

July 28, 1959

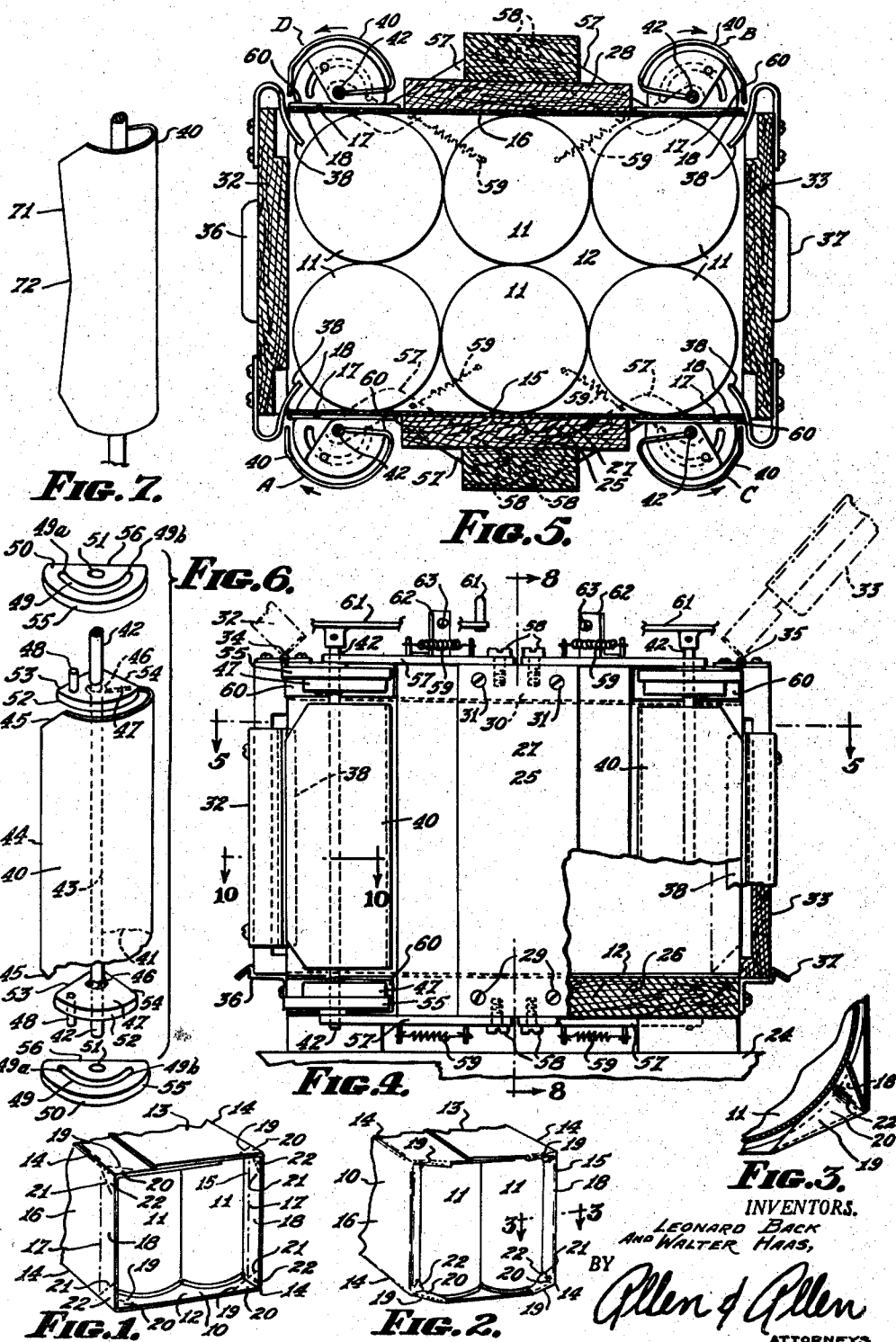
L. BACK ET AL

2,896,382

FOLDING DEVICE FOR PAPERBOARD CARRIERS

Filed Feb. 23, 1956

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

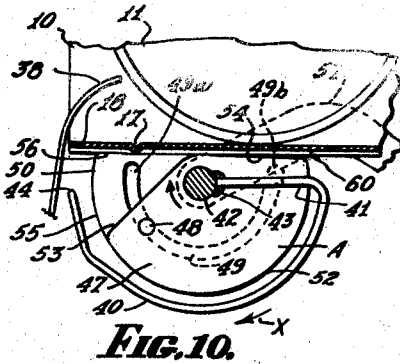


FIG. 10.

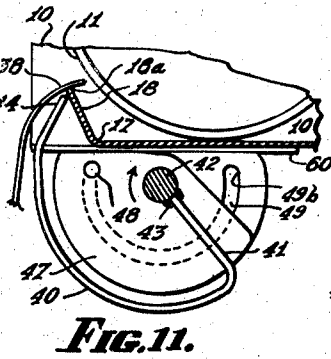


FIG. 11.

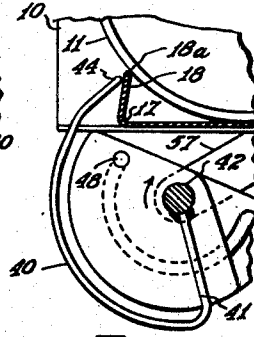


