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3,224,089

CARTON OPENING MACHINE

Filed Nov. 21, 1963

4 Sheets-Sheet 2

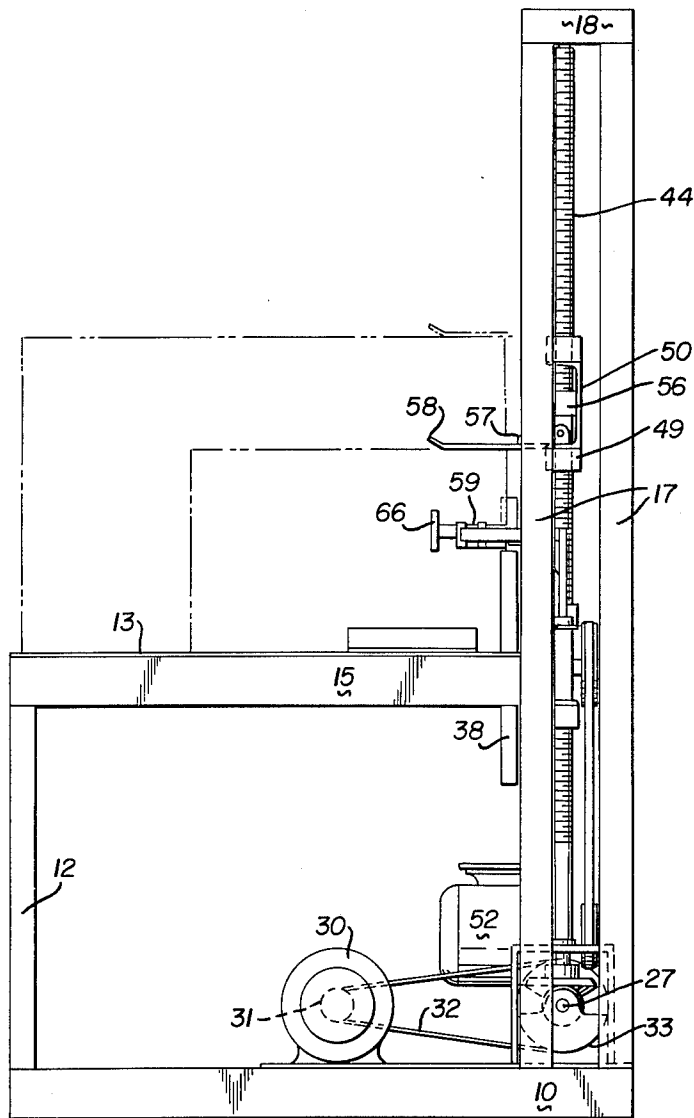


FIG. 2

