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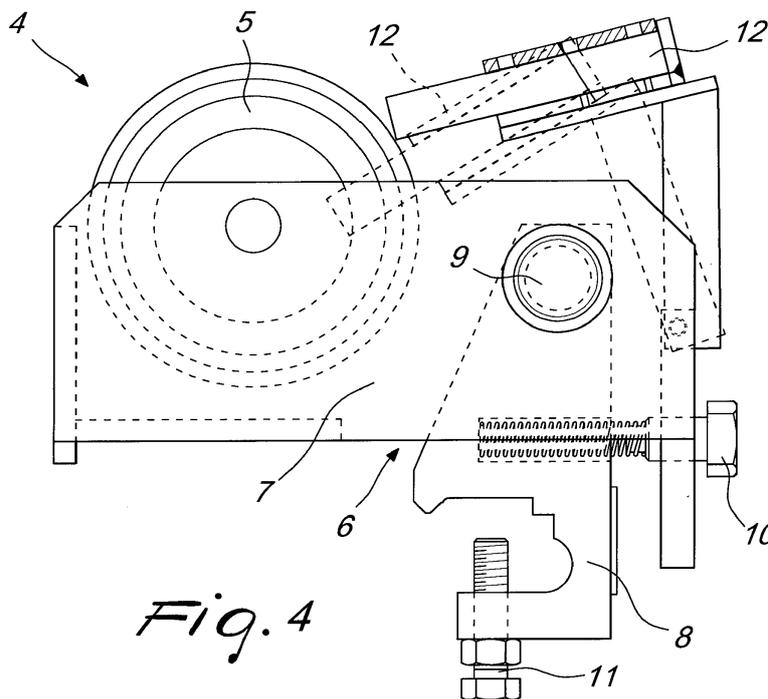
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(54) **APPARATUS FOR JOINING TWO OR MORE PLYS OF TISSUE PAPER, FOR PRODUCING INTERLEAVED ITEMS, PARTICULARLY FACIAL TISSUES**

(57) An apparatus for joining two or more plies of tissue paper for producing interleaved items, particularly facial tissues, characterized in that it includes a contrast roller arranged transversely with respect to the advancement direction of at least two plies of tissue paper, and a plurality of embossing wheel units acting on the plies of tissue paper in contrast with the contrast roller; each embossing wheel unit includes a wheel hinged in a support, which is associated with a fixed member of the ap-

paratus; each wheel is removable from the support without removing the support from the fixed member and includes protrusions that form a decorative pattern and are adapted to deform the plies of tissue paper in contrast with the contrast roller, joining the plies and forming a decoration thereon. The decorative pattern and joining lines thus formed produce a series of rows of tissues in the advancement direction of the tissue paper plies.



## Description

**[0001]** The present invention relates to an apparatus for joining two or more plies of tissue paper, for producing interleaved items, particularly facial tissues.

**[0002]** As is known, paper tissues of the type commercially known as tissues or facial tissues are generally constituted by two or more plies, normally two, three or four plies.

**[0003]** The plies that compose the tissue are generally joined by passing the plies between a smooth steel contrast roller and a set of knurled wheels, known as knurling tools, which are pressed against the paper and the smooth roller in order to join the fibers of the plies of paper. As a consequence of this treatment the plies are joined as if they were pasted together. The joining point of the plies is clearly visible as an embossed line on the two sides of the tissue and appears as a knurling of the paper that is as long as the tissue and is 1 to 10 mm wide.

**[0004]** Such knurling on the paper has a necessary function of joining the plies but it is not aesthetically attractive, therefore several manufacturers have joined the plies with decorative patterns.

**[0005]** The decorative patterns of products of the known type are provided by means of a pair of steel rollers of the male-female type or point to point rollers. This ply joining system is more expensive than the system with contrast roller and knurling tools, since steel-on-steel rollers or point to point rollers require precision in their scoring and suitable diameters in order to reduce the flexing that would compromise the joining of the plies. Even in the roller system, joining in fact occurs due to the pressure that the two scored rollers apply to the paper.