FIG. 12.

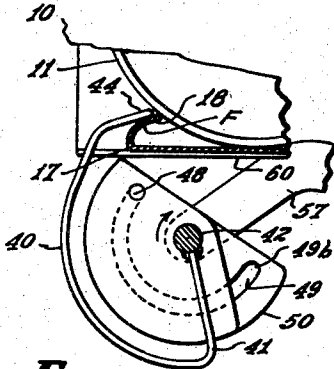


FIG. 13.

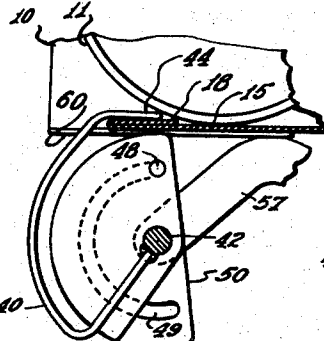


FIG. 14.

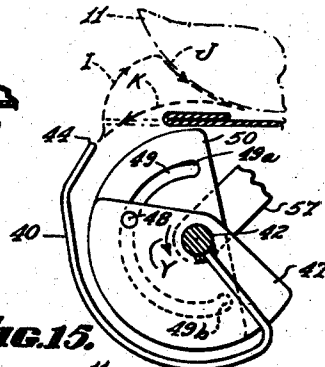


FIG. 15.

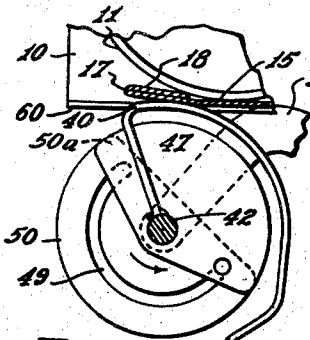


FIG. 16.

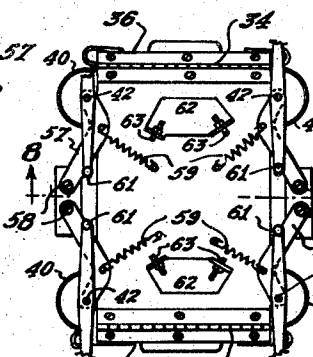


FIG. 9.

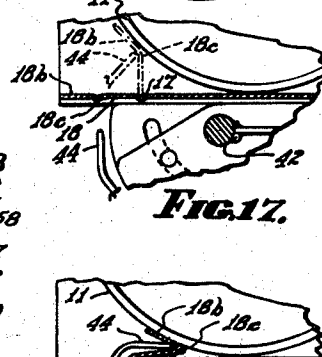


FIG. 17.



