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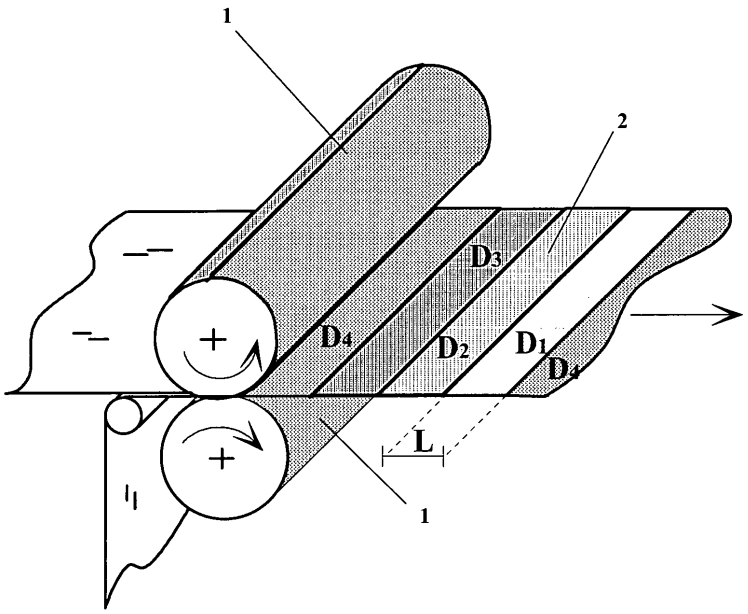
(54) **Embossing roller with multiple sequence of designs**

(57) The present invention concerns an embossing cylindrical roller 1 comprising a plurality of micro-protuberances distributed in correspondence of its outer cylindrical surface and destined in use to emboss a paper tape 2. In accordance with the present invention the roller 1 has a circumference which length **C** is a multiple of the cut off length **L** of said tape. This means that the overall length **C** of the circumference is equal to the product between an integer number **N** and the length **L** of cut off, **C**=**N**x**L**. The integer number is equal or higher to 2.

In this manner the circumference can be subdivided in a number of sectors **Cn** that coincides with said multiple number **N** and in which each sector comprises said pluralities of micro-protuberances distributed on its surface so as to define on each one of said sectors a specific design **Dn.**

According to this configuration of the roller, in correspondence of each complete rotation of the roller this cyclically imprints the tape according to the sequence corresponding to the designs **Dn** provided on it, each of which is destined to be printed inside an area of the tape delimited by said cut off length **L.**

Fig. 9



EP 2 277 690 A1

Description

Technical Field

[0001] The present invention refers to the technical field of machinery for the production of paper and similar products. In particular it refers to an innovative embossing roller suitable to emboss sheets with different designs in sequence.

[0002] It is also described here the relative product obtained.

Background Art

[0003] Varied types of machinery have long been known for the production of paper in general and in particular for the production of interfolded tissues, such as the "facial tissues" and the so-called "hand towels", or for the production of industrial rolls.

[0004] Most of such products is often constituted of different plies of paper overlapped one on top of the other so as to give consistence and thickness to the finished product. With the aim of attaching the plies among them in an overlapped manner, an embossing only process is therefore generally carried out (generally used for delicate paper destined in use for face drying and care) or embossing/gluing (generally used for tougher paper intended to be used for hand drying).

[0005] As it is well known, the embossing is realized by means of a pair of opposed rollers provided with micro-protuberances or incisions perfectly complementary among them and that reproduce a certain design. In such a manner, the continuous plies of paper, passing through the pair of rollers during all the production cycle, are therefore imprinted, thus remaining closely attached among them thanks to the punching action of the micro-protuberances that penetrate among the plies attaching one to the other closely. The ply coming out of the rollers is therefore a single continuous paper tape that plots the design of the embossing.

[0006] As it is well known, the paper tape coming out from the embossing section then goes into a specific machinery, such as an interfolding machine or a rewinder machine, with the aim of realizing the finished product.

[0007] Independently from the fact that an embossing phase or a combination of embossing and gluing phase is used, the existing embossing rollers are anyway configured so as to imprint the paper tape in a continuous manner but tracing out always the same design within an area of the paper tape delimited by the "cut off" length or rather cut length or perforation length of the paper tape. In such a way, when the product is finished, all panels that constitute, for example, a kitchen roll or indifferently a facial tissue or hand towel will always reproduce the same design.

[0008] It is therefore evident how the present technology significantly limits the possibility of technically realizing decorations of different embossing, for example according to a specific ordered sequence, on the same panels constituting a finished product and destined for the market (for example the roll or the paper towel case). Considering the present state of things, in such a manner it becomes difficult to be able to propose in the market products that can distinguish themselves from so many others in order to motivate and induce consumers to purchase them.

