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(54) **A tool for separating cardboard blanks**

(57) A tool for separating cardboard blanks from a blanks sheet, comprising a frame with a pair of longitudinal bars (101, 102) parallel to the direction of positioning the sheet over the tool, a pair of transverse bars (103, 104), at least one cutting bar (105) with a plurality of open-

ings (106), extending between the transverse bars (103, 104), and a plurality of strings (110), wherein each string extends between a string holder (111) mounted on one longitudinal bar (101), the opening (106) of the cutting bar (105) and a string tensioner (121) mounted on the other longitudinal bar (102).

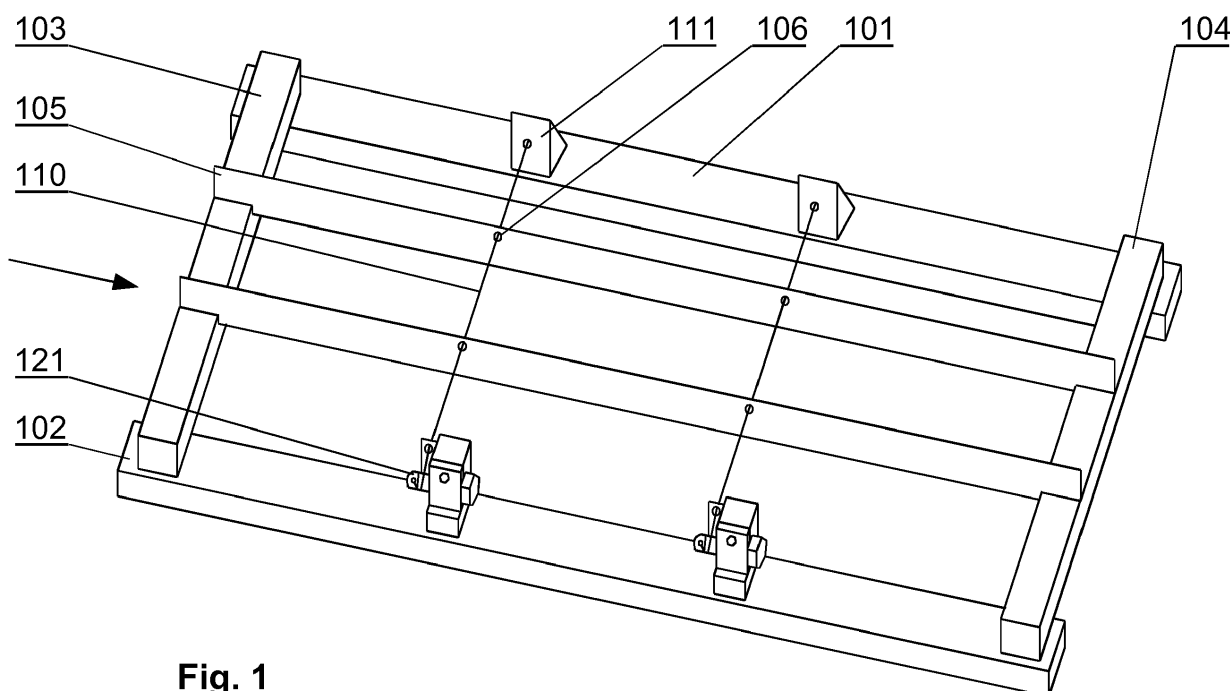


Fig. 1

Description

[0001] The object of the invention is a tool for separating cardboard blanks.

[0002] One of the processing steps of manufacturing of cardboard articles is separation of cardboard blanks from a pre-printed and pre-cut cardboard sheet. A large cardboard sheet may comprise even dozens of blanks arranged adjacently to each other, separated by cutting lines with small bridges for holding together the blanks during transport within a cutting machine between individual stations of the machine (cutting-waste stripping-separating).

[0003] The blanks can be separated from each other at a blanks separating device, comprising a lower tool in the shape of a grid having a pattern corresponding to the blanks and an upper tool with a plurality of pushers, configured to push the blanks via the apertures of lower tool and thus break the bridges between the blanks and separate the blanks. An exemplary blanks separating device is presented in a US patent No. US5810333. The lower tool comprises a plurality of lengthwise bars and cross-wise bars disposed in a pattern to form apertures in the location, shape and size of the banks. Such type of device is effective during normal operating conditions, but is highly susceptible to faulty conditions. For example, when a blank separates from the sheet of blanks before the sheet is aligned with respect to the lower tool, which may happen when the bridges between the blank are weak, the separated blank may clog the device when the pushers of the upper tool are activated. In an extreme case, where a plurality of blanks separate before alignment, the pressure exerted by the pushers of the upper tool may bend the bars and therefore destroy the lower tool. This may cause a long delay of the cardboard articles manufacturing process, requiring repair of the lower tool or installation of a new one.

