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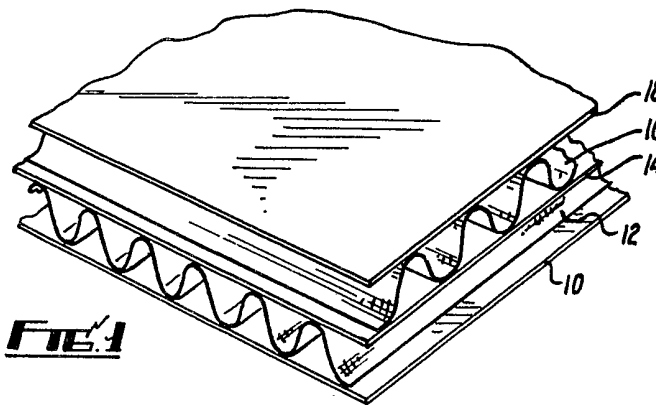
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**GB 0575470 GB 1220239 GB 1188834**

(58) Field of search  
**B5N**

(54) **Improvement in or related to  
corrugated products**

(57) A laminated corrugated paper board includes two sheets 12, 16 of corrugated paper fixed to and separated from each other by an intervening paper sheet 14 with the corrugations of each lying at angle to each other e.g. perpendicularly, an uncorrugated printed sheet being optionally attached to one of the outer faces of the board.



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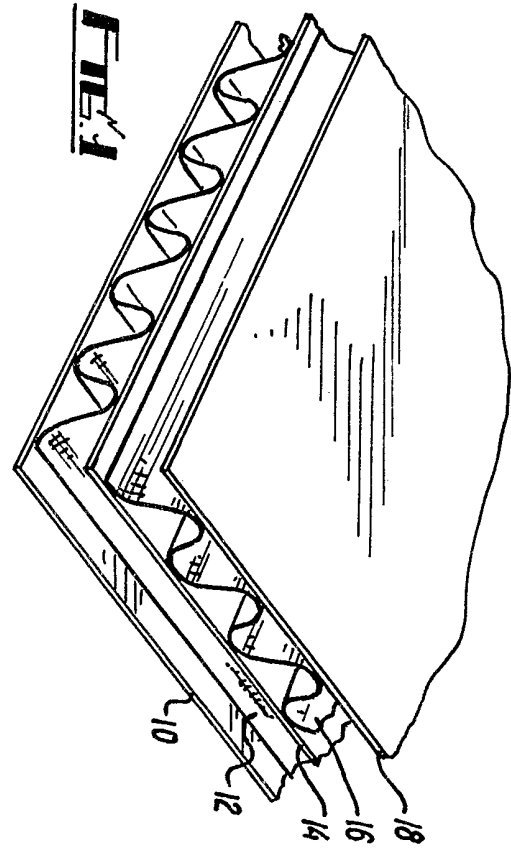
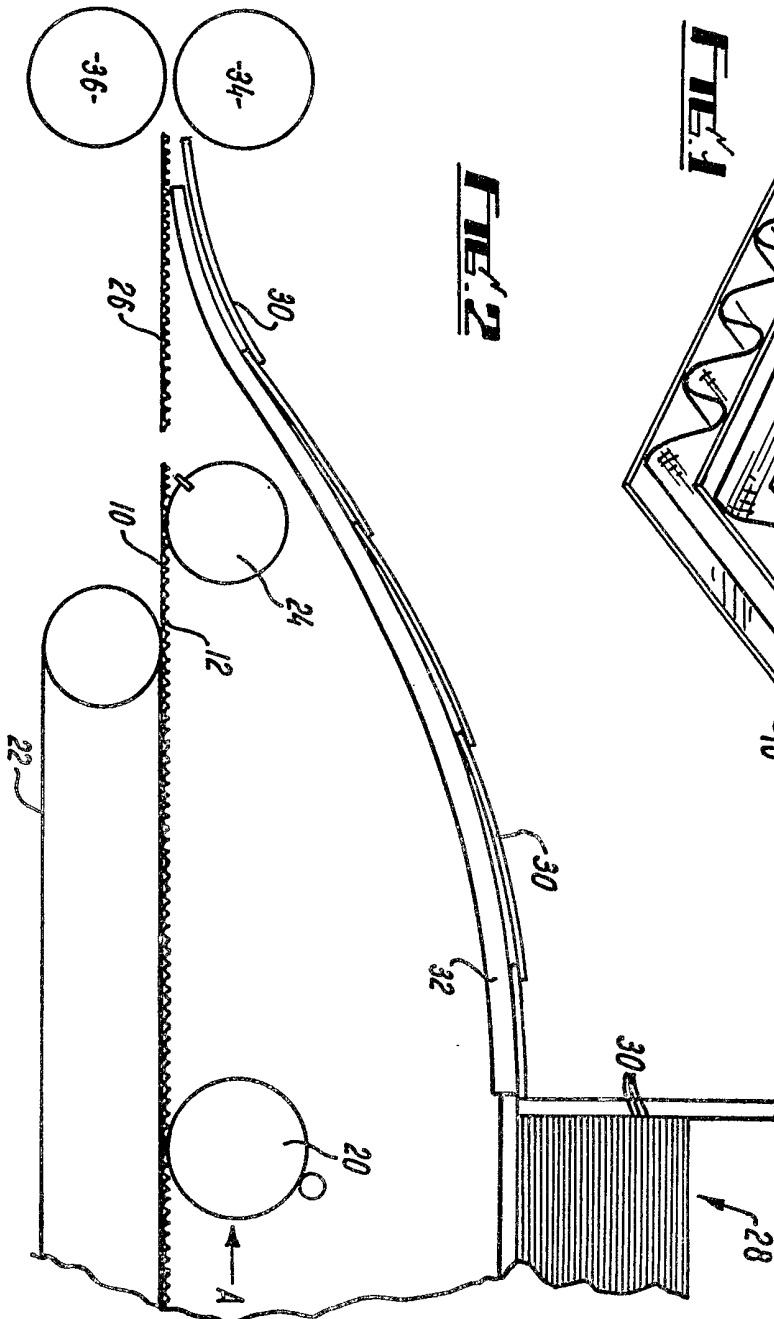