FIG. 18.

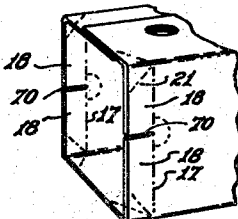


FIG. 19.

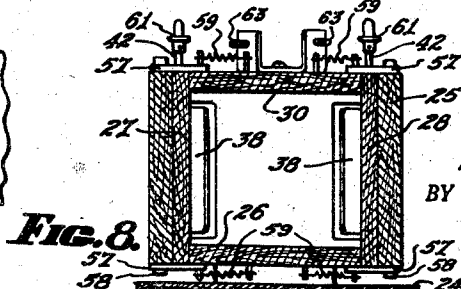


FIG. 8.

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FOLDING DEVICE FOR PAPERBOARD CARRIERS

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Application February 23, 1956, Serial No. 567,123

13 Claims. (Cl. 53—48)

This invention relates to folding devices and more specifically to folding devices to be employed in the packaging art to effect final closure of paperboard carriers and the like in which an assembly of cylindrical articles are packed.

Still more specifically the instant invention relates to a device for infolding container retaining and locking flaps at the ends of tubular type packaging structures such as the structures described in the copending application of Robert W. Nerenberg, filed February 28, 1955, and entitled Can Carrier. The said copending application describes an improved carrier of the tubular or "wrap around" type, also often referred to as a "sleeve type" carrier, wherein a plurality of cylindrical cans or containers are packed for convenient handling and merchandising. The carriers of the said copending application are characterized by a tubular rectangular body formed from paperboard and open at both ends, so that the cans to be packed may be readily inserted therein from one or both ends, as may be desired. Subsequent to the insertion of the cans narrow flaps at the ends of the carrier side walls are infolded and brought into locking engagement with the endmost cans in the carrier; and the infolding of the locking flaps results in the formation of container engaging saddle members bridging the corners of the carrier and serving to effectively retain the cans in place within the carrier structure until such time as positive force is applied to the carrier to release the locking flaps.

The present day demand for high speed and yet economical packaging makes mechanization of the folding operations a necessity, and it is therefore a principal object of this invention to provide an effective folding device serving to consistently and accurately infold and secure the locking flaps at the ends of the carrier.

Another object of the invention is to provide a folding device which, in addition to the infolding of the parts, also acts to effect a creasing or pressing operation along the fold lines of the flaps, the folding or creasing operation serving to preserve the original dimensions of the carrier as well as reduce to the desired degree the tendency of the locking flaps to spring back toward their unfolded position.

Still another object of the invention is to provide an arrangement of parts and folding mechanism whereby the printed surfaces of the cans will not be scratched or marred during the folding and creasing operation.

Yet a further object of the invention is the provision of mechanism which will readily lend itself to high speed commercial packaging and which mechanism may be incorporated in various packaging systems whether they be of the type wherein the tubular carriers are erected and filled from their open ends or the sales units of articles first assembled on a flat carrier blank, whereupon the blank is folded and tubed about the assembly of articles.

The foregoing as well as other objects of the invention which will appear hereinafter or which will be apparent

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to the skilled worker in the art upon reading these specifications are accomplished by those constructions and arrangements of parts of which several exemplary embodiments will now be described.

Referring now to the drawings wherein like parts have been designated by like reference numerals throughout the various views:

Figure 1 is a fragmentary perspective view showing an end of a filled carrier of the type to be acted upon by the folding device herein contemplated.

Figure 2 is a perspective view similar to Figure 1 but with the flaps in infolded condition.

Figure 3 is an enlarged fragmentary horizontal sectional view taken along the line 3—3 of Figure 2.

Figure 4 is a side elevational view having parts broken away and other parts in section, the view illustrating an exemplary folding device constructed in accordance with the invention.