[0004] Blank separating devices comprising a combination of bars and strings for separating blanks are known from European patent applications no. EP0343338 and EP0152214. However, these documents do not disclose means for tensioning the strings, which are of utmost importance in order to guarantee proper operation of the device at high speeds, when the strings must withstand large impact forces of the blanks.

[0005] A German utility model DE20016800 describes a string tensioner comprising a rotatable bolt, around which the string is rotated in parallel to the string tension direction, and a vice configured to tension the loose end of the string behind the bolt. Such string tensioner is relatively hard to operate, as it requires constant adjustment of the string with respect to the bolt and requires high clamping force between the vice and the string in order to provide sufficient string tension.

[0006] A PCT Application W09422644 describes a cardboard blanks separator with strings tensioned by a string tensioner. The tensioner comprises a bolt around which the string is wound, but no details are given about

means to immobilize the string or the bolt.

[0007] The aim of the present invention is to provide a tool for separating cardboard blanks which is more immune to faulty conditions and situations which may arise during operation of the blanks separating device and is easier to repair in case of misalignment of blanks sheet causing faulty conditions, which furthermore allows separation of long and narrow blanks.

[0008] The object of the invention is a tool for separating cardboard blanks from a blanks sheet, comprising a frame with a pair of longitudinal bars parallel to the direction of positioning the sheet over the tool, a pair of transverse bars and at least one cutting bar with a plurality of openings, extending between the transverse bars, and a plurality of strings, each string extending between a string holder mounted on one longitudinal bar, the opening of the cutting bar and a string tensioner mounted on the other longitudinal bar.

[0009] Preferably the string tensioner comprises a rotatable bolt with string attachment opening, the bolt configured to rotate around an axis perpendicular to the string tension direction so as to tension the string and a bolt clamp having a form of a vice configured to act directly on the bolt so as to immobilize the bolt, the vice operable by means of a screw

[0010] Preferably, the string a steel string having a diameter of 2-3 mm.

[0011] Preferably, the plurality of strings extend 5-10 mm below the top edge of the cutting bar.

[0012] The present invention is shown in an exemplary embodiment on a drawing, in which Fig. 1 shows a tool for separating cardboard blanks according to the invention and Fig. 2 shows details of a string tensioner.

[0013] Fig. 1 shows a tool for separating cardboard blanks according to the invention, which may form a lower tool of a conventional blanks separating device. The tool comprises a peripheral frame comprising longitudinal bars 101, 102 and transverse bars 103, 104. The longitudinal bars 101, 102 are positioned in parallel to the direction in which the blanks sheet enters over the tool. At least one cutting bar 105 with a plurality of openings 106 extends between the transverse bars 103, 104. The openings 106 increase the stability of tool operation, as explained below. The cutting bar is a flat bar. The tool further comprises a plurality of strings 110, wherein each string 110 extends between a string holder 111 mounted on one longitudinal bar 101, the opening 106 of the cutting bar 105 and a string tensioner 121 mounted on the other longitudinal bar 102, at the tool maintenance side. All string holders 111 may be located on one longitudinal bar 101 and all string tensioners 121 on the other longitudinal bar 102, which makes string tensioning easy for the tool operator. In order to provide efficient blanks separation, the cutting bar 105 is made of steel and has a thickness in the range of 3-5mm, which guarantees its strength. Preferably, the cutting bar 105 comprises bends at its top portion, which facilitate separation of the sheet to strips. Preferably, the top edge of the bar 105 is

5-10mm above the strings 110. The strings are made of steel or a steel cord, having 2-3 mm in diameter.

[0014] In order to guarantee proper operation of the tool, the strings 110 have to be appropriately tensioned. The strings 110 are statically secured at one end at string holders 111. From a string holder 111, each string passes via appropriate openings 106 in the cutting bars 105 and is secured to a string tensioner 121, shown in details in Fig. 2. The string tensioner 121 comprises a rotatable bolt 122 with string attachment opening 123, configured to rotate around an axis perpendicular to the string tension direction so as to tension the string. The string 110 enters the string tensioner 121 via an opening 127, which sets the position of the string within the tool. After the string is tensioned by the bolt 122, the bolt may be immobilized by a bolt clamp 124, 125. The bolt clamp 124, 125 may have a form of a vice operable by means of a screw 126, wherein one part of the bolt clamp 124 is static and the other part 125 is movable by turning the screw 126. The bolt clamp 124, 125 may have an internal shape corresponding to the diameter of the bolt 122, so as to increase the area of clamping contact with the bolt. In order to guarantee proper tensioning of the string, the bolt 122 may be operable by a torque wrench. The tension of the string is adjusted to guarantee stable working conditions, depending on the speed of operation, size of bridges and cardboard. The string tensioner according to the invention provides greater clamp force of the vice and therefore allows achieving greater string tensions than the prior art tensioners, wherein the vice clamps the string rather than the bolt. Furthermore, the tensioner is easy to operate, as the user does not have to manipulate the free end of the string.

