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(54) **METHOD OF RIGIDIFYING FANFOLD CARDBOARD MATERIAL**

(57) A method of rigidifying fanfold cardboard blank prior to forming packaging boxes and cartons therefrom, said cardboard blank having a plurality of transversely extending crease lines allowing the blank to be folded in fanfold arrangement, comprising applying tape to at least one side of the blank such that the tape overlies each transverse crease line to thereby rigidity the material in the region of each crease line.

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Description

[0001] This invention relates to a method of rigidifying fanfold cardboard material prior to forming packaging boxes and cartons therefrom, preferably in an automated packaging forming machine.

[0002] Fanfold cardboard (simply known as "Fanfold") is a continuous sheet of corrugated board that has been scored and folded in zigzag manner like a fan. Each score is referred to as a fanfold crease line. It is an ideal stock material for customers who have many different sized products and are using a large number of different packaging specifications.

[0003] Fanfold provides cost saving by facilitating the reduction of material used to form packaging and lowering inventory costs (because fewer different sizes of stock material need to be held in stock). It offers maximum flexibility as it can be used for packing different products in varying sizes and quantities.

[0004] For manual packaging processes, the board can easily be scored along its length, making it easy to fold to your required size.

[0005] Special fanfold processing machines are also available allowing the user to create made to measure boxes and other packaging from stock fanfold cardboard, bespoke to their needs and on their own premises.

[0006] Made from corrugated cardboard, fanfold is available in a number of different flutings and various widths. It can be supplied in two colour flexographic print or preprinted.

[0007] However, the transversely extending fanfold crease lines formed to allow the material to be folded in zigzag fashion can have a negative impact on the processability/ runnability of the fanfold cardboard and also a detrimental effect on the performance of a packaging made therefrom. The fanfold crease lines may cause the sheet material to jam in a machine used to convert the Fanfold sheet material into a box blank and can cause problems assembling the thus formed box blank into packaging, particularly where a fanfold crease line is close to an intended fold line of the box blank or extends through a tab or flap used to secure the box in an assembled configuration, and/or cause weakness in the assembled box or package.

[0008] There have been a number of prior art attempts to address the problem of fanfold crease lines when making packaging boxes and cartons from continuous fanfold corrugated board.

[0009] In WO 2018/136658, a system is used which detects the location of fanfold crease lines and, where it is determined that the crease lines will be in a problematic position in the resulting packaging, the sheet material is either cut to remove the problematic crease line from the resulting packaging or the sheet is manipulated to adjust the position of the crease line in the resulting packaging to a less problematic position. This clearly increases waste.

[0010] In EP3521006, rather than cutting out parts of the stock material in which the fanfold crease lines are located, the locations of the fanfold crease lines are determined and the locations of the folds, incisions and cut outs required to create the packaging are adjusted and optimised to avoid the fanfold crease lines being located in problematic locations in the finished packaging. While this can reduce waste, it can be a costly, time consuming and difficult process to achieve.

[0011] In WO 2014/188010, the material in the region of the fanfold crease lines is strengthened by forming indentations in the material extending across the crease lines. However, these indentations can themselves increase the abovementioned processability/ runnability problems of the fanfold cardboard and can be detrimental to the performance of packaging made therefrom, as well as being visually undesirable in the finished packaging.

[0012] According to a first aspect of the present invention there is provided a method of rigidifying fanfold cardboard material prior to forming packaging boxes and cartons therefrom, said cardboard material having a plurality of transversely extending crease lines allowing the material to be folded in fanfold arrangement, comprising applying tape to at least one side of the material such that the tape overlies each transverse crease line to thereby rigidify the material in the region of each crease line. The term "tape" is intended to encompass any strip of material, such as paper, fabric or foil.

[0013] Preferably the method comprises applying tape to both sides of the fanfold cardboard material in the region of each crease line thereof.

[0014] A suitable adhesive may be applied to the tape and/or the fanfold cardboard material to secure the tape over the respective crease line or the tape may comprise self-adhesive tape.

[0015] The tape may be made from a paper based material, although it is envisaged that the tape may comprise or contain metallic and/or polymeric materials.

[0016] According to a further aspect of the present invention there is provided an apparatus for rigidifying fanfold cardboard prior to forming packaging therefrom comprising a tape applicator adapted to apply tape to at least one side of the material to overly each crease line formed therein to thereby rigidify the material in the region of each crease line. Preferably the tape applicator is adapted to apply tape both sides of the fanfold cardboard material in the region of each crease line thereof.

[0017] The apparatus may include an adhesive applicator adapted to apply adhesive to the tape and/or the fanfold cardboard material to secure the tape to the fanfold cardboard material or the tape may comprise self-adhesive tape.