Figure 5 is a horizontal sectional view taken along the line 5—5 of Figure 4.

Figure 6 is a perspective view with parts in exploded relation showing a curved folding blade and other parts employed in conjunction therewith.

Figure 7 is a perspective view showing an alternate configuration of the folding blade of Figure 6.

Figure 8 is a vertical sectional view taken along the line 8—8 of Figure 4.

Figure 9 is a plan view of the folding device as taken from the top of Figure 8.

Figure 10 is a horizontal sectional view taken along the line 10—10 of Figure 4, the view being on an enlarged scale and illustrating the position of the curved folding blade and the parts associated therewith just prior to the start of the folding operation.

Figures 11 through 14 are views similar to Figure 10 illustrating progressively advanced positions of the folding blade and associated parts as will occur during the infolding operation.

Figures 15 and 16 are also horizontal sectional views illustrating how the rotation of the curved folding blade may be reversed to effect pressing of the folded flap along its line of articulation to the adjacent body wall.

Figures 17 and 18 are also horizontal sectional views illustrating the infolding of a modified type of locking flap, and

Figure 19 is a partial perspective view illustrating yet another type of locking flap arrangement capable of being folded by the instant device.

Referring now to Figure 1 of the drawings, there is illustrated a can carrier 10 of the type described in the aforementioned copending application of Robert W. Nerenberg. The carrier will be filled with a plurality of cans 11 which, as previously indicated, may be inserted from either or both ends of the carrier or may be assembled on the carrier blank and the blank subsequently tubed about the assembly of cans. In any event, the carton comprises a rectangular sleeve-like paperboard structure having a bottom panel 12 and a top panel 13 joined by parallel fold lines 14 to side wall panels 15 and 16, each of which has score lines 17 paralleling and spaced from the end edges of the side walls to define narrow flaps 18. Diagonally disposed score lines 19 extending between the score lines 14 and the free end edges of the top and bottom panels define triangular portions 20 in these panels while similar diagonally disposed score lines 21 coinciding at their inner ends with the ends of the score lines 19 define triangular portions 22 in the side wall panels.

As explained in detail in the aforementioned copending application the act of infolding the flap 18 to the position illustrated in Figures 2 and 3 of the drawings automatically causes the triangular portions 20 and 22

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to be infolded to form saddle-like members bridging the corners of the carrier and engaging the upper and lower rims of the endmost cans so as to retain the assembly of cans within the carrier. As will be clear from Figure 3, the free edges of the infolded flaps 18 abut against the surfaces of the adjacent cans and are retained in the folded position until positive pressure is exerted to release them.

Referring now to Figures 4, 5, 8 and 9, the folding device comprises a suitable understructure generally indicated at 24 which mounts a rectangular frame 25 comprising a bottom 26 to which upright members 27 and 28 are affixed, as by screws 29, to support a top panel 30 affixed to the upper ends of the upright members by screws 31. Thus, as perhaps best seen in Figure 8, the inner surfaces of the frame 25 provide a rectangular enclosure of a size to receive a carrier or carton such as that illustrated in Figure 1.

As best seen in Figures 4 and 5, additional panels 32 and 33 which serve as end closure members for the frame are hinged to the top panel 30 by means of hinges 34 and 35. The open position of these end closure members is indicated in broken lines while the closed position thereof, as required during the folding operation, is shown in solid lines. Spring type latches 36 and 37 are provided to retain the end closure members in closed position and each of these members mounts a pair of curved guide members 38 which guide members, in the closed position of the end closure members, assist in effecting the folding of the locking flaps.

It will now be clear that the frame structure 25 provides an enclosure in which the carrier is supported during the folding operation. The enclosing frame serves to restrain the body walls of the carrier from undue bending or flexing in an outward direction, whereas the cans 11 within the carrier prevent undue inward flexing of the wall panels; and the carrier is thus maintained in substantially rigid condition.

