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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	17-1040 (MW-12CP1)
First Inventor	Millard F. WALLACE
Title	Formed Thermoplastic Article Having
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☑ **Applicant claims small entity status.** See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 67]
   Both the claims and abstract must start on a new page
   (For information on the preferred arrangement, see MPEP 608.01(a))
4. ☐ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 29]
5. **Oath or Declaration** [*Total Sheets* 1]
   a. ☑ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
   (for continuation/divisional with Box 18 completed)
   i. ☐ DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☑ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
   (if applicable, items a. – c. are required)
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ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee _____
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☑ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503)
    (*Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s)**
    (if foreign priority is claimed)
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other: _____

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☑ Continuation-in-part (CIP) of prior application No.: PCT/US16/49692

Prior application information: *Examiner* _____ *Art Unit:* _____

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 27730 ***OR*** ☐ Correspondence address below

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Signature	/Gary D. Colby/	Date	28 February 2017
Name (Print/Type)	Gary D. Colby, Ph.D., .D.	Registration No. (Attorney/Agent)	40961

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ABSTRACT OF THE DISCLOSURE

The disclosure relates to forming shaped thermoplastic articles having smooth peripheries. Many thermoplastic articles have sharp edges formed upon molding or cutting the article from a feedstock sheet. Such sharp edges can damage thin plastic films or flesh which they contact, and smoothing the edges is desirable. Described herein are methods of forming a smooth periphery for such sharp-edged articles by rolling over the sharp edge. The smoothing operation is performed by forming a deflectable flange including a bend region separated from the potentially sharp peripheral edge by a spacer, deflecting a portion of the deflectable flange, and softening at least one bent portion of the deflectable flange to yield a smooth periphery upon cooling.

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CLAIMS

What is claimed is:

1. A method of making a shaped article having a body with a smooth periphery, the method comprising

forming a thermoplastic into a shape comprising the body and a deflectable flange at a peripheral portion of the body,

the deflectable flange comprising a spacer bearing a peripheral edge of the thermoplastic, the spacer being connected to the body by way of an extension that extends peripherally away from the body and a bend region interconnecting the spacer and the extension,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic; and

disengaging the ram from the spacer, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement to yield the body with a smooth periphery.

2. The method of claim 1 wherein the bent portion is cooled below the glass transition temperature prior to disengaging the ram from the spacer.

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3. The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle not less than 75 degrees, but less than 105 degrees.

4. The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle of about 87-93 degrees.

5. The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle of about 90-93 degrees.

6. The method of claim 1, wherein the spacer is disengaged from the ram prior to the bent portion being cooled below the glass transition temperature.

7. The method of claim 1, wherein the thermoplastic is formed into a shape comprising the body and having the deflectable flange at multiple peripheral portions thereof.

8. The method of claim 1, wherein the thermoplastic is formed into a shape comprising the body and having the deflectable flange about its entire periphery.

9. The method of claim 1, wherein the thermoplastic is formed into a shape comprising a boding having a concave compartment with an opening and the deflectable flange about the entire periphery of the opening.

10. The method of claim 9, further comprising sealing the compartment using a film that contacts the smooth periphery of the body about the entire periphery of the opening.

11. The method of claim 10, wherein the compartment is sealed by over-wrapping the body with the film and sealing the film to itself to envelop the body.

12. The method of claim 11, wherein the compartment is sealed by applying the film across the opening of the compartment and sealing the film about the periphery of the opening.

13. The method of claim 12, further comprising withdrawing gas from the compartment prior to sealing the film about the periphery of the opening.

14. The method of claim 13, further comprising injecting an atmosphere into the compartment prior to sealing the film.

15. The method of claim 12, wherein the film is thermoformable and is disposed in a softened state around the smooth periphery of the body and cooled below its softening temperature such that the film that must be stretched outwardly about the smooth periphery of the body in order to displace the film from the opening.

16. The method of claim 9, wherein the extension extends laterally in a plane about the periphery of the opening and wherein the spacer and the interior of the compartment and the spacer are disposed on the same side of the plane.

17. The method of claim 16, wherein the thermoplastic is formed into a shape comprising a concave rounded-rectangular compartment.

18. The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge away from the periphery of the shaped article sufficiently that a flexible film that tautly over-wraps the shaped article after cooling the bent portion does not contact the peripheral edge.

19. The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge sufficiently that the peripheral edge points at the body after cooling the bent portion.

20. The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge to a position at which a plane extending through the thermoplastic at the

peripheral edge is offset from the plane of the extension by an angle of not less than 120 degrees after cooling the bent portion.

21. The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge to a position at which a plane through the thermoplastic at the peripheral edge is offset from the plane of the extension by an angle of not less than 135 degrees after cooling the bent portion.

22. The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge to a position at which a plane through the thermoplastic at the peripheral edge is offset from the plane of the extension by an angle of not less than 180 degrees after cooling the bent portion.

23. The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge to a position at which a plane through the thermoplastic at the peripheral edge is offset from the plane of the extension by an angle of not less than 270 degrees after cooling the bent portion.

24. The method of claim 1, wherein the deflectable flange is deflected to differing degrees at selected portions of the ram, whereby the height of the deflected peripheral flange differs at peripheral portions corresponding to the selected portions after cooling the bent portion, yielding at least one portion useable as a stacking extension.

25. The method of claim 1, wherein the ram is impinged against the spacer sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be directly viewed from the exterior of the shaped article after cooling the bent portion.

26. The method of claim 1, wherein the ram is impinged against the spacer sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be perceived by a person running a finger along the periphery of the shaped article after cooling the bent portion.

27. The method of claim 1, wherein the spacer includes a peripheral flange at the peripheral edge of the deflectable flange and an elbow connecting the peripheral flange to the remainder of the spacer at an angle other than 180 degrees.

28. The method of claim 27, wherein the ram is impinged against the peripheral flange to deflect the spacer.

29. The method of claim 28, wherein the peripheral flange is heated to at least the glass transition temperature of the thermoplastic.

30. The method of claim 1, wherein the shape is formed by thermoforming a thermoplastic sheet into the shape and thereafter cutting the shape from the sheet to yield the peripheral edge of the shape where it is cut from the sheet.

31. The method of claim 30, wherein the shape is cut from the sheet using a heated die that heats the peripheral edge to a temperature less than the glass transition temperature of the thermoplastic upon cutting the shape from the sheet.

32. The method of claim 1, wherein the ram is urged against the spacer by applying force to the deflectable flange the direction of the ram.

33. The method of claim 32, wherein force is applied to at least the extension.

34. The method of claim 33, wherein the extension extends laterally in a plane about the entire periphery of the opening of a concave compartment in the body and wherein a plug that substantially fills the opening is inserted therein prior to urging the ram against the spacer, whereby the plug inhibits inward displacement of the deflectable flange into the opening.

35. The method of claim 34, wherein the plug substantially fills the compartment.

36. The method of claim 34, wherein at least one of the plug and an object used to apply force to the deflectable flange is cooled, whereby heating of portions of the thermoplastic in contact therewith is inhibited.

37. The method of claim 1, wherein after impinging the ram against the spacer and heating the bent portion to at least the glass transition temperature, the ram is further impinged against the spacer to further deflect the spacer toward the extension prior to disengaging the ram from the spacer.

38. The method of claim 37, wherein the ram delivers heat to the bent portion.

39. The method of claim 1, wherein after impinging the ram against the spacer, the method comprises multiple iterations of i) heating the bent portion of the spacer to at least the glass transition temperature and ii) thereafter further impinging the ram against the spacer to further deflect the spacer toward the extension.

40. The method of claim 1, wherein the ram impinges against the spacer at an upper face of the ram, the upper face having contour that deflects inwardly toward the body, whereby greater impingement of the spacer against the upper surface of the ram deflects the peripheral edge increasingly toward the body.

41. The method of claim 40, wherein the upper face of the ram is substantially flat.

42. The method of claim 40, wherein the upper face is curved.

43. The method of claim 42, wherein the upper face is curved sufficiently that increasing impingement of the spacer against the ram turns the peripheral edge toward the body.

44. The method of claim 42, wherein the upper face is curved sufficiently that increasing impingement of the spacer against the ram turns the peripheral edge at least about 180 degrees relative to its orientation prior to the impingement.

45. The method of claim 42, wherein the upper face has a J-shaped conformation, whereby greater impingement of the spacer against the upper surface of the ram deflects the peripheral edge increasingly farther from its orientation prior to the impingement.

46. The method of claim 42, wherein the upper face has a U-shaped conformation.

47. The method of claim 42, wherein the upper face has a partially ovoid conformation.

48. The method of claim 42, wherein the upper face has a partially circular conformation.

49. A method of making a container having a concave compartment and a smooth periphery, the method comprising

forming a thermoplastic sheet into a shape comprising a body including the concave compartment and a deflectable flange surrounding the compartment at the periphery of the body, the periphery being formed by cutting the shape from the sheet to form the peripheral edge of the shape,

the deflectable flange comprising a spacer bearing the peripheral edge, the spacer being connected to the body by way of an extension that extends peripherally away from the body and a bend region interconnecting the spacer and the extension,

the spacer including a peripheral flange which includes the peripheral edge and an elbow that connects the peripheral flange to the remainder of the spacer at an angle other than 180 degrees,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic;

cooling the bent portion below the glass transition temperature, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement; and

disengaging the ram from the spacer to yield the body with a smooth periphery.

50. A method of forming a smooth periphery on a thermoformed article that is made from a thermoplastic and that has a sharp peripheral edge, the method comprising

forming a deflectable flange about the peripheral edge of the article,

the deflectable flange comprising a spacer including peripheral edge of the article, the spacer being connected to the article by way of an extension that extends peripherally away from the article and a bend region interconnecting the spacer and the extension,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position,

the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic;

cooling the bent portion below the glass transition temperature, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement; and

disengaging the ram from the spacer to yield the article with a smooth periphery.

51. The method of claim 50, wherein the bend region interconnects the spacer with the extension at an angle greater than 75 degrees, but less than 105 degrees.

52. A thermoformed article having a smooth periphery, the article comprising a body made from a thermoplastic and having a smooth bend region connected to the periphery of the body by an extension of the thermoplastic, the bend region connecting the extension with a spacer bearing the peripheral edge of the thermoplastic at a position peripheral to the bend region, and a spacer having a rolled-over conformation formed by softening at least a portion of the spacer, bending the spacer toward the extension, and cooling the softened portion to retain the peripheral edge turned away from the periphery of the article.