**[0006]** A further drawback of the roller joining system is constituted by the fact that in order to change the decorative pattern it is necessary to replace the rollers, with consequent long tooling times.

**[0007]** US5433817 discloses a ply-bonding device for paper converting machines comprising a support to which a movable unit is pivoted. The movable unit is provided with a pressure wheel which cooperates with a counter-roller, and a pressure means which forces the wheel against the counter-roller. The wheel is resiliently supported on the movable unit and, during operation, the position of the unit is defined by an abutment on the support. The movable unit is pivotally supported on a plate having a handle. A plurality of spaced-apart plates are mounted on a beam. Each pressure wheel can be removed from the movable unit only by first removing the respective plate from the beam.

**[0008]** EP1533112 discloses an apparatus for manufacturing multiple-ply paper products by knurling, having a knurling wheel unit constituted by one or more knurling wheels, each of which cooperates with a contrast roller in order to decorate by knurling a paper ply and in order to decorate and join at least two paper plies. Each knurling wheel is provided with relief patterns arranged so that despite appearing to be separate they allow the knurling.

The knurling wheels may be supported by a single supporting shaft or individually by a holder for each knurling wheel. Each knurling wheel may be removed from its holder only after the holder is removed from the supporting beam.

**[0009]** US2002/0148578 discloses a device for applying an embossing to a web of tissue paper comprising a full width anvil roller and a plurality of small width embossing rollers which are rotationally movable around rotational axes which run parallel to the rotational axis of the anvil roller. The embossing rollers can be individually positioned against the anvil roller. Three embossing rollers are mounted on a unit comprising a bracket, which serves to mount the unit to a girder of the machine frame, and a frame element which is pivotally attached to the bracket via a pivot pin and holds the shaft of the embossing roller. The individual embossing rollers may be substituted by removing and disassemble the entire unit.

**[0010]** The aim of the present invention is to provide an apparatus for joining two or more plies of paper that overcomes the drawbacks of the cited prior art.

**[0011]** Within the scope of this aim, an object of the invention is to provide an apparatus that allows to modify the decorative pattern produced during the joining of the plies more rapidly and easily than traditional systems.

**[0012]** Another object of the invention is to provide an apparatus that is cheaper than the prior art apparatuses.

**[0013]** Another object of the present invention is to provide an apparatus which, by virtue of its particular constructive characteristics, is capable of giving the greatest assurances of reliability and safety in use.

**[0014]** This aim and these and other objects that will become better apparent hereinafter are achieved by an apparatus for joining two or more plies of tissue paper for producing interleaved items, particularly facial tissues, comprising a contrast roller, arranged transversely with respect to the advancement direction of at least two plies of tissue paper, and a plurality of embossing wheel units acting on said plies of tissue paper in contrast with said contrast roller; each of the embossing wheel units comprising a wheel hinged in a support; the support being associated with a fixed member of said apparatus; each wheel including protrusions that form a decorative pattern and are adapted to deform said plies of tissue paper in contrast with said contrast roller, joining said plies and forming a decoration on said plies; said apparatus being characterized in that each wheel is removable from said support without removing said support from said fixed member.

**[0015]** Further characteristics and advantages will become better apparent from the description of preferred but not exclusive embodiments of the invention, illustrated by way of example in the accompanying drawings, wherein:

Figure 1 is a schematic side view of an apparatus for manufacturing paper products with multiple plies, according to the present invention;

Figure 2 is a partially sectional bottom view showing the region of the embossing wheel units;  
 Figure 3 is an enlarged-scale view of a portion of Figure 2;  
 Figure 4 is a side view, partially in phantom lines, of an embossing wheel unit and its support;  
 Figure 5 is a sectional plan view of the embossing wheel unit of the preceding figure;  
 Figure 6 is a view of an example of a paper product manufactured according to the present invention.