FIG. 2



## SPECIFICATION

**Improvements in or relating to corrugated products**

5 The present invention concerns improvements in or relating to corrugated paper products. The invention relates, especially but not exclusively, to a board-like packaging material comprising a lamination of sheets of paper or board and corrugated paper or board.

10 In this specification the term "paper" will be used in a wide sense to cover all paper, paper-like and board material.

15 A problem with existing corrugated board, whether it is single-faced (that is it comprises a paper sheet with a corrugated sheet attached to one face thereof) or double-faced (that is it comprises a paper sheet attached to each face of a corrugated sheet) is that it lacks rigidity in a direction which is transverse to the axis of the flutes of the corrugated sheet.

20 It is an object of the present invention to obviate and mitigate this advantage.

25 According to the present invention there is provided a corrugated paper board comprising a laminate including two sheets of corrugated paper fixed to and separated from each other by an intervening paper sheet, the longitudinal axes of the corrugations of the first sheet lying at an angle relative to the longitudinal axes of the corrugations of the second sheet.

30 Preferably said angle is ninety degrees.

35 Preferably at least one facing sheet is fixed to the side of one of the corrugated sheets not attached to the intervening sheet.

40 Preferably a sheet of paper carrying print on its outermost face is attached to one of the outer faces of the board.

45 Further, according to the present invention there is provided a method of manufacturing a corrugated board comprising forming a continuous web of a first laminate by fixing a fluted sheet to an unfluted sheet, and fixing to said first laminate on its face remote from said unfluted sheet a second laminate comprising a fluted sheet and unfluted sheets fixed to each side of the said fluted sheet, the axis of the flutes of the second laminate being arranged at an angle to the axis of the flutes of the first laminate.

50 Preferably said second laminate is manufactured by producing a continuous web comprising a first unfluted sheet and a fluted sheet, separating a discreet length of product from said web and fixing a printed sheet to the fluted sheet on its face remote from said first sheet.

55 Preferably the second laminate is square and is rotated through ninety degrees prior to fixing it to the continuous first laminate in a manner similar to that in which the printed sheet is fixed to the second laminate.

60 An embodiment of the present invention will now be described by way of example only

with reference to the accompanying drawings in which:

70 *Figure 1* shows a diagrammatic perspective view of a corrugated product and

*Figure 2* shows a diagrammatic view of a machine for producing the product.

75 The board shown diagrammatically in Fig. 1 comprises a first sheet of paper 10 which is fixed by means of adhesive to the crests of the flutes a sheet 12 of corrugated paper. An intermediate unfluted sheet of paper 14 is fixed by adhesive to the crests of the flutes of the fluted sheet 12 and a further corrugated sheet 16 is fixed by adhesive to the crests of its flutes to the intermediate sheet 14, the longitudinal axes of the flutes of the sheet 16 being oriented at ninety degrees to the longitudinal axes of the flutes of the sheet 12. An outer sheet 18 is attached by adhesive to the crests of the flutes of the corrugated sheet 16.