53. The article of claim 52, wherein the spacer is bent toward the extension and its softened portion is cooled to retain the peripheral edge turned under the spacer sufficiently that the peripheral edge is not directly viewable from the exterior of the article.

54. The article of claim 52, wherein the spacer is bent toward the extension and its softened portion is cooled to retain the peripheral edge turned under the spacer sufficiently that the peripheral edge is disposed sufficiently away from the perimeter of the article that the article is suitable for sealing with a thin plastic film by any of OW, VSP, MAP technologies.

55. The article of claim 52, wherein the body has the shape of a rounded rectangular tray having a concave compartment formed therein, the extension encircling the periphery of the compartment.

56. The article of claim 55, wherein the compartment is configured such that a plurality of the article are stackable in a nested conformation.

57. A system for making a shaped article having a body with a smooth periphery, the system comprising

a thermoformer, including at least one mold for forming a thermoplastic sheet into a shape comprising the body and a deflectable flange about the periphery of the body,

the deflectable flange comprising a spacer bearing the peripheral edge of the thermoplastic, the spacer being connected to the body by way of an extension that extends peripherally away from the body and a bend region interconnecting the spacer and the extension,

the spacer including a peripheral flange which includes the peripheral edge and an elbow that connects the peripheral flange to the remainder of the spacer at an angle other than 180 degrees,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

a ram operably connected with the thermoformer for impinging the ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer; and

a heater for heating the bent portion to at least the glass transition temperature of the thermoplastic.

58. The system of claim 57, further comprising a trimmer for trimming the peripheral edge of the body to within a few millimeters of the elbow about the periphery.

59. The system of claim 58, wherein the trimmer includes a heating element for heating the peripheral edge upon trimming.

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TITLE OF THE DISCLOSURE

[0001] Formed Thermoplastic Article Having Smooth Edges

CROSS-REFERENCES TO RELATED APPLICATIONS

[0002] This application is a continuation-in-part of co-pending international application PCT/US16/49692, filed 31 August 2016, which is entitled to priority to U.S. provisional patent application No. 62/212,367, filed 31 August 2015, each of which applications is incorporated herein by reference in its entirety.

BACKGROUND OF THE DISCLOSURE

[0003] This disclosure relates generally to the field of forming shaped thermoplastic articles.

[0004] Formation of shaped articles from thermoplastic materials is well known. A wide variety of methods (e.g., thermoforming, casting, molding, and spinning) can be used to confer shape to a molten thermoplastic or to a preformed thermoplastic sheet that has been softened or melted.

[0005] Trimming of waste material from one or more edges of a shaped article is a common finishing technique, but leaves a sharp edge that can injure flesh or tear or cut materials which come into contact with the edge. One common use for shaped thermoplastics is to form containers that can be sealed with thin plastic films, such as trays, bowls, or bins intended to contain foodstuffs and intended to be sealed with transparent plastic film. Another common use is to contain items and to seal them from moisture or other materials which may come into contact with the container. Sealing of such containers typically involves extending or stretching the film across a compartment formed in the container and sealing the film around the periphery of the compartment, which periphery is often situated adjacent a trimmed edge of the article that includes the compartment. If that edge is sharp, it can cut or break the film, interfering with the sealing process.

[0006] Three well-known sealing technologies are commonly used in sealing foods and foodstuffs to form containers for commercial shipping, storage, display, and sale. These are referred to herein as OW, VSP, and MAP technologies. All of these technologies involve

combining a container and a thin plastic film. Owing to the fragility of such films and the need, in many instances, to minimize or eliminate punctures and tears from film portions which serve to define (together with the container) sealed compartments, it is critical to minimize the opportunities for containers to tear, puncture, or abrade the film of the same or nearby containers. In addition to plastic films used for sealing such containers, plastic films are also employed for shipping the containers, such as the "mother bags" (i.e., typically thin plastic bags) used for containing multiple product-in-container-packages during shipping and the plastic grocery bags used by consumers to transport purchased goods from a retailer. This can be achieved by reducing or eliminating sharp or rough container edges, at least positions on the container at which such edges might reasonably contact the film during packaging, storage, shipment, or display.

[0007] Overwrap (OW) technology involves enveloping or wrapping a shaped article (e.g., a thermoformed tray, sheet, bowl, or multi-compartment container) with a thin (often transparent) plastic film after a foodstuff or other item has been placed on one or more faces of the article and thereafter sealing the film to itself (e.g., by heating overlapping portions of the film). In such OW technology, sharp or rough edges of the shaped article can cut, abrade, or puncture the film, potentially allowing materials to pass through the film and defeating one or more of its purposes. Heretofore, OW technology has been used primarily together with foamed trays or bins lacking sharp edges. Many municipal recycling schemes exclude or disfavor foamed plastics, and such materials are therefore increasingly disfavored by consumers. It would be desirable if a thermoformable plastic container suitable for use with multiple wrapping technologies, including OW technology, could be made, since thermoformable materials tend to be widely acceptable in recycling programs.

[0008] Vacuum-sealed package (VSP) technology involves adhering a thin (again, often transparent) plastic film against a face of a shaped article bearing a foodstuff (for example, or a moisture-sensitive object as an alternate example) on a face of the shaped article. When VSP technology is employed, that item(s) to be packaged are placed on a surface or within a cavity of the shaped article, the film is overlain such that the item(s) are interposed between the shaped article and the film, air (or whatever other gases may be present) is withdrawn from the space between the film and the shaped article (optionally in coordination of application of

positive pressure to the exterior of one or both of the film and the shaped article) so that the film is closely opposed against the surface of the shaped article and/or the item(s), and the film is sealed (e.g., by way of an interposed adhesive, through heat-induced adhesion, or by static charge adhesion) to the surface of the shaped article across the desired area (usually completely encircling the item(s)), and any excess film can be trimmed from the desired area. The seal can be resistant to gas flow in order to maintain the gas-evacuated state on the interior of the sealed container. The resulting VSP-sealed package typically has a topology that mimics the shape of the surface of the shaped article having the item(s) thereon.

[0009] MAP is an abbreviation for modified atmosphere packaging and refers to a sealing technology in which a flexible (often transparent) film is sealed (e.g., using heat or an adhesive) about the perimeter of a substantially rigid shaped article. When the shaped article is otherwise closed (i.e., when it has no other openings than that sealed by the film), the gases present within the container can be controlled at the time the film is sealed to the article. Thus, if the article and film are sealed in the presence of a selected atmosphere (e.g., a gas, such as one selected to exclude oxygen or to promote fruit ripening), the selected atmosphere can be maintained within the sealed MAP package during subsequent storage, shipping, and display of the package.

[0010] As is known in the art, the shaped articles used in OW, VSP, and MAP sealing processes tend to have a variety of industry-accepted geometric shapes and properties which differ among the three types, such that a shaped article useful in one type of sealing process is often poorly suited for use in one or both of the others.

[0011] Containers used for OW-sealing, for example, tend to be rectangular and tray- or sheet-shaped, with smooth, blunt edges and rounded corners. The lack of sharp, rough, or pointed edges or corners serves to reduce the likelihood that the film used for overwrapping the container will be torn or punctured upon wrapping. OW-containers often have a flat portion (e.g., on the "bottom" of the container, relative to its intended display configuration) at which the overwrapped film can be urged against itself for the purpose of sealing the film to itself (e.g., upon application of heat to the overlapping film portions sufficient to cause such sealing), thus enclosing the container and any items on or in it.

[0012] Containers used for VSP-sealing tend to have a face or surface (sometimes within a concavity) adapted to carry an item to be sealed between the film and the container and adapted

to receive the sealing film by virtue of the absence of sharp points, protrusions, or edges. The absence of such features reduces the likelihood of punctures or tears in the film as it is drawn against the surface. Unlike OW-containers, VSP-containers can have sharp edges, corners, or protrusions, at least at portions other than the film-receiving surface, because those portions need not contact the film during sealing. However, such sharp portions can still damage sealing films, especially when multiple VSP-sealed packages are stored, shipped, or displayed near one another, because a sharp portion of one container can damage the film of another container (or a film or tissue in the vicinity of the container).

[0013] Containers used for MAP-sealing tend to have a planar surface (e.g., a broad, flat rim) surrounding an opening to be sealed by applying a sheet of film against it, sealing the film to the surface (often substantially irreversibly), and then trimming the film about the perimeter of the seal. Such containers must be configured such that the film can be applied to the surface without substantial risk of tears or punctures before and during sealing and to facilitate trimming of the film from the sealed container. However, because the film typically contacts only limited portions of MAP-containers during the sealing process, MAP-containers can, and often do, include sharp, pointed, or abrasive features at positions not involved in the sealing process.

[0014] It would be beneficial if the sharp edges of shaped thermoplastic articles could be displaced in such a way that the risk of injury or damage to sealing films could be reduced. It would be further beneficial if such individual shaped articles could be used with multiple known sealing technologies, such as two or more of OW, VSP, and MAP technologies. Reducing the sharpness and tendency of thermoformed articles to induce damage and injuries would be advantageous even in the absence of sealing. The subject matter disclosed herein addresses this shortcoming of prior shaped thermoplastic articles.

[0015] Others have recognized the desirability of reducing the occurrence of sharp edges at the edges of trays to be overwrapped. For example, Nelson et al. (U.S. patent application publication number 2015/0001127) disclosed a packaging tray that is formed by thermoforming a film sheet to yield a precursor tray having a generally U-shaped flange about its periphery, the open end of the U facing the sealing surface and the peripheral edge of the tray jutting peripherally. Nelson's tray is made by cutting the precursor tray from a sheet of

thermoformable material to yield an end in which the peripherally-extending peripheral edge is positioned at the terminus of the outer (relative to the tray body) arm of the U. Nelson then compresses that outer arm inwardly toward the tray body, leaving a smoother crimped portion of the U-shaped flange at the periphery of the tray, with the still-potentially-sharp peripheral edge extending toward the sealing surface. In this way, Nelson et al., generates a tray said to be suitable for overwrapping, an overwrapping film being intended to urge the outer arm of the U-shaped flange toward or against the inner arm. However, because the tray retains a sharp peripheral edge in a position in which it can cut films (the peripheral edge of Nelson's trays can be seen to contact both the film overwrap and the film overwrapping an adjacent tray in Nelson's Fig. 13A, for example), Nelson's tray remains unsuitable for all OW applications and generally unsuitable for use with VSP and MAP technologies. A tray lacking a film-accessible sharp peripheral edge or a sharp crimps (which Nelson's trays also possess – see item 124 in Nelson's Fig. 12A) would be preferable for use with each of these sealing technologies.

