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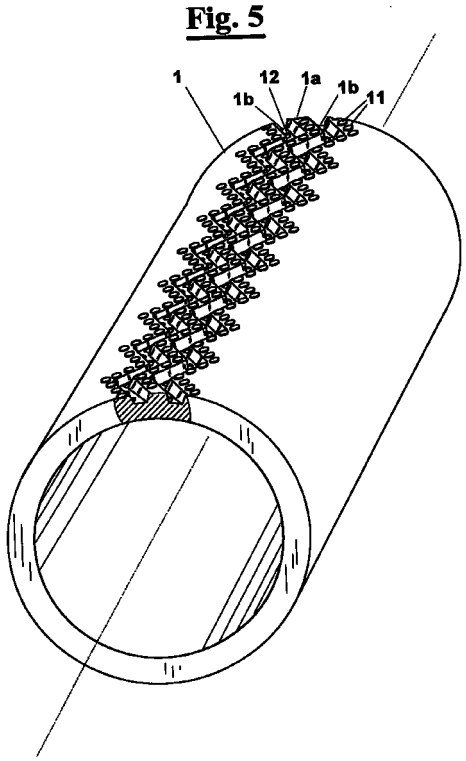
(54) Paper embossing method, embossing rollers therefor, and embossed paper obtained

(57) A paper embossing method of a single or multiple web of paper, non woven fabric and similar material, such as for example, but not exclusively, for the production of rolls of all purpose paper, toilet paper, industrial rolls and the like, wherein by the passage of said paper between an embossing roller and a pressure roller said embossing roller embosses thereon a succession of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave. An embossing roller (1 or 2) and an embossed paper with protrusions and recesses (1a and 1b or 2a,2b) have a succession of crests and grooves arranged like a wave. In particular, the wave has substantially sinusoidal shape. An embossed paper obtained by said roller.

Fig. 5



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Description

Field of the invention

[0001] The present invention relates to the field of the paper converting machines and, more precisely, it relates to a paper embossing method of a single or multiple web of paper, non woven fabric and similar material, such as for example, but not exclusively, for the production of rolls of all purpose paper, toilet paper, industrial rolls and the like.

[0002] Furthermore, the invention relates to a particular shape of embossing rollers, i.e. rollers used in embossing machines that carry out this method.

[0003] Finally, the invention relates to the embossed paper thus obtained.

Description of the prior art

[0004] Embossing machines are known comprising embossing rollers each of which has a plurality of rows of protrusions and recesses. On each embossing roller with a calendering function a pressure roller engages normally yielding and coated with rubberised material, suitable for pushing the web of paper against said protrusions and recesses. This way surface of paper is given a not smooth profile, with a succession of protrusions and recesses that substantially copy the surface of the embossing roller. The smooth paper is thus converted into embossed paper, which can maintain its shape up to the final utilisation.

[0005] An embossing machine can comprise, in particular, two embossing rollers combined with two pressure rollers. Between each couple of embossing roller / pressure roller a corresponding web of paper passes through that matches the other web of paper at the contact line between the two embossing rollers. Previously, one of the two webs of paper has been advantageously moistened with glue so that the two webs stick to each other.

[0006] Normally, the protrusions and recesses of the embossing rollers are arranged according to rows which are parallel or slightly oblique with respect to the generating lines of the cylindrical surfaces of the rollers same. This allows to obtain different embossing patterns affecting the shape, the distances and the mutual position of the protrusions and of the recesses.

[0007] The succession as such of protrusions and recesses, however, does not provide to the paper an appropriate longitudinal or transversal elasticity, but it only increases the surface of contact and improves its strength and absorbing properties.

[0008] It is object of the present invention to provide a paper embossing method which, besides delivering to the paper appropriate strength and absorbing properties, gives the paper improved longitudinal and transversal elasticity.

[0009] It is another object of the present invention to provide an embossing roller that carries out this method.

[0010] It is a further object of the present invention to provide an embossed paper web that has a high longitudinal and transversal elasticity.

Summary of the invention

[0011] These and other objects are achieved by the method according to the present invention for embossing at least a web of paper and similar material, whose characteristic is that it comprises the steps of:

- conveying the web through an embossing roller and a pressure roller;
- embossing by means of the embossing roller a succession of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave.

[0012] Preferably, the protrusions and the recesses are arranged according to respective waves that extend parallel to the axis of the embossing roller.

