Nov. 5, 1968 D. G. SLOUKA ETAL 3,409,206

CONTAINER BLANK, BODY, AND METHOD OF FORMING

Filed March 17, 1967 2 Sheets-Sheet 1

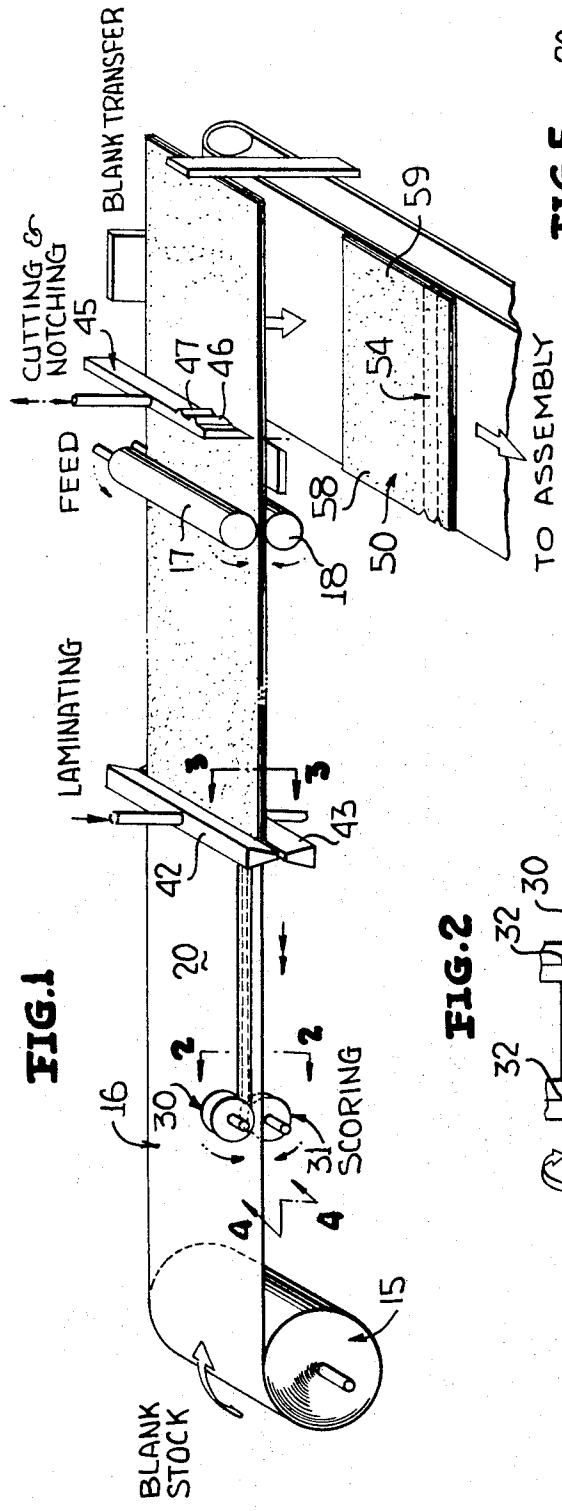


FIG.1

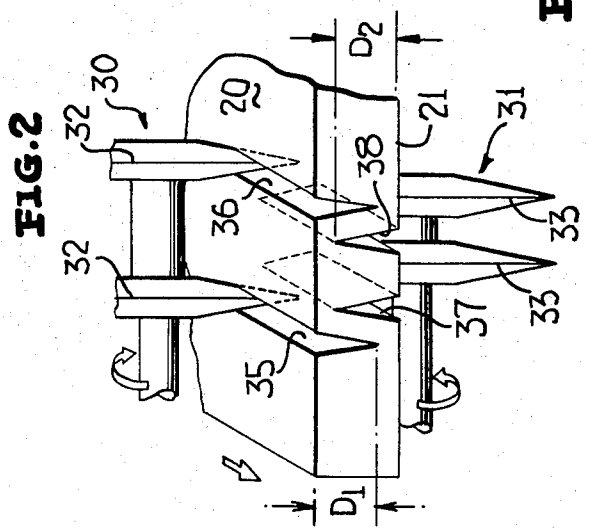


FIG.2

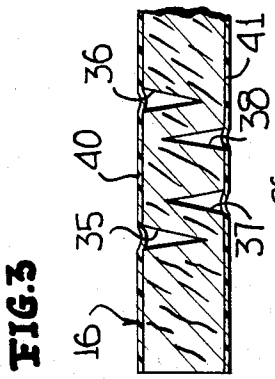


FIG.3

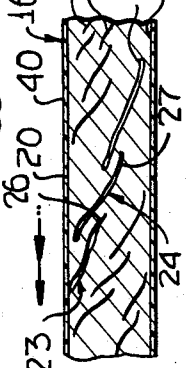


FIG.4

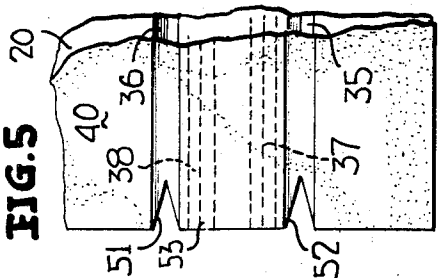


FIG.5

INVENTORS
DONALD G. SLOUKA
& ROBERT T. ELIAS

BY
Mason, Parker, Diller & Brown
ATTORNEYS

Nov. 5, 1968 D. G. SLOUKA ETAL 3,409,206

CONTAINER BLANK, BODY, AND METHOD OF FORMING

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FIG.6

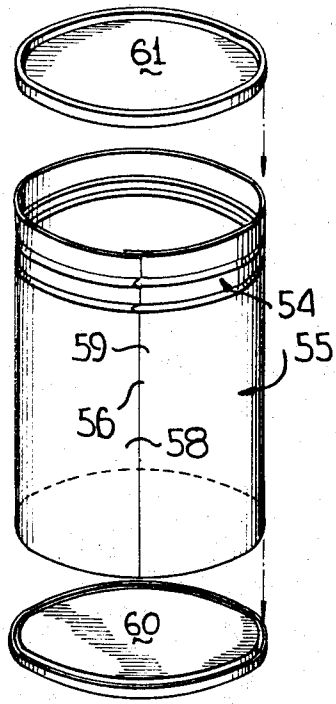


FIG.7

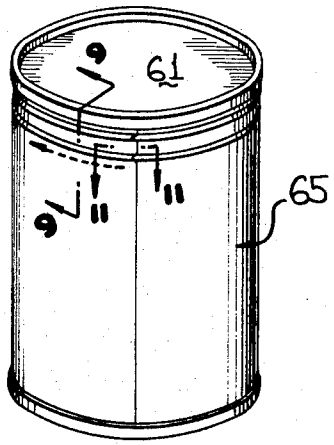


FIG.8

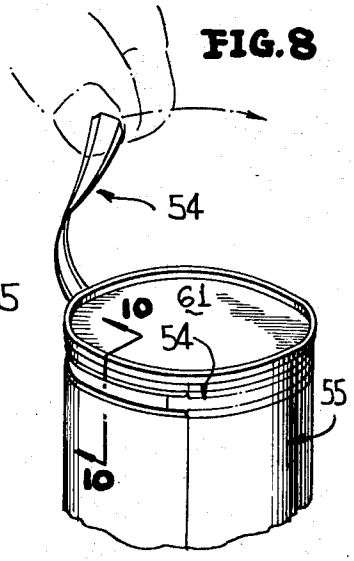


FIG.9

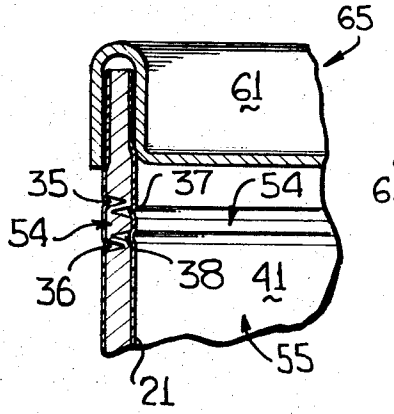


FIG.10

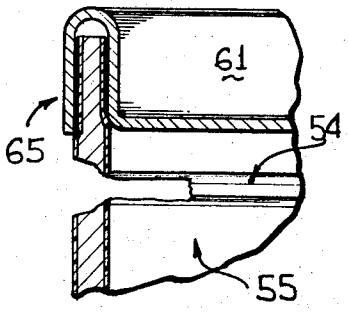


FIG.12

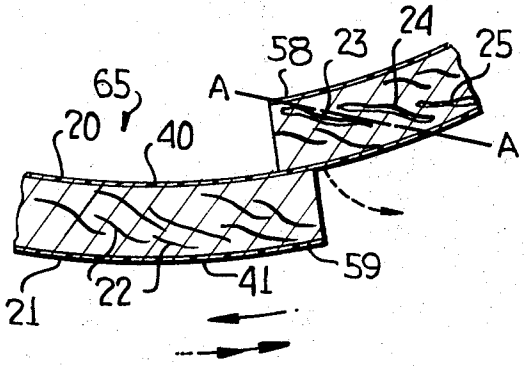
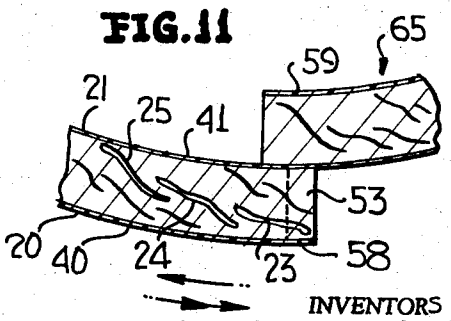


FIG.11



INVENTORS
DONALD G. SLOUKA
& ROBERT T. ELIAS

BY
Mason, Porter, Diller & Brown
ATTORNEYS

United States Patent Office

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CONTAINER BLANK, BODY, AND METHOD OF FORMING