As will be evident from Figure 5, when a carrier is positioned within the frame, the flaps 18 abut against the guide members 38 and folding devices, generally indicated at A, B, C, and D, lie immediately adjacent each of the flaps.

Referring now to Figure 6 of the drawings, certain elements of a folding device are shown in exploded relation. The folding device comprises a curved plate or cylindrical folding blade 40 having a radially inwardly extending portion 41 by means of which the blade is affixed to the shaft 42, as by being welded thereto by welding indicated at 43. The folding blade 40 has a vertically disposed free edge 44 the corners of which are cut away at 45. In the operation of the device, the folding edge 44 contacts one of the flaps 18 adjacent its outer edge to enforce the folding of the flap in a manner which will be explained more fully hereinafter.

Referring now to Figure 10, fixed near the upper end of the shaft 42, as by welding indicated at 46, a cam member 47 is provided with a fixed pin or stud 48 positioned to slidably engage in an arcuate slot 49 of a second cam 50 having a central bore 51 by means of which the cam 50 is slidably received on the shaft 42 and superposed to the cam 47. When so positioned, rotary movement of the cam 50 with respect to the cam 47 will be limited by the stud 48 engaging the opposite ends 49a and 49b of the slot 49. Near the lower end of the shaft 42 (see Figure 6) a similar, but inverted, set of cams 47 and 50 is provided. Excepting for their inverted position, the parts at the lower end of the shaft are identical in all respects with those at the upper end and, consequently, have been given like reference numerals.

The cams 47 are of a generally sectorial outline, the periphery of which includes an arcuate segment 52 which is radially concentric with the shaft 42 and is joined at its ends by angularly related faces 53 and 54. The cams 50, on the other hand, are of generally semi-circular

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outline consisting of an arcuate portion 55 radially concentric with the bore 51 and hence the shaft 42, the arcuate portion 55 being joined at its ends by a straight-line face or chord 56. With respect to the arcuate portions 52 and 55 of the cams 47 and 50, respectively, it may be pointed out that the radius of the arcuate portion 55 is slightly greater than that of the arcuate portion 52, the purpose for which will be explained more fully hereinafter.

Each of the folding devices A, B, C and D comprise the assembly of parts just described mounted on a shaft 42 adjacent each corner of the frame 25. However, as will be apparent from Figure 5, the devices A and B are required to rotate clockwise, whereas the devices C and D are required to rotate counterclockwise. This obviously requires that the pairs of folding devices should be allochiral and it may be pointed out that by merely inverting the assembly of parts shown in Figure 6 this requirement will be fulfilled.

Referring now to Figure 9, the upper and lower ends of the shaft 42 are rotatably journaled in the outer ends of bell cranks 57 which are pivotally mounted at their inner ends to the frame 25, as by means of screws 58. Tension springs 59 engage the fulcrums of the bell cranks and serve to urge the folding devices mounted thereon toward the side panels of the frame, as will be clear from Figure 5. Plates 60, fixedly mounted on the frame 25 adjacent the folding devices, provide bearing surfaces for the cams 47 and 50.

As shown in Figures 4 and 9, actuating levers 61 may be secured to the upper ends of the shafts 42 for manually rotating the shafts and the parts carried thereon. It is to be understood, however, that in place of the actuating levers 61 the several shafts may be coupled for automatic actuation in the course of a continuous machine operation without departing from the spirit and purpose of the instant invention.

In connection with the actuation of the shafts 42 by means of the levers 61, it is preferred to provide brackets 62 fixed to the upper surface of the frame which mount adjustable abutment screws 63 adapted to limit the movement of the levers 61 and hence arrest the folding movement of the folding blades.