[0015] When a blanks sheet is positioned over the tool and punched from above, it is first divided by the at least one cutting bar 105 to strips and next by the plurality of strings 110. Since the cutting bars 105 are parallel to the direction of the movement of the sheet over the tool and since the top edge of the cutting bars is above the strings, then even if some blanks fall from the sheet before alignment, the blanks will fall on the strings 110 and not on the cutting bars 105. Then, if the clogged tool is punched from above, the strings may deflect to compensate the clogging. In the worst case, only the clogged strings will break. This will make the tool inoperable, but the repair of the tool will be very simple, as only the broken strings will have to be exchanged, which is a simple and relatively fast operation.

[0016] In addition, the tool facilitates effective separation of narrow blanks, such as blanks narrower than 80 mm without a risk of damage to the blanks. A standard frame as disclosed in US5810333 has relatively wide edges and tends to deform the blank when the blank is pushed via the frame. In turn, the tool according to the invention utilizes thin strings, which practically do not affect the shape of the blank when it is pushed via the tool.

Claims

1. A tool for separating cardboard blanks from a blanks sheet, comprising a frame with a pair of longitudinal bars (101, 102) parallel to the direction of positioning the sheet over the tool, a pair of transverse bars (103, 104), at least one cutting bar (105) with a plurality of openings (106), extending between the transverse bars (103, 104), and a plurality of strings (110), **characterized in that** each string extends between a string holder (111) mounted on one longitudinal bar (101), the opening (106) of the cutting bar (105) and a string tensioner (121) mounted on the other longitudinal bar (102).
2. The tool according to claim 1, **characterized in that** the string tensioner (121) comprises a rotatable bolt (122) with string attachment opening (123), the bolt (122) configured to rotate around an axis perpendicular to the string tension direction so as to tension the string and a bolt clamp (124, 125) having a form of a vice configured to act directly on the bolt so as to immobilize the bolt (122), the vice operable by means of a screw (126).
3. The tool according to claim 1, **characterized in that** the string a 2mm steel string.
4. The tool according to claim 1, **characterized in that** the plurality of strings (110) extend 5-10 mm below the top edge of the cutting bar (105).