[0018] In a preferred embodiment said tape is made from a paper based material, preferably having an appearance/colouration adapted to blend in with the material of the fanfold cardboard material.

[0019] According to a further aspect of the present invention there is provided a method for automatically forming packaging boxes from fanfold cardboard comprising

the step of rigidifying the fanfold cardboard material by applying tape on at least one side thereof to overlie each crease line formed therein and thereby rigidify the material in the region of each crease line. The method preferably comprises applying tape to both sides of the fanfold cardboard material in the region of each crease line thereof. Preferably tape is applied to at least one side of each crease line of the fanfold cardboard material when the respective crease line is unfolded and exposed during unfolding of the fanfold material as it is fed into a package forming machine. Preferably strips of said tape are applied to both sides of the fanfold material over a respective crease line when the respective crease line is unfolded and exposed during unfolding of the fanfold material as it is fed into a package forming machine.

[0020] As mentioned above, fanfold cardboard material (simply known as "Fanfold") is a continuous sheet of corrugated board that has been scored and folded in zigzag manner like a fan. Each score line is referred to as a fanfold crease line. It is an ideal stock material for customers who have many different sized products and are using a large number of different packaging specifications. However, the fanfold crease lines have a negative impact on the processability/ runnability of the fanfold cardboard material and also a detrimental effect on the performance of a packaging made therefrom.

[0021] By applying strips of tape to the transverse crease lines of the fanfold cardboard, on at least one side of the material, as it is unfolded, these problems are alleviated in a simple and cost effective manner without any wastage of material.

[0022] The strips of tape are preferably made of paper based material and are adhesively secured, preferably to both sides of the fanfold over each transverse crease line thereof, by means of a cold or hot melt adhesive or by using a self-adhesive tape.

[0023] The strength properties of the tape are typically equal or stronger than the liners of the corrugated fanfold material.

[0024] The strips are preferably applied on both sides of the fanfold to resist subsequent folding of the material in the region of said transverse crease lines. However, it is envisaged that the tape may only be applied to one side of the fanfold.

[0025] The width of the tape should be at least one and a half times the width of the damaged area of the fanfold crease line.

[0026] The tape may be applied to the crease lines of the fanfold on a packaging machine, more specific after the unfolding of the fanfold and before or after application of cut creases in the fanfold.

[0027] The tape may be supplied on a reel and cut into strips of the required length and/or width before application to the fanfold.

[0028] The tape may be glued to the fanfold using either self-adhesive, hot melt glue or cold glue (PVA).

[0029] The invention is not limited to the embodiments described herein but can be amended or modified without departing from the scope of the present invention as defined by the appended claims.

Claims

1. A method of rigidifying fanfold cardboard material prior to forming packaging boxes and cartons therefrom, said cardboard material having a plurality of transversely extending crease lines allowing the material to be folded in fanfold arrangement, comprising applying tape to at least one side of the material such that the tape overlies each transverse crease line to thereby rigidity the material in the region of each crease line.

2. A method as claimed in claim 1, comprising applying tape to both sides of the fanfold cardboard material in the region of each crease line thereof.

3. A method as claimed in claim 1 or claim 2, wherein an adhesive is applied to the tape and/or the fanfold cardboard material to secure the tape over the respective crease line.

4. A method as claimed in claim 1 or claim 2, wherein said tape comprises self-adhesive tape.

5. A method as claimed in any of claims 1 o 4, wherein said tape is made from a paper based material.

6. An apparatus for rigidifying fanfold cardboard prior to forming packaging therefrom comprising a tape applicator adapted to apply tape to at least one side of the material to overly each crease line formed therein to thereby rigidity the material in the region of each crease line. Preferably the tape applicator is adapted to apply tape both sides of the fanfold cardboard material in the region of each crease line thereof.

7. An apparatus as claimed in claim 6, further comprising an adhesive applicator adapted to apply adhesive to the tape and/or the fanfold cardboard material to secure the tape to the fanfold cardboard material.

8. An apparatus as claimed in claim 6, wherein the tape comprises self-adhesive tape.

9. An apparatus as claimed in any of claims 6 to 8, wherein said tape is made from a paper based material.

10. An apparatus as claimed in claim 9, wherein said tape has an appearance/colouration adapted to blend in with the material of the fanfold cardboard material.

11. A method for automatically forming packaging boxes from fanfold cardboard comprising the step of rigidifying the fanfold cardboard material by applying tape on at least one side thereof to overlie each crease line formed therein and thereby rigidity the material in the region of each crease line.