Referring now to Figures 10 through 15 of the drawings, the operation of the folding device A will be described in detail and it will be understood that the operation of the remaining folding devices will be identical, excepting for their direction of movement, as that of device A. Figure 10 shows the position of parts prior to initiation of the folding operation by the rotation of the shafts 42 in a clockwise direction, as indicated by the arrow X. It should be first pointed out that the normally arcuate path of travel of the folding edge 44 relative to the shaft 45 will be modified, as the folding action progresses, by the action of the cams 47 and 50. The initial movement of the parts from the position of Figure 10 to that of Figure 11 results in the movement of the folding edge 44 in an arcuate path of travel, the initial travel of the folding edge being diagrammatically indicated by the arrow I in Figure 15. When the cam 47 reaches the position illustrated in Figure 11 it will bear against the plate 60 and continued rotation of the shaft 42 in the same direction will cause the cam to ride up on its arcuate segment 52 and this action, as illustrated in Figures 12 and 13, causes the bell cranks 57 and the shaft 42 to be shifted outwardly with respect to the side walls of the carton, the bell cranks 57 swinging outwardly about their pivoted mountings 58 against tension of the springs 59. This outward movement progressively shifts the axis of rotation of the folding edge 44 causing the edge to move in a path of travel indicated by the arrow J. The configuration of the cams and the length of the arms of the bell cranks 57 are so chosen that the path of travel J will be concentric with but slightly spaced from the cylindrical wall of the adjacent can 11, so that

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the folding edge 44 just narrowly misses the can and hence will not scratch or mar the printed surface of the can.

Referring again to Figures 11 through 14, it will be noted that as the pin 48 of cam 47 strikes the end 49a of slot 49, the cam 50 will thereafter rotate with cam 47.

As the folding edge 44 advances from the position of Figure 10 to that of Figure 11 (moving in the arcuate path I) it contacts the flap 18 adjacent its outer edge and folds the flap inwardly about the score line 17. During this movement the curved guide 38 bears lightly against the free edge 18a of the flap and acts to gently retain the outer edge of the flap in parallelism with the score line 17. Actually, the guide 38 presses inwardly on the free edge of the flap and this force is transmitted through the flap to the score line 17 where it tends to hold the end edge of the carrier side wall against undesirable bowing or flexing. In the position of Figure 12 the folding has been advanced to a position where the free edge 18a of the flap is brought into contact with the cylindrical wall of the adjacent can 11. It will be apparent from the drawing that, since the width of the flap is greater than the distance from its fold line 17 to the closest point on the periphery of the can, further inward folding of the flap requires the flap to be arched. The necessary arching of the flap, indicated at F in Figure 13, is effected by the folding edge 44 as it travels along path J, whereafter further clockwise movement of the folding edge completes the infolding of the flap to the position illustrated in Figure 14. When the position of Figure 14 is reached, it will be obvious that continued clockwise movement of the folding blade will be arrested as it contacts the side wall of the carrier.

The flap 18 having been thus fully infolded, the rotation of the parts is reversed, as indicated by the arrow Y shown in Figure 15. Bearing in mind that the radius of the arcuate portion of cam 50 is slightly greater than that of cam 47, the cam 50, due to frictional engagement with the plate 60, will remain in its advanced position (Figure 15) thereby retaining the bell cranks 57 and shaft 42 in their outwardly displaced positions. At the same time, the rotation of the shaft 42 in a counterclockwise direction results in the folding edge 44 being withdrawn from the carton, the path of travel of the folding edge during withdrawal being indicated by the arrow K. Continued movement of the parts in a counterclockwise direction brings them to the position illustrated in Figure 16 wherein it will be seen that the plate 40 is caused to bear against the side wall of the carton to press the folded flap 18 against the cylindrical wall of the can 11, thereby enforcing the folding of the flap.