[0013] In a preferred embodiment, the steps are provided of:

- conveying a first web of paper through a first embossing roller and a first pressure roller, on the first web being thus embossed a succession of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave;
- conveying a second web of paper through a second embossing roller and a second pressure roller, on the second web a succession being embossed of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave;
- conveying contemporaneously the first and the second web of paper between the first and second embossing roller, creating a doubled web of paper.

[0014] Preferably, the protrusions and recesses are arranged according to respective sinusoidal parallel waves.

[0015] Always preferably, the first and/or second web of paper are moistened with water or glue before passing through said first and second embossing roller.

[0016] According to another aspect of the invention, an embossing roller comprises on its surface a succession of a plurality of protrusions arranged like a wave and a plurality of recesses arranged like a wave.

[0017] In a preferred embodiment the protrusions and recesses are respectively grooves and crests arranged like a continuos wave on the cylindrical surface of the roller. The grooves have tapered walls and have on their bottom a plurality of circular shallow recesses. The crests have tapered shape and have on

the tip a plurality of substantially circular buttons. The shape of the buttons and of the recesses can be varied without departing from the scope of the invention. The successive waves of protrusions and recesses are preferably sinusoidal and parallel to one another. In particular, but not exclusively, they are parallel to the generating lines of the cylindrical roller.

[0018] According to a further physical aspect of the invention, a web of embossed paper has a succession of a plurality of protrusions arranged like a wave and a plurality of recesses arranged like a wave. Such protrusions and recesses have preferably sinusoidal shape and have respectively a crest with slightly raised circular buttons and a bottom with circular shallow recesses.

Brief description of the drawings

[0019] Further characteristics and advantages of the embossing method, of the embossing roller and of the embossed web according to the present invention will be made clearer with the following description of an embodiment thereof, exemplifying but not limitative, with reference to the attached drawings wherein:

- figure 1 shows a diagrammatical sectional transversal view of the embossing steps in a double web embossing machine;
- figure 2 is a cross sectional partial view of the matching step between the embossing rollers ;
- figure 3 shows a diagrammatical sectional transversal view of the embossing steps in an single web embossing machine;
- figure 4 shows a partially enlarged top plan view of an embossing roller according to the invention;
- figure 4a shows a partial cross sectional view of the embossing roller of figure 4, taken according to arrows IV-IV;
- figure 5 shows a perspective view of a portion of embossing roller, not necessarily a scale drawing, with partial view of the succession of protrusions and recesses arranged like a wave;
- figure 6 shows an enlarged impression on a plane of the protrusions of a portion of embossed paper according to the invention;
- figure 7 shows a top plan view of a portion of paper embossed with the method according to the invention;
- figures 8A and 8B show a cross sectional view of a portion of embossed paper according to the invention, in figure 8B the stretched paper being indicated with a dotted line.

Description of the preferred embodiments

[0020] With reference to figure 1, an embossing machine that carries out the method according to the present invention comprises a first and a second embossing roller, indicated with numerals 1 and 2, with axes parallel and touching each other (figure 2). In combination with embossing rollers 1 and 2, pressure rollers 3 and 4 are respectively provided having for example rubberised surface and suitable for pressing webs of paper 5 and 6, coming from separate directions, against embossing rollers 1 and 2.

[0021] The two webs 5 and 6, actually, are deformed by the calendering action of pressure rollers 3 and 4 against rollers 1 and 2, and are then coupled at 7, after that web 5 touched a gluing roller 8, creating thus a doubled embossed web 9. Deviating rollers 10 are provided upstream and downstream of point 7 for assuring to webs 5 and 6 and to doubled web 9 a correct trajectory and stretch.

[0022] With reference to figure 2, the region of contact between rollers 1 and 2 couples webs 5 and 6 through matching protrusions and recesses 1a and 1b of first embossing roller 1 with recesses and protrusions 2b and 2a of second embossing roller 2, respectively. According to the thickness of the final embossed paper it is possible an actual meshing of the protrusions and recesses (figure 2). Alternatively, it is possible a tip-to-tip coupling (not shown) of protrusions 1a and 2a against each other.

[0023] In other words, in case of embossing a doubled web, the paper can be embossed according to different techniques, for example tip-to-tip embossing type or different type. In the first case the embossing is carried out so that the depressions on both webs match to one another, whereas in the other case the depressions on both webs are opposed to one another.

[0024] As shown in figure 3, it is also possible to emboss a web 5, single or multiple, by means of its passage through a simple duo embossing roller 1 / pressure roller 3, without a further embossing step.