12. A method as claimed in claim 11, comprising applying tape to both sides of the fanfold cardboard material in the region of each crease line thereof.

13. A method as claimed in claim 11 or claim 12, wherein said tape is applied to at least one side of each crease line of the fanfold cardboard material when the respective crease line is unfolded and exposed during unfolding of the fanfold material as it is fed into a package forming machine.

14. A method as claimed in claim 13, wherein strips of said tape are applied to both sides of the fanfold material over a respective crease line when the respective crease line is unfolded and exposed during unfolding of the fanfold material as it is fed into a package forming machine.

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EUROPEAN SEARCH REPORT

Application Number
EP 23 16 6462

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	WO 2014/188010 A2 (NEOPOST TECHNOLOGIES [FR]) 27 November 2014 (2014-11-27) * page 1, line 16 - page 2, line 34; claims; figures *	1-14	INV. B31B50/62 B31B50/81
Y	US 1 960 800 A (STOKES JOHN S) 29 May 1934 (1934-05-29) * column 2, line 72 - column 3, line 60; figures *	1-14	
A	US 2009/199527 A1 (WEHR MARY ANN [US] ET AL) 13 August 2009 (2009-08-13) * paragraphs [0082] - [0096]; figures 6A,6B,7A,7B *	1-14	
A	EP 3 208 081 A1 (GRAPHIC PACKAGING INT INC [US]) 23 August 2017 (2017-08-23) * paragraphs [0032] - [0040]; figures *	1-14	
A	US 2008/020916 A1 (MAGNELL GREG [US]) 24 January 2008 (2008-01-24) * paragraph [0067]; claims; figures *	1-14	TECHNICAL FIELDS SEARCHED (IPC) B31B
A	WO 2010/091043 A1 (PACKSIZE LLC [US]; PETTERSSON NIKLAS [US]) 12 August 2010 (2010-08-12) * claims; figures *	1-14	
A	US 2020/290303 A1 (BLOMBERG JOHAN [SE] ET AL) 17 September 2020 (2020-09-17) * paragraphs [0072] - [0073]; figures *	1-14	
A	US 1 784 317 A (STOKES JOHN S) 9 December 1930 (1930-12-09) * figures *	1-14	
A	US 2002/022560 A1 (ZOECKLER MICHAEL [US] ET AL) 21 February 2002 (2002-02-21) * paragraphs [0055], [0056]; figures *	1-14	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 October 2023	Klinger, Thierry

CATEGORY OF CITED DOCUMENTS

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17-10-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014188010 A2	27-11-2014	NONE	
US 1960800 A	29-05-1934	NONE	
US 2009199527 A1	13-08-2009	US 2009199527 A1	13-08-2009
		WO 2009117076 A2	24-09-2009
EP 3208081 A1	23-08-2017	AU 776736 B2	23-09-2004
		BR 0103669 A	23-04-2002
		CA 2376836 A1	08-11-2001
		CN 1366487 A	28-08-2002
		CZ 20014474 A3	17-04-2002
		EP 1206345 A1	22-05-2002
		EP 3208081 A1	23-08-2017
		HU 0203022 A2	28-01-2003
		JP 4268780 B2	27-05-2009
		JP 2003531753 A	28-10-2003
		MX PA01011150 A	20-03-2002
		PL 351472 A1	22-04-2003
		SK 19052001 A3	04-04-2002
		US 8317671 B1	27-11-2012
		WO 0183204 A1	08-11-2001
US 2008020916 A1	24-01-2008	NONE	
WO 2010091043 A1	12-08-2010	BR PI1008107 A2	08-03-2016
		CN 102361809 A	22-02-2012
		EP 2393743 A1	14-12-2011
		ES 2761917 T3	21-05-2020
		JP 5576884 B2	20-08-2014
		JP 2012516823 A	26-07-2012
		PL 2393743 T3	05-10-2020
		RU 2011132492 A	10-03-2013
		US 2011319242 A1	29-12-2011
		WO 2010091043 A1	12-08-2010
US 2020290303 A1	17-09-2020	AU 2020236756 A1	23-09-2021
		CA 3131841 A1	17-09-2020
		CN 113811440 A	17-12-2021
		EP 3911504 A1	24-11-2021
		JP 2022524082 A	27-04-2022
		US 2020290303 A1	17-09-2020
		US 2023302755 A1	28-09-2023
		WO 2020183431 A1	17-09-2020
US 1784317 A	09-12-1930	NONE	

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 16 6462

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17-10-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002022560 A1	21-02-2002	NONE	

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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Patent documents cited in the description

- WO 2018136658 A **[0009]**
- EP 3521006 A **[0010]**
- WO 2014188010 A **[0011]**