It will be noted that the plate 40, since it has a radius greater than that of either of the cams, will serve to lift the cams free from the plate 60 and, as the cam 47 moves in a counterclockwise direction, the pin 48 will contact the end 49b of the slot in cam 50, thereby moving cam 50 in a counterclockwise position. The counterclockwise movement of the parts will be governed by the contact of the levers 61 with the abutment screws 63, whereupon the lever and the shaft 42 will again be rotated in a clockwise direction to return the parts to the starting position of Figure 10. Once the folding plate 40 is rotated sufficiently to disengage the side wall of the carrier, the spring 59 will return the bell crank 57 to its initial inward position. At the same time the face 54 of cam 47 and face 56 of cam 50 will seat against the plate 60.

Figures 17 and 18 illustrate the infolding of a modified flap structure incorporated a hinged extension 18b. As shown in Figure 17, the folding edge 44 folds the flap inwardly until the extension 18b contacts the can 11, whereupon the edge 44 acts to enforce the reversed folding of the extension 18b, the can 11 coacting with the folding edge to enforce the folding of the extension along the score line 18c, the completely folded condition of the

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flap being seen in Figure 18. The extension 18 will serve a dual function: (1) it forms a protective shield about the folding edge 44 to prevent marring or scratching of the cylindrical surfaces of the cans, and (2) the reversely folded extension provides a gripping element by means of which the flap 18 may be unfolded to release the cans for removal from the carrier.

Figure 19 illustrates a modified form of carton wherein the locking flaps 18 at the ends of the sides walls are severed intermediate their length by lines of cut 70 extending inwardly to the score lines 17. The transverse cuts 70 tend to lessen the resistance of the flaps to folding. In this connection, Figure 7 of the drawings illustrates an alternative configuration for the folding blade 40 wherein the folding edge 71 tapers inwardly toward an apex 72 at the center of the blade. With this arrangement, the folding of the flaps 18, particularly if they are transversely severed by lines of cut 70, is initiated immediately adjacent the diagonal score lines 71, whereupon the flaps are progressively contacted throughout the remainder of their lengths. This arrangement is particularly suited where the board from which the carrier is formed has a tendency to tear at the corners of the carrier.

Further modifications may be made in the invention without departing from the spirit and purpose of it. For example, it has been found that, depending upon the quality and folding characteristics of the board used for the carriers, in some instances the curved guide members 38 may be omitted. Similarly, it has been found that by increasing the width of the locking flaps 18, the guide members 38 may again be omitted.

Having thus described the invention in certain exemplary embodiments, what is desired to protect and secure by Letters Patent is:

1. A folding device comprising a curved folding blade having a folding edge, a shaft fixed to said folding blade, pivoted arms mounting said shaft and said blade for movement in a normally arcuate path of travel, a pair of cams mounted on said shaft for movement therewith, one of said cams being fixedly secured to the shaft and the other being rotatably journaled on said shaft, abutment means in the path of travel of said cams, said cams acting upon contact with said abutment means to move said pivoted arms so as to shift the position of the shaft and hence the path of travel followed by the folding edge of said blade.

2. A folding device comprising a frame adapted to receive a tubular carrier having foldable flaps articulated to the ends of its side walls, said frame including side wall members mounting folding devices positioned adjacent each corner of said frame, each of said folding devices comprising a curved folding blade of generally semi-circular cross section, a shaft mounting said blade for movement in an arcuate path of travel as said shaft is rotated, pivoted arms on said frame mounting said shaft for rotating movement, cam means for laterally displacing said shaft as said blade is rotated, said cam means being operatively connected to said shaft movable, upon rotation of said shaft, into contact with an abutment comprising a part of said frame, said frame including hingedly connected end members, said end members carrying curved guide members against which the ends of the foldable flaps are adapted to abut as the flaps are folded inwardly by said curved blades.

3. A folding device comprising a frame of a size to receive and support a tubular carrier having foldable flaps articulated to its end edges, folding devices mounted on said frame for contact with said foldable flaps, each of said folding devices comprising a curved folding blade having a folding edge, a shaft fixedly secured to said blade, pivoted arms mounting said shaft and said blade for movement in a normally arcuate path of travel, a pair of cams mounted on said shaft for movement therewith, one of said cams being fixedly secured to said shaft and

the other rotatably journaled thereon, abutment means in the path of travel of said cams, said cams acting, upon contact with said abutment means, to move said pivoted arms so as to displace said shaft laterally and thereby alter the path of travel followed by the folding edge of said blade as said blade is rotated.