Disclosure of invention

[0009] It is therefore the aim of the present invention to provide a new type of embossing roller that allows to overcome the above mentioned inconveniences.

[0010] It is therefore the aim of the present invention to provide a new embossing roller that allows to imprint a paper tape, single-ply or multiple-ply, so that for each pre-established sequence of sheets each sheet of the sequence reproduces a specific embossing design.

[0011] These and other aims are reached with the present cylindrical embossing roller (1) comprising a plurality of micro-protuberances distributed in correspondence of its outer cylindrical surface and destined in use to emboss a paper tape (2). In accordance with the present invention the roller (1) has an outer circumference which length **C** is a multiple of the cut off length **L** of the tape. In such a manner, it is therefore possible to sub-divide the length of the circumference in a number of sectors **Cn** that coincides with the multiple number **N** and in which each sector comprises its own specific pluralities of micro-protuberances distributed on its surface so as to define on each one of them a specific design **Dn.** Thus, in correspondence of each complete rotation of the roller, the roller cyclically imprints the tape according to a sequence corresponding to the designs **Dn,** each of which is destined to be printed within an area of the tape delimited by the cut off length **L.**

[0012] In accordance with such constructive solution, therefore, the paper tape is cyclically imprinted with different designs which, if the phase of the roller and the tape cut off are duly regulated, will rest within each single panel. The result will be therefore that of a product cyclically reproducing panels with different embossing ornaments.

[0013] Advantageously, the embossing roller (3) can be coupled in use to a complementary embossing roller and configured to be installed in such a manner in correspondence of an embossing section relative to an interfolding machine.

[0014] In such a case, an interfolded single-ply or multiple-ply product is obtained, simply embossed.

[0015] Alternatively, the embossing roller can be coupled in use with a complementary embossing roller and configured to be installed in use in an embossing section relative to a rewinder machine.

[0016] Without moving apart from the present inventive concept, the embossing roller (3) can also be coupled in use with a complementary rubber roller and configured

to be installed in an embossing/gluing section of an interfolding machine or in a rewinder machine.

[0017] Advantageously, the roller comprises rotation means to allow the connection of same in a rotating manner to a specific support of the embossing or embossing/gluing section.

[0018] Motorized means to rotate said one or two coupled rollers continuously at a predetermined programmable embossing speed are further provided, for example an electrical motor.

[0019] Furthermore means for approaching/spacing reciprocally the two coupled rollers are provided, so that the passage gap for the tape can be regulated. This means can be for example of the hydraulic or mechanic type.

[0020] It is further described here a paper towel kit for hygiene purposes comprising a case (4) and a plurality of sheets (5) of embossed or embossed/glued type, wherein said sheets are prearranged piled up inside said case so that they can be taken out individually and characterized by the fact that the sheets reproduce in a cyclic manner an embossing sequence of designs **Dn** obtained with at least one roller in accordance with what has been described.

[0021] Advantageously the designs **Dn** of the sequence are different one from the other.

[0022] Advantageously, the sheets are sheets of interleaved "facial" type.

[0023] Advantageously, each one of said sheets is constituted of at least two plies embossed and sized between them.

Brief description of the drawings

[0024] Further features and advantages of the present embossing roller, according to the invention, will be clearer with the description of one of its embodiments that follows, made to illustrate but not limit, with reference to the annexed drawings, in which:

- Figure 1 and figure 2 represent an embossing roller and a relative embossing section according to the prior art.
- Figures from 3 to 5 represent the products obtained according to an embossing phase with embossing rollers as per the prior art.
- Figure 6 represents an embossing roller in accordance with the present invention.
- Figure 7 represents a frontal view of the embossing roller in accordance with the present invention in which four different circular sectors Cn are shown.
- Figure 8 represents a plan development of said circular sectors and an axonometric view of the embossing roller in accordance with the present invention.
- Figure 9 represents an embossing phase of a paper tape in accordance with the present invention.
- Figures 10 and 11 represent a facial product embossed and glued in accordance with the rollers as per the present invention.

Description of a preferred embodiment

[0025] With reference to figure 1, an embossing roller 3 is schematized according to the prior art. Figure 2, for clarity purposes, indicates two rollers coupled in an embossing section so as to create a passage gap between them through which two or more plies of paper are joined in a single tape 2 coming out. The tape has a transversal length **H** substantially equal to the comprehensive length of the embossing rollers so that these can emboss the entire area of tape during its passage in the advancement direction according to the arrow indicated in the figure.