[0025] According to the present invention, as shown in figures 4, 4A and 5, protrusions and recesses 1a and 1b (or 2a, 2b) of embossing roller 1 (or 2) are shown as a succession of crests and grooves arranged like a wave. In particular, the wave has substantially sinusoidal shape.

[0026] As shown in said figure, from crests 1a of embossing roller 1 circular buttons 11 protrude that are arranged like a wave. Similarly, in grooves 1b circular shallow recesses 12 are made that are also arranged like a wave. Instead of a circular shape other geometric shapes can be provided for by the designers.

[0027] Buttons 11 and circular recesses 12 allow a correct embossing, giving to paper 5 a larger surface and then improving its absorbing function. In a possible embodiment, for example, the pitch between two successive wave crests is 4 mm, the distance between two buttons or circular recesses of a same wave is 2 mm and every button or circular recess has diameter 1 mm.

[0028] This allows to obtain an embossed paper whose impression seen from below is shown in figure 6. Every circle 15 is embossed by buttons 11. The profile of the protrusions and of the recesses, as well as the

embossing caused by to the circular recesses 12, is not shown. Owing to the symmetry of embossing roller 1, figure 6 represents also the circular recesses 12 of the embossed paper seen from the above.

[0029] In figure 7, instead of the impression of the paper, a top plan view of the embossed paper is shown. Both the impressions 15 of buttons 11 and the impressions 16 of recesses 12 are shown. Furthermore lines 18 of the edges made on paper 5 by crests 1a and by the grooves 1b are shown.

[0030] The profile of the paper, instead, is shown in figure 8A. More precisely, the impressions 15 of buttons 11 and the impressions 16 of recesses 12 are also shown. The wave-like shape increases the elasticity of the paper both transversally and longitudinally. This is clear, in particular, in figure 8B, where the paper of figure 7 is shown also in a position stretched elastically.

[0031] Obviously, other shapes arranged like a wave are possible besides that shown in the above figures.

[0032] The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Claims

1. Paper embossing method of a single or multiple web of paper, non woven fabric and similar material, such as for example, but not exclusively, for the production of rolls of all purpose paper, toilet paper, industrial rolls and the like, comprising the step of conveying said web through an embossing roller and a pressure roller;

   - **characterised in that** throughout said conveying step the embossing is carried out by said embossing roller of a succession of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave.

2. Method according to claim 1, wherein the further steps are provided of:

   - conveying a first web of paper through a first embossing roller and a first pressure roller, on said first web a succession being thus embossed of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave;
   - conveying a second web of paper through a second embossing roller and a second pressure roller, on said second web a succession being embossed of a plurality of protrusions arranged like a wave alternated to a plurality of recesses arranged like a wave;
   - conveying contemporaneously said first and said second web of paper between said first and said second embossing rollers, creating a doubled web of paper.

3. Method according to the previous claims, wherein said protrusions and recesses are arranged according to respective waves that extend parallel to the axis of said embossing roller, said waves being in particular sinusoidal parallel waves.

4. Method according to claim 2, wherein said or each web of paper is moistened with water or glue before passing through said first and second embossing roller.

5. Embossing roller, in particular but not exclusively suitable for being used in the method under the previous claims, characterised in that it comprises on its surface a succession of a plurality of protrusions arranged like a wave and a plurality of recesses arranged like a wave.

6. Embossing roller according to claim 5, wherein said protrusions and recesses are respectively grooves and crests arranged like a continuos wave made on the cylindrical surface of the roller.

7. Embossing roller according to claim 6, wherein said grooves have tapered walls and have on their bottom a plurality of circular shallow recesses and said crests have tapered shape and have on the tip a plurality of radially protruding buttons.

