

(1) TITLE OF THE INVENTION

Laminated carton-board like sheet material and method and equipment for its manufacturing.

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(2) CROSS REFERENCED APPLICATIONS

5 197 256 US

603 122 CA

10 1104490 FR

434420 GB

1 159 411 US

1 875 888 US

2 302 487 US

15 2 399 666 US

2 664 596 US

2 757 116 US

2 876 053 US

3 228 822 US

20 3 252 262 US

3 299 595 US

3 763 612 US

3 906 127 US

4 084 366 US

25 4 343 846 US

4 373 313 US

4 643 933 US

(3) BACKGROUND TO THE INVENTION

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Corrugated cardboard is widely used as packaging material. Packaging boxes are thus formed from such cardboard. A disadvantage of corrugated cardboard is that its strength is

mainly transverse to the direction of the corrugated core thus rendering it easily foldable in the direction of corrugations. It is amongst others an object of this invention to provide packaging sheet material that resists folding in any planar direction.

5 **(4) FIELD OF THE INVENTION**

This invention relates to laminated carton-board like sheet material and a method and equipment for its manufacturing.

10 **(5) PRIOR ART DESCRIPTION**

Carton-board like packaging material is commonly known in the art. Conventionally the core of such material is in corrugated form as adhesively laminated between outer sheets.

Packaging material is of necessity required to be lightweight while, however, strong. The
15 conventional corrugated carton-board like packaging material is thus lightweight but has the disadvantage that its strength extends transverse to the direction of the corrugations while being more easily foldable or otherwise deformable in the direction of such corrugations.

(6) BRIEF DESCRIPTION OF THE DRAWING

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The invention is now described, by way of example, with reference to the accompanying drawings. In the drawings

Figure 1 three dimensionally shows laminated sheet material employable for packaging
25 purposes, according to the invention, in the form of a laminated sheet of packaging material,

Figure 2 stepwise shows the method of manufacturing the strengthening core as pre-manufactured in the process of making the laminated sheet,

30 Figure 3 diagrammatically shows a piece of equipment used in the process of pre-manufacturing the core, and

Figure 4 diagrammatically shows equipment used for the continuous manufacturing of laminated sheets of carton-board like packaging material.

(7) DETAILED DESCRIPTION OF THE DRAWINGS

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Referring to figure 1 of the drawings, a sheet of laminated carton-board like packaging material in the form of a sheet of laminated carton board material, according to the invention, is generally indicated by reference numeral 10.

- 10 The laminated sheet 10 comprises a non-solid core 12 of lightweight material presenting a regular pattern of multi-sided in the form of hexagonally profiled open-ended cells 14 as defined between walls 16, adhesively affixed between opposing sheets of thin lightweight outer ply material 18. While the sheets 18 are by themselves subject to bendable deformation their combination into the laminated sheet 10 strengthens them against folding
- 15 in substantially all planar directions and in particular in the directions indicated by the axes 20 and 22 as extending transverse to one another; thus against folding actions as indicated by arrows 24.

The firmness as imparted to the laminated sheet 10 by the core 12 is a function of its

20 patterning thus enabling its manufacturing from lightweight material. The core is typically of fluting type material while having a density of in the order of 125 grams per square metre.

The sheets 18, as also of lightweight material, are typically of Kraft lining material having a density of in the order of 150 grams per square metre.

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As the laminated sheet 10 is used as packaging material it is necessarily thin to render a container or the like made therefrom or from a plurality of sheets 10 as conventionally inter-secured desirably lightweight and non-bulky. To this end its thickness is in the order of between one and ten mm and preferably between two and five mm. The sheets 10 have a

30 density of in the order of 500 grams per square metre, typical of carton-board packaging material.

The process of manufacturing laminated sheets 10 involves the pre-manufacturing of core material. Referring also to figures 2 and 3 the method of manufacturing the core 12 involves a first step of affixing a plurality of core defining sheets 26 to one another into a stack 28 via suitably staggered parallel securing zones as provided by off-set glue strips 30 as formed
5 along one major surface of each sheet 26. Referring to figure 2(a) the glue strips 30 are thus offset with respect to one another along alternate sheets 26. Figure 2(a) shows the sheets 26 just prior to being formed into the stack 28 while figure 2(b) shows them as urged together into forming the stack 28. To ensure that the cells 14 are regularly hexagonally formed, the glue strips 30, as of the same width, along alternate sheets 26 are offset by half
10 the distance by which the strips 30 are spaced apart. It will be appreciated that the glue strip width and spacing can be varied if another cell profile is desired.

