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(54) **METHOD FOR WRAPPING A ROLL OF MATERIAL AND A WRAPPED ROLL OF MATERIAL**

VERFAHREN ZUM EINWICKELN EINER MATERIALROLLE UND EINGEWICKELTE MATERIALROLLE

PROCEDE D'EMBALLAGE D'UN ROULEAU DE MATIERE ET ROULEAU DE MATIERE EMBALLE

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(73) Proprietor: **Raumaster Paper Oy**
26100 Rauma (FI)

(72) Inventor: **PAASIKIVI, Harri**
32210 Loimaa (FI)

(74) Representative: **Suominen, Kaisa Liisa**
Turun Patenttitoimisto Oy,
P.O.Box 99
20521 Turku (FI)

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Description

[0001] The present invention relates to a method for wrapping a roll of material and a wrapped roll of material in accordance with the preambles of the independent claims presented below. The invention in particular concerns a novel spiral wrapping method that can be used, for example, for wrapping a paper roll.

[0002] In various industries, for example in the paper and textile industries, finished rolls of material are wrapped in a protective wrapping, the purpose of which is to protect the easily damaged roll of material from mechanical surface damage and environmental influences, in particular from air humidity, during storage, handling and transportation.

[0003] In the paper industry, the diameter of finished paper rolls ready to be wrapped is typically approximately 0,5-2,5 m and the width typically approximately 0,5-4 m. The roll dimensions within mills vary between different production batches.

[0004] Known methods for wrapping paper rolls include full width wrapping in the direction of the perimeter of the roll, overlap wrapping in the direction of the perimeter of the roll and spiral wrapping. For example paper or deformable film, such as plastic, may be used as wrapper stock.

[0005] In full width wrapping in the direction of the perimeter of the roll, known for example from the publication EP 0519672, the roll to be wrapped is rotated on two or more rotating carrier rolls. The axis of the wrapping roll is substantially parallel to the axis of the roll to be wrapped and to the axes of the carrier rolls. The wrapping roll is somewhat wider than the roll to be wrapped so that the wrapper web, guided onto the perimeter of the roll to be wrapped by means of wrapper guide means, extends in both ends of the roll to be wrapped for a given distance, for example 100-300 mm, over the end of the roll to be wrapped. This axial overhang is folded between the so-called inner head disc and outer head disc to be attached to the end surface of the roll to be wrapped and having the shape of the roll end surface.

[0006] A weakness of this method is that different sizes of wrapper stock rolls are required for different sizes of paper rolls and, due to this, it is necessary to install either a wrapping station that is capable of using different widths of wrapping rolls or else several parallel wrapping stations, which makes the entire wrapping system remarkably complicated.

[0007] Overlap wrapping in the direction of the perimeter of the roll differs from full width wrapping in the direction of the perimeter of the roll in that the wrapping roll is narrower than the roll to be wrapped and that, at first, one sheet of wrapping is guided onto the perimeter of the roll to be wrapped and then the next sheet of wrapping, which overlaps the previous sheet in the direction of the axis of the roll to be wrapped and so on until the roll to be wrapped is completely wrapped. The overlapping parts of adjacent layers of wrapper stock are typically attached to each other by gluing.

[0008] Because the desired amount of wrapper stock, most usually three layers, is first wrapped at one point and after that, the next sheet of wrapping is wrapped at another point that is situated in the axial direction of the roll, at a distance equal to the width of the wrapping roll minus the width of the overlapping section, fairly large ridges are created at the overlapping sections, which ridges cause harmful impressions in the surface layers of a wrapped roll during further handling of the roll, for example, while rotating the roll on rollers. Furthermore it can be mentioned as a weakness of this method that, while wrapping long rolls, wrapping has to be started and stopped many times. Especially the end sections of the wrapping, which often are inadequately attached, impair the appearance of the roll wrapping.

[0009] Spiral wrapping differs from the two above mentioned methods in that the wrapping is guided onto the perimeter of the roll to be wrapped along a helical path and preferably in such a way that adjacent layers of wrapper stock overlap each other. Spiral wrapping is presented, for example, in the U.S. patent US 2872767. In the patent publication EP 0765809, a method for spiral wrapping has been presented in which method the wrapper stock is packaging paper and the longitudinal edge of the wrapper web is guided onto the roll to be wrapped at an angle to the direction of the perimeter of the roll to be wrapped and is then guided helically around the roll to be wrapped. The helically guided wrapper web terminates at both ends of the roll before the end of the roll, and in addition, another wrapper web is wound around the roll at the roll end, which web is not helical, but parallel to the direction of the perimeter of the roll. The web wound at the roll end preferably laps over the helical wrapping and creates an axial overhang at the end of the roll, which overhang is folded onto the end surface of the roll. A roll of material wrapped by spiral wrapping according to the prior art is illustrated schematically in Figures 2 and 4 of the drawing.