Donald G. Slouka, Glen Ellyn, and Robert T. Elias, Downers Grove, Ill., assignors to Continental Can Company, Inc., New York, N.Y., a corporation of New York

Filed Mar. 17, 1967, Ser. No. 623,927
14 Claims. (Cl. 229—51)

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a container blank and its manufacture wherein the blank is provided with a pair of weakening lines in inner and outer surfaces thereof with one of the pair of weakening lines being wholly confined within the area between the other pair of the weakening lines and defining therewith a removable tear strip portion, the blank being formed from fibrous material, and the fibers of the material being in overlapping relationship and primarily oriented in alignment with the longitudinal axis of the tear strip portion.

Containers of the type to which this invention is directed are relatively well known and are generally constructed by feeding fibrous paperstock material from a roll along a predetermined path. The web is perforated, scored or similarly provided with lines of weakening which define individual tear strips when the web is afterward cut into body blanks. The body blanks are conventionally formed into tubular hollow container bodies which are longitudinally seamed by, for example, butt or lap seams. A closure is thereafter secured to an axial end of each container body, and a packager subsequently charges the containers with a suitable product and closes the remaining still open axial end of each container.

The tear strip of each packaged container generally includes a starting tab which is manually grasped by a consumer and pulled to remove the tear strip from the container body incident to the removal of the packaged product. The tear strip is generally disposed circumferentially about the body but can also be conventionally disposed in a spiral fashion.

Such conventional easy-open type containers are generally acceptable for a large number of consumer goods, both edible and inedible, but two distinct disadvantages are common to most of these type containers. A major disadvantage is the tendency of the tear strip to tear across its width prior to the entire removal thereof from an associated container. This is particularly true if the tear strip is removed with little caution and in a rapid manner, but even under optimum conditions transverse severance of the tear strips has occurred.