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4 Sheets-Sheet 3

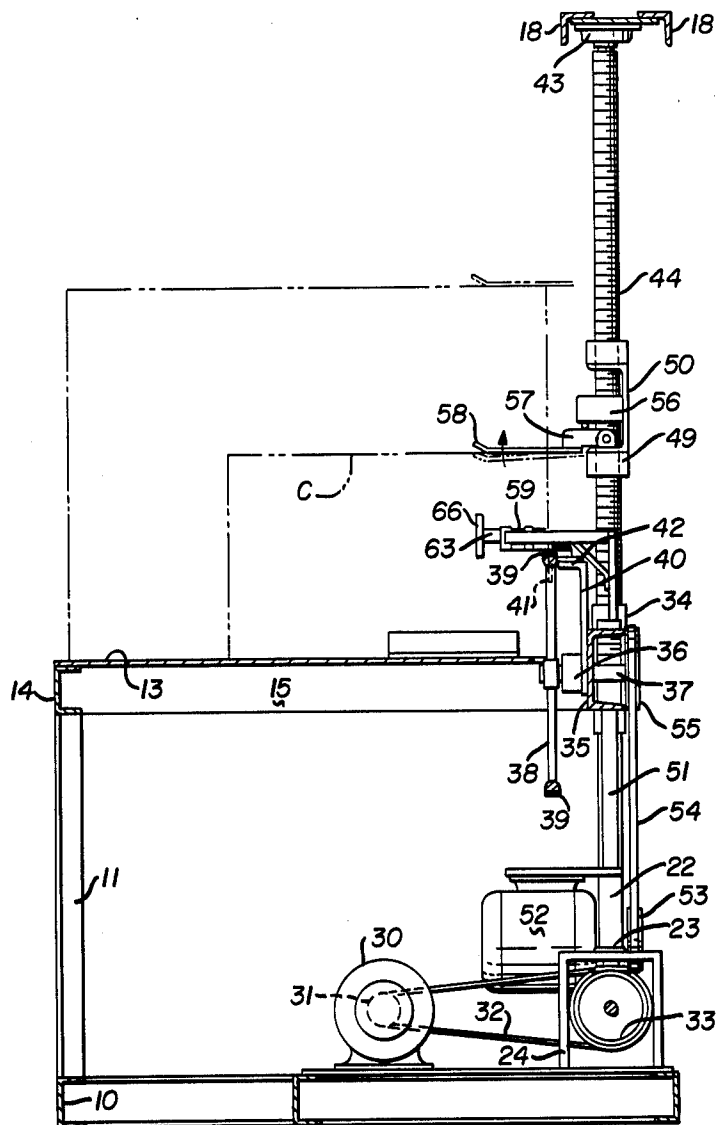


FIG. 3

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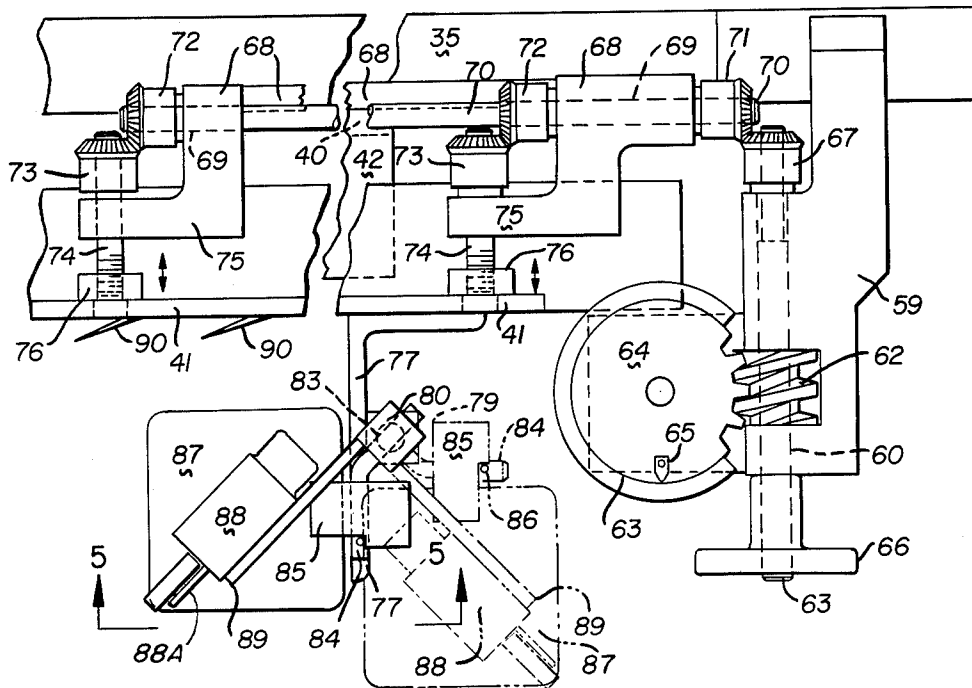