**[0016]** With reference to the cited figures, the apparatus according to the invention, globally designated by the reference numeral 1, includes at least one station 2 for joining two or more plies of tissue paper; the station 2 has a contrast roller 3 and a set of embossing wheel units 4 that act on the contrast roller 3.

**[0017]** The embossing wheel units 4 are anchored to a supporting beam 16, which extends parallel to the contrast roller 3 and includes a pneumatic means adapted to push the embossing wheel units against the contrast roller 3.

**[0018]** The pneumatic means is constituted by an inflatable hose 17.

**[0019]** Each embossing wheel unit 4 is constituted by a wheel 5 that is pivoted in a support 6 which in turn is associated with the frame of the apparatus 1.

**[0020]** The embossing wheel units 4 are mounted on the supporting beam 16 so that they can be replaced easily by removing the wheel 5 from the support 6 or by disassembling the support itself.

**[0021]** In the specific case, a support 6 is shown which is constituted by a bracket 7 that is pivoted in a block 8 by means of a pivot 9.

**[0022]** The support 6 includes a pair of fixing screws 10 and 11.

**[0023]** Each support 6 is provided with a lubrication device 12 that is adapted to lubricate the wheel 5. The lubrication device 12, which includes a felt, can tilt in order to compensate the wear of the felt.

**[0024]** Each wheel 5 is provided with protrusions which form a decorative pattern and are adapted to deform the plies of tissue paper in contrast with the contrast roller 3.

**[0025]** The embossing wheel units 4 are anchored to the supports so that they can be easily replaced by disassembling the wheels 5 or by replacing the supports complete with the rollers.

**[0026]** The wheels 5 and the contrast roller 3 are advantageously made of hardened steel with adequate hardness.

**[0027]** The joining of the plies occurs by deformation of the paper that passes between the decorative wheels 5 and the contrast roller.

**[0028]** The protrusions of each wheel form a decorative pattern 14 and at the same time join the plies of tissue paper. The decorative and joining lines thus formed produce a series of rows of tissues in the direction of advancement of the plies of tissue paper.

**[0029]** The plies of tissue paper are then cut longitudinally along a cutting line 15 that is extended in a central region of the decoration 14.

**[0030]** In the illustrated example, the number of embossing wheel units 4 is a function of the width of the tissue paper 13 being unwound.

**[0031]** The width of the tissue 13 normally varies from 100 to 300 mm; in the specific case, a tissue 13 is shown which has a width of 210 mm, while the width of the spool is 2780 mm, from which 25+25 mm of trim must be removed, obtaining thirteen rows of 210-mm tissues, so that the number of embossing wheel units 4 is fourteen, since each assembly joins and decorates two adjacent plies or a trim + tissue.

**[0032]** The apparatus according to the present invention allows to provide products of various kinds.

**[0033]** Figure 6 is a view of a product obtained by means of the apparatus according to the present invention, which has decorations 14 on both edges.

**[0034]** In practice it has been found of the invention achieves the intended aim and objects, providing an apparatus that allows to join two or more plies of tissue paper by means of a series of decorative embossing wheel units, which act on a contrast roller, which can be replaced quickly and easily to change the pattern embossed by them.

**[0035]** Each embossing wheel unit can in fact be removed from the respective support and replaced easily, without necessarily disassembling the support from the frame as well.

**[0036]** The present apparatus allows to avoid the long tooling times required to change the decoration of the edges when using traditional systems for joining by means of steel-on-steel rollers.

**[0037]** Another important advantage of the present invention is the reduced cost of the decorative embossing wheel units with respect to steel-on-steel rollers of traditional systems.

#### Claims

1. An apparatus for joining two or more plies of tissue paper for producing interleaved items, particularly facial tissues, comprising a contrast roller, arranged transversely with respect to the advancement direction of at least two plies of tissue paper, and a plurality of embossing wheel units acting on said plies of tissue paper in contrast with said contrast roller; each of the embossing wheel units comprising a wheel hinged in a support; the support being associated with a fixed member of said apparatus; each wheel including protrusions that form a decorative pattern and are adapted to deform said plies of tissue paper in contrast with said contrast roller, joining said plies and forming a decoration on said plies; said apparatus being **characterized in that** each wheel is removable from said support without removing said

support from said fixed member.