[0016] The subject matter disclosed herein includes shaped thermoformed articles which are suitable for sealing with multiple technologies.

[0017] Thermoformed drinking cups having smooth, rolled edges are also known. Such cups are made by thermoforming cups having a flange about the perimeter of the cup opening, the flange including a potentially sharp peripheral edge at the flange end distal to the interior of the cup. The flanged cups are stacked in a nested fashion, heated at their flange portions, and then passed through helical rim-rolling threads to create the rolled edge. Such technology is useful only for rolling the edge surrounding a circular orifice, and is therefore of no practical use in making shaped articles having rolled edges surrounding non-circular openings. Rolled-edge drinking cups are also not designed to facilitate wrapping or sealing with thin plastic films.

BRIEF SUMMARY OF THE DISCLOSURE

[0018] The disclosure relates to methods of displacing a sharp edge away from the periphery of an article made from a thermoplastic material, where the sharp edge might otherwise damage surfaces that contact the periphery of the article. The disclosure also relates

to articles processed according to those methods and to equipment for performing such processing.

[0019] The disclosure relates to a method of forming a smooth edge (i.e., a smooth periphery) on an article made of a thermoplastic material. The method includes a step of forming a deflectable flange at an edge of the body of the article. The deflectable flange includes a peripheral edge of the thermoplastic material at the peripheral end of the deflectable flange, optionally on a peripheral flange that extends peripherally from the deflectable flange. In one embodiment, the peripheral flange is connected by an elbow to a spacer and extends peripherally beyond the spacer by a peripheral flange distance. The peripheral flange distance can be selected to yield a desired degree of deflection when it is impinged against a surface. In one embodiment, the peripheral flange distance is selected to be zero (i.e., the peripheral edge exists where the elbow would otherwise be. The spacer is connected by a bend region to the body, the bend region defining an angle (which can be acute or obtuse, and is preferably approximately a right angle) between the spacer and the body. The deflectable flange is urged within the interior of a cavity defined by an upper body, for example, the distance between the elbow and the interior being smaller than the peripheral flange distance, so that the deflectable flange is deflected at the bend region upon impingement of a portion of the interior of the cavity on the peripheral flange. Sufficient heat is applied to the bent portion (here, the bend region) of the deflectable flange to soften the thermoplastic material at the bend region. The upper body and the article are separated, whereby the bend region remains deflected upon cooling, yielding a smooth edge (i.e., periphery) on the article.

[0020] This method can be used to form a smooth edge about the entire periphery of the article. To do so, the deflectable flange is formed about all edges of the article and the interior of the cavity is configured to simultaneously impinge upon the deflectable flange about all edges of the article when the deflectable flange is urged within the interior. In the resulting article, the peripheral edge is effectively 'hidden' (e.g., it is behind the deflected peripheral flange or deflected away from the periphery of the article) so that materials (e.g., thin plastic films or animal tissue) which contact the periphery of the article will be less likely to contact the peripheral edge of the thermoplastic material from which the article is made.

[0021] The disclosure also relates to a method of forming a sealed compartment. This method includes steps thermoforming a thermoplastic sheet to form an article having a concave compartment surrounded by substantially planar sealing surface, cutting the article from the sheet peripherally to the sealing surface, forming a smooth edge about the entire periphery of the article as described herein, and thereafter sealing a top sheet to the sealing surface to form the sealed compartment. In one embodiment of this method, the top sheet is trimmed peripherally about the sealing surface after it is sealed to the sealing surface. In another embodiment, the top sheet is heat-sealed to the sealing surface.

[0022] The disclosure further relates to a method of forming a sealed compartment. This method includes steps of thermoforming a thermoplastic sheet to form an article having a concave compartment surrounded by substantially planar sealing surface, cutting the article from the sheet peripherally to the sealing surface, forming a smooth edge about the entire periphery of the article as described above , and thereafter wrapping and sealing a flexible plastic film about the article to form the sealed compartment.

[0023] In some embodiments of the methods described herein, after urging the deflectable flange within the interior of the cavity and before separating the upper body and the article, a ram can be urged into the interior, closely opposed against the interior, behind the deflectable flange to an extent that a face of the ram impinges upon and further deflects the deflectable flange, for example, at the bend region. The face can be substantially planar, for example. The face can also be substantially perpendicular to the portion of the interior that impinges upon the peripheral flange. The face can define an obtuse angle with the portion of the interior that impinges upon the peripheral flange. The face can have a concave profile, relative to the interior. If the ram is heated, urging the ram against the deflectable flange can cause bending of the portions of the deflectable flange which contact the ram, further deflecting the peripheral edge of the thermoplastic sheet away from the periphery of the shaped article.

[0024] In a non-heat-based embodiment, the disclosure relates to a method of forming a smooth edge on an article made of a plastic material (e.g., a thin plastic material backed by a deformable metal layer). This method includes forming a deflectable flange at an edge of the body, the deflectable flange including a peripheral edge of the thermoplastic material at the peripheral end of a peripheral flange. In one embodiment, the peripheral flange is connected by

an elbow to a spacer and extends peripherally beyond the spacer by a peripheral flange distance (which is effectively zero if there is no peripheral flange). The spacer is connected by the bend region to the body or an extension therefrom. The bend region defines an angle (which can be acute or obtuse, and is preferably approximately a right or slightly obtuse angle) between the spacer and the body. The deflectable flange can urged within the interior of a cavity defined by an upper body, the distance between the spacer and the interior being smaller than the peripheral flange distance or impinged upon a shaped ram surface that deflects the deflectable flange inwardly. The deflectable flange is thereby deflected, such as at the bend region, upon impingement. Sufficient pressure is applied to irreversibly bend the plastic material. The upper body and the article are separated, whereby the deflectable flange remains deflected upon removal of pressure, yielding a smooth edge on the article.

BRIEF SUMMARY OF THE SEVERAL VIEWS OF THE DRAWINGS

[0025] Figure 1 consists of Figures 1A, 1B, and 1C and illustrates the basic operation of the structures and methods described herein. Parallel straight lines "//" indicate positions at which structures, dimensions, and proportions which can optionally be present are omitted for clarity.

[0026] Figure 1A illustrates a sectional view of a thermoplastic article **100** having a deflectable flange **160** formed at an edge thereof. The deflectable flange **160** in this embodiment includes an extension **50**, a bend region **150**, a spacer **140**, and a peripheral flange **120**. The extension **50** connects the shaped body **10** of the article **100** to the bend region **150** of the deflectable flange **160**. A spacer **140** can be (and preferably is) interposed between the bend region **150** and the peripheral flange **120**. The peripheral flange **120** is connected to the spacer **140** by way of an elbow **130**, which is shown as a right-angle bend in this embodiment. The bend region **150** connects the extension **50** and the spacer **140** at an approximately right angle (the angle designated **A**). The peripheral flange **120** terminates at the peripheral edge **110** of the thermoplastic material (represented by a thick solid line in this figure) of which the article **100** is formed.

[0027] Figure 1B illustrates the thermoplastic article **100** inserted within the interior of an upper body **200**, which is shown as a broken-away portion (indicated by the rough line). In this embodiment, impingement of the peripheral edge **110** of peripheral flange **120** upon the inner

surface **202** of the upper body **200** causes the deflectable flange **160** to defect, owing to bending of the deflectable flange **160** at one or more points **B** within the bend region **150**.

[0028] Figure 1C illustrates the outcome of inserting ram **300** (only a broken-away portion shown, as indicated by the rough line) into the interior of the upper body **200** behind the thermoplastic article **100** (i.e., when the ram **300** is inserted into the structures illustrated in Figure 1B). The ram **300** is closely opposed against the inner surface **202** of the upper body **200** and the the peripheral edge **110** of peripheral flange **120** impinges upon the upper face **302** of the ram **300**, causing even greater deflection of the deflectable flange **160** and yielding a rounded periphery to article **100** at the point(s) **B** at which bending is induced within the bend region **150**.

[0029] Figure 2 consists of Figures 2A, 2B, 2C, and 2D and illustrates a matched upper body **200** and ram **300** for deflecting one or more deflectable flanges **160** formed on the periphery of a shaped thermoplastic article having the conformation of a rectangular tray with rounded corners. Figure 2A illustrates the upper body **200** disposed above the ram **300**, and Figure 2B illustrates the upper body **200** engaged with the ram **300**. Figure 2C is a cutaway view of the engaged upper body **200** and ram **300** shown in Figure 2B and illustrates that a portion of the ram **300** fits within and closely opposed to the interior surface of a recess in the upper body **200**. Figure 2D is a detail of the section indicated in Figure 2C and illustrates the close opposition between the ram **300** and the interior of the upper body **200**. In Figure 2D, the sloping conformation of the upper face **302** of the ram **300** is apparent.

[0030] Figure 3 consists of Figures 3A, 3B, and 3C, which are images of a smoothed periphery and corner of a clear, shaped thermoplastic article having the conformation of a rectangular tray with rounded corners. The article was smoothed using an upper body **200** and ram **300** similar to those illustrated in Figure 2. In Figure 3A, a finger is visible within the interior of the tray, and the smoothed corner is visible to the left of the finger. Also visible at the portion where the finger is located is a stacking lug, which is a portion of the corner of the tray which extends peripherally to a greater extent than the portion of the corner below the finger. Extending (downwardly in the figure) from the smoothed corner is a smoothed straight sidewall of the tray. Wrinkling of the peripheral flange is visible beneath the smoothed corner, and deflection of the peripheral flange under the smoothed straight edge can be seen behind the

corner on the left side of the figure . Figure 3B is another view of a smoothed corner of a similarly-made tray, also seen from below the rim of the tray. The prominent extension at the corner just below the rim is a stacking lug. Figure 3C is a view of the smoothed corner, with a finger pointing to a smooth region formed by bending, softening, bending, and cooling of the bend region of the deflectable flange. This smooth region can, for example, be urged against a thin plastic film without tearing it easily, since the relatively sharp edge of the thermoplastic material from which the tray is formed is bent under the corner, as shown in Figures 3A and 3B.