A further and related disadvantage of such conventional containers is the problem of "wicking" i.e., the absorption of liquid into the fibrous material of the container body through the exposed interior (or exterior) cut edges of the weakening lines. If, for example, a relatively moist product is packaged in a container having weakening lines in its interior surface the moisture is readily absorbed into the container body, causing the same to weaken appreciably and in cases of pronounced wicking the absorption of the moisture causes discoloration of the exteriorly decorated container body. The container is therefore rendered undesirable from the standpoint of its strength characteristics as well as esthetic appearances and consumer appeal. The weakening of the container body in the area of the tear strip also can cause the tear strip to prematurely "pop" at its starting end if the packaged product expands and/or releases a gaseous

medium, as in the case of yeast dough packaged for baking purposes which can release CO_2.

In keeping with the above it is a primary object of this invention to provide novel container blanks and bodies which are adapted to be formed into containers of the easy-open type in which tear strips can be consistently completely removed and conventional wicking is completely precluded.

A further object of this invention is to provide a novel container blank adapted to be formed into a tubular container body, the blank being formed of a generally polygonal sheet of fibrous material, a pair of lines of weakening in opposite surfaces of the sheet defining an elongated removable tear strip portion for facilitating the opening of a container body formed from the blank, the pair of weakening lines in one of the surfaces being wholly confined within an area between the other pair of weakening lines, and at least one of the pair of weakening lines being covered by means susbtantially impermeable to liquid media.

Still another object of this invention is to provide a novel blank of the type heretofore defined wherein the fibers of the sheet are disposed in shingle-like overlapping relationship and are primarily oriented in alignment with the longitudinal axis of the tear strip portion whereby the fiber orientation prevents premature transverse severing of the tear strip portion upon the removal thereof from an associated container.

Yet another object of this invention is to provide a novel container body from any one of the blanks heretofore described by forming the sheet to a tubular configuration having contiguous edge portions secured to each other, and the tear strip portion is disposed generally circumferentially about the tubular sheet.

A further object of this invention is to provide a novel container body of the type immediately heretofore set forth wherein the trailing ends of leading fibers are more closely adjacent an inner surface of the tubular sheet than the leading ends of adjacent trailing fibers whereby the shingle-like arrangement of the fibers assures the entire removal of the tear strip portion.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter, and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a highly schematic perspective view of an apparatus for forming easy-open container blanks in accordance with this invention, and illustrates a web of fibrous material being sequentially scored, coated and severed to form individual blanks.

FIGURE 2 is a highly enlarged fragmentary sectional view taken generally along line 2—2 of FIGURE 1, and illustrates opposed scoring rolls forming a pair of score lines in opposite surfaces of the web.

FIGURE 3 is a highly enlarged fragmentary sectional view taken generally along line 3—3 of FIGURE 1, and illustrates liquid impervious means covering the opposite surfaces of the web.

FIGURE 4 is a highly enlarged fragmentary sectional view taken generally along line 4—4 of FIGURE 1, and illustrates the shingle-like overlapping relationship of the fibers and the orientation thereof relative to the "machine direction" of the web.

FIGURE 5 is a fragmentary enlarged top plan view of a portion of a blank cut from the web, and illustrates a gripping tab of a tear strip portion.

FIGURE 6 is a perspective view of a container body, and illustrates a pair of closures prior to being secured to opposite axial ends of the container body.

FIGURE 7 is a top perspective view of a fully assembled and charged container, and illustrates the tear strip portion thereof adjacent an upper closure of the container.

FIGURE 8 is a fragmentary top perspective view of the container of FIGURE 7, and illustrates the manner in which the tear strip portion is manually removed.

FIGURE 9 is a highly enlarged fragmentary sectional view taken generally along line **9—9** of FIGURE 7, and illustrates the details of the removable tear strip portion.

FIGURE 10 is a highly enlarged sectional view taken generally along line **10—10** of FIGURE 8, and illustrates the manner in which the body wall is severed upon the removal of the tear strip portion.

FIGURE 11 is a highly enlarged sectional view taken generally along line **11—11** of FIGURE 7, and illustrates the shingle-like orientation of the fibers relative to the direction of removal of the tear strip portion.