4. The device claimed in claim 3 wherein said fixedly secured cam is of generally sectorial outline, the periphery of which includes an arcuate segment which is radially concentric with said shaft and is joined at its ends by angularly related faces, wherein said rotatably journaled cam is of generally semi-circular outline consisting of an arcuate portion radially concentric with said shaft and joined at its ends by a straight-line face, and an arcuate slot in said rotatably journaled cam, and a pin secured to said fixedly mounted cam, said pin being positioned to slidably engage in the arcuate slot in said rotatably journaled cam.

5. The device claimed in claim 4 wherein the radius of the arcuate portion of said fixedly secured cam is slightly less than the radius of the arcuate portion of said rotatably journaled cam, whereby, when the arcuate portion of said rotatably journaled cam is in contact with said abutment means, said fixedly secured cam and said shaft may be moved relative to said abutment means.

6. In a folding device, a support, a pair of arms pivotally connected to said support in spaced apart relationship, a shaft extending between and rotatably mounted to said arms, a curved blade fixed to said shaft, an abutment, means urging said arms the shaft carried thereby toward said abutment, cam means on said shaft for contact with said abutment, said cam means comprising a pair of cams one of which is fixedly secured to said shaft and the other of which is rotatably journaled on said shaft, and means interconnecting said cams for joint movement upon rotation of said shaft in one direction and for independent movement upon rotation of said shaft in the opposite direction.

7. The device claimed in claim 6 wherein said means interconnecting said cams becomes operative, upon rotation of said shaft to a predetermined point in said opposite direction to connect said cams together for joint movement in said opposite direction.

8. The device claimed in claim 7 wherein said curved blade has an arcuate portion which is substantially radially concentric with said shaft, and wherein a curved guide is fixedly supported relative to said curved blade, said guide member being concentric with but lying beyond the path of travel followed by said curved blade upon movement of said shaft in said first named direction of rotation, whereby the free edge of a flap adapted to be contacted and infolded by said curved blade will

contact said curved guide-member and will move therealong as the said flap is folded inwardly by said curved blade.

9. In a folding device including a frame adapted to receive a tubular carrier having a foldable flap articulated to the end of a body wall of said carrier, a folding device positioned adjacent said foldable flap, said folding device comprising a curved folding blade of generally semi-circular cross section, means mounting said folding blade for rotary movement in an arcuate path of travel about an axis of rotation, and a curved guide member fixably supported relative to said folding blade, said guide member being concentric with but lying just beyond the path of travel followed by said folding blade upon rotary movement thereof, said guide member being positioned to be contacted by the free edge of the foldable flap of said carrier, whereby as the flap is folded inwardly by said folding blade its free edge will move inwardly sliding along said curved guide member.

10. The device claimed in claim 1 wherein said cams are juxtaposed, wherein said rotatably journaled cam has an arcuate slot therein, and wherein said fixedly secured cam has a pin fixed thereto positioned to slidably engage in said slot.

11. The device claimed in claim 10 wherein said fixedly secured cam is of generally sectorial outline, the periphery of which includes an arcuate segment which is radially concentric with said shaft and which is joined at its ends by angularly related faces, and wherein said rotatably journaled cam is of generally semi-circular outline consisting of an arcuate portion radially concentric with said shaft and joined at its ends by a straight-line face.

12. The device claimed in claim 11 wherein the radius of the arcuate portion of said fixedly secured cam is slightly less than the radius of the arcuate portion of said rotatably journaled cam.

13. The device claimed in claim 12 wherein the arcuate segment of said fixedly secured cam is less than 180° and wherein the arcuate portion of said rotatably journaled cam is no less than 180°.

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