[0031] Figure 4 illustrates a section taken through a storage container article **100** being formed using the methods described herein (parallel straight lines "//" indicate positions at which structures, dimensions, and proportions which can optionally be present are omitted for clarity). In the figure, the article **100** has a deflectable flange **160** formed on each of the sides of the container visible in the figure. A single upper body **200** extends across the entire container, including around the sides at which the deflectable flanges **160** are located. A single ram **300** (only two portions shown in the figure) has been inserted within the interior of the cavity in the upper body **200** behind the article **100**. The peripheral edge **110** of the thermoplastic sheet from which article **100** is formed, infringes upon the upper face **302** of the ram **300** at each deflectable flange **160**, causing the deflectable flange **160** to deflect inwardly toward the body of the article **100** by flexing at one or more portions **B** of the bend region **150** of each deflectable flange **160**. Application of heat at **B** in an amount sufficient to soften the thermoplastic sheet causes the deflectable flanges **160** to retain approximately the conformation shown in this figure, with the peripheral edges **110** of the thermoplastic sheet positioned anti-peripherally (i.e., within the periphery of the article **100**, which occurs at the positions indicated by **B** in this figure), yielding smooth peripheries to the formed container upon cooling of the softened portions.

[0032] Figure 5 consists of Figures 5A, 5B, and 5C, each of which illustrates a section taken through a storage container article **100** being formed using the methods described herein (parallel straight lines "//" indicate positions at which structures, dimensions, and proportions which can optionally be present are omitted for clarity). In the figure, the article **100** has a deflectable flange **160** formed on each of the sides of the container visible in the figure. The

deflectable flanges **160** have been deflected inwardly by infringement thereupon by the upper face **302** of a single ram **300** (only two portions shown in the figure) at each deflectable flange **160**. The peripheral edge **110** of the thermoplastic sheet from which article **100** is formed, infringes upon the upper face **302** of the ram **300** at each deflectable flange **160**, causing the deflectable flange **160** to deflect inwardly toward the body of the article **100** by flexing at one or more portions **B** of the bend region **150** of each deflectable flange **160**. Application of heat at **B** in an amount sufficient to soften the thermoplastic sheet causes the deflectable flanges **160** to retain approximately the conformation shown in this figure, with the peripheral edges **110** of the thermoplastic sheet positioned anti-peripherally (i.e., within the periphery of the article **100**, which occurs at the positions indicated by **B** in this figure), yielding smooth peripheries to the formed container upon cooling of the softened portions. In this embodiment, the two parts of the ram **300** are shown with different profiles (one flat and one curved), to illustrate differences in deflection that can be induced by the different profiles. Figures 5A, 5B, and 5C differ in the distance between the elbow and the peripheral edge, this distance being greater in Fig 5A than in Fig. 5B and being zero in Fig. 5C.

[0033] Figures 6A, 6B, 6C, 6D, and 6E illustrate deflectable flanges formed in tray-shaped articles thermoformed from a sheet of thermoplastic material. In each of Figures 6A and 6B, a finger touches the sharp edge (i.e., the peripheral edge **110** at the periphery of peripheral flange **120**) where the tray has been cut from the sheet. In these figures, the deflectable flange has not yet been softened, deflected, and cooled, so the sharp edge remains positioned about the periphery of the tray. By comparison, the sharp edge has been deflected inwardly and away from the periphery of the trays shown in Figure 3 and in the tray shown in the lower portion of Figure 6C. The tray shown in the upper portion of Figure 6C is the same as that shown in the lower portion, differing in that the tray in the upper portion has not had its deflectable flange "rolled over" as the tray in the lower portion has. Figure 6D is a view from the underside of a rounded rectangular tray which has a "rolled over" edge about its entire periphery. The absence of sharp edges at or near the periphery of this tray is visible. Figure 6E is an oblique view of three initially-identical trays, each having a "rolled over" edge as described herein, the degree to which the edge has been "rolled over" differing among the three. The tray labeled "1" has a peripheral edge that has only barely been "rolled over" (i.e., the portion of the deflectable

flange including the peripheral edge **110** has been deflected not more than about 45 degrees inwardly from the plane of the remainder of the spacer **140**, most which remains substantially flat in this tray. The tray labeled "2" has a peripheral edge that has been more fully "rolled over" -- so much so that the peripheral edge **110** can nearly not be seen (it has been 'tucked' behind the remaining visible portion of the spacer **140**). On the tray labeled "3," the deflectable flange has been rolled over further still and the peripheral edge **110** cannot be seen. That the deflectable flange of tray "3" has been rolled over to a greater degree than that of tray "2" is detectable by virtue of the shorter portion of spacer **140** that remains visible on tray "3" than on tray "2" (and the visible portion of spacer **140** of each of trays "2" and "3" is shorter than the visible portion of spacer **140** of tray "1.") The three trays shown in Figure 6E can thus be thought to illustrate discrete degrees of "rolling over" of the deflectable flange.

[0034] Figure 7 consists of Figures 7A, 7B, and 7C and illustrate an embodiment in which an article **100** formed of a thermoplastic sheet (parallel straight lines "//" indicate positions at which structures, dimensions, and proportions which can optionally be present are omitted for clarity) resting on a horizontal surface (solid horizontal line) has its peripheral edges smoothed as described herein. In this embodiment, an upper body **200** (two portions shown in this cross section) is lowered over the article **100** in the direction indicated by the open arrow, causing each of the article's two deflectable flanges **160** to deflect inwardly. In Figure 7A, outwardly-flared portions of the upper body **200** have just contacted the peripheral flanges **120** of the article **100** as the upper body **200** is lowered onto the article toward the horizontal surface; the deflectable flanges are beginning to deflect at the areas marked "B." In Figure 7B, the the upper body **200** has been lowered onto the horizontal surface, and the peripheral edges **110** and the 9eripheral flanges **120** of the article **100** are partially deflected inwardly toward the body **10** of the article **100**. In Figure 7C, the ram **300** has been inserted, in the direction indicated by the open arrow, into a cavity in the upper body **200** behind the article **100** and further deflects the peripheral flanges **120** (and, with them, the deflectable flanges **160**) through bending of the thermoplastic sheet of which the article is formed at the areas marked "B."

[0035] Figure 8 consists of Figures 8A, 8B, 8C, 8D, 8Di, 8Dii, 8E, 8F, 8G, 8H, 8J, and 8K and illustrates deflection and rolling over of the deflectable flange **160**, including the sharp peripheral edge **110** thereof using a ram **300** as described herein. Each of Figures 8A-8C, 8E-

8G, and 8H-8K is a cross-sectional view including only one edge of the article; the same deflection and rolling over of the edge can be performed on multiple edges (e.g., all edges) of the article simply by using multiple rams or a ram that contacts all edges to be so treated.

[0036] Figures 8A, 8B, and 8C sequentially depict the effect of urging the shaped article **100** farther against the ram **300** in the direction indicated by the open arrow in each figure, as can be seen by comparing the portion of the article appearing in the left portion of each figure. In the embodiment shown in Figures 8A-8C, the deflectable flange **160** lacks an elbow and a peripheral flange. The initial (pre-ram-impingement) conformation of the shaped article is that shown in Figure 9A.

[0037] In Figure 8A, the article has been urged against the ram such that its deflectable flange **160** contacts the upper face **302** of the ram at its peripheral edge. The deflectable flange **160** deflects from its pre-contact position by virtue of resistance to movement encountered by the deflectable flange as it contacts the inclined portion of the upper face **302**. In the figure, the peripheral edge **110** of the deflectable flange rests against the upper face at a position where the inclined portion of the upper face transitions to a curved contour and a portion of the spacer is in close proximity to the ram, which is heated and transfers heat thereto.

[0038] Figure 8B shows the effect of urging the article **100** depicted in Figure 8A further against the ram **300**. Because the ram **300** shown in Figure 8B is heated, it softens the material from which the deflectable flange **160** is made at portions where the deflectable flange is in close proximity to or contacts the upper face **302** of the heated ram **300**. Because of the shape of the upper face **302**, the deflectable flange **160** reaches a position at which it can no longer advance by merely sliding along the upper face surface. Because the article **100** (including the deflectable flange **160**) is being urged in the direction indicated by the open arrow, and because the material of which the deflectable flange is constructed has been softened by the heated ram **300**, the deflectable flange deforms (at positions **B**) to follow the contour of the upper face **302** of the ram as the deflectable flange is advanced against the ram.

[0039] Figure 8C shows the effect of continuing to urge the article **100** depicted in Figure 8B against the heated ram **300**. As the article (including the deflectable flange **160**) is urged in the direction indicated by the open arrow, the deflectable flange continues to bend where softened by contact with the heated ram (i.e., at positions **B**). As movement of the deflectable

flange against the ram continues, the peripheral edge **110** of the deflectable flange eventually reaches an edge of the upper face **302** of the ram. The portion of the deflectable flange including the peripheral edge remains softened for a period of time (the period being dependent on the operating conditions in predictable ways). If the peripheral end contacts a portion of the article **100** while softened, it can be deflected thereby (e.g., upwardly, as suggested in the embodiment shown in Figure 8C). Deflection of the portion of the peripheral flange leaving contact with the upper face can also be influenced by the contour of the upper face **302**, for example inducing a "curled" or "spiraling" conformation as shown in Figure 8C.

[0040] Figure 8D illustrates using one or more objects to assist with deflection and rolling over of the deflectable flange as describe herein. Object **401** (referred to elsewhere herein as a plug) is disposed within an interior compartment of the shaped article **100** and abuts against an inner surface of the shaped article **100** during impingement of the deflectable flange **160** against the ram **300**, in order to reduce or prevent inward deflection of the inner surface during the operation. Object **403** applies downward pressure (open arrow) against, in this embodiment, the extension **50** portion of the deflectable flange **160**, in order to impinge the deflectable flange **160** against the upper surface **302** of the ram **300**. In this embodiment, object **402** rigidly connects objects **401** and **403**. Filled arrows depict forces imposed upon the article **100** upon application of the downward pressure. Figure 8Di depicts a shaped article in the form of a rounded rectangular tray **T** having an interior and a plug **P** that is shaped and dimensioned to fit within that interior, so as to act as object **401** in Figure 8D and to reduce or prevent inward deflection of the side walls of the tray **T** during the rolling over of the deflectable flange of the tray **T**. Figure 8Dii shows the plug inserted within the interior of the tray.

[0041] Figures 8E, 8F, and 8G (analogously to Figures 8A, 8B, and 8C) sequentially depict the effect of urging the shaped article **100** farther against the ram **300** in the direction indicated by the open arrow in each figure. In the embodiment shown in Figures 8E-8G, the deflectable flange **160** includes a peripheral flange **120** at the peripheral end of the spacer **140**. In this figure, it can be seen the peripheral flange **120** deflects during bending of the deflectable flange **160** to the extent that it becomes indistinguishable from the spacer **140**.

