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DEADENED CREASE

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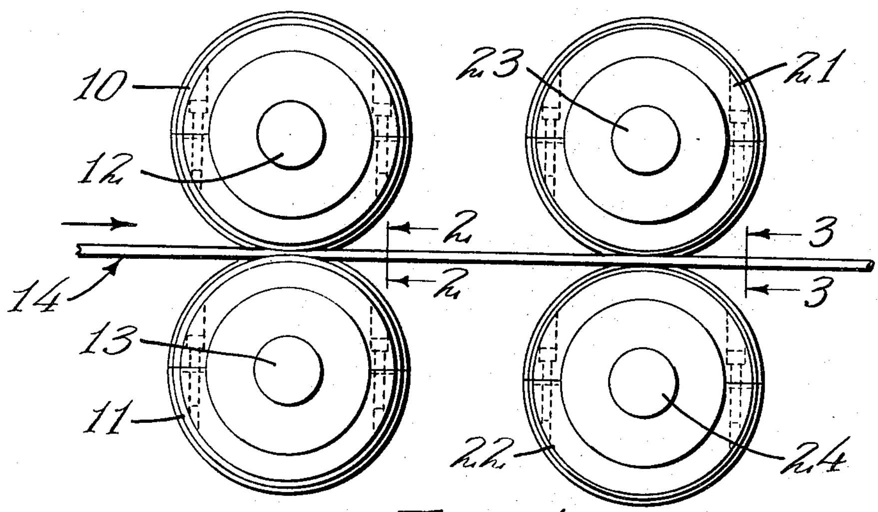