FIGURE 12 is a highly enlarged sectional view taken through another container body generally along a line identical to the line **11—11** of FIGURE 7, and illustrates the orientation of the fibers when the body blank is folded to a tubular configuration in a direction opposite to that of the body of FIGURES 6 through 11.

This invention will be best understood by first referring to one aspect of a typical paper-making operation which directly affects a major feature of the invention.

Paper-making proper from prepared pulp stock, whether of wood, straw, rags or other raw materials, may be said to begin with the operation technically known as "beating" wherein the pulp is beaten in water to produce a slurry from which a paper web is formed on a paper machine wire. The wire receives the stock in a desired thickness through a slice of the head stock, and as the stock is conveyed toward the couch rolls the water flows from the wire by gravity and/or suction. During the movement of the pulp with the wire the fibers tend to align themselves in the machine direction due to the combining effect of the wire on the fibers. That is, any fibers which leave the slice in a position other than horizontal tend to be pulled at their lower ends into a position generally parallel to the wire direction because of the greater velocity of the water near the wire. In most cases this results in a marked shingle-like overlapped alignment of the fibers on the wire side of the sheet which progressively lessens toward the felt side. In general, a higher ratio of wire speed to stock velocity means that a higher proportion of the fibers will be drawn into the machine direction i.e., a relatively low head of stock in the head box and a relatively high wire speed. Under these conditions there is therefore both vertical and horizontal fiber orientation caused by the combined effects of the speed of movement of the stock and the ends of the fibers being pulled toward the wire by gravity and/or suction.

The sheet then passes between couch rolls which press out most of the remaining moisture and impart sufficient consistency to the paper to enable it to leave the wire. The paper is next carried by means of endless felts between press rolls to obliterate the impression of the wire from the underside of the now continuous web. The web of paper is finally dried by passing over a series of hollow steam-heated drying cylinders and reeled into rolls.

One such roll of fibrous paperstock material is illustrated in FIGURE 1 of the drawings, and is generally designated by the reference numeral **15**. A web **16** is conveyed from left-to-right by a pair of feed rolls **17, 18** driven by conventional driving means (not shown).

The web **16** includes an upper surface **20** (FIGURES 1 and 4) and a lower surface **21**. The upper surface **20** is the "wire" surface i.e., that surface of the web **16** which was more closely adjacent the Fourdrinier wire during the manufacture of the web, while the surface **21** is the "felt" surface i.e., that surface against which endless felts are pressed during the pressing operation heretofore described. The "machine direction" of the web **20** during its formation upon and movement with the Fourdrinier wire is from right-to-left as viewed in FIGURE 1 of the drawings, as indicated by the double-headed arrows in FIGURES 1 and 4.

Referring particularly to FIGURE 4 of the drawings, the web **16** is formed of numerous fibers, generally designated by the reference numeral **22**, which are shown highly magnified in this figure. Three fibers **23, 24** and **25** are illustrated in vertically overlapped relationship to impart a generally shingle-like arrangement to these as well as the numerous other fibers **22** of the web **16**. As related to the "machine direction" (double-headed arrow in FIGURE 4) a trailing end **26** of the leading fiber **23** is more closely adjacent the surface **20** of the web than a trailing end **27** of the next adjacent trailing fiber **24**. The trailing end **27** of the fiber **24** is similarly more closely adjacent the surface **21** than a trailing end **28** of the adjacent trailing fiber **25**. This arrangement or disposition of the fibers **23** through **25** is merely exemplary of the similar shingle-like pattern formed by like partial overlapping of the remaining fibers **22** which serves a function to be described more fully hereafter.