[0042] Figures 8H, 8J, and 8K (analogously to Figures 8A, 8B, and 8C; Figure 8I is deliberately omitted) sequentially depict the effect of urging the shaped article **100** farther

against the ram **300** in the direction indicated by the open arrow in each figure. In the embodiment shown in Figures 8H-8K, the deflectable flange **160** includes a peripheral flange **120** at the peripheral end of the spacer **140**. In these figures, it can be seen the peripheral flange **120** deflects during bending of the deflectable flange **160** to the extent that it becomes completely bent over the spacer **140**, forming a 'hook'-like structure. **B** in Figure 8J indicates that bending is occurring in the portion of the deflectable flange **160** spanning the indicated portion of the upper face **302** of the ram **300**.

[0043] Figure 9 consists of Figures 9A, 9B, 9C, 9D, 9E, and 9F and illustrates a beneficial feature of one embodiment of the shaped articles disclosed herein.

[0044] Figure 9A is a cross-sectional view of one edge of an article **100** showing the conformation of its deflectable flange **160** prior to the rolling-over operation described herein, including the property that the potentially sharp or rough peripheral edge **110** is accessible to contact a film used to seal the article or another nearby film or object. Figure 9B is a cross-sectional view of one edge of an article **100** have a peripheral edge **110** rolled over by the technique illustrated in Figures 8A-8C. Relative to the article engaged with the ram illustrated in Figure 8C, the deflectable flange **160** of the article has 'rebounded' in a peripheral direction following disengagement from the ram. Because the plastic material of which the article is constructed is flexible, the rolled-over edge shown in Figure 9B exhibits 'springiness' when urged in directions normal to the plane of the figure, such as in the directions indicated by the open arrows.

[0045] Figure 9C is a cross sectional view of the edges of three of the articles **100** shown in Figure 9B, the articles being stacked in a nested configuration. Because each of the article has the same shapes (e.g., a tray like the one shown in the lower portion of Figure 6C), each article can nest and be urged together until with others its rolled-over edge contacts the tray above and/or below it. Figure 9C illustrates three thus-stacked nested trays, with open arrows indicating positions at which standard de-nesting equipment can be employed to separate the nested trays. Fingers or threads, for example, can engage the inter-tray regions at these positions, the fingers or threads being operable (per ordinary de-nesting procedures) to separate the trays from one another for individual use.

[0046] Figure 9D is an image of a prior art thermoformed plastic tray having a stacking lug (the corner extension beneath the rim, toward which the finger in the image is pointing). The stacking lug serves to maintain a controlled separation distance between stacked trays, as shown in the left portion of Figure 9E (which is an image of two of these prior art trays stacked against one another, with the inter-tray distance being limited by the stacking lug). The right portion of Figure 9E shows two stacked, nested trays having rolled-over edges (as illustrated diagrammatically in Figure 9C with three trays). An inter-tray division is visible between the rims of the two stacked trays. Figure 9E illustrates that two trays having rolled-over edges as described herein can be stacked in a separable way in a smaller volume than can prior art trays having stacking lugs. Figure 9F shows, on its left side, three nested and stacked trays having rolled-over edges and having stacking extensions **180** formed into the corners thereof to increase separation between the straight edges of the stacked trays. The three stacked trays having stacking extensions **180** can be seen to have greater separation (large brackets on left side of figure) than the separation (small brackets on right side of figure) of three otherwise-identical stacked trays lacking stacking extensions.

[0047] Figure 10 consists of Figure 10A, 10B, and 10C. Figure 10A is an image of a ram **300** having a shaped article **100** in the form of a rimmed, rounded rectangular tray borne thereby. In the lower right portion of the image can be seen the upper surface **302** in which a second article could be disposed, but which does not currently bear an article. In the article **100** borne by the ram **300** in the upper part of the figure, it can be seen that the extension **50** connects the spacer **140** and peripheral flange **120** portions of the deflectable flange to the body **10** of the article **100**. The spacer **140** and peripheral flange **120** are carried by the upper surface of the ram **300** in the upper part of the figure, and that upper surface (analogous to upper surface **302** in the lower right portion of the figure) cannot therefore be seen directly. "10B" indicates a portion of the ram **300** shown (with the shaped article **100** removed) in Figure 10B. In Figure 10B, portions of the upper surface **302** of the ram **300** can be seen. Dashed line 10C-10C in Figure 10B indicates the approximate position of the cross-section depicted in Figure 10C, and letters A-E are included as landmarks so that the surface configuration of the ram **300** can be better understood by comparing Figures 10B and 10C. Figure 10C is a diagrammatic cross-section of the ram **300** shown in Figure 10B, including landmark letters A-E.

DETAILED DESCRIPTION

[0048] The subject matter disclosed herein relates to formation of shaped thermoplastic articles, and more specifically to articles which are formed such that one or more of the edges of the article has a conformation wherein the peripheral edge of a thermoplastic sheet from which the article is formed is turned away from a face of the article, and preferably away from the periphery of the article, so that a fragile material (e.g., flesh or a thin, flexible plastic sheet) that is applied against the face or periphery does not contact the edge of the sheet. Because such sheet edges can be sharp, especially when the edge has been cut or broken, directing the edge away from a face and/or periphery of the article can prevent damage to fragile materials which contact the face or periphery. The subject matter disclosed herein is of particular use in forming containers which will be sealed with fragile plastic films applied against a face of the container or in which the container is wrapped. In a preferred embodiment disclosed herein, the peripheral edge of the thermoplastic sheet from which the article is formed is turned away from the article's periphery so far that the resulting article is suitable for use in any or all of OW, VSP, and MAP sealing technologies. Desirably, thermoformable and moldable plastics tend to be widely acceptable in recycling programs, and articles made therefrom can be more readily recycled than, for example, foamed plastic articles.

[0049] Briefly summarized, the basic method described herein for forming a shaped thermoplastic article having a smooth edge involves forming a deflectable flange at the periphery of the article. The deflectable flange includes the potentially-sharp or –rough peripheral edge of the thermoplastic material from which the article is formed. The deflectable flange is softened (i.e., raised to a temperature at or above the glass transition temperature of the material of which the flange is formed, and preferably a temperature less than the melting point of the material) at one or more portions thereof so that the peripheral edge is directed away from the periphery of the article when the deflectable flange is deflected toward the body of the article (preferably 'hiding' the peripheral edge between the deflected portion of the deflectable flange and the extension, the body, or both. Cooling (i.e., stiffening) the softened and deflected deflectable flange below its glass transition temperature "locks" the peripheral

edge in that position, lessening the likelihood that material (e.g. flesh or film) that contacts the periphery of the article will be damaged by the sharpness or roughness of the peripheral edge.

[0050] It is the presence of the deflectable flange formed at the periphery that permits peripheral edges (and, particularly, curved edges and corners of peripheral edges) to be "rolled over" to yield a smooth periphery. In previous trays which included an exterior flange (e.g., a tray having a periphery like that shown in Figure 1A, lacking the bend region **150**, the spacer **140**, the elbow **130**, and the peripheral flange **120**, and having the peripheral edge **110** at the periphery of the extension **50**), bending or rolling of the exterior flange might have been possible along straight edges, but bending or rolling curved edges and corners of such exterior flanges could not be performed without buckling or wrinkling of the material in the flange, yielding an undesirable non-smooth edge. It is the presence of the smooth bend region **150** and the spacer **140** of the deflectable flange described herein that permits the peripheral edge **110** to be deflected away from the periphery of the article without such buckling or wrinkling, yielding a smooth periphery. It can be seen from Figures 1, 4, 5, 7, and 8 that the bending, flexing, and curling that the deflectable flange undergoes can be effected in any one or more of the extension **50**, the bend region **150**, the spacer **140**, the elbow **130**, the peripheral flange **120**, and even at the peripheral edge **110**. Whichever one or ones of these elements are caused to bend or deflect in order to achieve the effect, the resulting disposition of the potentially sharp peripheral edge **110** away from the periphery of the article, and preferably not reasonably accessible from the exterior of the article at its periphery yields an article having a smooth periphery which is suitable for contacting with fragile films, tissues, or other surfaces.

[0051] In one embodiment, the deflectable flange includes a peripheral flange that juts outs in a peripheral direction from the article and is attached to a spacer portion by way of an elbow (e.g., a 90-degree turn or a turn through some other offset angle, such as one of 60-120 degrees) in the thermoplastic material that forms the article. The body of the article is attached to the spacer by way of a bend region, which defines an angle (angle **A** in Figure 1A; preferably an approximately right angle) between the spacer and the portion of the body adjacent the bend region (i.e., this portion will usually be the extension which serves to connect the body to the bend region). The deflectable flange is inserted into the interior of a cavity in a body (e.g., an upper body **200** or a ram **300**) such that the peripheral flange is impinged by a wall of cavity,

thereby deflecting the deflectable flange in the direction of the body of the article. Upon such deflection, heat is applied to the bend region that is sufficient to soften or melt the thermoplastic material at the bend region, so that the deflectable flange remains deflected toward the body when the bend region cools. Optionally, a ram can be inserted into the cavity after the deflectable flange, and a face of the ram which contacts the deflected peripheral flange can induce further deflection of the deflectable flange, further displacing the peripheral edge of the article away from the periphery of the article upon cooling. In this way, a smooth, "rolled" edge of the thermoplastic material forms the outermost periphery of the article, while the peripheral edge of the thermoplastic material remains within the outermost periphery of the article, where the sharpness of that edge is less likely to damage fragile materials which contact the outermost periphery of the article.

[0052] In another embodiment, the deflectable flange is contacted with a ram that deflects the deflectable flange in a direction that deflects the sharp edge of the thermoplastic sheet away from the periphery of the article. Before, during, or after such deflection, one or more portions of the deflectable flange (e.g., the bend region, the spacer, the elbow, the peripheral flange, any portion(s) that contact the ram, or a combination of these) are heated sufficiently to soften the thermoplastic material, and the deflectable flange is thereafter cooled to “lock in” the deflection. Depending on the degree of deflection, the peripheral edge of the thermoplastic material can be simply turned away from the periphery of the article, turned in a direction approximately opposite the periphery, or even “rolled up” by deflecting the deflectable flange at a sufficiently tight radius while it is softened that a J-shaped, U-shaped, or even spiral-shaped conformation is achieved (i.e., any shape yielding a substantially smooth peripheral edge), with the peripheral edge being thereby rendered virtually incapable of damaging flesh or film present at the periphery of the article.

[0053] Individual elements and aspects of the shaped articles and methods for making them are now described in greater detail.