FIG. 1

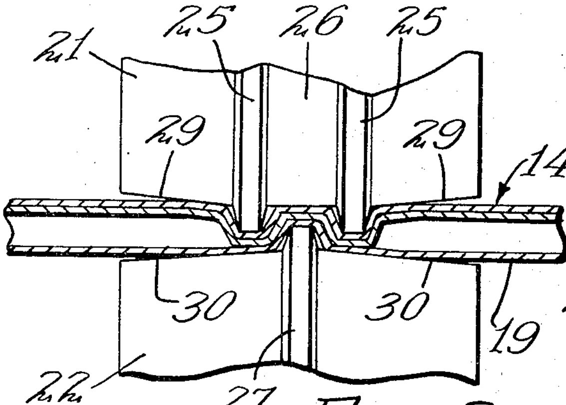

FIG. 3

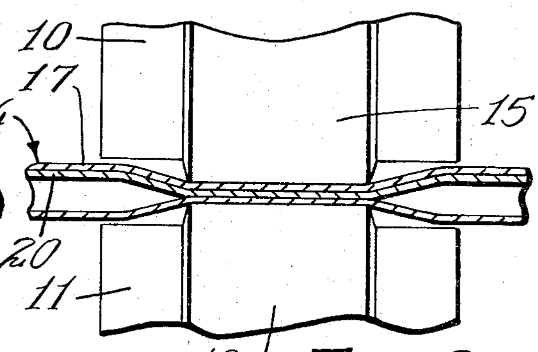

FIG. 2

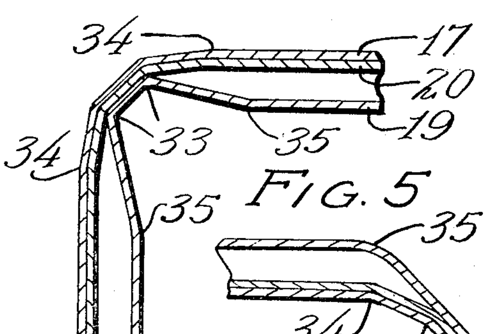

FIG. 5

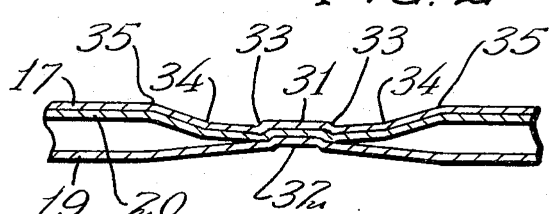

FIG. 4

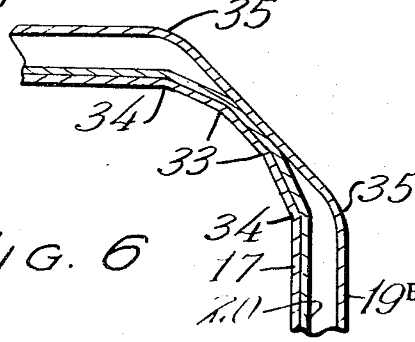

FIG. 6

INVENTOR

WALTER H. RASMUSSEN

BY

ATTORNEY

3,717,074

DEADENED CREASE

Walter H. Rasmussen, St. Paul, Minn., assignor to Hoerner-Waldorf Corporation, St. Paul, Minn.

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ABSTRACT OF THE DISCLOSURE

The present invention relates to a deadened crease in corrugated paperboard, and particularly a crease extending transversely of the corrugations. The crease is formed by crushing a relatively wide area of the corrugated along the crease, preferably between a pair of male creasing rollers, and then adding a narrower crease along the center line of tne crushed area. The second crease is formed by male and female creasing rollers in preferred form, and provide an offset area extending longitudinally of the crushed area at the center thereof, the paperboard folding along the edges of the offset area.

This invention relates to an improvement in deadened crease and deals particularly with a particular form of crease and a method and apparatus for forming the same.

Corrugated paperboard is often produced in which the body of the paperboard is so stiff and rigid that it is difficult to fold along conventional score lines. This is particularly true when the corrugated paperboard in question is what is commonly known as double walled corrugated board which includes two corrugated mediums sandwiched between the liner sheets. Creases of conventional form usually fold readily in one direction, and much less readily in the other. When creases of this type are used to connect the rectangular body walls of a container to their respective closure flaps, the creases are usually arranged so that the flaps will fold inwardly readily to permit the container to be closed. However, in many instances, particularly where the containers are sealed on case sealing equipment, it is necessary to fold the closure flaps outwardly during the filling operation before they are folded inwardly. Difficulty is often experienced in doing this.

Attempts have been made to solve the problem by widening the crease and crushing the corrugated paperboard between two opposed male creasing rollers. However, when this is done, it is difficult to accurately determine just where the actual line of fold will occur. When the flaps are folded, the actual line of fold may be anywhere throughout the width of the wide creases. In some instances, the flaps will fold along a diagonal line across the wide creases. When the flaps are folded into closed position, the actual line of fold may be so located that the outer closure flaps may either terminate in spaced relation or else tend to overlap.

I have found that an effective crease may be produced in corrugated paperboard of this type by directing the paperboard through a plurality of creasing stations. In preferred form, the paperboard blanks or webs are first directed between a pair of opposed relatively wide male creasing rollers which are centered in opposed relation. These rollers tend to crush a relatively wide area of the corrugated paperboard into substantially flat form. The blanks or the web next pass between a pair of substantially conventional male and female creasing rollers which are centered with respect to the wide crushed areas which have previously been formed. The male and female creasing rollers form a second crease extending along the center of the crushed area, defining a definite line of fold. Due to the fact that the crushed area does not return to its original form, and is therefore thin as compared with the thickness of the corrugated sheet, the corrugated board may fold in either direction along the center line of the crushed area, or along the second formed crease.

One of the difficulties involved in creasing corrugated board transversely of the corrugations lies in the fact that these creases are usually applied on the corrugator, while the web is hot and rather damp. After a period of time, the blanks dry and stiffen. As a result, when the container is formed and filled, and the flaps folded through ninety degrees to close the container, the folded flaps tend to spring back toward alignment with the container walls, straining the adhesive connection between the flaps or the tape securing the container closed. By deadening the creases in the manner described herein, this "spring back" tendency is greatly reduced, resulting in a more effective closure.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of the specification,

FIG. 1 diagrammatically illustrates two pairs of creasing rollers successively engaged by the corrugated web or the corrugated blanks.