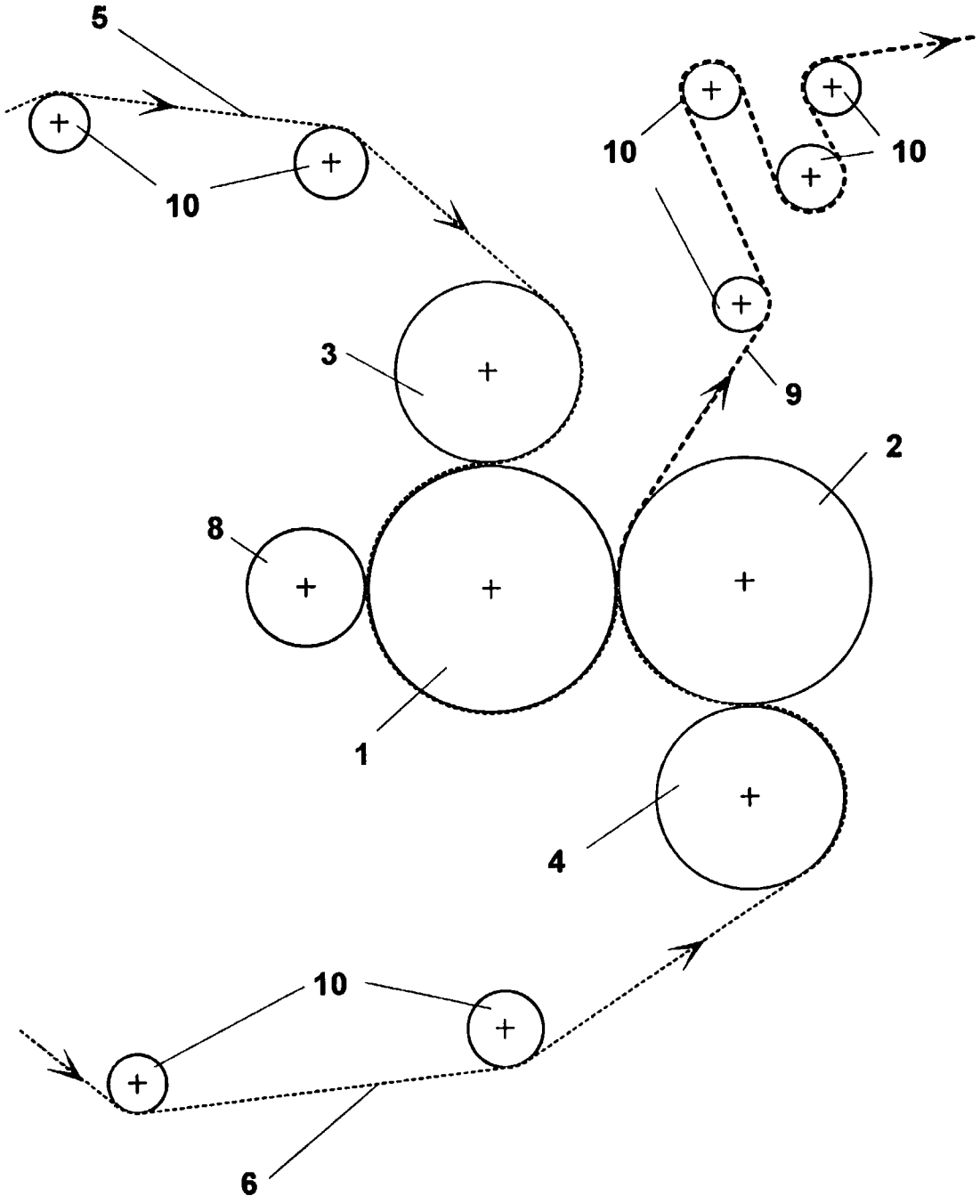
8. Embossing roller according to claim 7, wherein said waves formed by said succession of protrusions and recesses are preferably sinusoidal and are parallel to the generating lines of the cylindrical roller.

9. Embossed paper, in particular but not exclusively obtained from the paper embossing method and with the embossing roller under the previous claims, characterised in that it comprises on its surface a succession of a plurality of protrusions arranged like a wave and a plurality of recesses arranged like a wave.

10. Embossed paper according to claim 9, wherein such protrusions and recesses have preferably

sinusoidal shape and have respectively a crest with slightly raised circular buttons and a bottom with circular shallow recesses.