[0010] A weakness of the spiral wrapping method according to the prior art is the overlap section of the helical wrapping and the wrapping at the roll end in the direction of the perimeter of the roll, which overlap section is difficult to render sufficiently tightly sealed. While wrapped rolls are stored in the vertical position, humidity condensing on their surface is liable to seep between the helical wrapping and the wrapping in the direction of the perimeter of the roll. Even if the wrappings were attached to each other by gluing at the overlap section, even a small leak in the narrow glued seam would cause humidity to enter under the wrapping. Because several layers, most often three layers, of the wrapping in the direction of the perimeter of the roll are wrapped at the same point on the roll, a fairly large ridge is created at the overlap section of the helical wrapping and the wrapping in the direction of the perimeter of the roll to be wrapped, which ridge causes harmful impressions in the surface layers of a wrapped roll during further handling of the roll, for exam-

ple while rotating the roll on rollers.

[0011] The purpose of the invention presented here is to improve the spiral wrapping method according to the prior art and alleviate or even eliminate the above-mentioned problems arising in the prior art.

[0012] A method for wrapping a roll of material and a wrapping according to the preambles of the independent claims presented below invention are characterised by what is presented in the respective characterising portion of said claims.

[0013] All embodiments of the invention presented in this text and their advantages refer, where applicable, to both to the method and the wrapping according to the invention even though this may not be explicitly stated while discussing each embodiment.

[0014] In a typical embodiment of the invention, the first wrapper web, for example of wrapping paper, is wound around the perimeter of the roll to be wrapped, the longitudinal edge of which web is set on the roll to be wrapped at a first angle to the direction of the perimeter of the roll to be wrapped. The direction of the perimeter refers to a direction perpendicular to the longitudinal axis of the roll. After that, the first wrapper web is guided helically around the perimeter of the roll to be wrapped. In addition to the first wrapper web, a second wrapper web is wound at one end of the roll around the perimeter of the roll to be wrapped, the longitudinal edge of which web is placed on the roll to be wrapped at a second angle to the direction of the perimeter of the roll to be wrapped. Thereafter, the second wrapper web is guided helically around the perimeter of the roll to be wrapped.

[0015] The wrapping of the second wrapper web is preferably started at the end of the roll to be wrapped in such a way that an axial overhang is created at the roll end.

[0016] The first wrapper web typically covers at least a part of the peripheral surface of the roll of material to be wrapped. The first wrapper web preferably terminates before the end of the roll to be wrapped so that it is easier to make a roll end fold in the second wrapper web. It is possible, however, to wrap the first wrapper web over the edge at one or both ends of the roll to be wrapped so that an axial overhang is created.

[0017] The invention preferably also comprises a third wrapper web, which web is wound at the other end of the roll of material to be wrapped at a third angle to the direction of the perimeter of the roll to be wrapped.

[0018] The apparatus for wrapping a roll of material, which apparatus is used in the method according to the present invention, comprises, besides means for moving the roll of material to be wrapped, such as rollers, and means for feeding the wrapper web, also means for controlling the apparatus. The said means for controlling the apparatus comprise means which enable the apparatus to wrap the rolls of material to be handled in it in the manner according to the invention described in this application. Most preferably these control means comprise a computer and a computer program arranged to be run in the memory of the computer, by use of which program the apparatus is controlled. The computer program of the apparatus comprises such elements of program code that cause the apparatus to perform the method according to the invention when the said computer program is run in the memory of the computer. Such an apparatus further comprises data transmission equipment for transmitting the control data generated by the control means to the apparatus. Preferably the apparatus also comprises means for data input that can be used for providing the computer program with the information required for wrapping, such as the size and grade of the roll to be wrapped.

[0019] A typical wrapping of a roll of material according to the invention comprises a first and a second wrapper web wound helically around the perimeter of the roll to be wrapped, as described above, and preferably also a third wrapper web. Furthermore, the wrapping typically consists of head discs arranged to cover the ends of the roll to be wrapped. In paper mills, for example, the end of a paper roll is generally provided with a so-called inner head disc and an outer head disc, between which discs a wrapper web according to the invention is typically fixed.

[0020] One of the most important advantages of the invention is that significantly tighter sealing is obtained by it as compared with the prior art at the point where the first and the second wrapper web meet, because the point has several adjacent glued seams. Even if one glue seam were to leak, for example, due to insufficient application of glue, the humidity possibly seeping between the first and the second wrapper web could not reach the surface of the roll of material since there are still several sealing glued seams left. As a result of the overlapping edges of the wrapper stock, no major ridges are created on the side surface of the roll, and therefore no harmful impressions are created in the surface layers of a wrapped roll during further handling of the roll, for example while rotating the roll on rollers.

[0021] The width of the wrapper web may vary according to the need in the case concerned. A typical wrapper web according to the invention is approximately 50 cm wide. In one preferred embodiment of the invention the magnitude of the first angle is such that adjacent windings of wrapper web are substantially overlapping. Such overlapping may, for example, be approximately 1/4, 1/2, 2/3 or 3/4 of the width of the wrapper web. The angle to be used depends on the diameter of the roll to be wrapped and on the desired overlapping, the angle being preferably within the range of 1-20 degrees, most preferably approximately 10 degrees.