2. The apparatus according to claim 1, **characterized in that** said support is removable from said fixed member. 5
3. The apparatus according to claim 1, **characterized in that** said support comprises a bracket that is pivoted in a block by means of a pivot; said support comprising members for fixing to said fixed member. 10
4. The apparatus according to claim 1, **characterized in that** said fixed member, to which said embossing wheel units are anchored, is constituted by a supporting beam that lies parallel to said contrast roller. 15
5. The apparatus according to claim 1, **characterized in that** said supporting beam comprises a pneumatic means adapted to push said embossing wheel units onto said contrast roller. 20
6. The apparatus according to claim 1, **characterized in that** said pneumatic means is constituted by an inflatable hose. 25
7. The apparatus according to claim 1, **characterized in that** each support comprises a lubrication device adapted to lubricate said wheel; said lubrication device tilting in order to compensate the wear of said lubrication device. 30
8. The apparatus according to the one or more of the preceding claims, **characterized in that** it comprises at least two embossing wheel units that are adapted to join said plies along two decorative pattern lines, forming at least one row of plies. 35
9. The apparatus according to one or more of the preceding claims, **characterized in that** it comprises at least three embossing wheel units adapted to join said plies along three decorative pattern lines, forming at least two rows of plies. 40

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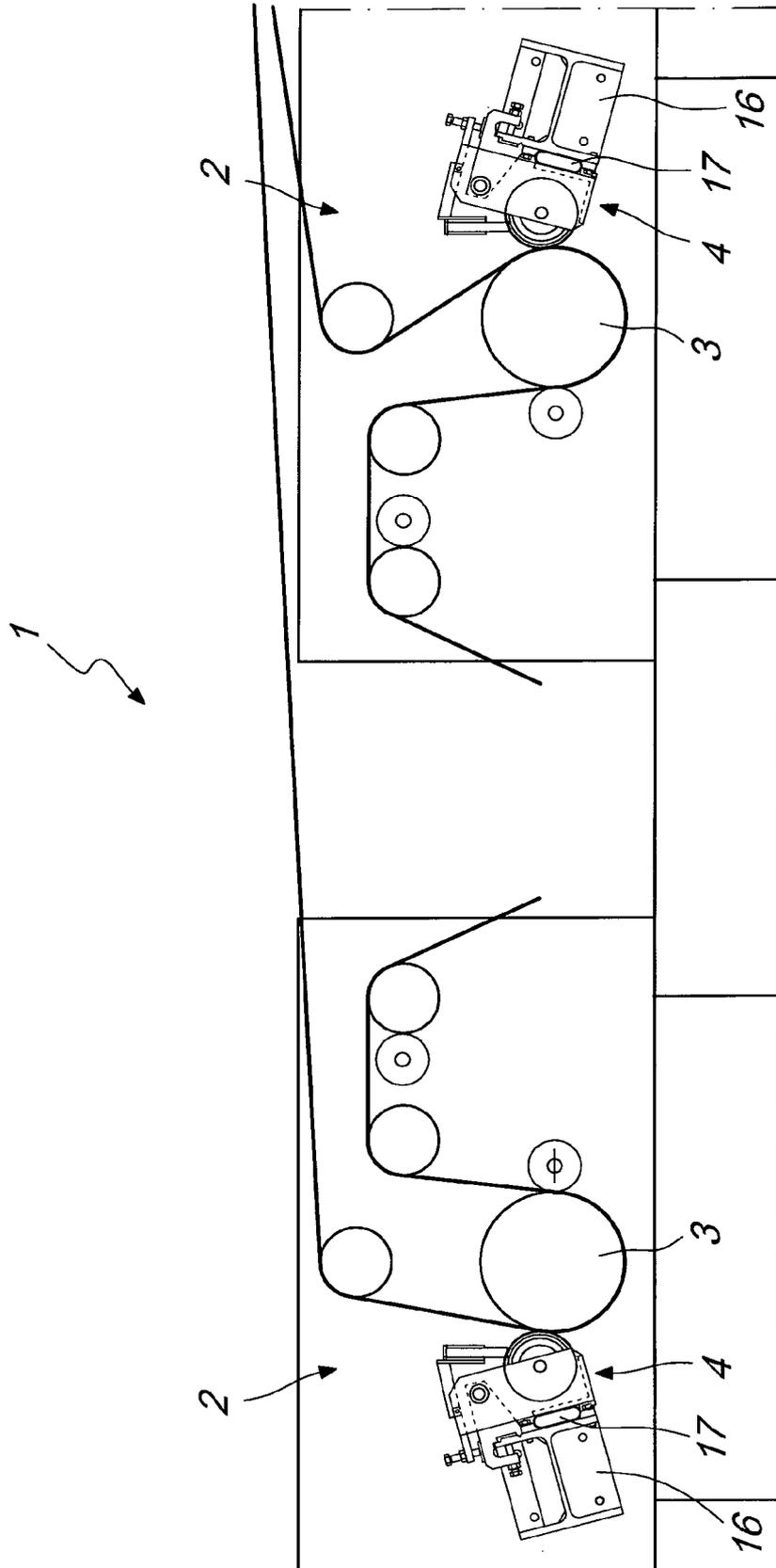
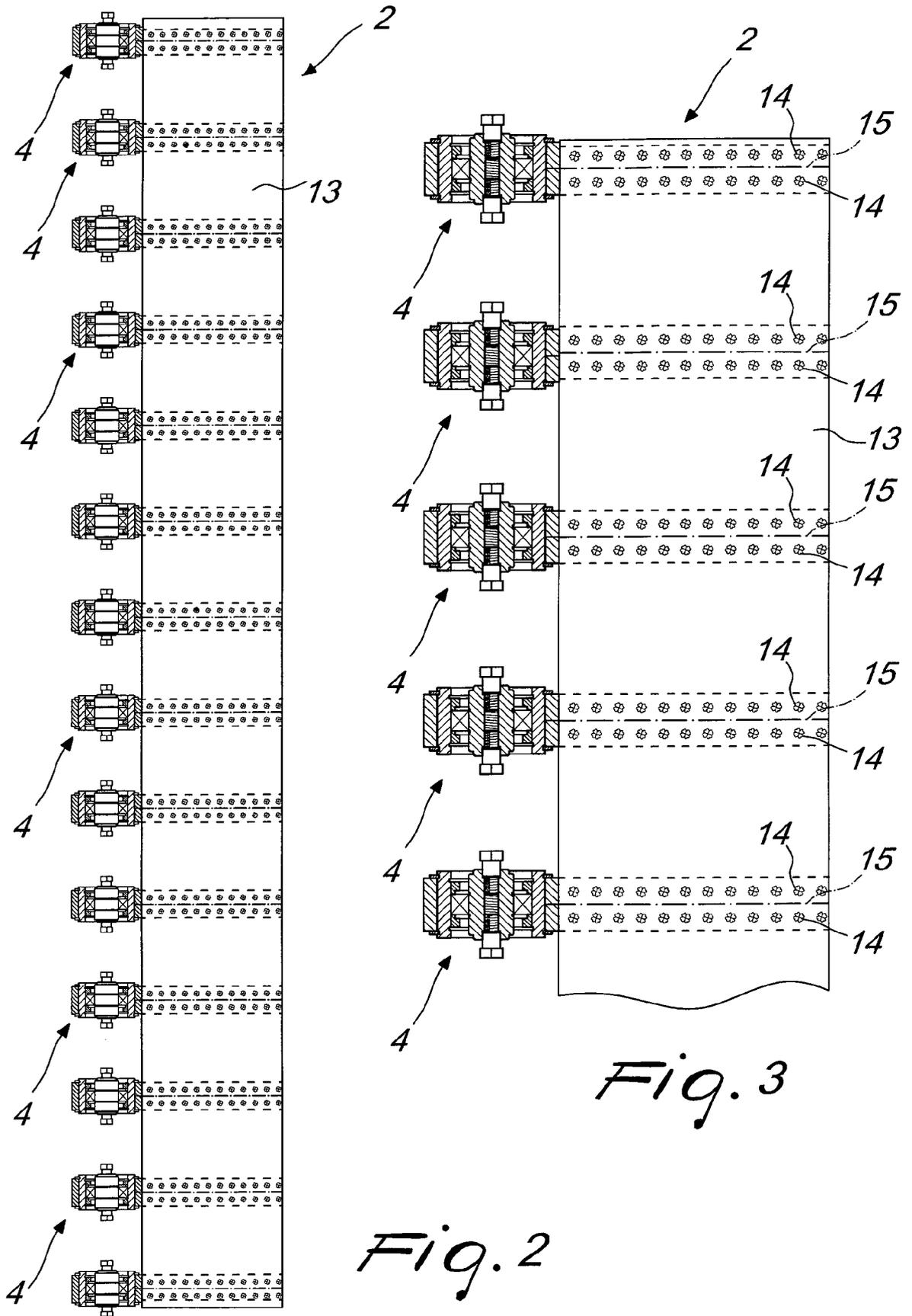
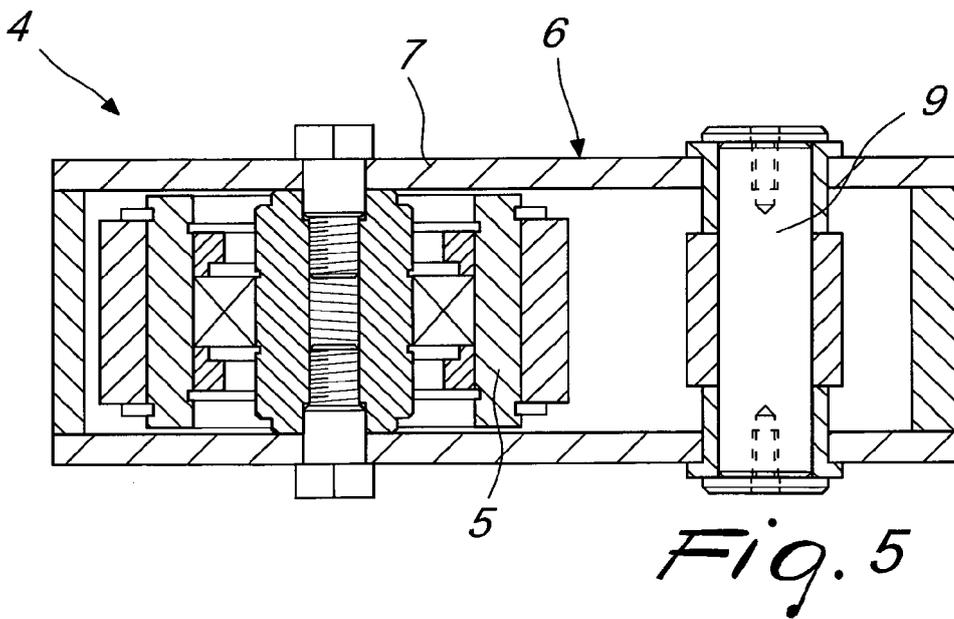
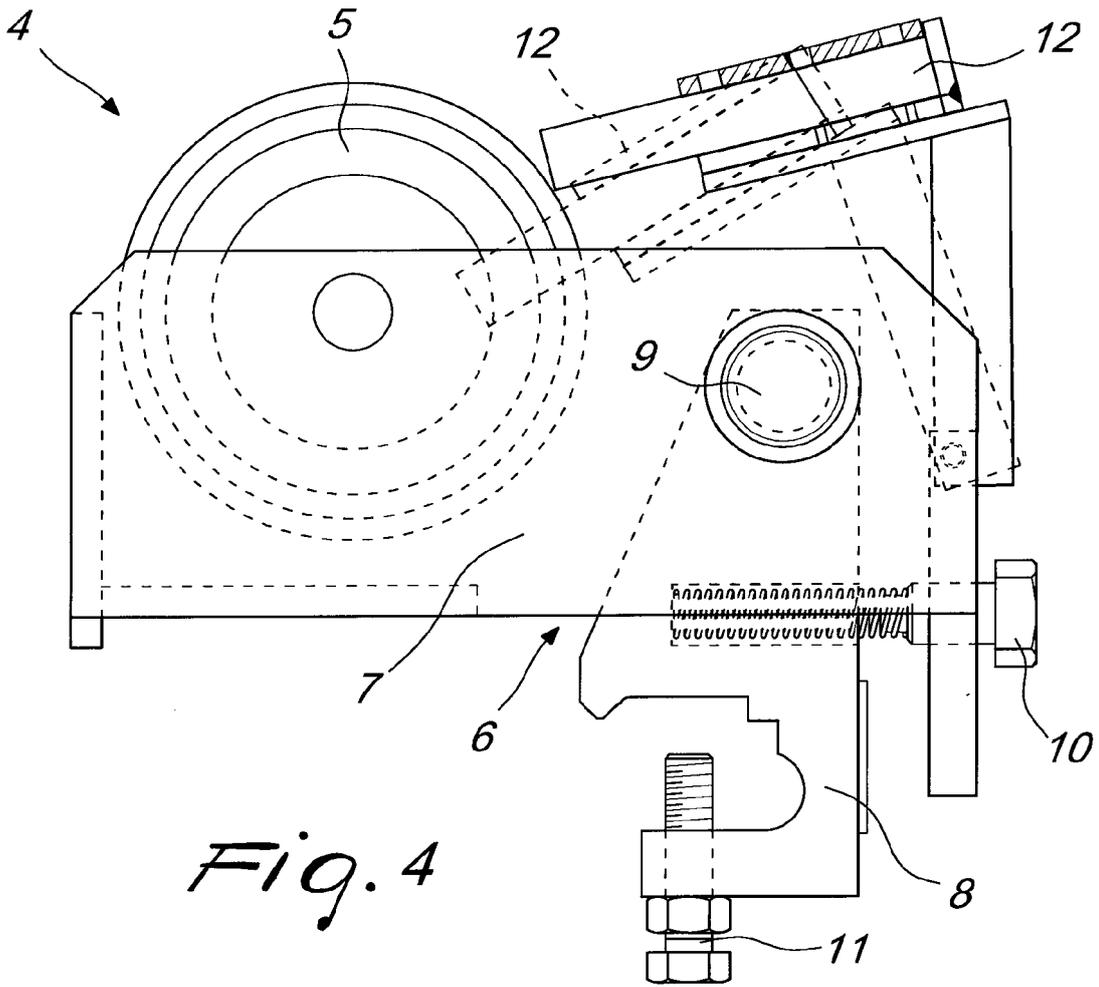