[0026] Figure 3 represents an embossed tape 2 with the aim of evidencing a plurality of "cut off" lengths **L,** all equally distanced among them longitudinally along the entire length of the tape. As it is well known from the prior art, the cut off line is a transversal clear cut line or a transversal line comprising a plurality of perforations depending on the product that the tape will constitute.

[0027] In particular, when the tape coming out of the embossing section enters a rewinder machine, this is provided with perforating rollers so as to perforate transversally at pre-defined intervals of length **L** all the width **H** of the tape as this is reeled around a carton core. Successively, the log produced is cut in appropriate cut section in kitchen rolls or the like to be then launched to the market. The roll is therefore constituted of paper of a pre-established measurement reeled around the core and provided with said tear off lines at a pre-established distance **L** distanced one from the other so that the final user can from time to time tear off a panel, or sheet, from the reeled tape.

[0028] Likewise, the tape coming out of the embossing section can go inside an interfolding machine in general. In such a case, as represented in figure 4, the cut off represents a clear cut line. The tape fed within the machine is cut in panels of comprehensive length L and then interfolded according to known forms (for example, V or Z forms). Figure 5 represents the final log of interfolded product which is then size cut (length **T** of figure 5) in an appropriate gang-saw machine to be then packaged in appropriate cases.

[0029] In accordance with the present invention, therefore, as represented in figure 6, an embossing roller 1 is provided with a circumference profile **C** which comprehensive length is pre-established so as to result a multiple **N** of the cut off **L** of the product to be made, or **C=NxL.** By multiple it is intended, in this case, any positive integer number higher or equal to 2. In particular, figure 6 represents, absolutely in a non limiting manner, a plan development of such circumference with the aim of comparing its length **C** with a paper tape 2 reproducing the cut off length **L** of the product to be made. The example chosen indicates a circumference **C** which length is four times that of the cut off of the product. Naturally, different

multiples of four can be used without moving apart from the present inventive concept. During a complete rotation of the roller, therefore, this will imprint a length of tape that coincides with four times the length of cut off, or rather **4L.**

[0030] As described in the successive figure 7, therefore, the embossing roller (only in the case of a circumference **C** four times long the cut off **L)** is realized in such a way that it is provided with four corresponding circular sectors C_1, C_2, C_3 and C_4, all of them of equal length among them and therefore that substantially coincide with the cut off length **L.** As represented in figure 8, each sector is therefore provided with a plurality of micro-protuberances such as to define, for each sector, a different design **Dn.** For that purpose, always figure 8 details a plan development of the circumference **C** of comprehensive length that coincides in this case with **4xL,** so as to mark with different background colours the four different designs D_1, D_2, D_3, and D_4 defined by the embossing micro-protuberances. Figure 8 also represents a perspective view of such roller. It is naturally evident how any number **N** of sectors **Cn** can be realized depending on the length **C** of circumference, along with combinations of embossing designs practically infinite, without moving apart from the present inventive concept.

[0031] Figure 9 represents an example of functioning of a roller with four sectors, even if, as already stated, any number of sectors can be chosen. The figure therefore shows the passage of the paper tape 2 between the rollers 1 and the consequent imprint of same, realizing an equivalent sequence of designs from D_1 to D_4 on the tape each of which is printed within the area of cut off. The figure naturally shows the cyclic nature of the designs reproduced on the tape. By realizing, therefore, a passage of paper between the rollers duly in phase with the sectors and the cut off and further selecting the cut off **L** so that it results equivalent to the length of each sector **Cn** that constitute the outer circumference **C** of the roller, panels reproducing the sequence of different designs **Dn** of the roller will be realized.

[0032] Figure 10 represents the case of an interfolded product of "facial" type embossed and in this case also glued in accordance with the present invention. In such a case, a case 4 contains the interfolded sheets 5 according to a sequence 6, 7 and 8 which reproduces the relative sequence of designs D_1, D_2 and D_3 of the sectors present on the embossing roller. Once more, it is evident how the example of the product has been described considering an embossing section comprising in this case embossing rollers with three different sections, even if a different number of sections can be used without moving apart from the present invention.

Claims

1. An embossing cylindrical roller (1) comprising a plurality of micro-protuberances distributed in correspondence of its outer cylindrical surface and destined in use to emboss a paper tape (2) and **characterized by the fact that** said roller (1) has a circumference which length **C** is a multiple of the cut off length **L** of said tape, said circumference being subdivided in a number of sectors **Cn** that coincides with the multiple number **N** and in which each sector comprises said pluralities of micro-protuberances distributed on its surface so as to define on each one of said sectors a specific design **Dn** so that, in correspondence of each complete rotation of the roller said roller cyclically imprints the tape according to a sequence corresponding to the designs **Dn,** each of which is destined to be printed inside an area of the tape delimited by said cut off length **L.**

2. An embossing cylindrical roller (1), according to claim 1, where said embossing roller (3) is coupled in use to a complementary embossing roller and configured to be installed in an embossing section of an interfolding machine.