[0022] The second and the third angle are typically equal to the direction of the perimeter of the roll to be wrapped, but they may also be different if need arises. The second and the third wrapper web are preferably wound diagonally in different directions, so that the second and the third angle turn in different directions from the said direction of the perimeter. The second and the

third angle are typically of such magnitude that the wrapper web laps over itself for 1-5 cm, most preferably for 2-3 cm for each winding of wrapper wound around the roll.

[0023] In one preferred embodiment of the invention, adjacent wrapper webs are glued together. In other words, the first wrapper web is preferably glued to both the second and the third wrapper web, as a result of which gluing both ends of the wrapping of the roll of material are tightly sealed.

[0024] In the following, the invention is described in more detail by referring to the accompanying schematic drawings, in which

Figure 1 represents an apparatus for wrapping a roll using spiral wrapping,

Figure 2 is a cross-sectional view of a roll wrapped by spiral wrapping according to the prior art,

Figure 3 is a cross-sectional view of a roll wrapped by double spiral wrapping according to the invention,

Figure 4 represents a side view of a roll wrapped by spiral wrapping according to the prior art, and

Figure 5 represents a side view of a roll wrapped by double spiral wrapping according to the invention.

[0025] Figure 1 represents a preferred apparatus according to the invention suitable for spiral wrapping of a paper roll 11 as seen from above. The paper roll 11 is represented by broken lines. A slide carriage 2 has been arranged to move on a frame 1, to which slide carriage has been attached a wrapper feeder unit 3. The energy for moving the slide carriage is generated by a motor 10. The wrapper feeder unit 3 includes, among others, a wrapper web roll 4. Turnable folding arms 6 of the folding station 5 are used for folding the wrapper web extending over the edges of the ends of the roll 11 in the direction of the end surfaces. The roll 11 rests on a rotator roller system 8 in the apparatus. The roller 7 is a rotator roller, i.e. it has been arranged to be rotated by the motor 9. The roller 12 rotates freely. The apparatus in Fig. 1, i.e. mainly the wrapper feeder unit 3 and the rotator roller system 8 are controlled by means of a computer (not shown in the figure) and software to be run in the computer and installed in its memory. Various kinds of rolls and the wrappings required for them may be pre-set in the computer program software, and the operator or the automatic control system selects the appropriate wrapping program for each application.

[0026] Figures 2 and 4 represent a roll wrapped by spiral wrapping according to the prior art and the wrapping of the roll.

[0027] Figures 3 and 5 represent a preferred wrapping 13 according to the invention arranged on the paper roll 11 by a method according to the invention with the apparatus according to the invention shown in Fig. 1, or with an equivalent apparatus. The figures are schematic, i.e. some of the dimensional relations do not correspond to the actual values. The roll 11 is represented by broken lines in Fig. 3. The wrapping 13 is formed as follows: Initially, the first wrapper web 15 of wrapping paper is wound around the perimeter of the side surface 14 of the roll 11 to be wrapped, the longitudinal edge 16 of which first wrapper web is placed at the first end 17 of the roll to be wrapped at an angle A to the direction of the perimeter of the roll 11 to be wrapped. That is, the direction of the perimeter is perpendicular to the direction of the longitudinal axis of the roll 11. After this, the first wrapper web 15 is guided helically around the perimeter of the roll to be wrapped until the other end 18 of the roll to be wrapped, but not over the edge. The advancing of the edge 16a, 16b, 16c... of the first wrapper web can be seen clearly in Figures 3 and 5. The angle A is of such magnitude that the first wrapper web 15 laps over itself for approximately half of its own width L during one winding around the roll 11. After that, the second wrapper web 19 of wrapping paper is wound around the perimeter of the roll to be wrapped at the other end 18 of the roll, the longitudinal edge 20 of which second wrapper web is placed on the roll 11 to be wrapped at an angle B to the direction of the perimeter of the roll 11 to be wrapped. The angle B is not represented in the Figures, but it can be clearly seen, for example by comparing the edge 16a of the first wrapper web and the edge 20a of the second wrapper web shown in Fig. 5, that the angle B is smaller than the angle A. Therefore, the second wrapper web 19 laps over itself for approximately 95% of its width L during one revolution. The second wrapper web 19 is helically wound around the perimeter of the roll 11 for approximately three revolutions, and the advancing of its edge 20a, 20b, 20c can be seen clearly in Figures 3 and 5. The winding of the second wrapper web 19 is started at one end 18 of the roll to be wrapped so that an axial overhang 21 is created at the roll end, which overhang is folded between a so-called inner head disc and an outer head disc (not shown in the Figures), which discs are the same shape as the roll end surface, i.e. circular in shape, and which discs are attached to the other end surface 22 of the roll to be wrapped. Finally, a third wrapper web 23 of wrapping paper is wound at the first end 17 of the roll to be wrapped, around its perimeter, in a similar manner as the second wrapper web 19 described above. As seen in Fig. 5, the third wrapper web 23 is diagonal in relation to the direction of the perimeter of the roll in the same direction as the first wrapper web 15, i.e. in a different direction as compared to the second wrapper web 19. The angle of advance C (not shown in the Figure) of the third wrapper web 23 is equal, however, to the angle of advance B of the second wrapper web 19. In the wrapping 13 of Figures 3 and 5, a thin strip of glue 24 is sprayed under both edges of the second and third wrapper webs 19 and 23 throughout the wrapping. The glue strip secures the seals of the wrapping 13. For the sake of clarity, the glue strips 24 have only been shown in the top right-hand corner of Fig. 3.