[0054] The Shaped Article

[0055] The methods described herein are believed to be applicable to articles having a wide range of shapes and sizes, especially articles which normally have a sharp peripheral edge when

made by common methods. Motivation for making shaped thermoplastic articles with smooth edges stemmed in part from a desire to make common storage trays (e.g., plastic trays used for storing foodstuffs such as fresh or frozen meats, fruits, or vegetables) having edges that are sufficiently dull (non-sharp) that the trays can be wrapped in or contacted with thin plastic films such as polyvinylidene chloride and polyethylene films without the film being cut or punctured by the tray edge under normal usage conditions. However, once the methods described herein were developed, it was recognized that the smooth, rounded edges are desirable in a variety of other situations, such as preventing injury to the flesh of humans handling trays and other shaped articles and preventing damage to films sealing one tray by sharp edges of a second sealed tray (e.g., as in a shipping container containing multiple sealed trays).

[0056] By way of example, a common method of making shaped articles such as meat trays is by thermoforming a sheet of a thermoplastic. In thermoforming processes, a portion of a long sheet of a thermoplastic is raised to a temperature at which the thermoplastic softens and can be molded. The softened thermoplastic is applied against the surface of one or more molds (often with the aid of negative air pressure to ensure a tight opposition of the softened thermoplastic film against the mold surface). As the film cools (e.g., upon contact with the mold surface), the thermoplastic hardens and becomes less easily deformable, resulting in the thermoplastic film attaining and retaining the shape imposed upon it by the molding process. Multiple casts are often made of the same article in a single sheet of film in thermoforming processes, and the individual articles are freed from the film by cutting (e.g., die cutting) the film about the periphery of the article. This process tends to yield a sharp edge at the cut portions of the film, including a sharp edge that surrounds all or a portion of the periphery of the article (i.e., where the article was cut from the film).

[0057] Further by way of example, a thermoplastic material can be melted in an extruder and injected into a mold cavity which defines the shape of the molded article. After cooling, the mold can be opened to release the molded article. In molding processes, it is common for thermoplastic material to appear at parts of the finished articles where it is not desired, such as "flashing" that occurs when molten thermoplastic flows between mold plates or at the ports through which the molten thermoplastic was fed into the closed mold. These non-desired parts

can be sharp in their own right, and sharp edges can be left when these non-desired parts are cut from the molded article.

[0058] The size and shape of the articles described herein are not critical. In general, the shaped articles will be ones for which handling of the articles or contact between peripheral edges of the article and one or more fragile materials is anticipated. The edge-smoothing process described herein can remove one or more sharp edges from thermoplastic articles which normally have such sharp edges, regardless of the method(s) by which the articles are produced.

[0059] The Smoothing Method

[0060] The periphery of a thermoplastic article – particularly one formed from a bent or shaped sheet of a thermoplastic material – can be smoothed by a process that includes forming a deflectable flange near the periphery of the edge to be smoothed, deflecting a bent portion of the flange to displace the edge from the periphery of the article, softening the bent portion at least while the flange is in the deflected position, and re-hardening the bent portion while the flange is in the deflected position. This process is illustrated in Figure 1. The portion of the deflectable flange **160** that can be softened and bent can be the bend region **150** or, preferably, a portion of the deflectable flange distal to the bend region **150**, but proximal to the peripheral edge **110**. By way of example, softening the spacer **140** permits its peripheral portion, including the elbow **130**, peripheral flange **120** (if these two elements are present), and peripheral edge **110** to be bent inwardly (i.e., toward the body **10** of the article **100**) sufficiently to displace the peripheral edge **110** away from the periphery of the article.

[0061] Preferably, at least a portion of the spacer **140** is softened and bent sufficiently that the peripheral edge **110** is "rolled over," such that the peripheral edge **110** is positioned such that a film that overwraps the article or that is draped across the article does not contact the peripheral edge **110**, even if pulled taut. Still more preferably, the deflectable flange **160** is rolled over sufficiently that the peripheral edge **110** is visually obscured by the spacer **140** or the bend region **150** such that the peripheral edge **110** cannot be seen when the article **100** is viewed horizontally from it periphery (i.e., from its peripheral side). Also preferably, the deflectable flange **160** is rolled over sufficiently that the peripheral edge **110** "points" toward the body **10** or toward the underside of a portion of the deflectable flange **160**, meaning that the

plane of the deflectable flange at the portion including its peripheral edge **110** intersects the body **10**, including the underside **161** of the peripheral edge. When the plane of the deflectable flange at its edge including the peripheral edge **110** does not point at the body **10** or the underside **161**, then that peripheral edge should at least be displaced far enough from the periphery of the article **100** or rolled over sufficiently to obscure the peripheral edge **110** by one or more portions of the deflectable flange **160**.

[0062] Figure 1A illustrates a thermoplastic article **100** having a body **10** (with, in this figure, an irregular shape) and a deflectable flange connected with the body **10**. The deflectable flange includes a peripheral flange **120** which includes a peripheral edge **110** of the thermoplastic sheet from which the article **100** is formed. The deflectable flange also includes a bend region **150** interposed between the body **10** of the article **100** and the peripheral flange **120**. The bend region **150** is separated from the body **10** by an extension **50**, which is simply a flat portion of the thermoplastic sheet in this embodiment. The peripheral flange **120** is similarly separated from the bend region by a flat portion of the thermoplastic sheet designated the spacer **140** in this embodiment. The peripheral flange **120** is connected to the remainder of the deflectable flange by an elbow **130** which, in this embodiment, is a portion of the thermoplastic sheet formed into a right angle.

[0063] Figure 1A is a cross-section of such an article **100**, in which the solid black line represents the cross-section of the thermoplastic sheet from which it is formed. The peripheral edge **110** forms the periphery of the article **100** because no other portion of the article **100** extends farther to the right (in this figure), the spacer **140** and the other portions of the peripheral flange **120** being nearer to the body **10** than the peripheral edge **110** of the sheet. Thus, if an object were urged against the right side (in Figure 1A) of article **100**, the object would tend to contact peripheral edge **110** and the sharpness of that peripheral edge **110** could affect the object, such as by cutting, damaging, or injuring the object.

[0064] In Figure 1B, the thermoplastic article **100** is inserted within an interior cavity of an upper body **200**. The inner surface **202** of the upper body impinges upon the peripheral flange **120**, deflecting it inwardly (i.e., anti-peripherally) toward the body **10** of the article **100**. In this embodiment, both the peripheral edge **110** of the thermoplastic sheet from which the article **100** is formed and the peripheral-most portion of the bend region **150** are positioned about equally

peripherally from the body **10**. Preferably, the deflectable flange **160** is deflected inwardly sufficiently far that the peripheral edge **110** of the thermoplastic sheet is contained within the interior cavity of the upper body **200**. In this embodiment, the spacer **140** is essentially rigid and substantially all bending occurs within the bend region **150**. If heat sufficient to soften the thermoplastic sheet is applied to the bend region **150** (at approximately the location identified as "**B**" in Figure 1B) and the sheet is subsequently cooled (preferably below its glass transition temperature), then the deflectable flange **160** will retain the configuration shown in Figure 1B (i.e., deflected relative to its initial conformation shown in Fig. 1A on account of impingement of the peripheral edge **110** against the inner surface **202** of the upper body **200**) even after upper body **200** is separated from the article **100**. In this deflected conformation, the peripheral edge **110** does not extend peripherally beyond the rounded bend region **150**, and the resulting article will be more suitable for sealing with a thin plastic film applied to extension **50** and bend region **150** than was the original, pre-deformation article shown in Figure 1A (i.e., on account of the protuberance of potentially sharp peripheral edge **110** beyond the periphery of bend region **150**, at which position the peripheral edge **110** might readily snag, abrade, or cut the film).

[0065] Figure 1C illustrates an optional, but preferable step in which a ram **300** is inserted within the cavity in the upper body **200** behind the article **100** (i.e., sandwiching at least the deflectable flange **160** between the upper body **200** and the ram **300**). This step further deflects (relative to the embodiment show in Figure 1B) the deflectable flange **160** towards the body **10** of the article **100**, thereby displacing the (potentially sharp) peripheral edge **110** of the thermoplastic sheet further from the periphery of the article (i.e., farther from inner surface **202** of the upper body **200**). Heating the bend region **150** of the deflectable flange **160** sufficiently to at least soften it while it is in the conformation shown in Figure 1C and subsequently cooling it below its glass transition temperature will 'freeze' the deflectable flange in the conformation shown. In this conformation, the sharp peripheral edge **110** of the sheet from which the article is formed is 'tucked' under other portions (e.g., the bend region **150** and the extension **50**, if present) of the deflectable flange **160**, and is consequently less accessible to objects contacting the periphery of the article (and less liable to tear, cut, or injure materials which contact the periphery of the article). For example, if a thin plastic film is applied to extension **50** and bend

region **150**, then the film is even less likely to be snagged, abraded, or cut by the potentially sharp peripheral edge **110** in this embodiment than it was in the embodiment shown in Figure 1B. From this progression (i.e., greater deflection in Figure 1C than in Figure 1B and Figure 1A), it can be seen that the more the peripheral edge **110** is deflected away from the periphery of portions of the article to which a sealing film is applied, the less likely damage to the film from the edge becomes.

[0066] The ram **300** and the upper body **200** each serve the purpose of deflecting the deflectable flange by impacting upon or against it. These two items are therefore essentially interchangeable and can each be used alone or in combinations two or more ram(s) and upper body(ies). In this disclosure, the term "ram" is used to refer to a body that impinges upon the deflectable flange by being applied thereto or thereagainst in a direction from the portion of the deflectable flange most distal from the body of the shaped article. Similarly, the term "upper body" is used to refer to a body that impinges upon the deflectable flange by being applied thereto or thereagainst in about the opposite direction (see, e.g., Figures 1C and 4).

[0067] In the example shown in Figure 1C, the portions of the ram **300** which impinge upon the peripheral flange **120** of the deflectable flange **160** while the article is lodged within the cavity in the upper body **200** has a wedge-shaped cross section. Such a ram can be useful for directing the peripheral flange **120** and peripheral edge **110** anti-peripherally, in that the farther the ram is advanced within the interior in the direction from the peripheral edge **110** toward the bend region **150**, the farther the peripheral flange **120** and peripheral edge **110** will be deflected in an anti-peripherally direction. However, these portions of the ram **300** need not be wedge-shaped. Substantially any shape of ram **300** that will deflect the peripheral flange **120** and peripheral edge **110** anti-peripherally when the ram **300** is inserted behind the article **100** in the upper body **200** can be used, such as blunt or rounded (convex or concave at its upper face **302**), or a combination of any of these, can be used, for example as shown in Figure 5.