3. An embossing cylindrical roller (1), according to claim 1, where said embossing roller is coupled in use to a complementary embossing roller and configured to be installed in use in an embossing section of a rewinder machine.

4. An embossing cylindrical roller (1), according to claim 1, where said embossing roller (3) is coupled in use to a complementary rubber roller and configured to be installed in an embossing/gluing section of an interfolding machine.

5. An embossing cylindrical roller (1), according to claim 1, where said embossing roller is coupled in use to a complementary rubber roller and configured to be installed in an embossing/gluing section of a rewinder machine.

6. An embossing cylindrical roller (1), according to one or more claims from 1 to 5, where said roller comprises rotation means to allow its connection in a rotating manner to a specific support of said embossing or embossing/gluing section.

7. An embossing cylindrical roller (1), where motorized means for rotating same continuously at a predetermined programmable embossing speed are provided.

8. A paper towel kit for hygiene purposes comprising a case (4) and a plurality of sheets (5) of the embossed or embossed/glued type and wherein are pre-arranged piled up inside said case so that they can be taken out individually and **characterized by the fact that** said sheets reproduce in a cyclic manner a sequence of designs **Dn** with at least one roller in ac-

cordance with one or more of the preceding claims.

9. A paper towel kit, according to claim 8, wherein said designs **Dn** of the sequence are different one from the other.

10. A paper towel kit for hygiene purposes, according to claim 8 or 9, where said sheets are sheets of "facial" type interfolded.

11. A paper towel kit for hygiene purposes, according to claim 10, where each one of said sheets is constituted of at least two plies embossed and glued one to the other.