FIG. 4

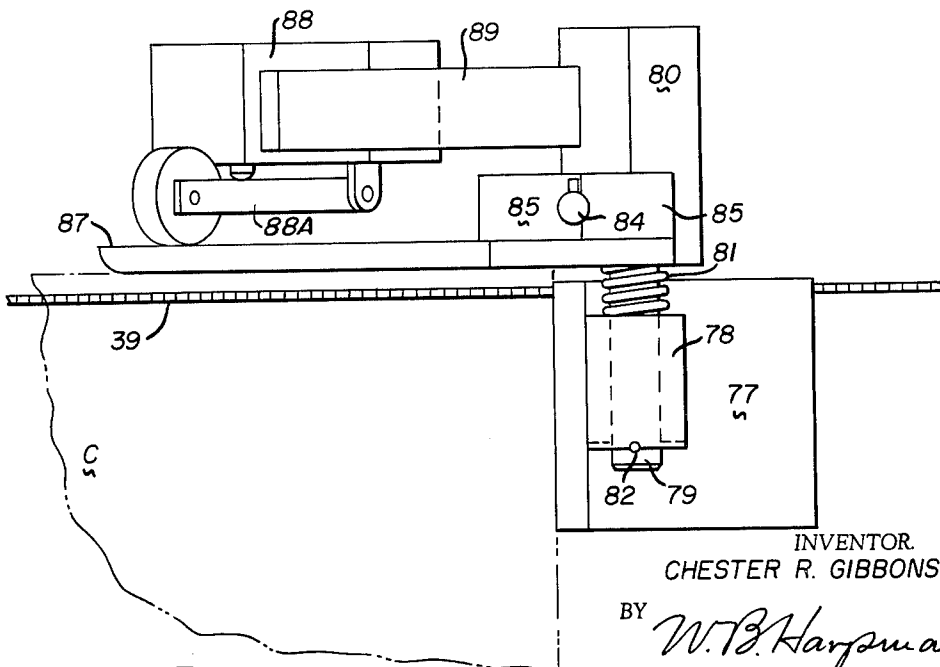


FIG. 5

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## CARTON OPENING MACHINE

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4 Claims. (Cl. 30-2)

This invention relates to a carton opening machine and more particularly to a device that will cut the top from a cardboard carton in which canned goods are packed.

The principal object of the invention is the provision of a carton opening machine which will either remove the top of a cardboard carton containing canned goods, or cut the carton midway between the top and bottom portions thereof to expose the layers of canned goods therein.

A further object of the invention is the provision of a carton opening machine that will cut only the cardboard of the carton and not touch the canned goods or other packages in the carton.

A further object of the invention is the provision of a carton opening machine that utilizes a band saw as the cutting means for engaging the carton and severing the top or the side walls thereof.

A further object of the invention is the provision of a carton opening machine of simple and economic construction capable of acting to open a carton accurately and positively.

A still further object of the invention is the provision of a carton opening machine that will automatically determine the size of a carton positioned therein and cut the same midway between the top and the bottom thereof without touching the contents of the carton.

The carton opening machine disclosed herein comprises a device that is particularly useful in a supermarket wherein cardboard shipping cartons of various canned or packaged goods are received and opened so that the cans or packaged goods may be placed on the shelves of the supermarket for display and sale.

In the past, such cartons have been commonly opened by stock boys or the like with various tools which frequently damage the packages or canned goods in the cartons and which at best are unsatisfactory. The present invention relates to a machine which will receive a carton to be opened, engage the top of the carton and either remove only the top of the carton by cutting the four side walls immediately adjacent thereto, or, alternately, engage the top of the carton and cut the carton side walls midway between the top and bottom portions of the carton as is necessary when the case contains two layers of packages or canned goods.

The carton opening machine herein utilizes a novel means of cutting through the cardboard of the carton in that it provides an endless band saw with a section thereof arranged horizontally in appropriate relation to a carton receiving platform so that the band saw running between the appropriate guides and controlled as to depth cut may effectively sever the cardboard of the carton without tearing the same or in any way damaging the contents of the carton.

The carton opening machine disclosed herein includes a unique principle of determining where to cut the cardboard carton so as to either remove the top thereof or to cut the carton in half so that the carton may be opened book-wise so that each half contains a layer of the packages or canned goods therein. The carton opening machine includes the actual cutting mechanism arranged horizontally and adjustable vertically relative to the carton supporting platform and guide means arranged horizontally and adjustable vertically and movable vertically downwardly to engage the top of a carton

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positioned in the machine and whereby the cutting means is simultaneously and automatically positioned in the proper relation to the carton to cut either the top thereof or to cut the carton midway between the top and bottom thereof as indicated.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawings, wherein:

FIGURE 1 is a front elevation of the carton opening machine.

FIGURE 2 is a side elevation thereof.

FIGURE 3 is a vertical section on line 3-3 of FIGURE 1.