[0068] Figure 8 illustrates an alternate method of rolling or otherwise shaping the edge of an article. As can be seen in Figure 8A, the deflectable flange **160** in this embodiment lacks an elbow or peripheral flange, and instead includes only a spacer portion that terminates at the peripheral edge **110** of the thermoplastic sheet. This deflectable flange is urged (in the direction indicated by the open arrows in Figure 8, regardless of how such urging is achieved,

such as by moving either or both of the article **100** or the ram **300**) against the upper surface **302** of a heated ram. When the direction of travel of the deflectable flange closely parallels the conformation of the upper surface (i.e., as in Figure 8A), relatively little of the deflectable flange may contact the upper surface and relatively little heat may be transferred from the ram to the deflectable flange. However, as shown in Figure 8B, when relative movement of the article and the ram cause greater surface contact or greater proximity between the upper surface of the ram and the deflectable flange, the interfacial area of contact/proximity can be greater, resulting in greater heat flow from the ram to the deflectable flange. Sufficient heat flow will result in softening of the thermoformable material, causing the deflectable flange to assume the conformation of the upper surface. When, as shown in Figure 8C, still further relative movement of the article and the ram is made, a greater portion of the deflectable flange will be softened and deflected. As with the embodiment shown in Figure 1B, it can be seen in this embodiment that heat suitable for bending the deflectable flange is being applied (at multiple locations **B** in Figures 8B and 8C); however, in order to "roll over" the portion of the deflectable flange that includes the peripheral edge, little or no flexion, and no heat application, is occurring at the bend region **150** (other than perhaps to a small degree as the peripheral-most portions of the bend region **150** approach the heated ram **300**, as in Figure 8C). For the purposes of the processes described herein, it is substantially immaterial which portions of the deflectable flange are softened and bent, so long as the desired result is obtained: the potentially sharp peripheral edge **110** is deflected away from the periphery of the article and, preferably, sequestered (as in Figure 8C) where it is very unlikely to contact any easily-damaged film or tissue which contacts the periphery of the shaped article. The deflectable flange can be contacted with, or brought into close proximity with, the ram in a single smooth motion, in a plurality of discrete, incremental advances, or a combination of these, in order to permit portions of the deflectable flange to soften sequentially.

[0069] As the thermoformable material moves out of contact with the ram (either by disengaging the two or, as shown in Figure 8C as a portion of the deflectable flange moves beyond the upper surface of the ram), the thermoformable material can cool and the deflection induced therein will be retained upon cooling. As shown in Figure 9A, disengagement of the

article and the ram results in a rolled-over edge of the article, the rolled-over edge having a smooth periphery and being suitable for handling and/or contact with fragile plastic films.

[0070] In Figure 8A-8C, the deflectable flange was depicted lacking the elbow **130** and peripheral flange **120** illustrated in Figure 1A for the sake of simplicity of illustration. Although production of deflectable flanges lacking the elbow and peripheral flange is possible (e.g., by mechanically or laser-cutting the deflectable flange at the spacer **140** shown in Figure 1), such production can be difficult and costly and is therefore of limited practicality in large-scale production operations. For this reason, shaped articles **100**, such as those intended for use as packaging trays for food, that are processed described herein will often have both the elbow and peripheral flange illustrated in Figure 1A. As illustrated in Figures 8E-8K, shaped articles bearing the elbow and peripheral flange can nonetheless be processed using the methods and equipment described herein.

[0071] Figures 8E-8G depict processing of a shaped article **100** that has a deflectable flange **160** that includes both the peripheral flange **120** and the elbow **130** described herein, and the processing depicted in these figures is roughly analogous to that depicted in Figures 8A-8C. In Figure 8E, the peripheral edge of the deflectable flange **120** directly contacts the upper surface **302** of the ram **300**. Because the ram is heated, heat is conducted directly to the peripheral edge where it contacts the ram and by radiation from closely-opposed portions of the spacer **140**. By controlling heat flowing from the ram and the residence time of the article **100** in the position shown in Figure 8E, an operator can induce softening of portions of the deflectable flange, particularly including at its peripheral edge and at portions of the spacer near that peripheral edge. Softening of these portions facilitates bending of the deflectable flange at the softened portions, such as by urging the article further against the ram, such that a curved portion of the upper surface will induce bending as the more-peripheral portions of the deflectable flange are driven against the curved portion of the upper surface by the less-peripheral portions (which transmit force applied to the article), as shown in Figure 8F. Further urging of the article against the ram, as shown in Figure 8G, causes the portions of the deflectable flange that are in contact with the upper surface of the ram to slide across that upper surface. As material is driven beyond positions in which it is in contact with the upper surface, it may remain softened (and susceptible to further bending) for a short period of time, or it may cool and become only

deflectable (rather than bendable or moldable). Whether cooled by movement past the heated portion(s) of the ram or by removing the article from contact with the ram (or even by applied cooling, such as by directing cool air at shaped portions, by using a cooled plug element within the body of the article, or otherwise), cooling of the deflectable flange below its glass transition temperature "sets" or "locks in" the conformation of the material at the time of that transition. Thus, by shaping the deflectable flange so that it has the conformation shown in Figure 8G and cooling it below its glass transition temperature, the edge of the article can be rendered smooth (both because its bend region **150** is smooth and because its spacer **140**, including its peripheral edge **110** have been changed to have a conformation in which no rough or sharp edges are present at the periphery of the article.

[0072] As shown in Figure 8F, the peripheral flange **120** can be partially deflected during shaping of the deflectable flange; in the finished article, the peripheral edge preferably "points" toward the body or the underside of the deflectable flange. As shown in Figure 8G, shaping of the deflectable flange will sometimes result in disappearance of the peripheral flange and the elbow interposed between it and the remainder of the spacer. This can occur because the material in the peripheral flange "melts" into the spacer or simply because the offset angle of the elbow becomes approximately 180 degrees. As can be seen in Figure 8J, for example, though, the peripheral flange **120** can deflect in a direction that it remains distinct from the remainder of the spacer, potentially forming a hook-like structure. Because such a structure could position the potentially-sharp or –rough peripheral edge at or near the periphery of the article, it is preferable that the deflectable flange be deflected sufficiently that any such hook-like structure is contained within (relative to the periphery of the article) the rolled-over edge, as illustrated in Figure 8K.

[0073] In the methods illustrated in Figures 1 and 8, impingement of the upper body **200**, the ram **300**, or both upon the deflectable flange **160** can induce inward flexing of the walls of the shaped article. By way of example, the compression induced in the deflectable flange upon impingement upon the flange of the sidewalls of the upper body (compare the positions of spacer **140** in Figures 1A and 1B) will induce inward (i.e., away from the sidewalls of the upper body and toward the shaped body **10** of the article **100**) force on extension **50**, which force will be transmitted to the shaped body, potentially causing a portion of the body to buckle or deflect.

Similarly, impingement of the ram upon the peripheral flange portion **120** of the deflectable flange will also induce inward force on the extension and thereby upon the shaped body. Further by way of example, inward force exerted upon deflectable flanges in embodiments shown in Figures 7 and 8 can also be transmitted to the shaped body of the article. Transmission of force from the deflectable flange to the shaped body can be undesirable for at least two reasons. First, deflection of the shaped body can alter the orientation of the deflectable flange and the portions that are bent as described herein, making control of the final shape of the article (and its edge) difficult. Second, force that is transferred from the deflectable flange to the body will generally not drive the deflectable flange against the ram and/or upper body, meaning that the force will not cause the bending and deflection of the deflectable flange described herein, at least to the intended degree. It is therefore desirable to limit transmission of force from the deflectable flange, deflection of the shaped body by such forces, or both, so as to direct the force into deflection of the deflectable flange.

[0074] Substantially any equipment or method for preventing or reducing transmission of force from the deflectable flange to the body, reducing or preventing deflection of the shaped body, or both can be employed. Shown in Figure 8D is an example of such equipment and how it is used. Figure 8D illustrates shaping of the deflectable flange **160** in a shaped article **100** by application of downward force (open arrow), as shown in Figure 8B. In contrast with Figure 8B, the shaped article shown in Figure 8D is coupled with three objects, **401**, **402**, and **403**. Shown here in cross-section, each of the three objects is a solid having a rounded square profile (e.g., rounded metal bars). Object **401** is abutted against a portion of the shaped article **100** upon which inward force (smaller, horizontal solid arrow) is applied when the downward force causes the deflectable flange **160** to impinge upon the upper surface **302** of the ram **300**. Object **403** abuts the extension **50** of the deflectable flange and transmits the downward force to the deflectable flange. Object **402** connects (rigidly, in this example, but not necessarily) objects **401** and **402**. One or more of the three objects can be cooled, to prevent heat (e.g., from heated ram **300**) from softening the plastic at its body or extension.

[0075] In Figure 8D, when downward force (open arrow) is applied to the object **403**, the force is transmitted to the deflectable flange. Impingement of the deflectable flange upon the ram **300** opposes the downward force. This force could, in the absence of object **401** be

transmitted through the deflectable flange (i.e., through extension **50**) to the shaped body of the article **100**. However, because object **401** is present and held in place sufficiently to prevent deflection of the portion of the article it abuts, downward force applied to the deflectable flange cannot be dissipated by deflection of the shaped body (i.e., in the direction indicated by the small horizontal black arrow in Figure 8D, because object **401** prevents such deflection), and the downward force is instead imposed along the deflectable flange in the direction shown by the large black arrow in Figure 8D. This force drives the deflectable flange (particularly its peripheral edge, the peripheral flange if present, and the portion of the spacer nearest the peripheral edge) against the ram **300** and induces deflection of the deflectable flange, conformation of portions of the deflectable flange against the upper surface **302** of the ram (especially when the amount of heat provided by the ram is sufficient to soften those portions), and displacement of the deflectable flange across the surface of the ram. As shown in the figure, the contour of the upper surface of the ram is thereby imparted to the peripheral-most portions of the deflectable flange, resulting in smooth bending of those portions (assuming a smooth contour to the upper face of the ram) and displacement of the peripheral edge of the deflectable flange toward the body of the article (or even 'curled' back beyond the body, for example as shown in Figure 8C).