Fig. 1



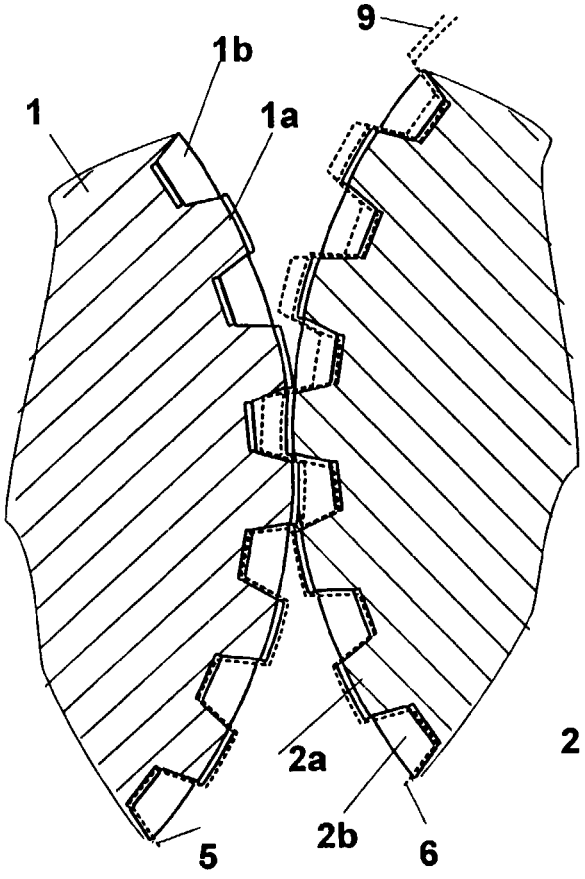


Fig. 2

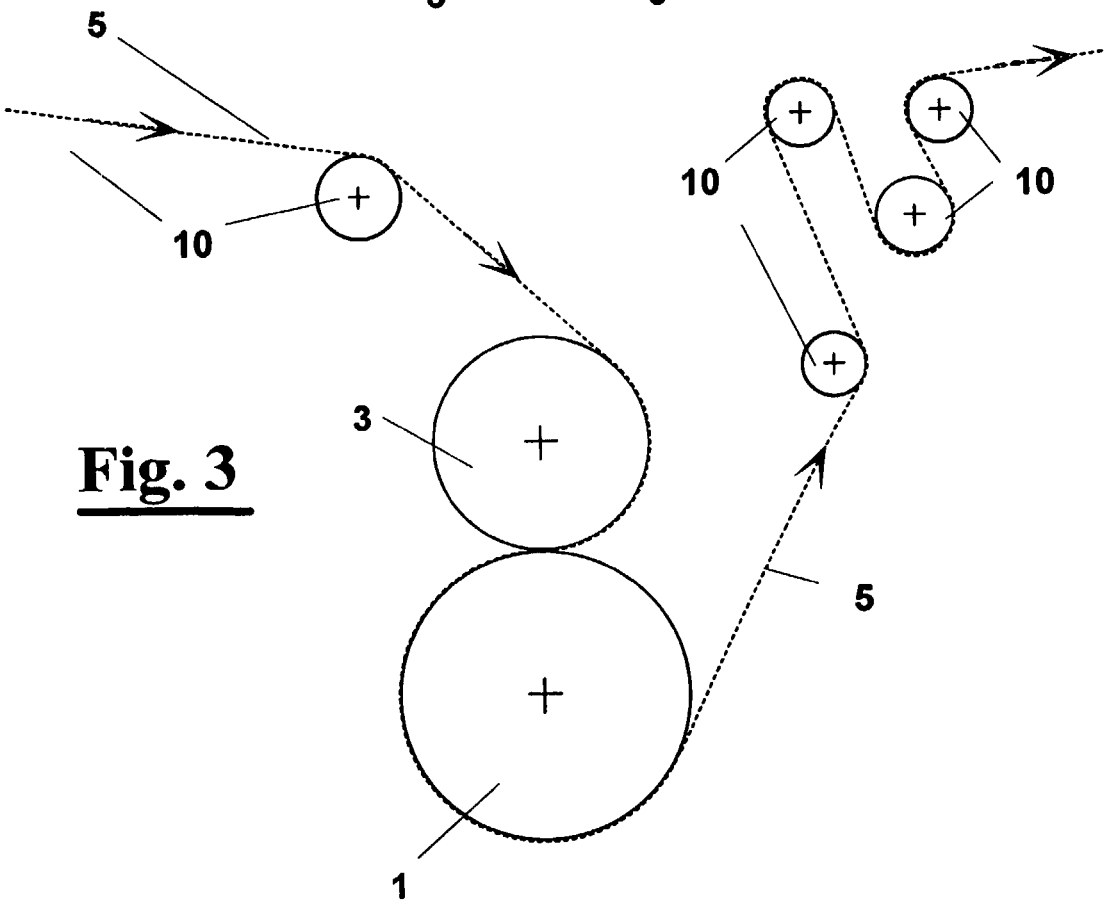


Fig. 3

Fig. 4

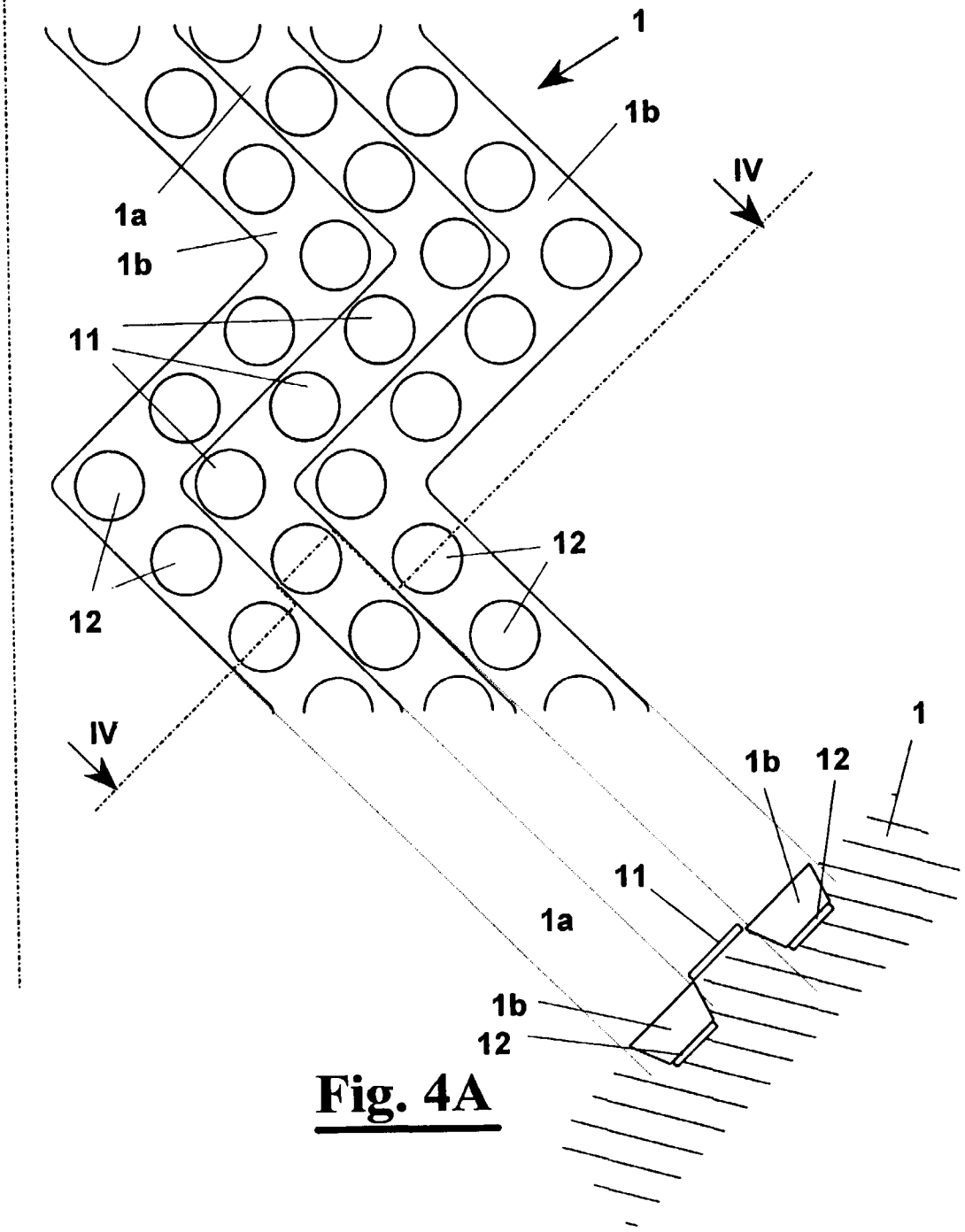


Fig. 4A

Fig. 5

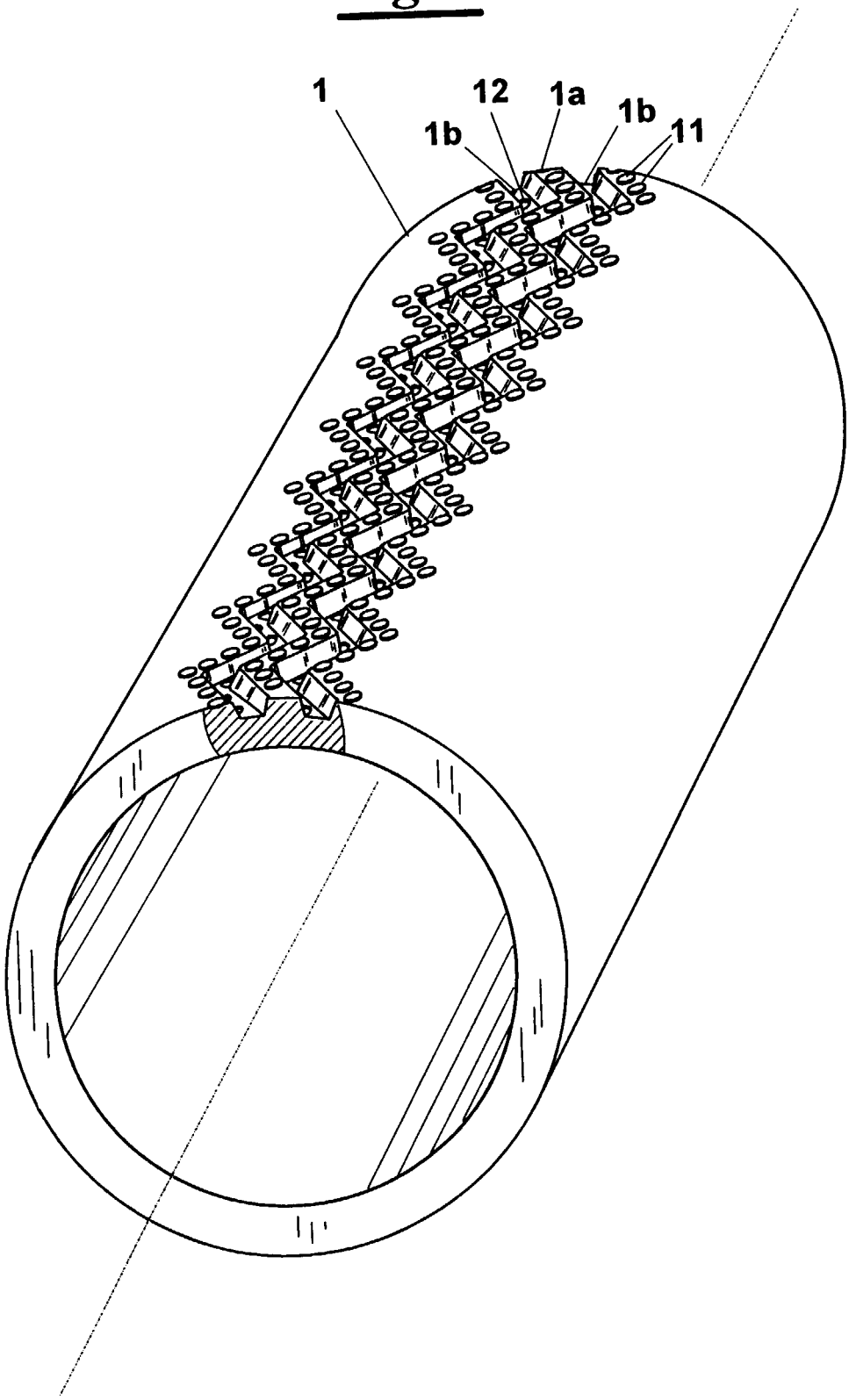