FIGURE 4 is a horizontal section on line 4-4 of FIGURE 1.

FIGURE 5 is a horizontal section on line 5-5 of FIGURE 4.

By referring to the drawings and FIGURES 1, 2 and 3 in particular, it will be seen that the carton opening machine comprises a base frame 10 having vertically standing side frames 11 and 12 which define the sides thereof and which terminate at table height in a table top 13, which is supported by transversely positioned frame members 14 and 15. The frame members 14 and 15 are secured to the side frames 11 and 12. The rear-most portions of the side frames 11 and 12 extend vertically above the table top 13 as indicated by the numerals 16 and 17, and they are interconnected transversely at their uppermost ends by top frame members 18. Diagonally disposed braces 19 interconnect the vertical extensions 16 and 17 and the top frame members 18 as best seen in FIGURE 1 of the drawings, and angular brackets 20 formed on the side extensions 16 and 17 extend toward one another, as best seen in FIGURE 1 of the drawings and are provided on their lower horizontal surfaces with journals 21 in which the upper ends of a pair of vertically positioned threaded rods 22 are supported. The lower ends of the threaded rods 22 are journaled in bearings 23 positioned in openings in inverted U-shaped subframes 24 and beveled gears 25 are secured to the lower ends of the threaded rods 22 below the bearings 23 and disposed horizontally so that they will register with vertically positioned secondary beveled gears 26 on a horizontal shaft 27 which is carried on a plurality of transversely spaced bearings 28 positioned in elevated relation by supports 29 on the base frame 10.

By referring to FIGURES 1 and 2 of the drawings, it will be seen that a reversible electric motor 30 is positioned on the base frame 10 and is provided with a sheave 31 over which a belt 32 is trained. A secondary and larger sheave 33 is secured to the transverse shaft 27 so that actuation of the electric motor 30 will revolve the sheaves 31 and 32 and the shaft 27 which in turn will revolve the bevel gears 26 and 25 and hence cause the threaded rods 22 to revolve on their vertical axes. The electrical energizing circuit for the electric motor 30 is controlled by a manual starting switch, not shown, and includes means for stopping the electric motor 30 as hereinafter described.

The threaded rods 22 threadably engage a pair of tubular interiorly threaded members 34 as best seen in FIGURE 1 of the drawings, and these tubular members 34, which are supported on the threaded rods 22 and

movable vertically when the threaded rods 22 are revolved as hereinbefore described, are secured to and form a part of a transversely positioned channel 35 which is provided with horizontally spaced bearings 36 which in turn journal shafts 37 which carry wheels 38 over which an endless band saw blade 39 is trained.

It will be observed that slightly less than the upper half of each of the wheels 38 extends above the table top 13 heretofore described as the device is illustrated in FIGURE 1 of the drawings. It will be obvious to those skilled in the art that when the threaded rods 22 are revolved by the electric motor 30, as hereinbefore described, the transverse channel 35 will move vertically whereupon the wheels 38 will also move vertically as will the band saw blade 39 trained thereover. Thus, the position of the upper horizontal portion of the band saw blade 39 relative to the table top 13 is controlled by the rotary motion imparted the threaded rods 22.

Still referring to FIGURE 1 of the drawings, it will be seen that a plurality of vertical body members 40 are secured to the transverse channel 35 and extend upwardly therefrom and support a pair of spaced parallel horizontally disposed members 41 on horizontal extensions 42. The members 41 are positioned one above and one below the upper horizontal portion of the band saw blade 39 so as to act as guides therefor and means by which the exposed portion of the band saw blade 39 may be varied.

It will be understood by those skilled in the art that cutting teeth on the band saw blade 39 are toward the front, as seen in FIGURE 1 of the drawings, or towards the left as seen in FIGURE 3 of the drawings. The members 41 are therefore adjustably positioned so that a carton, such as shown in broken lines in FIGURES 2 and 3, positioned on the table top 13 and moved toward the band saw blade 39 will engage the same to a very limited degree and then engage the members 41 so as to prevent the band saw blade 39 from penetrating the carton being cut deeper than the wall thickness thereof.