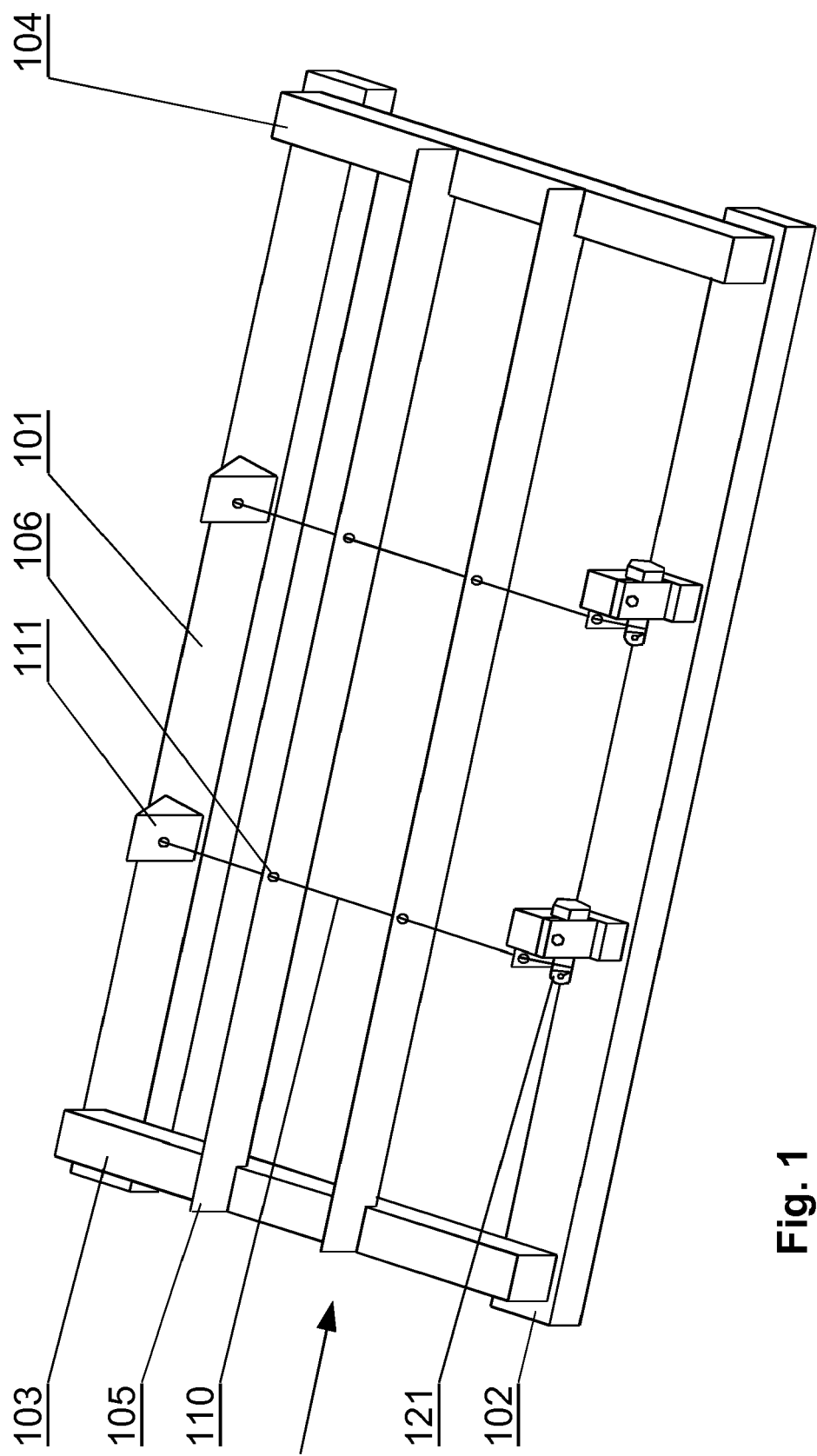


Fig. 1

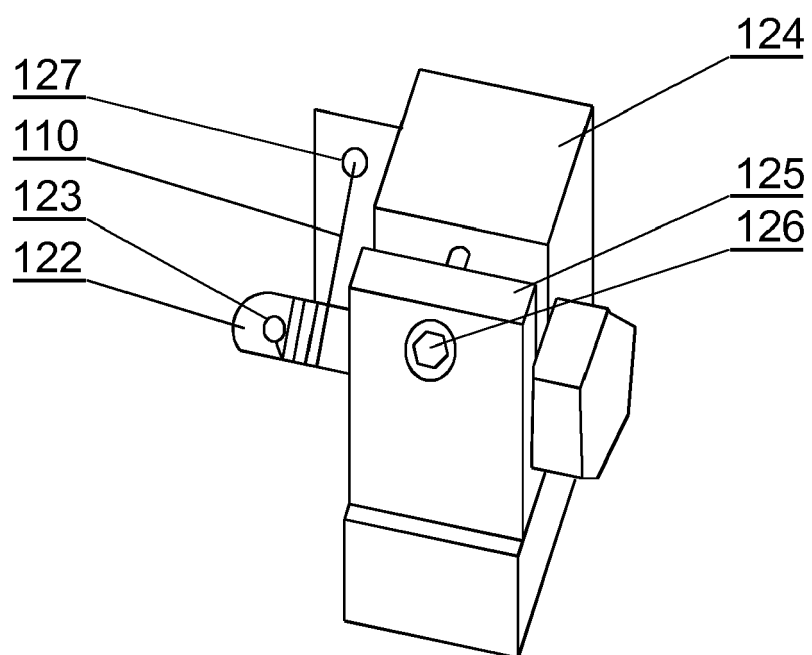


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 10 18 7647

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	EP 0 152 214 A2 (MEAD CORP [US]) 21 August 1985 (1985-08-21) * figure 1 *	1-4	INV. B26D7/18
Y	DE 200 16 800 U1 (HESSE STANZWERKZEUGE GMBH [DE]) 22 November 2001 (2001-11-22) * figures 2,3 *	1	
Y	GB 697 389 A (BELLING & LEE LTD) 23 September 1953 (1953-09-23) * figure 4 *	2-4	
			TECHNICAL FIELDS SEARCHED (IPC)
			B26D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 January 2011	Examiner Wimmer, Martin
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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EPO FORM 1503 03.82 (P04C01)

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

EP 10 18 7647

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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24-01-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0152214	A2	21-08-1985	CA 1232193 A1
DE 20016800	U1	22-11-2001	NONE
GB 697389	A	23-09-1953	NONE

REFERENCES CITED IN THE DESCRIPTION

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- US 5810333 A [0003] [0016]
- EP 0343338 A [0004]
- EP 0152214 A [0004]
- DE 20016800 [0005]
- WO 9422644 A [0006]