Fig. 1

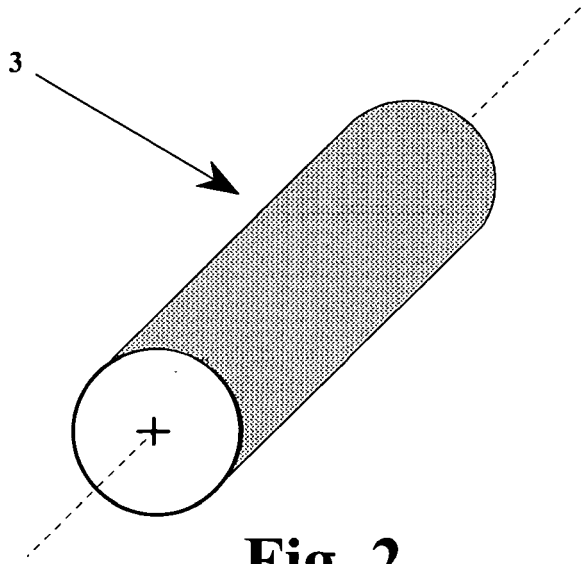


Fig. 2

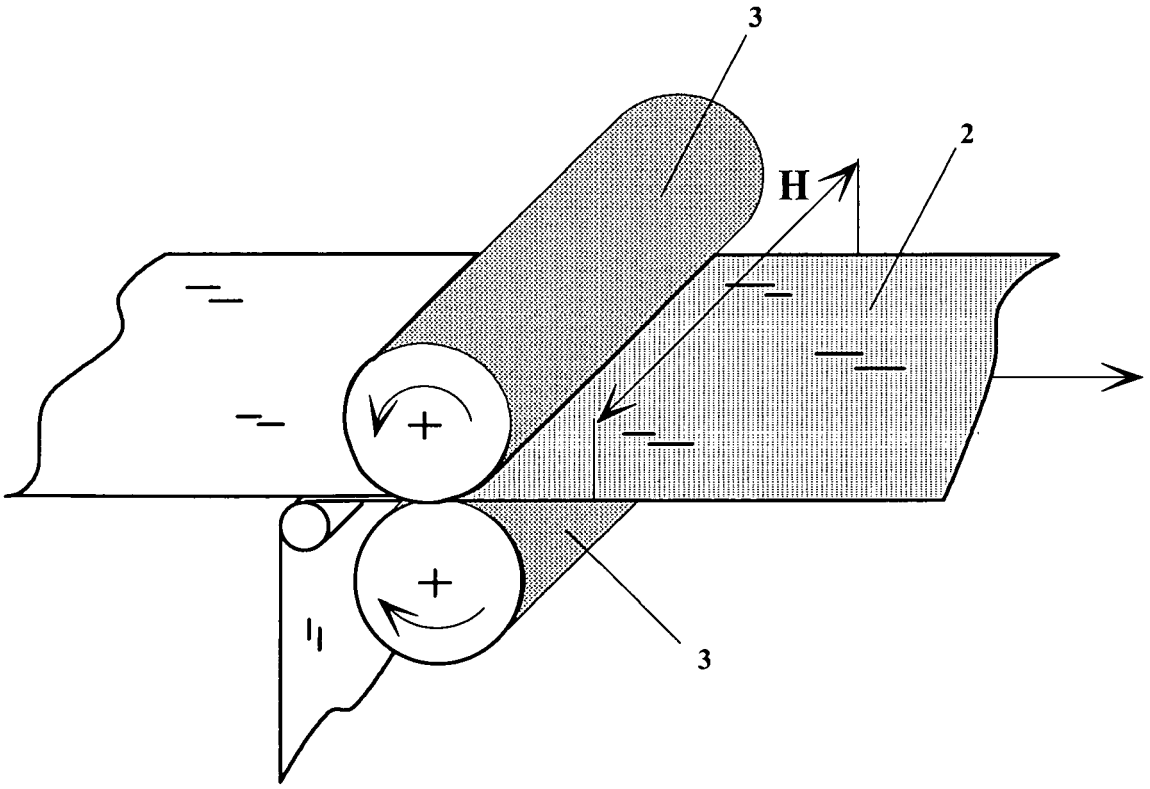


Fig. 3

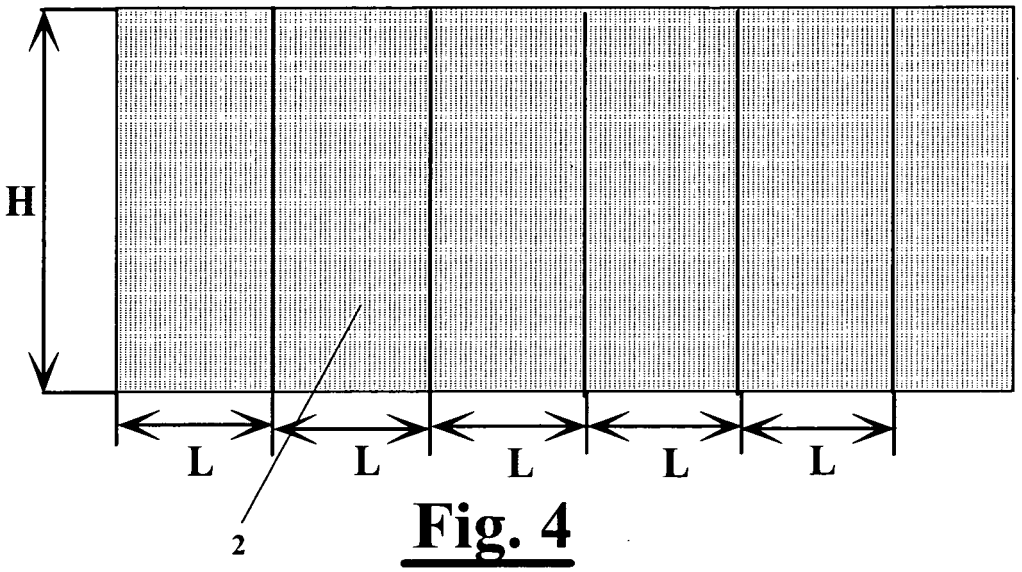


Fig. 4

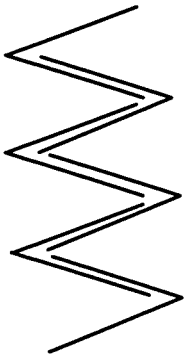


Fig. 5

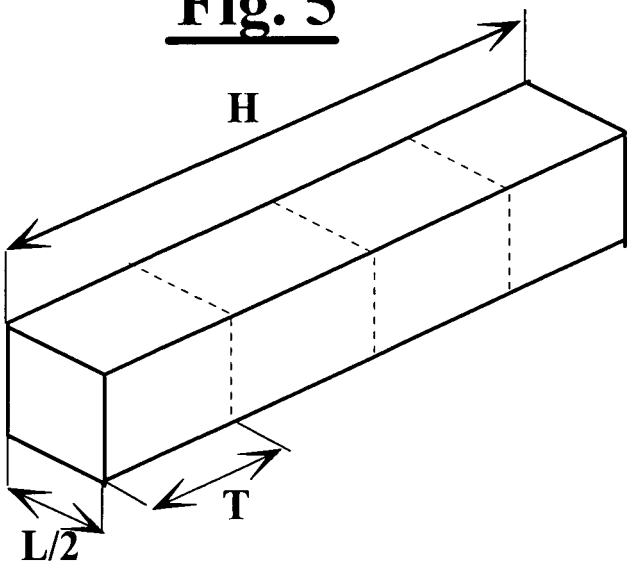


Fig. 6

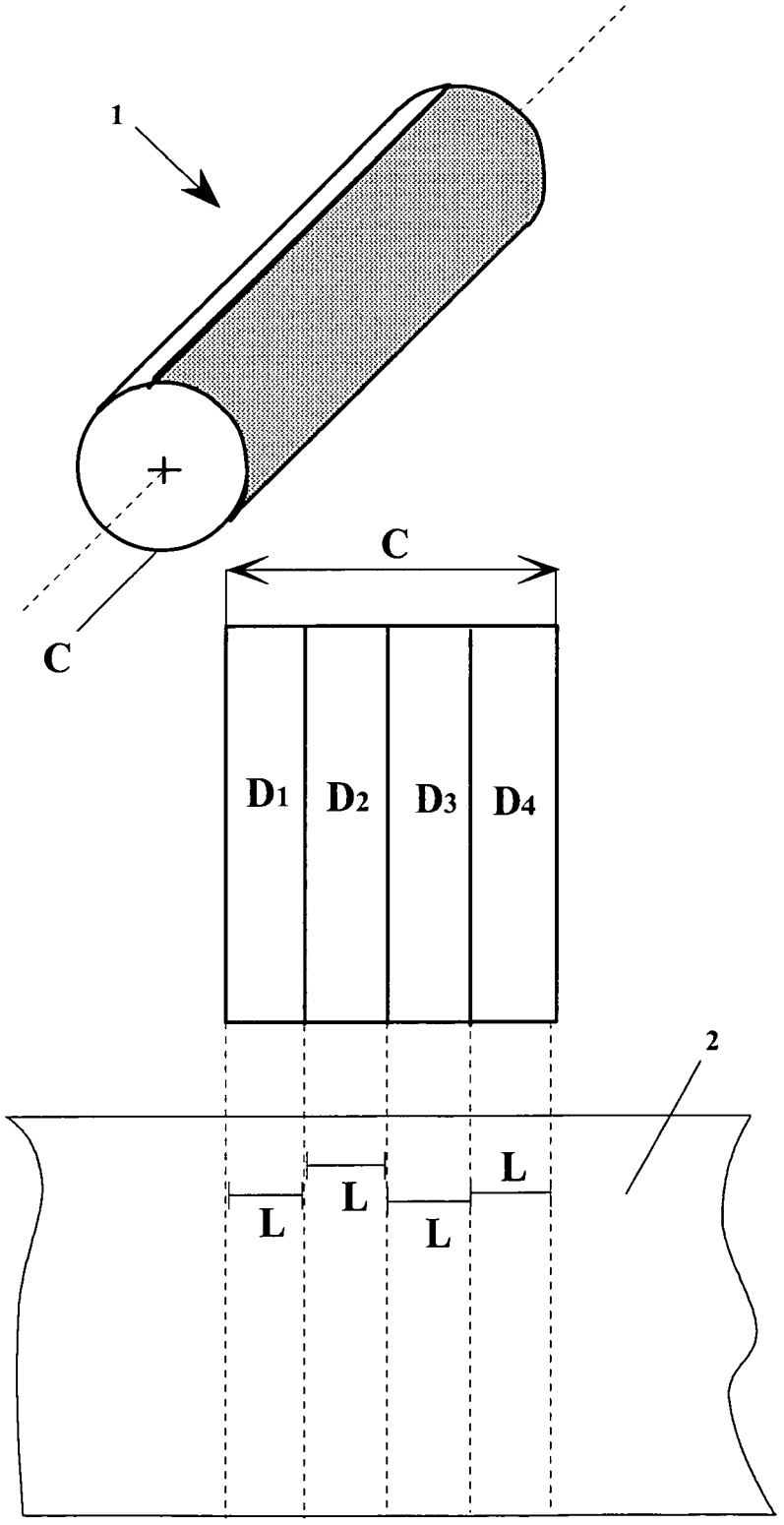


Fig. 7

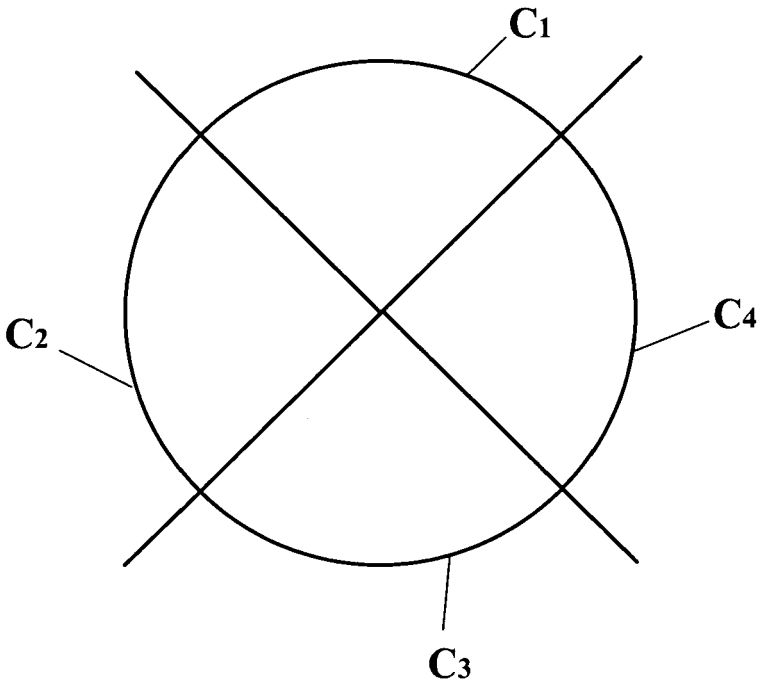


Fig. 8

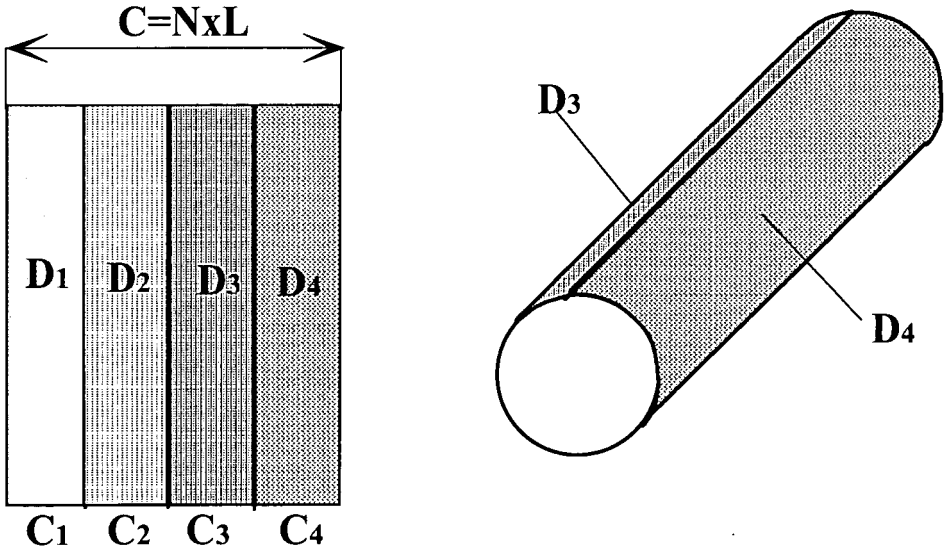


Fig. 9

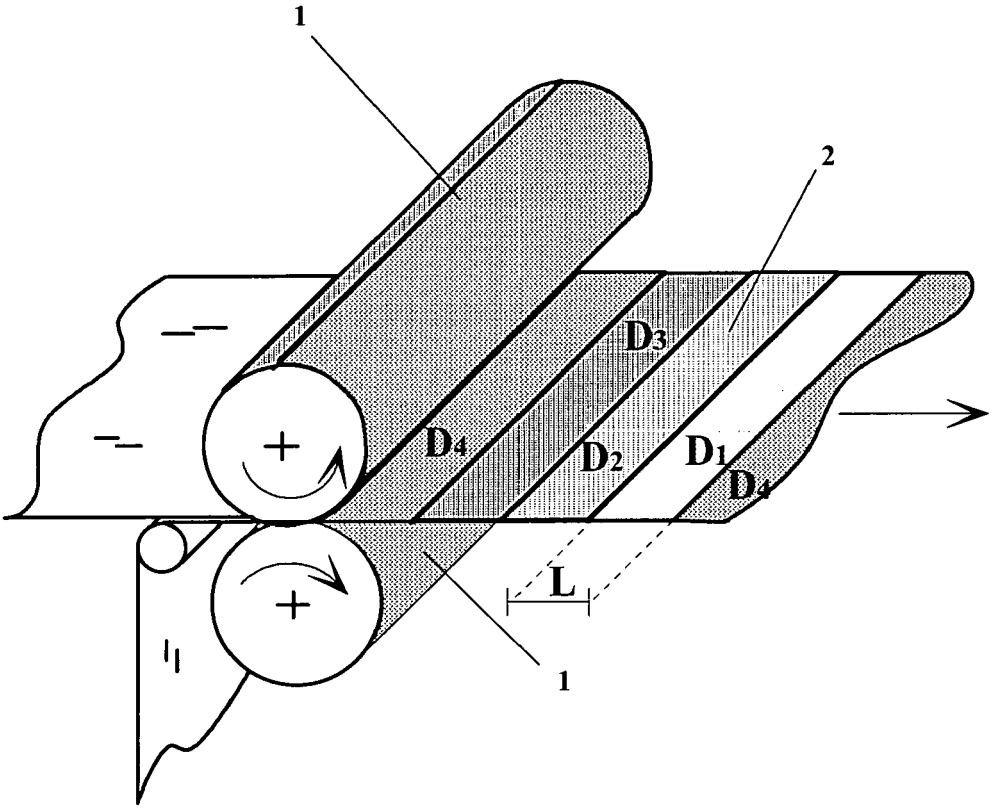


Fig. 10

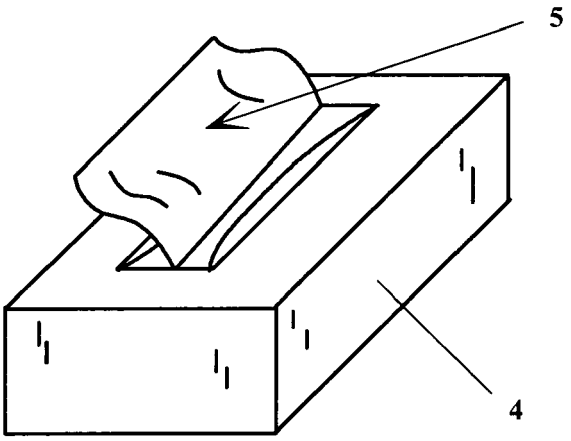
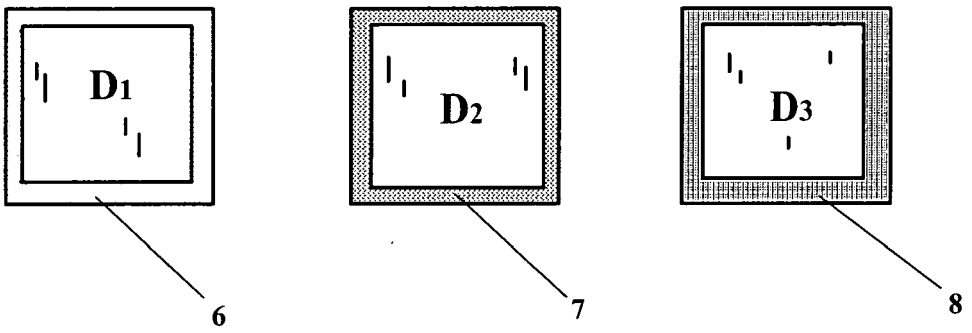


