

Jan. 29, 1963

H. E. ROTHMANN
EASY TO OPEN CARTON

3,075,684

Filed Jan. 30, 1961

3 Sheets-Sheet 1

FIG. 1.

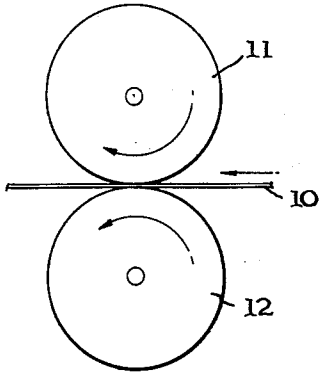


FIG. 3.

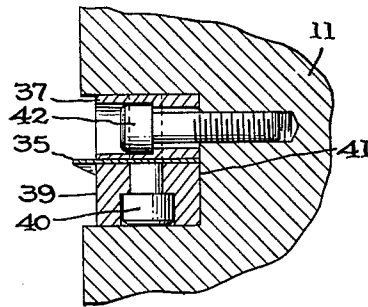


FIG. 3A.

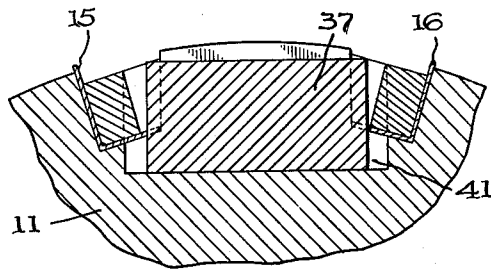


FIG. 4.

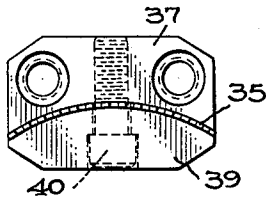


FIG. 5.

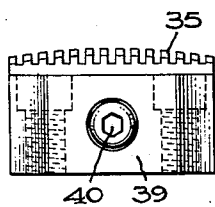


FIG. 6.

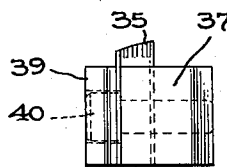


FIG. 9.



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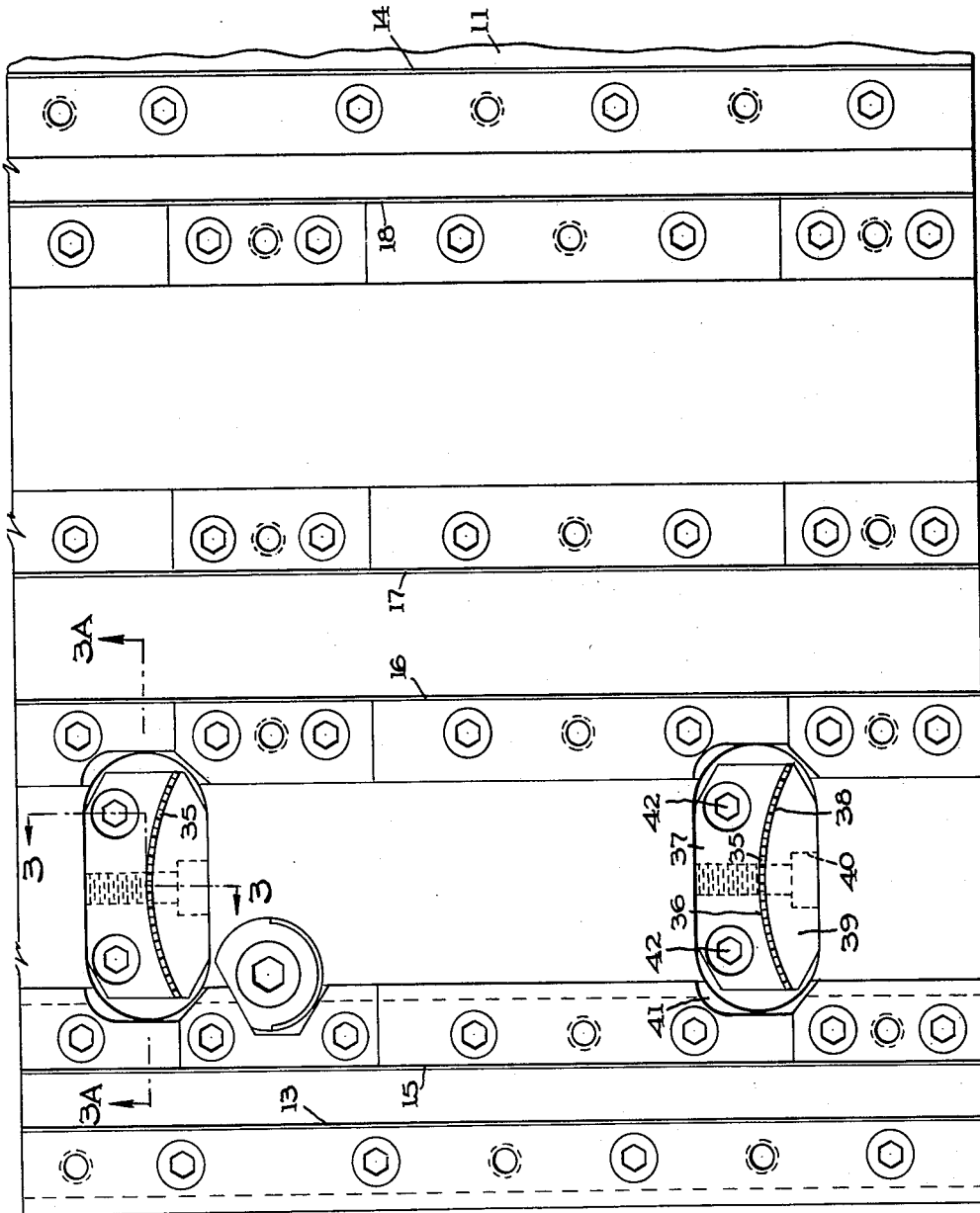