[0028] In the wrapping according to the prior art rep-

resented in Fig. 2, it can be seen how the edges of the wrapper web covering an end of the roll are located at the same point and thus form a high protrusion 25.

[0029] In the examples shown in the Figures, the same wrapper stock, for example from the roll 4 of Fig. 1, is used for all wrapper webs 15, 19 and 23. It is obviously possible to use wrapper webs of different widths or, say, of different materials for a single wrapping.

[0030] It is not intended in any way to limit the scope of the invention only to its embodiments as presented above in the description, but it may rather be modified within the scope of the inventive idea presented in the claims.

Claims

1. A method for wrapping a roll of material (11), in which method

   - a first wrapper web (15), the longitudinal edge (16) of which is placed on the roll (11) to be wrapped at a first angle (A) to the direction of the perimeter of the roll (11) to be wrapped, is guided helically around the perimeter of the roll (11) to be wrapped so that it covers at least a part of the peripheral surface (14) of the roll, and
   - a second wrapper web (19) is wound around the perimeter of roll at one end (18) of the roll,

   characterised in that the second wrapper web (19) is wound so that its longitudinal edge (20) is placed on the roll (11) to be wrapped at a second angle to the direction of the perimeter of the roll (11) to be wrapped, after which the second wrapper web (19) is guided helically around the perimeter of the roll (11) to be wrapped.

2. A method according to claim 1, **characterised in that** the winding of the second wrapper web (19) is started at the end (18) of the roll to be wrapped in such a way that an axial overhang (21) is created at the roll end (18).

3. A method according to claim 1 or 2, **characterised in that** the first wrapper web (15) terminates before the end (17, 18) of the roll to be wrapped.

4. A method according to claim 1, 2 or 3, **characterised in that** the first (A) angle is of such magnitude that adjacent layers of wrapper web are substantially overlapping, preferably for approximately 1/2 or 2/3 of the width (L) of the wrapper web.

5. A method according to any of the previous claims, **characterised in that** the adjacent parts of the wrapper web (15, 19, 23) are glued (24) together.

6. A method according to any of the previous claims, **characterised in that** a third wrapper web (23) is wound at the other end (17) of the roll so that its longitudinal edge is placed on the roll (11) to be wrapped at a third angle to the direction of the perimeter of the roll (11) to be wrapped, after which the third wrapper web (23) is guided helically around the perimeter of the roll (11) to be wrapped.

7. A method according to claim 6, **characterised in that** the winding of the third wrapper web (23) is started at the end (17) of the roll to be wrapped in such a way that an axial overhang is created at the roll end.

8. A wrapped roll of material, comprising

   - a first wrapper web (15) wound mainly around the peripheral surface (14) of the roll so as to advance helically and
   - a second wrapper web (19) wound at one end (18) around the perimeter of the roll.

   characterised in that the second wrapper web (19) is wound so as to advance essentially helically.

9. Wrapped roll according to claim 8, **characterised in that** the second wrapper web (19) is arranged so as to create an axial overhang at the end (18) of the roll to be wrapped.

10. A wrapped roll according to claim 8 or 9, **characterised in that** it comprises a third wrapper web (23) that is wound at the other end (17) of the roll so as to advance essentially helically.

Patentansprüche

1. Verfahren zum Einwickeln einer Materialrolle (11), bei welchem Verfahren

   - eine erste Einwickelmaterialbahn (15), deren longitudinale Kante (16) unter einem ersten Winkel (A) zu der Richtung des Umfangs des einzuwickelnden Rolle (11) auf der einzuwickelnden Rolle (11) angeordnet wird, spiralförmig um den Umfang der einzuwickelnden Rolle (11) gefhürt wird, so dass sie zumindest einem Teil der Umfangsoberfläche (14) der Rolle bedeckt, und
   - eine zweite Einwickelmaterialbahn (19) an einem Ende (18) der Rolle um den Umfang der Rolle gewickelt wird,

   dadurch gekennzeichnet, dass die zweite Einwikkelmaterialbahn (19) derart gewickelt wird, dass ihre longitudinale Kante (20) unter einem zweiten Winkel zu der Richtung des Umfangs der einzuwickelnden

Rolle (11) auf der einzuwickelnden Rolle (11) angeordnet wird, wonach die zweite Einwickelmaterialbahn (19) spiralförming um den Umfang der einzuwickelnden Rolle (11) geführt wird.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Wickeln der zweiten Einwickelmaterialbahn (19) an dem Ende (18) der einzuwikkelnden Rolle in einer derartigen Weise begonnen wird, dass ein axialer Überstand (21) an dem Rollenende (18) erzeugt wird.

3. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die erste Einwickelmaterialbahn (15) vor dem Ende (17, 18) der einzuwickelnden Rolle endet.

4. Verfahren gemäß Anspruch 1, 2 oder 3, **dadurch gekennzeichnet, dass** der erste (A) Winkel eine derartige Größe aufweist, dass benachbarte Lagen der Einwickelmaterialbahn im Wesentlichen überlappend sind, bevorzugt über ungefähr 1/2 oder 2/3 der Breite (L) der Einwickelmaterialbahn.

5. Verfharen gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** benachbarte Teile der Einwickelmaterialbahn (15, 19, 23) zusammengeklebt (24) werden.

6. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine dritte Einwickelmaterialbahn (23) derart an dem anderen Ende (17) der Rolle gewickelt wird, dass ihre longitudinale Kante unter einem dritten Winkel zu der Richtung des Umfangs der einzuwickelnden Rolle (11) auf der einzuwikkelnden Rolle (11) angeordnet wird, wonach die dritte Einwickelmaterialbahn (23) spiralförmig um den Umfang der einzuwickelnden Rolle (11) geführt wird.

7. Verfahren gemäß Anspruch 6, **dadurch gekennzeichnet, dass** das Wickeln der dritten Einwickelmaterialbahn (23) an dem Ende (17) der einzuwikkelnden Rolle in einer derartigen Weise begonnen wird, dass ein axialer Überstand an dem Rollenende erzeugt wird.

8. Eingewickelte Materialrolle, umfassend

- eine erste Einwickelmaterialbahn (15), welche hauptsächlich um die Umfangseberfläche (14) der Rolle gewickelt ist, so dass sie spiralförmig fortschreitet, und
- eine zweite Einwickelmaterialbahn (19), welche an einem Ende (18) um den Umfang der Rolle gewickelt ist

dadurch gekennzeichnet, dass die zweite Einwickelmaterialbahn (19) gewickelt ist, so dass sie im Wesentlichen spiralförming fortschreitet.

9. Eingewickelte Rolle gemäß Anspruch 8, **dadurch gekennzeichnet, dass** die zweite Einwickelmaterialbahn (19) angeordnet ist, um einen axialen Überstand an dem Ende (18) der einzuwickelnden Rolle zu erzeugen.

10. Eingewickelte Rolle gemäß Anspruch 8 oder 9, **dadurch gekennzeichnet, dass** sie eine dritte Einwikkelmaterialbahn (23) umfasst, welche an dem anderen Ende (17) der Rolle gewickelt ist, so dass sie im Wesentlichen spiralförmig fortschreitet.

Revendications

1. Procédé d'emballage d'un rouleau de matière (11) procédé dans lequel

- une première nappe d'emballage (15), dont le bord longitudinal (16) est placé sur le rouleau (11) à emballer suivant une première inclinaison (A) par rapport à la direction du périmètre du rouleau (11) à emballer, est guidée de façon hélicoïdale autour du périmètre du rouleau (11) à emballer de sorte qu'elle couvre au moins une partie de la surface périphérique (14) du rouleau, et
- une seconde nappe d'emballage (19) est enroulée autour du périmètre du rouleau au niveau d'une extrémité (18) du rouleau,

caractérisé en ce que la seconde nappe d'emballage (19) est enroulée de façon que son bord longitudinal (20) soit placé sur le rouleau (11) à emballer suivant une seconde inclinaison par rapport à la direction du périmètre du rouleau (11) à emballer, après quoi la second nappe d'emballage (19) est guidée de façon hélicoïdale autour du périmètre du rouleau (11) à emballer.

2. Procédé selon la revendication 1, **caractérisé en ce que** l'enroulement de la seconde nappe d'emballage (19) est commencé au niveau de l'extrêmité (18) du rouleau à emballer de telle manière qu'un surplomb axial (21) soit créé au niveau de l'extrémité de rouleau (18).

3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** la première nappe d'emballage (15) se termine avant l'extrémité (17, 18) du rouleau à emballer.

4. Procédé selon la revendication 1, 2 ou 3, **caractérisé en ce que** la première inclinaison (A) est d'une grandeur telle que des couches adjacentes de nappe

d'emballage se trouvent essentiellement en chevauchement, de préférence sur 1/2 ou 2/3 approximativement de la largeur (3) de la nappe d'emballage.

5. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les parties adjacentes de la nappe d'emballage (15, 19, 23) sont collées (24) ensemble.

6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une troisième nappe d'emballage (23) est enroulée au niveau de l'autre extrémité (17) du rouleau de sorte que son bord longitudinal soit placé sur le rouleau (11) à emballer suivant une troisième inclinaison par rapport à la direction du périmètre du rouleau (11) à emballer, après quoi la troisième nappe d'emballage (23) est guidée de façon hélicoïdale autour du périmètre du rouleau (11) à emballer.