The web **16** is drawn by the feed rolls **17, 18** through the bight of scoring rollers **30, 31** positioned respectively above and below the web **16**, as viewed in FIGURES 1 and 2 of the drawings. The scoring rollers **30, 31** each include a pair of respective circular cutting edges **32, 32** and **33, 33**. During the rotation of rollers **30, 31** in opposite directions, as indicated by the associated headed unnumbered arrows in FIGURE 1, the cutting edges **32** form generally V-shaped lines of weakening or score lines **35, 36** in the upper surface **20** of the web **16** while the cutting edges **33** similarly form lines of weakening or score lines **37, 38** of an inverted V-shaped configuration in the lower surface **21** of the web **16**. The depth D_1 of the score lines **35, 36** is approximately three-quarters of the thickness of the web **16**, as is the depth D_2 of the score lines **37, 38**. The score lines **35** through **38** are also in parallel relationship with each other and with the generally linear direction of orientation of the individual fibers **22**. The score lines **37, 38** are also disposed wholly inwardly of the area set off between the score lines **35, 36**, as is best illustrated in FIGURES 2 and 3 of the drawings.

After the score lines **35** through **38** have been formed in the respective surfaces **20, 21** of the web **16** the surfaces **20, 21** are covered with coverings or layers **40, 41** of fluid impermeable material such as, for example, polyethylene or similar copolymeric thermoplastic material. The coverings **40, 41** are preferably laminated upon the surfaces **20, 21**, respectively, by conventional laminating or extruding heads **42, 43**. The raw edges of the score lines **35** through **38** are thereby prevented from absorbing moisture either from a packaged product or atmosphere, as will be more apparent hereafter. If desired, the coverings **40, 41** can be aluminum or similar webs of impermeable material adhesively secured to the surfaces in a conventional manner.

After the layers **40, 41** have solidified the web **16** is transversely severed by conventional, reciprocal cutting and notching means **45**. The means **45** includes a lower transverse cutting edge (unnumbered) and a pair of generally triangularly shaped notch-forming cutting blades **46, 47** which are in alignment with the score lines **35, 36**, respectively. An edge **58** of each polygonal sheet material blank, generally designated by the reference character **50**, cut from the web **16** is therefore provided with a pair of V-shaped notches **51, 52** between which is a projecting tab **53** of a removable tear strip portion **54**. The tear strip portion **54** is relatively elongated and ends at a terminal edge **59** remote from the notches **51, 52**.

The blank **50** is thereafter formed by conventional means to a generally tubular configuration to form a container body **55** (FIGURE 6). A longitudinal lap seam **56** secures the transverse edge portions **58, 59** of the now tubular blank **50** to each other as by, for example, heat-

sealing or other conventional adhesive securing means. If desired the inner surface of the tab **53** can be provided with a coating of conventional resist material which prevents the tab from adhering to the underlying surface of the body thereby facilitating the manual grasping of the tab incident to the removal of the tear strip portion.

Conventional identical lower and upper closures **60**, **61** are thereafter secured to the container body **55** in a conventional manner to form an easy-opening container **65** (FIGURE 7). The lower closure **60** is preferably heat-sealed or otherwise secured to the lower axial end (unnumbered) of the container body **55** by the manufacturer while the upper closure **61** is secured in position by a packager only after the container **65** is charged with a suitable product.

Reference is now made to FIGURE 11 of the drawings which illustrates the relationship of the fibers **22** to both the "machine direction" of the web (unnumbered double-headed arrow) and the direction of removal of the tear strip (unnumbered single-headed arrow). The fibers **23**, **24** and **25** of FIGURE 4 have been reproduced in FIGURE 11 and it is to be noted that the orientation of the fibers relative to the machine direction is opposite to the orientation of the fibers with respect to the direction of removal of the tear strip portion. That is, the fiber **23** leads the fiber **24** and the trailing portion (unnumbered) of the fiber **25** is more closely adjacent the surface **21** than the trailing end of the adjacent trailing fiber **24**. When the tab **53** is gripped and pulled in the direction of the single-headed arrow in FIGURE 11 the orientation of the fibers and the partially overlapped relationship thereof relative to the direction of removal permits the entire pull tab portion **54** to be removed as the pull is continued in a clockwise direction. The effect of the orientation of the fibers and the overlapping thereof is such that the leading ends of the trailing fibers continually act against the trailing ends of adjacent leading fibers to permit the continuous uninterrupted removal of the tear strip portion. This is analogous to imagining gripping the lowest shingle of a roof and pulling the shingle upwardly toward the ridge whereby, except for the staggered nature of the shingles, a straight continuous line of the shingles (corresponding to the fibers **22**) would be raised upwardly. An opposite pull on the same lowest shingle in a downward direction would remove but the lowest shingle and prevent any movement of adjacent shingles toward the ridge. Thus, from the standpoint of the direction of tear so long as the leading ends of leading fibers are more closely adjacent the inner surface **21** of the container body than the leading ends of adjacent trailing fibers a smooth uninterrupted continuous removal of the tear strip portion **54** is assured.