FIG. 2.

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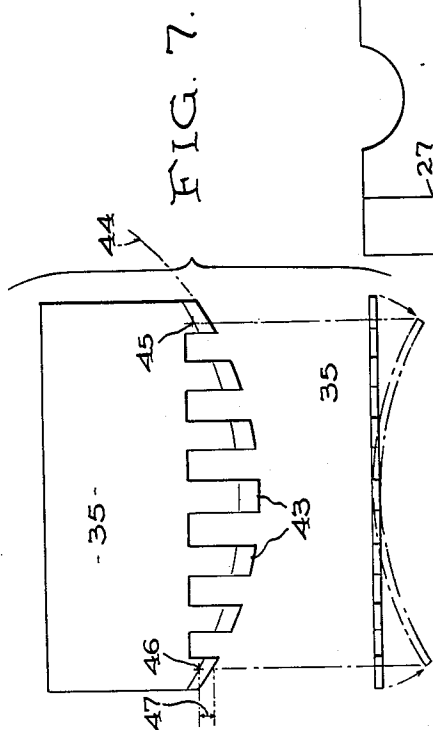


FIG. 7.

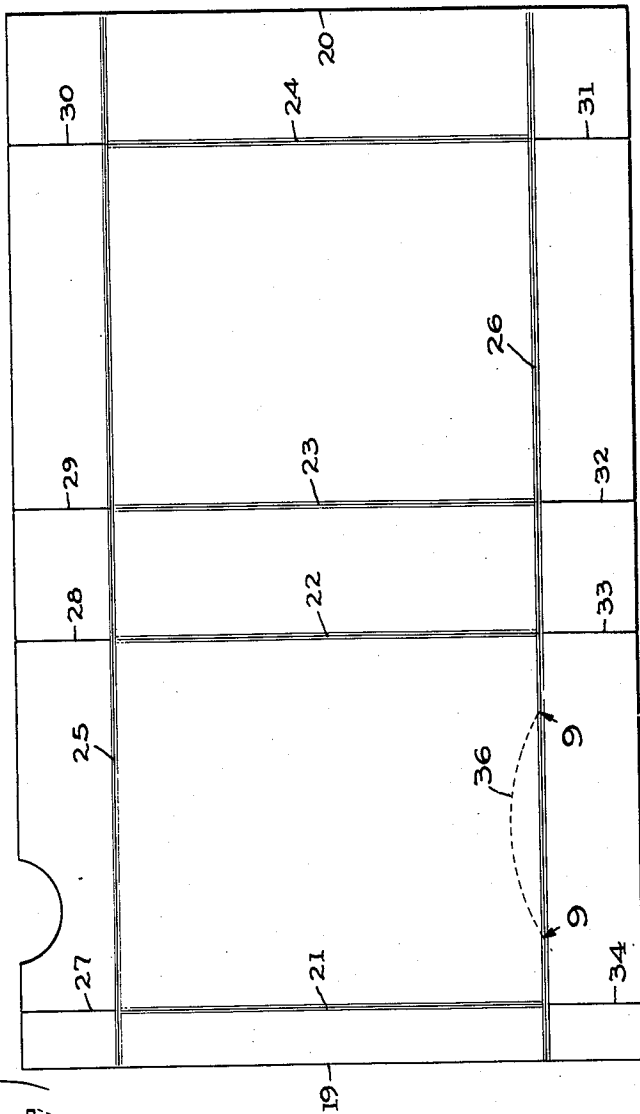


FIG. 8.