Still referring to FIGURE 1 of the drawings, it will be seen that the transverse frame members 18 are provided with a pair of secondary journals 43 which receive and rotatably position the upper ends of a pair of secondary threaded rods 44. The lower ends of the pair of secondary threaded rods 44 are rotatably journaled in bushings 45 formed on inverted U-shaped brackets 46 located on the base frame 10 and secondary sets of bevel gears 47 and 48 positioned on the transverse shaft 27 and the secondary threaded rods 44 respectively provide means for imparting rotary motion thereto. The sizes of the secondary bevel gears 47 and 48 on the secondary threaded rods 44 are reversed as compared with the bevel gears 25 and 26 heretofore referred to so that the secondary threaded rods 44 will revolve at twice the rate of rotation of the threaded rods 22.

By referring to FIGURES 1, 2 and 3 of the drawings, it will be seen that a pair of secondary tubular members 49, threaded internally, are engaged on the secondary threaded rods 44 and that they support a secondary transverse beam 50 which will therefore move vertically at double the rate of motion of the transverse beam 35 which carries the wheels 38 and the band saw blade 39 trained thereover. In order that the wheels 38 may be revolved so that the band saw blade 39 may be caused to move so as to be effective in cutting the tops from cartons positioned on the table top 13, depending brackets 51 are formed on the transverse channel member 35 and support, at their lowermost ends, a secondary electric motor 52. The electric motor 52 is provided with a first sheave 53 over which an endless belt 54 is trained, and one of the wheels 38 is provided with a secondary sheave 55 over which the same endless belt 54 is trained. Thus, energization of the electric motor 52 will revolve one of the wheels 38 and hence cause motion of the band saw blade 39 which may then be effectively used for cutting the carton top away therefrom.

The electrical energizing circuit for the electric motor 52 is controlled by a switch 56 which is mounted on the secondary transverse beam 50 adjacent one end thereof and in position for actuation by one of a pair of pivoted arms 57, having a horizontal extension 58 thereon as best seen in FIGURE 3 of the drawings.

As illustrated in FIGURE 2 and FIGURE 3 of the drawings, the portions of the carton opening machine just described are shown in engagement with the upper surfaces of a cardboard carton so that the pair of pivoted arms 57 and horizontally disposed extension 58 upon touching the top of the carton will actuate the switch 56 and energize the motor 52 and start the band saw blade 39 in its cutting motion. It will be observed that the upper horizontal portion of the band saw blade 39 is exactly half way between the table top 13 and the top of the carton C, for example in FIGURE 3 of the drawings, so that assuming that the carton C contains two layers of packages or two layers of canned or packaged goods, the cutting action will take place at the exact middle portion between the two layers and thus in effect cut the carton into two halves which may then be opened book-like and each still serve as means for containing or holding half of the packages or cans that were originally in the whole carton.

The purpose of cutting the carton in the middle as just described, so that it may be opened book-like and thus expose the ends of the packages or cans in the carton, is to provide for the convenience marking of price information on the ends of the packages or cans thus exposed.

Those skilled in the art will thus observe that the foregoing remarks with respect to the location of the band saw blade 39 being exactly half way between the table top 13 and the top of the carton C thereon will apply to the carton regardless of its height inasmuch as the automatic positioning feature of the invention insures such action and operation. Thus, when a relatively larger sized carton is used, such as also shown in broken lines in FIGURES 2 and 3, the horizontal extension 58 will first be elevated sufficiently to clear the larger carton and it will then be moved downwardly until it engages the top thereof, which action will control the relative vertical movement of the upper portion of the band saw blade 39 so as to properly position it. The control is obtained by the means in the energizing circuit of the electrical motor 30, which is also responsive to the electric switch 56, and acts to stop the motor 30.

By referring now to FIGURES 1, 4 and 5 of the drawings, it will be seen that the vertically spaced horizontal members 41 which are attached to one another are positioned above and below the top and bottom surfaces of the upper portion of the band saw blade 39, and that these members 41 are so positioned that they control the depth of cut of the band saw blade 39 relative to the carton moved thereagainst. This particular depth of cut is adjustable so that it may be altered to match various thicknesses of the cartons as will obviously be desirable. The horizontal members 41 are fixed with respect to one another and are movably mounted on the horizontal extensions 42 of the vertical members 40 which in turn are supported on the transverse channel 35, as best seen in FIGURE 3 of the drawings.