Fig. 6

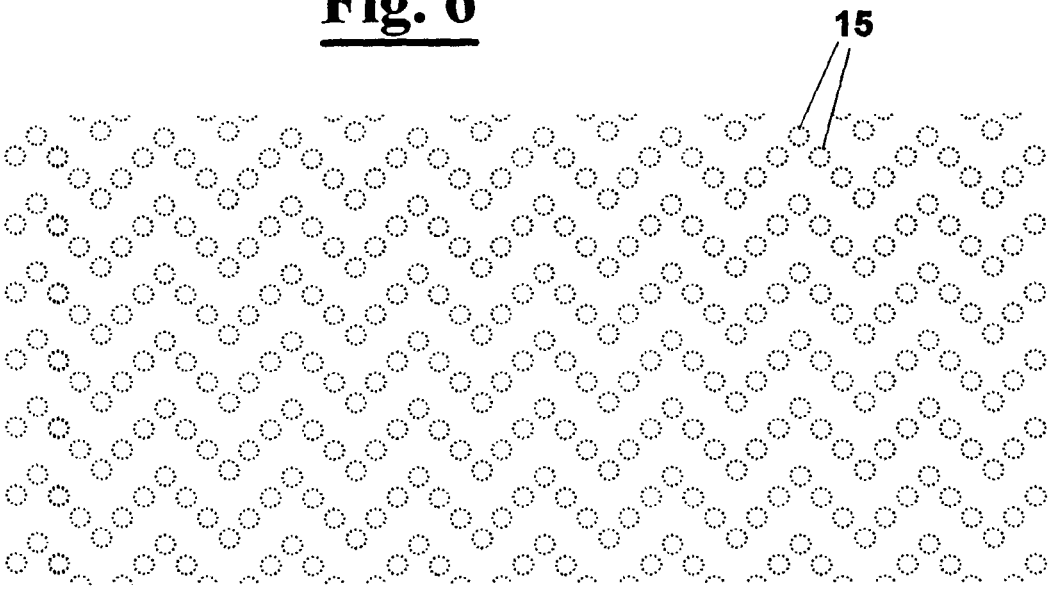


Fig. 7

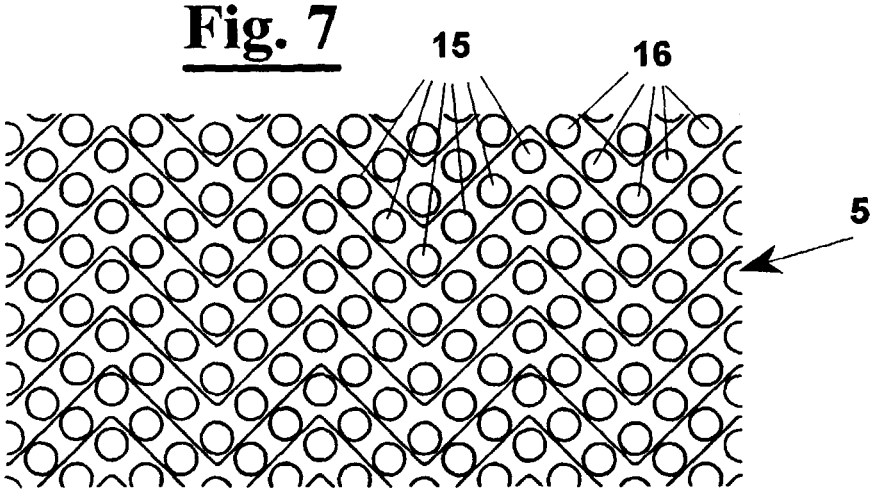


Fig. 8A

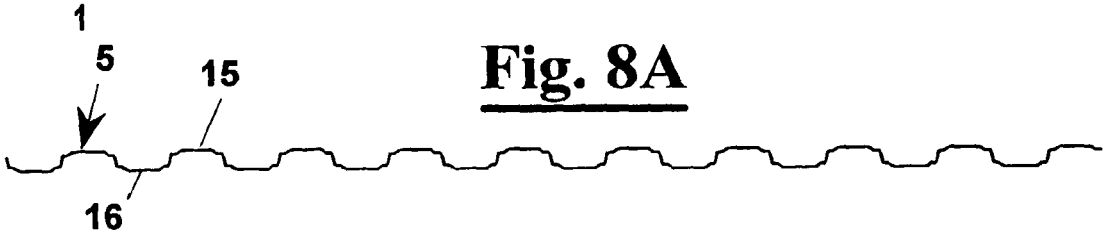
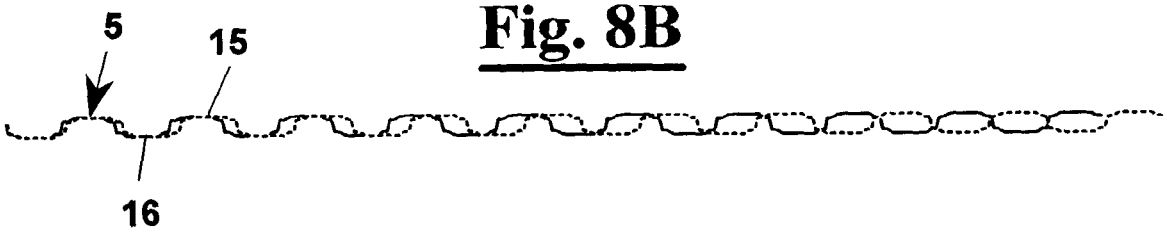


Fig. 8B



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EUROPEAN SEARCH REPORT

Application Number
EP 99 12 5689

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 738 588 A (SCOTT PAPER CO) 23 October 1996 (1996-10-23) * abstract; claims; figure 4 *	1,2,4,9	B31F1/07
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B31F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 March 2000	Soederberg, J

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