7. Procédé selon la revendication 6, **caractérisé en ce que** l'enroulement de la troisième nappe d'emballage (23) est commencé au niveau de l'extrémité (17) du rouleau à emballer de telle manière qu'un surplomb axial soit formé au niveau de l'extrémité du rouleau.

8. Rouleau de matière emballé, comprenant :

- une première nappe d'emballage (15) enroulée principalement autour de la surface périphérique (14) du rouleau de façon à progresser de façon hélicoïdale et
- une seconde nappe d'emballage (19) enroulée au niveau d'une extrémité (18) autour du périmètre du rouleau,

caractérisé en ce que la seconde nappe d'emballage (19) est enroulée de façon à progresser de façon essentiellement hélicoïdale.

9. Rouleau emballé selon la revendication 8, **caractérisé en ce que** la seconde nappe d'emballage (19) est disposée de façon à créer un surplomb axial au niveau de l'extrémité (18) du rouleau à emballer.

10. Rouleau emballé selon la revendication 8 ou 9, **caractérisé en ce qu'**il comprend une troisième nappe d'emballage (23) qui est enroulée au niveau de l'autre extrémité (17) du rouleau de façon à progresser de façon essentiellement hélicoïdale.

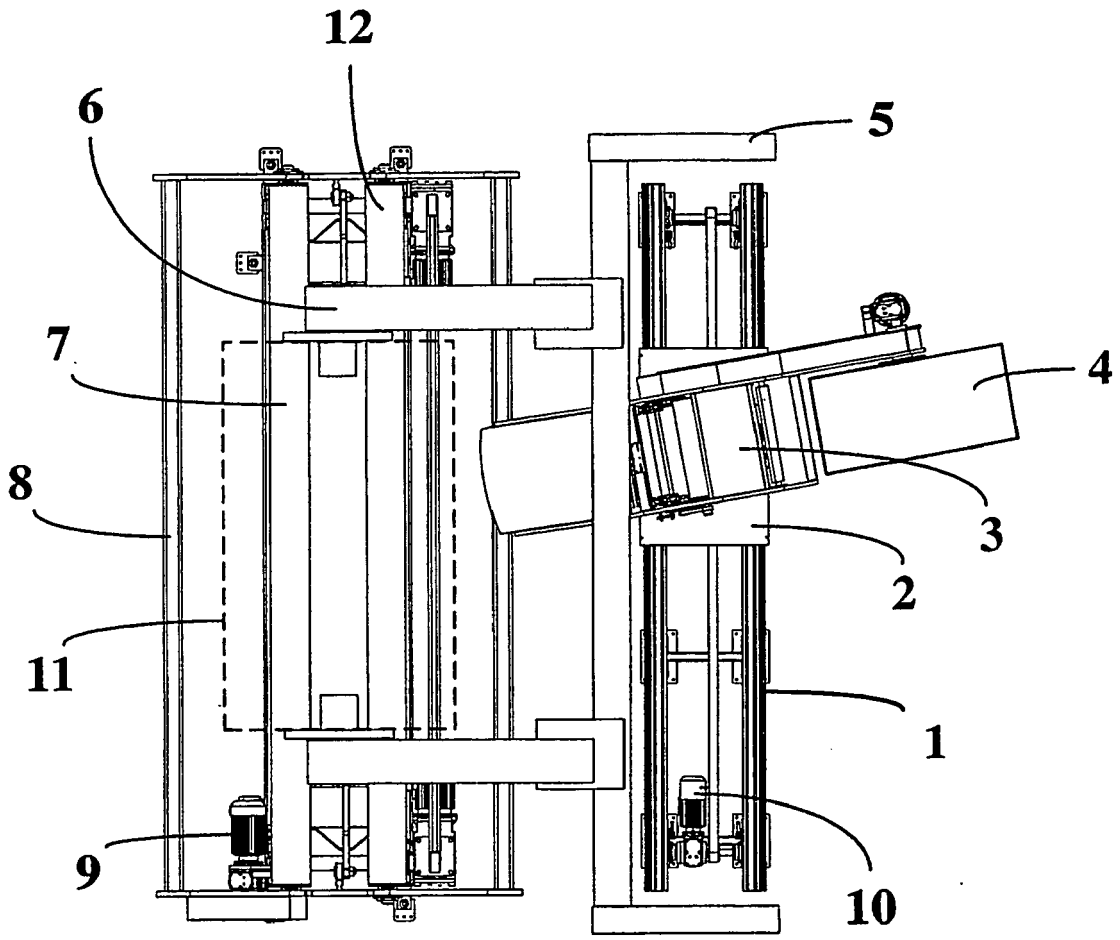
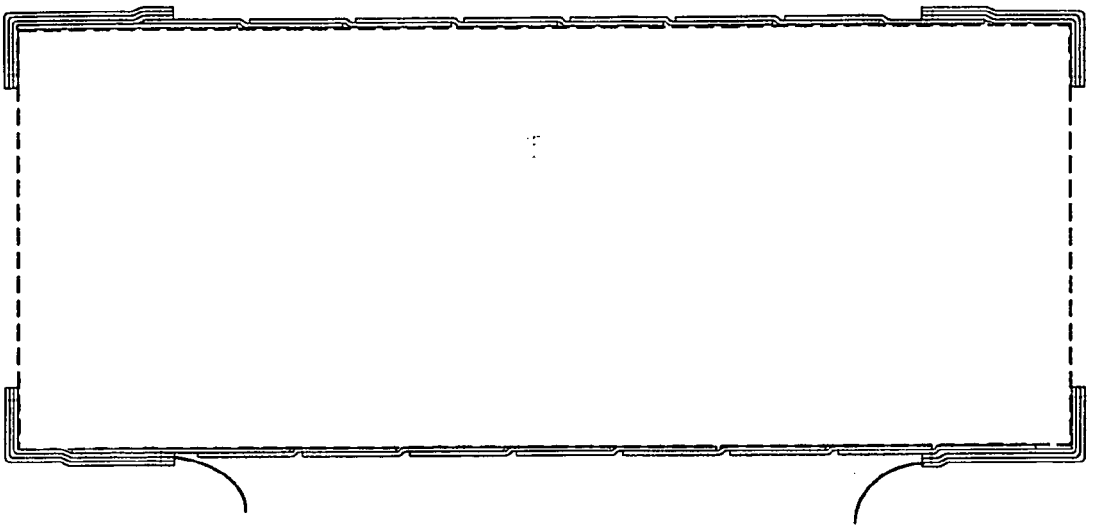