By referring again to FIGURES 3 and 4 of the drawings, it will be seen that the transverse channel 35 carries an elevated body member 59 which has a bore 60 longitudinally thereof. The body member 59 has a cutaway area so that a spiral actuating member 62 positioned on a shaft 63 located in the bore 60 may rotate in the cutaway area. A circular opening 63 in a side portion of the body member 59 adjacent the cutaway area surrounds a pivoted indicator disc 64 having an indicator hand 65 thereon. Suitable indicia may be printed around the circular portion of the body member defining the opening 63 so that the indicator hand 65 will register therewith and indicate the exposed area of the band saw

blade 39 and thereby indicate the depth of the cut possible with a particular setting.

A hand wheel 66 is located on the outermost end of the shaft 63 and keyed thereto and the opposite or innermost end of the shaft 63 has a first bevel gear 67 secured thereto which will rotate when the hand wheel 66 is rotated. Brackets 68 on the vertical members 40 in spaced relation to the body member 59 have transverse bores 69 therethrough in which a secondary shaft 70 is positioned. A second bevel gear 71 positioned on the right end of the secondary shaft 70 is in mesh with the first bevel gear 67. The secondary shaft 70 extends in parallel spaced relation to the members 41 to the opposite side thereof as seen in FIGURE 4, where one of the brackets 68 is located. A pair of bevel gears 72 are positioned on the secondary shaft 70 adjacent the brackets 68 so as to mesh with other bevel gears 73 secured on rotatably mounted bolt-like members 74 which are rotatably caged in arms 75 of the brackets 68. The extending threaded ends of the bolt-like members 74 are threadably engaged in threaded openings in bosses 76 formed on the front portion of one of the members 41 which are thereby movable on a horizontal plane on the horizontal extensions 42 when the hand wheel 66 is turned.

The carton positioned in the machine for cutting is presented against the blade 39 and the members 41 which control the position of the carton relative to the position of the band saw blade 39 therefore control the depth of the cut. It will be obvious to those skilled in the art that this portion of the device operates whether the band saw blade is cutting the top of the carton only or whether it is cutting the carton side wall midway between its upper and lower ends.

By referring to FIGURES 4 and 5 of the drawings, it will be seen that one of the members 41 has a projecting secondary bracket 77 thereon at the extreme right side thereof and at one side of a carton positioned on the table top 13 of the machine. The secondary bracket 77 has a vertically apertured boss 78 thereon in which a shaft 79 is rotatably positioned and which shaft 79 has a block 80 on the upper end thereof which is spring tensioned by a coil spring 81 positioned about the shaft 79 and between the boss 78 and the body member 80. The bottom end of the shaft 79 has a transverse pin 82 therethrough which prevents the shaft 79 and block 80 from moving vertically. Grooves in the bottom of the boss 78 are indexed at 90 degrees to one another to provide registering areas for the pin 82.

It will thus be seen that the body member 80 is rotatable on the vertical axis of the shaft 79. The body member 80 has a transverse opening 83 therethrough in which one end of a rod 84 is positioned. The rod 84 has a secondary block 85 pivotly secured thereto. A flat pressure plate 87 of generally square shape is attached thereto and extends outwardly therefrom. The secondary block 85 has an offset forming an abutment engageable against an upstanding pin 86 in the rod 84 to position the secondary block on a horizontal plane as shown and permit it to move upwardly in a pivotal action on the rod 84.

The electrical energizing circuits for the electric motors 30 and 52 are also controlled by an electric switch 88 which is mounted on an arm 89 which extends outwardly from the body member 80. In position as shown in solid lines, the plate 87 serves as the sensing means for the switch 88 to determine the top of the carton and thereby position the band saw blade 39 in position for removing only the top portion of the carton by stopping the electric motor 30 and also starting the electric motor 52 to operate the bandsaw blade 39.

By referring again to FIGURE 4 of the drawings, it will be seen that there are a plurality of diagonally positioned needle-like members 90 secured to the lower one of the horizontal members 41 and in a position where

they will piercingly engage the side wall of a carton presented thereagainst. These needles 90 serve to hold the carton wall on a straight line and to some degree move it outwardly from the carton and toward the band saw blade.