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EASY TO OPEN CARTON

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4 Claims. (Cl. 229-51)

This invention relates to an easy to open carton and to a perforating knife for producing a perforated pattern on flat carton stock in the form of an arc to provide a convenient and easy to open aperture in the finished carton providing ready access to the contents of the carton.

It is conventional, as in U.S. Patents Nos. 2,865,235 and 2,885,933, to provide cut and fold lines in flat carton stock, as by rolling contact of the carton stock between rotary die rolls, to procure a carton blank which can then be folded and suitably joined into a finished carton. It is also conventional, as in these patents, to provide arc-shaped cuts in some suitable part of the carton blank to provide an access opening to the carton. In these patents the arc-shaped cuts are so disposed as to provide a pouring spout in a narrow side of the finished carton.

When an arc-shaped perforated pattern is provided in one side of a carton for easy rupture by the fingers when opening the carton, the ends of the arc may fall adjacent to a fold line, particularly when the carton is small, which unduly weakens the structural strength of the finished carton at the edge of the carton where the perforated arc is most suitably located.

In accordance with the present invention an easy to open carton is provided having an arc shaped pattern of perforation in a wall of the carton with the ends of the arc adjacent an edge of the finished carton. This perforated pattern preserves the structural strength of the finished carton at the adjacent edge by so disposing the perforating knife that the penetration of the central perforating teeth of the knife are deeper than those at the ends of the knife. The shallower perforations are adjacent the edge of the carton so that the structural strength of the carton at the edge is not appreciably altered, as it is at the center of the arc of perforations. The weakening of the carton at the central portion of the arc where the perforations are deepest is most advantageous as it is in this area that finger pressure is exerted to open the carton and easy rupture of the carton in this area is desired.

When carton blanks are formed by passing flat carton stock between rotary die rolls, the perforating knife is suitably mounted in the upper roll to act against an anvil provided by the lower roll. The knife is provided with any suitable number of spaced teeth and the curvature of the cutting edge of the knife is intentionally deviated slightly from the true radius of the die roll so that the ends of the knife deviate from a true radius. The cutting edge of the knife is therefore a curve of constantly varying radius of curvature with the greatest radius of curvature at the center of the knife.

In one embodiment of the present concept deviation for the knife from the true radius of the die rolls is obtained by grinding the cutting edge of the knife in the flat to the true radius of the die roll. The flat perforating knife is then mounted in the die roll against a surface forming an arc so that the knife is forced out of a flat plane into the shape of the arc to be perforated in the carton blank. Bending the knife out of the flat into an arc displaces the ends of the knife in the direction of the radius of the roll so that the knife when brought into contact with the carton blank perforates the same in an arc having the perforations at the ends of the arc shallower than those at the middle of the arc.

The present invention is capable of various structural

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embodiments, one of which is illustrated in the accompanying drawings and is described hereinafter. This illustrative embodiment should not be construed as defining or limiting the invention.

In the accompanying drawings, in which like reference characters indicate like parts,

FIG. 1 is a schematic view of a web of flat carton stock advancing through upper and lower die rolls;

FIG. 2 is an enlarged detail of a part of the surface of the upper die roll of FIG. 1 showing the relative location of arcuate perforating knives of the present invention mounted therein;

FIG. 3 is a sectional view on the lines 3-3 of FIG. 2;

FIG. 3a is a sectional view on the line 3a-3a of FIG. 2;

FIG. 4 is a top view of the knife mounting clamp shown in FIG. 2;

FIG. 5 is a front view of the knife mounting clamp of FIG. 4;

FIG. 6 is a side view of the knife mounting clamp of FIG. 4;

FIG. 7 is a schematic view of the perforating knife of FIG. 2 to illustrate the displacement of the ends of the knife when the knife is bent from the flat into an arc;

FIG. 8 is a carton blank formed and perforated in accordance with the present invention to the scale of the portion of the die roll shown in FIG. 2; and

FIG. 9 is a cross-sectional view on the line 9-9 of FIG. 8 schematically showing the grading of depth of the perforations in the carton blank in accordance with the present concept.

