product on which the label will be applied characterized by the fact that the idler roller(R) is rotating with cranks around an axis.

2. Apparatus for curved laminating booklet labels on self adhesive web with adjustable curvature radius according to claim 1 characterized by the fact that the cranks that support the idler roller are commanded by a driving mechanism on which curvatures are indicated.

3. Apparatus for curved laminating booklet labels on self adhesive web with adjustable curvature radius according to claim 2 characterized by the fact that the driving mechanism is made of a gear box reducer with a non reversible helical gear wheel and an endless worm driven by a handwheel, with a graded scale located on the front to visualize the selected working angle, with a
rotating shaft mounted on the slow output of the gear box reducer.

4. Apparatus for curved laminating booklet labels on self adhesive web with adjustable curvature radius according to claim 2 characterized by the fact that the driving mechanism is made of an electric motor with an encoder mounted on the rotating shaft in order to determine the angle of which the cranks that support the idler roller must rotate.
Fig. 4a

\[ L_1 = L_2 + L_3 + L_4 \]

Fig. 4b

\[ L_1 = s \times 2\pi r + L_2 + L_3 + L_4 \]
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. B65C1/02 B31D1/02

ADD.

According to International Patent Classification (IPC) into both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

B31D B65C G09F G08B

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 practicable, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C.

See patent family annex.

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is taken alone

"Z" document member of the same patent family

Date of the actual completion of the international search

1 July 2013

Date of mailing of the international search report

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Form PCT/ISA210 (second sheet) [April 2005]
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