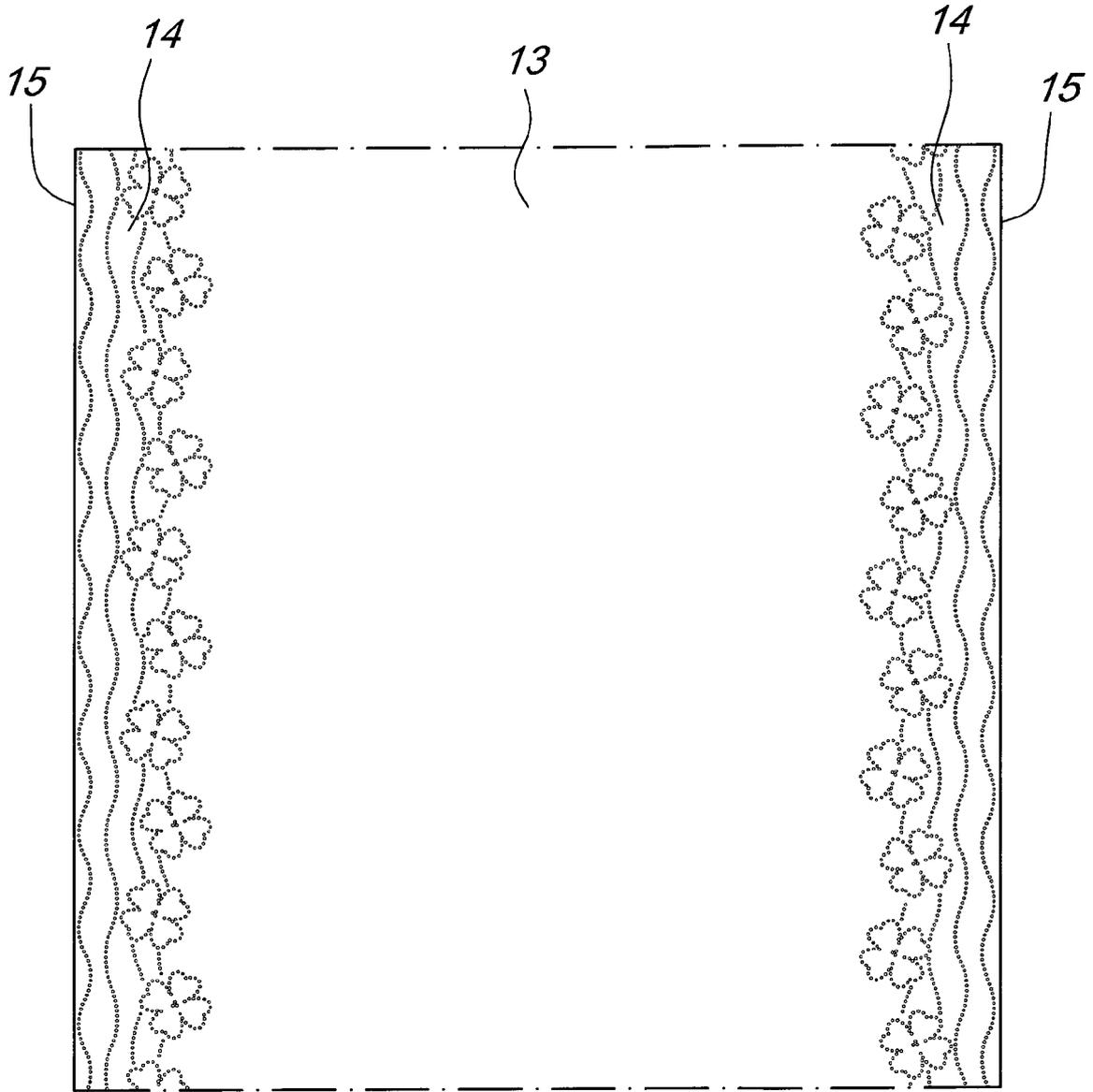
Fig. 1



*Fig. 3*

*Fig. 2*





*Fig. 6*



EUROPEAN SEARCH REPORT

Application Number  
EP 16 00 1674

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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	US 5 433 817 A (BIAGIOTTI GUGLIELMO [IT]) 18 July 1995 (1995-07-18) * the whole document * -----	1-9	INV. B31F1/07 B31F5/02
X	EP 1 533 112 A1 (IND CARTARIE TRONCHETTI SPA [IT]) 25 May 2005 (2005-05-25) * paragraph [0012] - paragraph [0021]; figure 6 * * paragraph [0028] - paragraph [0029] * -----	1-9	
X	US 2002/148578 A1 (REILLY IAN [GB] ET AL) 17 October 2002 (2002-10-17) * the whole document * -----	1-6,8,9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B31F
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>28 October 2016</b>	Examiner <b>Johne, Olaf</b>
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 00 1674

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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28-10-2016

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

**REFERENCES CITED IN THE DESCRIPTION**

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