Fig. 1



prior art

Fig. 2

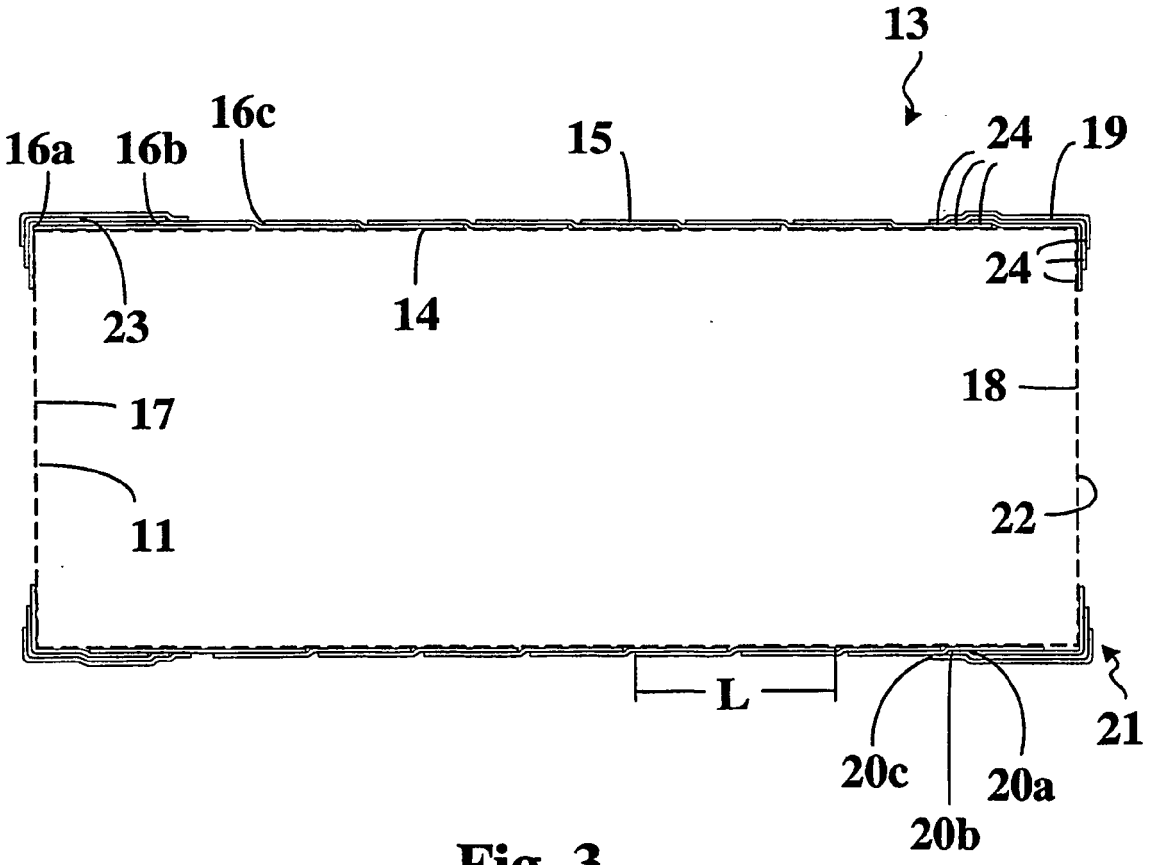
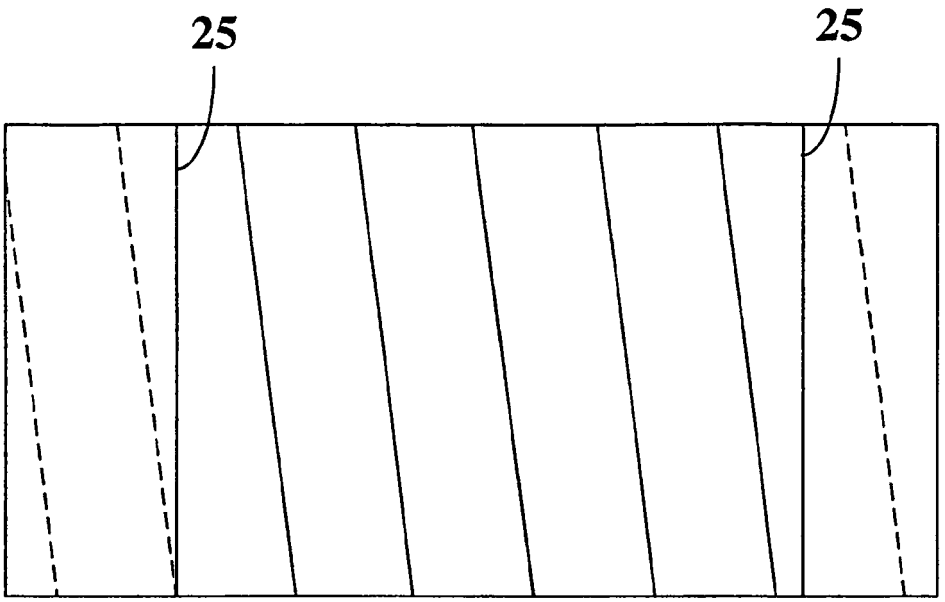