FIG. 2 is a sectional view on an enlarged scale through a portion of the web closely adjacent to the first creasing rollers.

FIG. 3 is a view similar to FIG. 2 but showing the web closely adjacent to the second creasing rollers.

FIG. 4 is an enlarged sectional view through the creased sheet.

FIG. 5 is a view similar to FIG. 4 after the sheet has been bent along the fold lines.

FIG. 6 is a view similar to FIG. 5 showing the sheet folded in a reverse direction.

In the formation of containers made of corrugated paperboard, it is usual practice to crease the corrugated web longitudinally of the web and transversely of the corrugations thereof to define the fold lines connecting the body of the container to the upper and lower closure flaps. After the web has been creased, the web is usually cut into blanks of the proper length. These blanks are then usually fed through a printer slotter in a direction parallel to the flutes of the corrugations. In this apparatus, the blanks are normally printed, the fold lines defining the side and end walls are added, and the flap areas are slotted to separate the flaps one from another. FIG. 1 of the drawings diagrammatically illustrates two sets of creasing rollers in tandem arrangement engaging the web one after the other. The manner of mounting the shafts supporting the creasing roller is not shown as this structure may be varied depending upon whether the web is being creased on the corrugator, or blanks are being creased.

FIG. 1 of the drawings indicates a pair of creasing rollers **10** and **11** mounted upon parallel shafts **12** and **13** above and below the corrugated paperboard web **14**. As is indicated in FIG. 2 of the drawings, both the upper creasing roller **10** and the lower creasing roller **11** are what is commonly known to the trade as male creasing rollers, being provided with a relatively wide peripheral flange **15** and **16** thereupon. The flanges **15** and **16** usually of equal width, and are spaced apart a distance substantially equal to the thickness of the paper forming the corrugated web. In the drawings, the web **14** comprises double face corrugated paperboard including an upper liner **17**, a lower liner **19**, and an intermediate corrugated medium **20**, the flutes of which are adhered to the liners **17** and **19**. Obviously, the corrugated web **14** could comprise double wall corrugated paperboard which includes an upper liner, upper corrugated medium, an intermediate liner, a lower corrugatel medium, and a lower liner, the upper and lower corrugated mediums having their flutes adhered to the liners with which they are in contact.

As will be noted in FIG. 2 of the drawings, the upper and lower liners are crushed against the corrugated medium, providing a relatively wide crushed area which is somewhat greater in width than the normal crease.

A second pair of creasing rollers **21** anl **22** are mounted upon vertically spaced shafts **23** and **24** to engage the web **14** after it has been creased by the creasing rollers **10** and **11**. As is indicated in FIG. 3 of the drawings, the upper creasing roller **21** comprises what is known as a female creasing roller, and includes a pair of spaced peripheral flanges **25** with a groove **26** therebetween. The lower corrugated roller **22** comprises a male creasing roller and includes a single peripheral flange **27** encircling the roller. As may be seen in FIG. 3, the outer peripheral surfaces **29** of the creasing roller **21** which are outwardly of the flanges **25** may taper somewhat toward their outer ends so as to relieve pressure against the web. The outer surfaces **30** of the male creasing roller **22** may also taper toward their ends to relieve pressure against the under surface of the web out of the actual creasing area.

As is indicated the flanges **25** are spaced apart a distance substantially greater than the width of the male creasing flange **27** so that the paperboard forming the corrugated board may be engaged by the overlapping flanges or the rollers without shearing the sheets. The male creasing roller **27** forces the paperboard into the groove **26** between the flanges **25**, while the flanges **25** of the female roller tend to crush the corrugated board against the surfaces **30** of the roller on either side of the flange **27**. The outer edges of the flanges **25** are spaced apart a distance somewhat less than the width of the crushed area formed by the flanges **15** and **16**, and the flange **27** is centered between the flanges **25** and centered with respect to the crushed area formed by the flanges **15** and **16**.