Although not only limited to such method the glue strips 30 can conveniently be formed along the sheets 26 by means of equipment 32 as shown in figure 3. The equipment 32
15 comprises a frame 34 between the side members of which a nip-roller 36, a series of glue application rollers 38 and a transfer roller 40 are rotatably mounted. The roller 40 is driven from a motor 42 while the roller 36 and 38 are driven via meshing sprockets 44 from the roller 40. The roller 32 rolls through a tray 46 containing gluing liquid once the equipment 32 is in use.

20 Glue strip application to sheets 26 are achieved by passing successive sheets along the nip 36.1 between the nip roller 36 and the application rollers 38. Successive sheets 26 are alternately laterally off-set passed along the equipment 32 at the desired lateral spacing to achieve the desired off-set application of the glue strips 30 as described above.

25 Referring again to figure 2(b) the stack 28 is thus formed in response to successive sheets 26 becoming adhesively secured to one another via the adhesive effect of the glue strips 30.

The next step in the formation of the core 12, and referring to figure 2(c) which shows the
30 stack 28 in the direction into the figure 2(b) drawing, involves severing an end portion 46 from the stack 28 by way of trimming it off with the use of a guillotine or the like (not shown). As the thickness of the end portion 46 mainly determines the width of a laminated sheet 10 because of defining the core 12 once expanded, this end portion 46 is naturally also less

than 10 mm and preferably between two and five mm to provide the desired width of laminated sheet once formed. The stack 28 is naturally trimmed to provide a plurality of core bases that are expanded into cores 12. The stack 28 can even be cut by simultaneously providing a plurality of core bases 29.

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In referring to figures 2(c) and 2(d), the final step in forming a core 12 involves simply expanding a core base 29 as trimmed off from the stack 28 in the direction of arrow 48 into defining the hexagonally cell shaped item. To this effect the sheets 26 are of firm but bendable material to permit the necessary deformation of a strip cut there from into forming the celled core 12.

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Once a core 12 is formed the final step in manufacturing a laminated sheet 10 involves simply adhesively securing sheets 18 of matching dimensions as regards one another and the core 12 to opposite sides of the core 12. Any suitable glue can be used for adhesively securing the sheets 18 to the core 12 and the sheets 26 to one another. Typical is a modified polyvinyl acetate resin emulsion such as a type known in South Africa under the identification QAR 173A as provided by Qualichem (Pty) Ltd.

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Although the sheets 10 can be individually made it will be appreciated that such process will be time consuming.

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In referring to figure 4 equipment used for the continuous manufacturing of laminated sheets 10 of packaging material is generally indicated by reference numeral 50. The equipment 50, as being generally conventional for manufacturing laminated sheets of material except where specifically indicated, provides two outer ply sheet material supply reels 52 and core feeding, pre-processing and drying/curing equipment generally indicated by reference numeral 54. The equipment 54 includes a core supply magazine 56 into which core bases 29, manufactured as discussed above with reference to figures 2 and 3, and adhesively secured as discussed in the previous paragraph, are fanfold fashion stored in their still unexpanded form. The core supply magazine 56 is conveniently spring loaded to maintain core supply in easily withdrawable form once the equipment 50 is in use.

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The equipment 50 includes an outer sheet pre-processing unit 60 and subsequent drying and curing station 62, a pressing and laminating station 64, a laminated sheet rotary die-cutting unit 66 and a storing magazine 68.

5 In use the reels 52 in synchronisation with the core providing material 56 thus supplies core providing material 70 and outer sheet providing material 72 to the laminating station 64.

Once withdrawn from the reels 52 the opposite sheets of outer sheet providing material 72 first pass along the unit 60 where the material 72 is typically processed by way of coating, printing and/or any other standard packaging material pre-treatment while passing along
10 appropriate sets of guide and treatment rollers 74. The material 72 thus progresses to the drying and curing station 62 where it, while also passing along guide and treatment rollers 76, is in a way conventional to the packaging process dried and cured. The material 72 is thus fed to the laminating station via sets guiding rollers generally indicated by reference numeral 78.

15 In synchronisation with the supply of material 72 the core providing material 70 is withdrawn from the core supply magazine 56. To prepare a continuous supply of core material 70 and referring to figures 2 and 3 above, individual core bases 29 as cut from the stack 28 are end on, along end faces 35 as shown in figure 2(d), adhesively secured to one another and the
20 continuous length of core so formed stacked into the magazine 56 thus remaining substantially unexpanded except for expanding somewhat at the fan fold bends. The core providing material 70 thus progresses over a core material advancing roller 80 and along a series of expansion and stabilising nip rollers 82 where it is properly expanded into its core forming condition (such as shown in figure 2(d)). The outer sheet providing material 72 and
25 the core providing material 70 thus become laminated and pressed together in the station 64 in response to glue being applied to the appropriate surfaces of the outer sheet providing material 72 or the opposite edges of the core providing material 70 or both. The pressing effect is obviously controlled to ensure that the core providing material 70 is not in the process damaged.