Fig. 3



prior art

Fig. 4

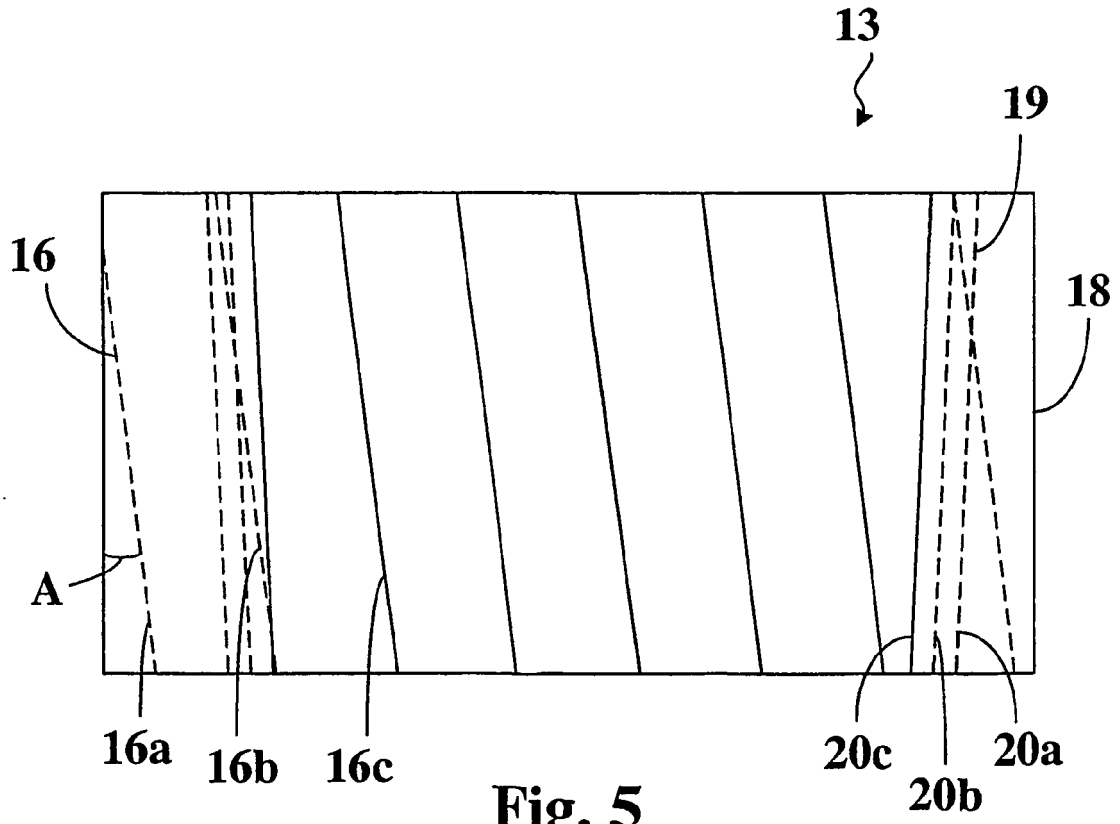


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0519672 A **[0005]**
- US 2872767 A **[0009]**
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