80 The composite laminate thus produced provides a rigid board as it utilises the reinforcing effect of the flutes of the sheets in two mutually perpendicular directions.

85 A method of manufacturing the board is illustrated diagrammatically in Fig. 2 which shows the outlet from a known machine for manufacturing single or double faced corrugated board, the arrangements for forming the corrugated sheet 12 and fixing it to the unfluted sheet 10 not being illustrated. A continuous web of single faced corrugated board arrives from the machine in the direction of arrow A and adhesive is applied to the crests of the corrugations by an adhesive applicator 20, the web being supported and carried past the applicator by a pneumatic endless conveyor 22. A rotating shear 24 is positioned at the end of the conveyor 22 and separates off lengths of web into square first laminates 26 of single faced corrugated board. A magazine 28 feeds second laminates 30 having dimensions similar to the first laminates 26 along a feed table 32, the table being gently radiused such that board sections thereon can conform to the table surface without damage. A feeding and timing arrangement (not shown) is provided at the lower end of the table 32 and supplies laminates 30 to the tops of the laminates 26 exiting from the shear, the top laminates 30 being pressed against the bottom laminates 26 by a pair of rollers 34, 36.

90 The stack of boards 30 in the magazine is arranged such that their corrugations are parallel to the direction in which they are travelling, that is they are transverse to the corrugations of the laminates 26 and thus the completed boards emerging from the rollers 34, 36 take the form of that shown in Fig. 1.

95 It will be realised, therefore, that the second laminate 30 is not a sheet of single-faced corrugated board, it is double-faced. Conveniently this double-faced board is manufactured in the same way as the first board on the same machine. The manufacturing steps de-

scribed above are again followed but rather than load the magazine with laminates 3 single sheets, which are printed on their outer face are used. Thus in a manufacturing step 5 carried out prior to that illustrated in Fig. 2 the second laminates are manufactured. These second laminates comprise intermediate sheet 14, corrugated sheet 16 and printed outer sheet 18. A stack of second sections is then 10 loaded into the magazine, ensuring that the axes of the flutes of the corrugated sheets are turned through ninety degrees with respect to the direction from which they exit from the machine during the preliminary manufacturing 15 step.

Various modifications can be made without departing from the scope of the invention, for example the machine can manufacture double-faced board, either when manufacturing 20 the first or second laminates or both.

In a modified manufacturing technique, the second laminates are moved along a table with their flutes running parallel to the direction of movement, adhesive having been applied thereto, and the second laminate is 25 rolled of a continuous web presented to either the top of the bottom of the laminates on the table.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any 30 patentable feature or combination of features hereinbefore referred to whether or not particular emphasis has been placed thereon.

#### CLAIMS

- 40 1. A corrugated paper board comprising a laminate including two sheets of corrugated paper fixed to and separated from each other by an intervening paper sheet, the longitudinal axis of the corrugations of the first sheet lying at an angle relative to the longitudinal 45 axes of the corrugations of the second sheet.
2. A board as claimed in claim 1, in which said angle is ninety degrees.
3. A board as claimed in claim 1 or claim 2, in which at least one facing sheet is fixed 50 to the side of one of the corrugated sheets not attached to the intervening sheet.
4. A board as claimed in any one of claims 1 to 3, in which a sheet of paper carrying print on its outermost face is attached 55 to one of the outer faces of the board.
5. A method of manufacturing a corrugated board comprising forming a continuous web of a first laminate by fixing a fluted sheet to an unfluted sheet, and fixing to said first 60 laminate on its face remote from said unfluted sheet a second laminate comprising a fluted sheet and unfluted sheets fixed to each side of the said fluted sheet, the axis of the flutes of the second laminate being arranged at an 65 angle to the axis of the flutes of the first

laminate.

6. A method as claimed in claim 5, in which said second laminate is manufactured by producing a continuous web comprising a 70 first unfluted sheet and a fluted sheet, separating a discreet length of product from said web and fixing a printed sheet to the fluted sheet on its face remote from said first sheet.

7. A method as claimed in claim 5 or 75 claim 6, in which the second laminate is square and is rotated through ninety degrees prior to fixing it to the continuous first laminate in a manner similar to that in which the printed sheet is fixed to the second laminate.

8. A corrugated paper board substantially as hereinbefore described with reference to the accompanying drawings.

9. A method of manufacturing a corrugated board, substantially as hereinbefore described with reference to the accompanying 85 drawings.

10. Any novel subject matter or combination including novel subject matter herein disclosed, whether or not within the scope of or 90 relating to the same invention as any of the preceding claims.

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