30 The laminated sheet material 84 is thus passed on via a conveyor 86 that provides for drying and curing of the laminated sheet material 84, to a die cutting unit 66 in which the continuous laminated sheeting is processed into packaging cardboard like product such as

carton-board blanks and thence to a stacking station 88 in which the cut sheets now in the form of individual laminated sheets 10 are stored in the storage magazine 68. The sheets 10 can also be passed on directly for conventional further application or treatment.

- 5 It is an advantage of the invention as specifically described, that it provides laminated sheet material eminently suitable for packaging while other applications are obviously not excluded.

(8) CLAIMS

(1) Laminated carton-board like sheet material at least employable for carton board fashion packaging purposes comprising,

5 a non-solid strengthening core of lightweight material providing the desired strengthening characteristic mainly because of its patterning, affixed to and extending between opposing sheets of lightweight outer ply material each of a substance prone to bendable deformation with the core extending according to a suitable pattern to strengthen the sheets, as
10 laminated into an item of laminated sheet material in conjunction with the core, against folding in directions also extending at least substantially transverse with respect to one another.

(2) Laminated carton-board like sheet material as claimed in claim 1 in which the core at
15 least mainly provides a plurality of adjacently located open-ended cells separated by walls along the edges of which the sheets of outer ply material are affixed to the core.

(3) Laminated carton-board like sheet material as claimed in claim 2 in which the cells of the core are formed by strips of fluting type material.

20 (4) Laminated carton-board like sheet material as claimed in claim 3 in which the core is of material of in the order of 125 grams per square metre density.

(5) Laminated carton-board like sheet material as claimed in any one of claims 2 to 4 in
25 which the core extends according to a regular pattern.

(6) Laminated carton-board like sheet material as claimed in any one of claims 2 to 5 in which the core provides a plurality of multi-sided cells.

30 (7) Laminated carton-board like sheet material as claimed in claim 6 in which the core is manufactured from an appropriate plurality of core defining sheets of firm material that permits deformation at least when severed into strips with the core defining sheets being



secured to one another along staggered parallel securing zones as regards adjacent sheets into a stack from which an expanded end slice forms the core of which the height is thus defined by the thickness of such slice.

- 5 (8) Laminated carton-board like sheet material as claimed in claim 6 or claim 7 in which the cells of the core present at least generally the same end profile.

(9) Laminated carton-board like sheet material as claimed in any one of claims 6 to 8 in which the cells of the core are hexagonally shaped.

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(10) Laminated carton-board like sheet material as claimed in any one of the preceding claims in which the core is affixed to the opposing sheets of outer ply material by being adhesively secured thereto.

- 15 (11) Laminated carton-board like sheet material as claimed in any one of the preceding claims in which the sheets of outer ply material are in the form of Kraft lining material.

(12) Laminated carton-board like sheet material as claimed in claim 11 in which the sheets of outer ply material have a density of in the order of 160 grams per square metre.

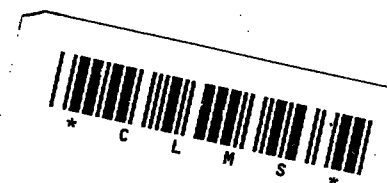
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(13) Laminated carton-board like sheet material as claimed in any one of the preceding claims which has a thickness of between one and ten mm.

- 25 (14) Laminated carton-board like sheet material as claimed in claim 13 which has a thickness of between two and five mm.

(15) Laminated carton-board like sheet material as claimed in any one of the preceding claims which has an overall density of in the order of 500 grams per square metre.

- 30 (16) Laminated carton-board like sheet material as claimed in claim 15 which has an overall density of between 300 and 400 grams per square metre.



(17) Laminated carton-board like sheet material as claimed in any one of the preceding claims which is of a thickness of between three and four mm as often used for carton-board type packaging product.

- 5 (18) A method of manufacturing laminated carton-board like sheet material at least employable for packaging purposes comprising

affixing sheets of a substance prone to bendable deformation by way of sheets of outer ply material to a pre-manufactured core of non-solid lightweight material that extends according
10 to a suitable pattern to strengthen the sheets of outer ply material, once laminated into an item of sheet material in conjunction with the core, against folding in directions also extending at least substantially transverse with respect to one another.