It will be observed that this latter action occurs automatically when the carton is pushed against the horizontal member 41 and moved to the right toward stop member 91 (see FIGURE 1) positioned on the table top 13.

It will be understood that when the carton is to be cut in the middle, the pressure plate 87 and switch 88 are swung on shaft 79 to inoperative position to the right of the mounting bracket 77 as seen in broken lines in FIGURE 4 of the drawings and that when the carton top is to be cut, the pressure plate 87 and switch 88 are in operative position as seen in solid lines in FIGURE 4 of the drawings. The switch 88 is operatively positioned relative to the pressure plate 87 by a lever mounted roller carrying actuating arm 88A so that the switch mechanism is actuated by the initial movement imparted to the pressure plate 87 when it contacts the top of the carton C and thereby controls the vertical movement of the guide members 41 and the vertical positioning of the upper portion of the band saw blade 39 relative to the table top 13 of the device as well as the motion of the bandsaw blade 39.

It will thus be seen that a carton opening machine has been disclosed that meets the several objects of the invention and having thus described my invention, what I claim is:

1. A machine for opening a carton and comprising a carton supporting table, an endless cutting blade and means movably mounting said endless blade with a portion thereof in parallel relation to said table and thereabove, said means for mounting said endless blade being movable vertically relative to said table, at least one elongated member positioned adjacent said portion of said blade and supported by said means mounting said blade, and arranged to engage said carton subsequent to said blade's engagement thereof, means for moving and positioning said endless blade mounting means and said portion of said endless blade vertically relative to said carton supporting table, a transverse beam, a carton engaging member on said transverse beam, an electric motor, a switch and an electric circuit including said switch and electric motor, said switch arranged to be actuated by said carton engaging member, means including said motor for moving said transverse beam vertically interconnected with said means for mounting said endless blade and wherein said means operates to move said transverse beam at twice the rate of motion imparted said endless blade mounting means.

2. The machine for opening a carton set forth in claim 1 and wherein the means for moving and positioning said endless blade and said mounting means therefor includes a secondary elongated member having threaded openings therein, a pair of vertically positioned threaded rods threadably engaged in said threaded openings, and wherein said means for moving said transverse beam comprises a secondary pair of vertically positioned threaded rods engaged in threaded openings in said transverse beam.

3. The machine for opening a carton set forth in claim 2 and wherein the means interconnecting the motor with the pair of vertically positioned threaded rods and with the secondary pair of vertically positioned threaded rods comprises a transverse shaft journaled in said machine, bevel gears on each of said threaded rods and secondary threaded rods and a plurality of bevel gears on said transverse shaft in mesh with said bevel gears on said threaded rods and secondary threaded rods and wherein the bevel gears on the pair of threaded rods are twice as large as the bevel gears on the secondary threaded rods.

4. A machine for opening a carton comprising a carton supporting member, an endless cutting blade and means for moving the same, means mounting said endless

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cutting blade with a portion thereof in spaced parallel relation to said carton supporting member, said means for mounting said endless cutting blade being movable at a right angle to said carton supporting member, at least one elongated member positioned adjacent said cutting blade, support means for said elongated member, said support means comprising part of said means mounting said endless cutting blade, said elongated member arranged to engage said carton subsequent to said endless cutting blade's engagement thereof, means for moving and positioning said endless cutting blade, mounting means at a right angle to said carton supporting member, a motor and means interconnecting said motor and said means for moving and positioning said endless cutting blade, a transverse beam, a carton engaging member on said transverse beam, a switch arranged to be actuated by said carton engaging member, an electric circuit including said switch and said motor, means for moving said transverse beam at a right angle to said carton supporting member, said means for moving said transverse beam mechanically interconnected with said means for mounting said endless cutting blade and wherein said

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means for moving said transverse beam operates to move the same at double the rate of motion imparted said endless cutting blade mounting means, said means for moving said endless cutting blade comprising a secondary electric motor, an electric circuit including said switch and said secondary electric motor, said means for moving said endless cutting blade arranged to operate when said means for moving said means mounting said endless cutting blade stops.

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