In the embodiment of the invention thus far described, the container body **55** was described as being formed with the wire side **20** and its associated coating **40** forming an exterior surface of the body while the felt side **21** formed an interior surface thereof. However, in accordance with this invention it is also possible to form a container body in which the wire side **20** is the inner surface of the body and the felt side **21** is the outer surface. Assuming, for example, that the notches **51**, **52** are formed in the opposite edge of the blank **50** and this opposite edge is placed in exterior lapping engagement as shown in FIGURE 12, the fibers **23**, **24** and **25**, as well as the remaining fibers **22**, would be disposed in the manner illustrated in FIGURE 12. The direction of tear and the machine direction are again indicated by the single-headed and double-headed arrows, respectively, in FIGURE 12, and it will be noted that the shingle-like orientation and overlapping arrangement of the fibers **22** assure the continuous removal of the tear strip when the same is removed in the direction of the single-headed arrow in this figure.

It is to be particularly noted that if the overlapping relationship of the edge portions were reversed and an attempt was made to remove the tear strip portion by pulling in a direction opposite to the single-headed arrows, complete removal of the tear strip portions would be virtually impossible because of the tendency of the fibers to shear or separate from each other. That is, assuming the edge portion of the container body containing the fibers **23**, **24** and **25** was pulled in the direction of the unnumbered broken arrow in FIGURE 12, the fiber **23** would tend to pull away from the adjacent fiber **24** along the shear line A—A. Succeeding fibers would similarly tend to shear away from adjacent fibers and the overall effect would be the inability of the tear strip portion to be completely removed from the container body. In general, any tear with the felt side up made in the machine direction will be short but a tear in the same direction with the wire side up would be long, while the opposite would be true of tears against the machine direction. That is, with the felt side up and tearing against the machine direction the tears would be long but with the wire side up the tears would be short.

In addition to constructing the tear strips parallel to the orientation of the fibers (with the grain) it has also been observed that the shingle-like overlapping arrangement of the fibers in the direction of machine travel may not necessarily be perfectly parallel to the direction of travel. Rather, it is possible for the fibers to cant from the wire side upwardly toward the felt side to either side of a vertical plane depending upon, for example, a slight tilting of the Fourdrinier wire relative to the horizontal. If the wire were tilted downwardly to the right as viewed in the machine direction the fibers of the stock would similarly tend to tilt to the right while an opposite inclination of the wire would result in an opposite direction of inclination of the fibers relative to the vertical. This results in a similar shingle-like overlapping of fiber groups toward either of the opposite edges of the paper during its formation. This unobvious observation makes it possible to construct a container blank having a tear strip portion adapted for removal against the grain i.e., transverse to the machine direction.

Tests have been conducted to determine the behavior of cross grain tearing by positioning several (15) sheets with the wire side up and the direction of machine travel pointed toward the tester. All 15 tears from right-to-left ran longer than tears from left-to-right indicating that the inclination of the groups of fibers was from left-to-right from the felt side to the wire side with the upper ends of leftmost groups of lower fibers overlapping the lower end of adjacent lower ends of rightmost fiber groups. With the felt side of the tested samples up and the machine direction still toward the tester, all 15 right-to-left tears were again longer, indicating that the orientation of fibers and groups of fibers in both vertical and horizontal planes can be regulated to obtain longer tears than heretofore provided by known conventional fibrous containers.