- (19) A method as claimed in claim 18 in which the sheets of outer ply material are affixed to
15 the core as at least mainly providing a plurality of adjacently located open-ended cells separated by walls, along the edges of the walls.

(20) A method as claimed in claim 19 in which the cells of the core, to which the sheets of outer ply material become affixed, are formed by strips of fluting type material.

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(21) A method as claimed in claim 19 or claim 20 in which the core, to which the sheets of outer ply material become affixed, is provided by a material having a density of in the order of 150 grams per square metre.

- 25 (22) A method as claimed in any one of claims 19 to 21 in which the core, to which the sheets of outer ply material become affixed, extends according to a regular pattern.

(23) A method as claimed in any one of claims 19 to 22 which involves pre-manufacturing the core from an appropriate plurality of rectangular core defining sheets of firm material that
30 are deformable at least when severed into strips with the core providing sheets being alignably secured to one another into a stack along staggered parallel securing zones from which stack severing of an end slice, as expanded, forms the core of which the height is thus defined by the thickness of the end slice.



(24) A method as claimed in claim 23 in which the thickness of the end slice as sliced from the stack is between one and ten mm.

5 (25) A method as claimed in claim 24 in which the thickness of the end slice as sliced from the stack is between two and five mm.

(26) A method as claimed in any one of claims 23 to 25 in which pre-manufacturing of the core involves adhesively securing the core defining sheets to one another by way of glue
10 strips extending off-set with respect to one another along the appropriate surfaces of the core defining sheets.

(27) A method as claimed in any one of claims 23 to 26 which is performed on a continuous basis involving the continuous lamination of a pre-manufactured core supply as feedingly
15 held, and as formed from end-on inter-connected end slices, between sheets of outer ply material, as appropriately supplied, and cutting the laminated product into desired lengths thereby forming sheets of carton-board like material.

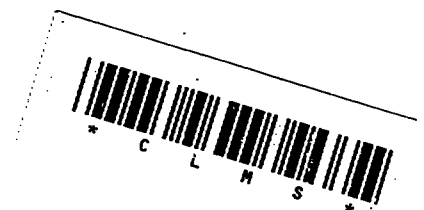
(28) A method as claimed in claim 27 in which the core supply is fan fold stacked fashion
20 feedingly held.

(29) A method as claimed in claim 28 which involves passing the core material along an advancing roller that performs at least the function of promoting its expansion

25 (30) A method as claimed in any one of claims 27 to 29 in which the sheets of outer ply material is supplied on a continuous basis.

(31) A method as claimed in any one of claims 18 to 30 in which the core, to which the sheets of outer ply material become affixed, provides a plurality of multi-sided cells.
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(32) A method as claimed in claim 31 in which the core, to which the sheets of outer ply material become affixed, presents cells of at least generally the same end profile.



(33) A method as claimed in claim 31 or claim 32 in which the core, to which the sheets of outer ply material become affixed, presents hexagonally shaped cells.

5 (34) A method as claimed in any one of claims 18 to 33 in which the sheets of outer ply material are affixed to the core by being adhesively secured thereto.

(35) A method as claimed in any one of claims 18 to 34 in which the sheets of outer ply material, as becoming affixed to the core, are in the form of Kraft lining material.

10 (36) A method as claimed in claim 35 in which the sheets of outer ply material, as becoming affixed to the core, have a density of in the order of 150 grams per square metre.

(37) A method as claimed in any one of claims 18 to 36 in which the parameters of the outer material and the core are selected to enable the manufacturing of laminated sheet material
15 employable for forming carton packaging product.

(38) Equipment for continuously manufacturing sheet material at least employable for packaging purposes comprising

20 core supply and outer sheet feeding means for continuously and in a synchronised way supplying core and outer sheet providing material for lamination and severing into laminated sheet material as claimed in any one of claims 1 to 17,

a laminating station in which such core and outer sheet providing material are secured to
25 one another, and

a cutting and storing facility in which such laminated product is cut into desired lengths thus providing sheets of laminated carton-board like material that is disposed for storage or direct further use, the core supply feeding means making provision for feeding such core as fan
30 fold fashion held via an expanding and nip roller layout to the laminating station to achieve the desired matching between such core and such outer sheet providing material.



(39) Equipment as claimed in claim 38 which incorporates an outer sheet providing material pre-processing facility in which such material is conventionally processed prior to lamination.

(40) Equipment as claimed in claim 38 or claim 39 which includes a rotary die cutting facility
5 by mean of which the laminated sheets are desirably individual sheet fashion cut for further use.

(41) Equipment for continuously manufacturing sheet material substantially as described with reference to figure 4 of the drawings.