Referring now to the several figures, a web of flat carton stock 10 is advanced by suitable means between upper male die roll 11 and lower female die roll 12 which are rotated in the direction of the arrows thereon to bring the pattern mounted on the surface of roll 11 into engagement with the sheet or web of stock 10 to form carton blanks as shown in FIG. 8. Referring particularly to FIG. 2, the surface of roll 11 is provided with any suitable number of patterns across the length and around the circumference thereof, in known manner, to form a plurality of carton blanks, as shown in FIG. 8, for each rotation of the die rolls. Knife edges 13 and 14 are suitably mounted on roll 11 to separate the carton blank from the web 10 and spaced upstanding blades 15, 16, 17 and 18 are disposed along roll 11 to provide spaced fold lines for the carton blank.

With reference to FIG. 8, knives 13 and 14 sever the carton blank from the web along edges 19 and 20, respectively, and blades 15, 16, 17 and 18 form fold lines 21, 22, 23 and 24, respectively. In like manner fold lines 25 and 26 are formed in the carton blank and cuts 27, 28, 29, 30, 31, 32, 33 and 34 are provided to form end tabs and end pieces when the carton blank is folded into the finished carton. Arc-shaped knives 35 are suitably spaced apart and are mounted in the surface of roll 11 to provide an arc-shaped perforated pattern 36 terminating in fold line 26 in a suitable side or wall of the carton.

Knife 35 is mounted against an arc-shaped face 37 of block 37 and is held in place by the arc-shaped face 38 of block 39 which is secured to block 37 by bolt 40. Block 37 is mounted in aperture 41 in roll 10 by bolts 42.

FIGS. 3-6 show the details of construction of the knife mounting clamp and FIG. 6 shows the displacement of the ends of the knife in the radius of the die roll to obtain shallower perforations at the ends of the arc-shaped pattern of perforations.

FIG. 7 schematically shows knife 35, here provided with few perforating teeth 43. Teeth 43 are widely spaced for illustrative purposes only. It is to be understood that any suitable number of teeth 43, suitably spaced apart, may be employed to obtain the desired pattern

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of perforations as shown at 36 in FIG. 8. Knife 35 has a curved cutting edge having a radius 44 which is equal to the radius of male roll 11. When knife 35 is bent out of the flat into an arc between blocks 37 and 39 the ends of the cutting edge of the knife move to positions 45 and 46 changing the curvature of the cutting edge to a curve of uniformly decreasing radius from the center of the curve towards the ends thereof. The total resulting difference in depth of cut from the center of the knife to an end of the knife is shown at 47.

It is therefore apparent, as schematically shown in FIG. 9, that the arc-shaped pattern of perforations 36 will be deeper at the center of the arc than at the ends thereof. The perforations will become progressively more shallow as the ends of the arc-shaped pattern of perforations 36 is approached adjacent fold line 26. The structure of the carton is therefore not weakened appreciably at fold line 26 while reduced finger pressure is required to break the carton beginning at the center of the perforated arc 36 when the carton is to be opened.

It should now be apparent that the present invention in every way satisfies the several objectives discussed above.

Changes in or modifications to the above described illustrative embodiment of the present invention may now be suggested to those skilled in the art without departing from the present inventive concept. Reference should therefore be had to the appended claims to determine the scope of this invention.

What is claimed is:

1. In a carton blank having spaced fold lines defining carton surfaces in the finished carton, means for easy opening of the finished carton comprising an arc-shaped

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pattern of perforations in one carton surface with the ends of said pattern adjacent a fold line, said perforations being deeper at the center of said pattern and progressively decreasing in depth from the center of said pattern toward the ends of said pattern.

2. An easy to open carton having at least one flat surface and an arcuate pattern of perforations in said surface with the ends of the pattern adjacent an edge of said surface, said pattern of perforations decreasing in depth from the center toward the ends thereof.

3. In a carton blank having spaced fold lines defining carton surfaces in the finished carton including carton sides and carton end forming flaps, means for easy opening of the finished carton comprising an arc-shaped pattern of perforations in a carton side with the ends of said pattern adjacent a fold line of an end forming flap, said perforations being deeper at the center of said pattern and progressively decreasing in depth from the center of said pattern towards the ends of said pattern.

4. An easy to open carton having at least one flat side and an end separated from the side by a fold edge and an arcuate pattern of perforations in said side with the ends of the pattern adjacent said fold edge, said pattern of perforations decreasing in depth from the center towards the ends thereof.

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