After passing between the two pairs of creasing rollers, the corrugated board appears in section substantially as indicated in FIG. 4 of the drawings. The upper surface of the upper liner **17** is slightly offset upwardly as indicated at **31**, and the lower liner **19** is correspondingly upwardly recessed as indicated at **32**. The numerals **33** are designed to indicate the sides of the center crease formed by the creasing rollers **21** and **22**. The numerals **34** have been applied to FIG. 4 to indicate the sides of the crushed area formed by the flanges **15** and **16**. From the points **34** to the points or lines **35**, the corrugated paperboard tapers in thickness and outwardly of the lines **35** the corrugated board is of full thickness.

With this arrangement, it has been found that the corrugated board will fold along the narrowly spaced side edges **33** of the center crease much in the manner indicated in FIG. 5 of the drawings, the portions of the paperboard between the crease lines **33** extending diagonally. It has further been found that with this type of crease, the paperboard will fold along these same lines **33** even if folded in a reversed direction as indicated in FIG. 6. As a result, the container flaps may be folded outwardly into a common plane for filling or during the case sealing operation. Many case sealing machines fold the outer two closure flaps outwardly through an angle of 90 degrees before they are folded inwardly to overlie the first folded flaps. The present form of crease permits such reverse folding without changing the actual location of the crease line maintaining the location of the crease when folded back in the proper direction.

In explanation of the operation of the present structure, it should be stated that when the corrugated paperboard is crushed, as by the creasing rollers **10** and **11** there is always some tendency for the outside liners to return to their original position and thus for the liners to spread apart rather than to remain crushed. When the second creasing operation takes place between the male and female rollers **21** and **22**, the added crimps or kinks along the lines **33** tend to hold the offset portion between these fold lines flat as illustrated in FIG. 4. The outer portions of the crushed area outwardly of the fold lines **33** tend to spread apart and it will be noted that the liners are spread apart to some extent inwardly of the fold lines **34**. When the paperboard is folded along the crease lines, the board will fold along the fold lines **33** rather than along the fold lines **34** due to the separation of the plies inwardly of the fold lines **34**, making the board more resistant to folding along the fold lines **34**, than along the fold lines **33**. It is for this reason that the fold is controlled as described.

When the board is creased as disclosed, the container is deadened by crushing and by the second creasing operation. As a result, the tendency for the flaps to spring back toward alignment with the walls to which they are hinged is greatly reduced, permitting the flaps to be more readily adhered together or taped in closed position.

I claim:

1. A method of creasing corrugated paperboard having parallel liners and at least one corrugated medium therebetween including the steps of:

crushing the corrugated board inwardly from opposite sides between opposed male dies to provide an elongated crushed area the opposite sides of which are between the planes of said parallel liners,

compressing the crushed area between cooperable male and female dies to offset the central portion of the crushed area relative to the remainder thereof and extending longitudinally throughout the length thereof.

2. The process of claim **1** and in which the offset portion is narrow relative to the width of the crushed area.

3. The process of claim **1** and in which the crushed area and offset portion are sequentially formed between creasing rollers.

4. Method of creasing corrugated paperboard having parallel liners and at least one corrugated medium therebetween through the use of two pairs of creasing rollers mounted in alignment on parallel shafts and between which the paperboard is moved, one pair of creasing rollers comprising opposed male creasing rollers and the other pair of creasing rollers comprising cooperable opposed male and female creasing rollers, the method comprising the steps of:

crushing the corrugated paperboard between said male rollers to provide an elongated crushed area extending transversely of the corrugations of the paperboard and offset inwardly from the parallel surfaces of the paperboard.

creasing the crushed area between the second pair of rollers to offset a portion of the crushed area relative to the remainder thereof.

5. The process of claim **4** and in which said offset portion is narrow relative to the width of said crushed area.

6. The process of claim **5** and in which said offset portion is substantially centered relative to said crushed area.

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TRAVIS S. McGEHEE, Primary Examiner

U.S. Cl. X.R.

93—58.1; 161—123