It is also pointed out that in the case of forming paper on cylinder machines the same directionalism encountered on Fourdrinier machines is even more extreme because of the greater differences in velocities of the cylinder and the pulp stock. As soon as the fibers strike the moving wire face of the cylinder mold the motion drags the fibers with the mold lining up the fibers in the machine direction in the shingle-like fashion heretofore noted. Therefore, the invention is applicable to either of the two predominant processes of forming paperstock sheet material.

While preferred forms and arrangement of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claimed subject matter.

We claim:

1. A blank adapted to be formed into a tubular container body comprising a generally polygonal sheet of fibrous material having opposite surfaces, means defining an elongated removable tear strip portion of said sheet

for facilitating the opening of a container formed from the blank, and fibers of said sheet being disposed in overlapping relationship and primarily oriented in alignment with the longitudinal axis of the tear strip portion.

2. The blank as defined in claim **1** wherein said sheet is of a tubular configuration and includes secured contiguous edge portions, and said tear strip portion is disposed generally circumferentially about said sheet.

3. The blank as defined in claim **1** wherein said sheet is of a tubular configuration and includes secured contiguous edge portions, and the trailing ends of leading fibers are more closely adjacent an inner surface of the tubular sheet than the leading ends of adjacent trailing fibers whereby the fibers are arranged in a shingle-like pattern which assures the entire removal of the tear strip portion.

4. The blank as defined in claim **3** wherein said defining means include lines of weakening, and said weakening lines are disposed generally circumferentially about said sheet.

5. The blank as defined in claim **3** wherein said defining means include lines of weakening, said weakening lines are disposed generally circumferentially about said sheet, and said weakening lines are covered by means substantially impermeable to fluid.

6. The blank as defined in claim **3** wherein said defining means include at least a pair of lines of weakening in inner and outer surfaces of said sheet, and the pair of lines of weakening in said inner surface are wholly confined within an area between the other pair of weakening lines in said outer surface.

7. The blank as defined in claim **6** wherein at least one of said pair of weakening lines is covered by means substantially impermeable to fluid.

8. A method of forming a container body blank comprising the steps of providing a sheet of fibrous material in which the fibers are disposed in shingle-like overlapping relationship and are primarily oriented in a single direction, and forming an elongated removable tear strip portion in the sheet having a longitudinal axis in substantial alignment with the direction of orientation of the fibers.

9. The method as defined in claim **8** including the step

of forming the blank into a tubular container body in which trailing ends of leading fibers are more closely adjacent an inner surface than the leading ends of adjacent trailing fibers relative to the direction of removal of the tear strip portion thereby assuring the entire removal of the latter portion from a container constructed from said body.

10. The method as defined in claim **8** wherein the tear strip portion is formed by forming a pair of lines of weakening in each surface of the sheet with the pair of weakening lines in one of the surfaces being wholly confined within an area between the other pair of weakening lines.

11. The method as defined in claim **8** comprising the step of applying fluid impermeable means upon the inner surface of the blank.

12. The method as defined in claim **9** wherein the tear strip portion is formed by forming a pair of lines of weakening in each surface of the sheet with the pair of weakening lines in one of the surfaces being wholly confined within an area between the other pair of weakening lines.

13. The blank as defined in claim **1** wherein the means defining said elongated removable tear strip portion includes at least a single score line, and said score line is coated with a layer of liquid impermeable material.

14. The blank as defined in claim **1** wherein said defining means includes at least a pair of lines of weakening in each of said surfaces, and the pair of lines of weakening in one of the surfaces is wholly confined within an area between the other pair of the lines of weakening.

References Cited

UNITED STATES PATENTS

2,608,341	8/1952	Eckman	229—51
3,014,630	12/1961	Whelan et al.	229—51
3,142,433	7/1964	Balocca	229—51
3,175,752	3/1965	Stabenow	229—66

DAVID M. BOCKENEK, *Primary Examiner.*