Fig. 11



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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5298

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 970 193 A2 (PERINI FABIO SPA [IT]) 17 September 2008 (2008-09-17) * paragraphs [0025], [0029], [0030]; claims 23,26; figures 14-17 *	1-7	INV. B31F1/07
X	WO 2006/092817 A1 (PERINI FABIO SPA [IT]; GELLI MAURO [IT]) 8 September 2006 (2006-09-08) * paragraphs [0049], [0052], [0059], [0061], [0063]; figures 1-4 *	1-7	
X	WO 2008/122589 A1 (BRITISH AMERICAN TOBACCO CO [GB]; IMP TOBACCO CANADA LTD [CA]; CODERRE) 16 October 2008 (2008-10-16) * paragraphs [0008], [0031], [0033], [0042]; claim 1; figures 3-7 *	1-7	
X	US 2004/003521 A1 (PENN DANIEL JOEL [US] ET AL) 8 January 2004 (2004-01-08) * paragraphs [0028], [0039], [0052]; claims 7-9; figures 4,6-8 *	8-11	TECHNICAL FIELDS SEARCHED (IPC) B31F
X	US 2007/045334 A1 (SHERMAN CRYSTAL E [US] ET AL) 1 March 2007 (2007-03-01) * paragraphs [0041], [0042], [0048], [0050], [0062]; figures 1,8,9 *	8-11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 May 2010	Sundqvist, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 09 42 5298

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 09 42 5298

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7

   Embossing roller.

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2. claims: 8-11

   Paper towel kit.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 42 5298

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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04-05-2010

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