[0076] The shape, size, arrangement, attachments (if any) of objects **401**, **402**, and **403** are not critical. Likewise, not all three objects need necessarily be used together; one, two, or all three can be employed. In one embodiment, the three objects are fixed together to form a "lid" or "plug" for a container like that shown in Figure 6, so that the portion of the lid/plug that corresponds to object **401** can substantially fill the interior of the container (i.e., pressing against all walls, and especially including the four long, straight walls of the container), the portion of the lid/plug that corresponds to object **403** forms a ring that can be applied against the entire rim of the container surrounding its interior, and the portion of the lid/plug that corresponds to object **402** can be any material or mechanism that connect them. For example, such a lid/plug could be formed from a single piece of material (e.g., a 'plug' that fills the entirety of the interior and overlaps the rim surrounding the interior). One or more of the objects can be cooled to reduce heating of the shaped article (other than where desired, at

portions of the deflectable flange) and to thereby prevent undesired deformation of the shaped articles during processing.

[0077] Generalized, object **401** is simply a mass for preventing flexing of the sides of the shaped article during deflection of the deflectable flange. Such an object may fill substantially all portions of the interior of the shaped article (e.g., the entire interior of the container shown in Figure 6D). Alternatively, one or more objects **401** may be used to buttress portions of the shaped article that are more easily deflected than others (e.g., the long straight sides of the container shown in Figure 6D).

[0078] Object **403** can be any object that can urge the deflectable flange against the ram. Multiple objects can be used to urge the deflectable flange against one or more rams at various locations on the article, or a single object **403** that contacts the article at or near all portions of the deflectable flange can be used. In one embodiment, object **403** is the upper body **200** described herein, such as in the form that completely surrounds the rim of a container such as that shown in Figure 6D. Object **403** can be a frame designed to fit snugly against the entire rim of a container surrounding an internal concave compartment of the chamber, so as to simultaneously urge a deflectable flange that completely surrounds that rim against a ram in the manner described herein. In one embodiment, object **403** can be deliberately cooled (e.g., by directing a cooling fluid such as chilled water, chilled oil, or ambient air against or through the object, particularly where the object is made of a good conductor of heat, such as a metal) so as to reduce, inhibit, or prevent heating of the body of the shaped article during processing (e.g., as shown in Figure 8D). Object **403** can be linked, rigidly or movably, with object **401** so that the flex-resisting object **401** can be applied to the interior of a shaped article simultaneously with application of force to the deflectable flange of the shaped article by object **403**.

[0079] Object **402**, when present, can be an object that connects object **403** to a source of force, an object that holds object **401** in place within a concave portion of shaped article **100** during deflection of deflectable flange **160**, or a combination of these.

[0080] As illustrated in Figures 9C and 9E, an additional advantage of the rolled-over edge formed by this process is that the rolled edge can be used instead of conventional stacking lugs (i.e., thermoform-shaped portions of articles contoured to limit how closely an article can nest within another otherwise-identically shaped article). Such known stacking lugs, in order to

perform their desired anti-nesting function, must furthermore be narrower at their upper end than their lower end (referring to Figure 9D as an example) in order to prevent nesting of the stacking lugs of adjacent trays. This 'narrower-at-the-top' conformation presents known difficulties with de-molding the trays during thermoforming, since the narrower 'top' portion of the lug must be stretched or deformed over the larger 'bottom' portion of the lug mold in order to remove the thermoformed tray from the mold. The rolled edge depicted in Figures 8 and 9 (i.e., made as described herein) avoids this difficulty, while still preventing inappropriately close nesting of adjacent trays. Trays having the rolled edge described herein can be separated using conventional de-nesting equipment (e.g., screw- and finger-based machines for separating adjacent nested/stacked trays) and, as shown in Figure 9E, permit denser packing of trays than is possible using trays having formed stacking lugs.

[0081] Figure 9F illustrates an optional embodiment of the rolled edge described herein that also affects the stacking characteristics of shaped articles having the rolled edge. On the right side of Figure 9F are shown three stacked trays having the rolled edge described herein, the rolled edge being substantially identical (including in height) about the entire periphery of the tray. On the left side of Figure 9F are shown three other stacked trays, these trays also bearing a rolled over edge as described herein about their entire periphery. However, in contrast to the trays on the right of the figure, the rolled edge of those on the left are not uniform about their entire periphery. As shown in the figure at one corner, a smaller portion of the deflectable flange has been rolled over at the corners of these trays than the portion of the deflectable flange that is rolled over along other portions of their edge. As a result, the trays bear rounded stacking extensions **180** at their corners. Like that stacked trays shown on the right of Figure 9F, those on the left of the figure are nested within one another and settle until the lower surface of the rolled edge of a tray contacts and rests upon the upper surface of the rolled edge of a second tray within which it is nested. However, because the stacking extensions **180** of the trays on the left of the figure have a greater height than much of the rest of the rolled edge of those trays, the trays on the left will nest such that the lower surface of a stacking extension **180** rests on the upper surface of the rolled edge of a tray beneath it, leaving the lower surface of much of the rolled edge of the upper tray out-of-contact with the tray beneath it, yielding a gap between the nested trays (compare the gap indicated by the large brackets in the left of Figure

9F with the indentation indicated by the small brackets in the right of Figure 9F). When a shaped article **100** is given a rolled over edge including a stacking extension **180** as described herein, the degree to and way in which the deflectable flange is deflected should nonetheless be selected to position the peripheral edge **110** at the stacking extension **180** such that it is unlikely to contact films or other materials at the periphery of the article **100**, as described herein.

[0082] Yet another advantage of the 'rolled edge' depicted in Figures 8 and 9 is the mechanical strength imparted to a shaped article by such an edge conformation. Thin plastic films tend to be highly flexible, and articles formed from such films can have 'flimsy' edges that are easily deformed upon handling or manipulation (e.g., during sealing or wrapping with film). For the same reasons that hollow tubes or rounds of material tend to be stronger and more rigid than planar sheets of material of the same type and thickness, the curved or rolled edge described herein confer greater edge strength and rigidity to the shaped articles described herein than corresponding articles lacking such an edge. This edge strength and rigidity permits formation of lids upon, or engagement of separately-made lids with shaped articles described herein. Thus, in addition to the shaped articles being sealable with film using OW, VSP, or MAP technologies, the enhanced edge strength of the shaped articles described herein permits them to be sealed with snap-on/snap-off type lids or other conventional sealing technologies. The edge strength and rigidity conferred to the shaped article also prevents deflection induced by tension in a film used to overwrap or seal the article (e.g., so-called "bow-tying" as the phenomenon of a concave article closing upon its concavity when wrapped or sealed) and to withstand stresses imposed by (or necessary to the operation of) container-handling equipment, such as de-nesting equipment used for segregating individual containers from a stack of nested containers.

[0083] What is important in these methods is that the potentially sharp peripheral edge **110** of the thermoplastic sheet(s) from which the article **100** is formed should be deflected away from the periphery of the article and 'frozen' in that position by heat-softening and cooling a portion of the sheet that is bent (which will normally include substantially only portions of the deflectable flange) while the sheet is so deflected. The heated, bent, and cooled region preferably includes at least the bend region **150** of the deflectable flange **160**, because that region is designed for smooth flexing and yields a smooth periphery to the container.

Softening, flexing, and hardening of other portions of the deflectable flange (e.g., the extension **50**, spacer **140**, elbow **130**, and/or peripheral flange **120**) can also (or alternatively) be done, and can contribute to smoothness of the article's periphery.

[0084] Alternatively, any of these portions of deflectable flange **160** can simply be bent without heating, so long as sufficient bending force is applied that the thermoplastic material irreversibly bends (rather than merely reversibly deflecting upon removal of pressure) at the bent location. However, non-heating-and-softening-based bending methods will tend to leave relative sharp (or, at least, less smooth) edges where bends are imposed, and so such methods are not favored unless care is taken (e.g., by bending materials about a rounded 'mold' member) to ensure that such bends are smooth. The deflectable flange **160** disclosed herein provides a convenient structure for practicing this method.

[0085] The Deflectable Flange **160**

[0086] The deflectable flange includes a bend region **150**, a peripheral edge **110**, and a spacer **140** interposed between the two. The bend region forms an angle of less than 180 degrees between the body **10** and the spacer **140** and functions as a flexible 'hinge' at which the spacer region can be displaced relative to the body. The angle formed by the bend region (i.e., the angle designated **A** in Figure 1A) is preferably about ninety degrees (i.e., approximately a right angle, meaning not less than 75 nor more than 105 degrees, more preferably not less than 85 nor more than 100 degrees, still more preferably not less than 87 nor more than 93 degrees, and most preferably about 92 degrees). When this angle is less than 90 degrees, it can be difficult to remove the thermoformed article from the thermoforming mold (i.e., because the portion of the mold nearest the extension between the spacer and the body can be broader than the width between the body and the spacer nearer to the peripheral edge, meaning that the thermoformed article will 'grip' the mold and must be pulled or expanded to displace it from the mold). Thus, it is preferable that the angle formed by the bend region is 90 degrees or greater (e.g., 91, 92, 93, 94, or 95 degrees) to ease separation of the thermoformed article and the mold, but the angle can be smaller if the body of the article recedes away from the periphery, for example. Less preferably, an angle of 110, 115, 120, 125, 130, or 135 degrees can be employed, but such articles may require application of both an upper body **200** to reduce

the angle near to 90 degrees prior to impacting the deflectable flange against the ram **300**. As this angle increases, the amount of thermoplastic that is present at exterior corners (e.g., the four corners of the tray shown in Figures 6A and 6B) of the thermoformed precursor article increases and can interfere with bending (i.e., "rolling-over"). This thermoplastic material can be accommodated, for example, by permitting the spacer to 'bow out' above the ram (or into a space built into the upper surface of the ram) at sections where the material occurs.

[0087] Upon sufficient displacement of the spacer, the bend region forms the periphery of the article (i.e., when the spacer is bent "under" the connected portion of the body, regardless of orientation relative to gravity). Thus, the bend region will normally form the smooth periphery of the article that is desired in one embodiment. The spacer nonetheless forms a part of the periphery of the article in this embodiment (normally the "underside" of the periphery, relative to the article **100**, with the underside **161** of the deflectable flange **160** being contained within the curvature of the rolled-over edge). For this reason, portions of the spacer (potentially including the elbow **130** and the peripheral flange **120**) that are reasonably accessible to a film or other material pressed against the exterior of the article (e.g., against the underside of its periphery) should preferably be smooth as well.

[0088] In formation of the shaped articles with a smooth periphery described herein, deflection of the spacer (and/or other portions) of the deflectable flange induces bending within the bend region, within the spacer, or both. The angular shape of the bend region both controls the location of that bending and the smoothness of the resulting edge. As illustrated in Figures 1 and 8, it can be beneficial if the angular portion of the bend region is not formed as a sharp (i.e., bi-linear) angle, but is instead formed as flat portions (e.g., an extension **50** and a spacer **140**) arranged at an angle to one another, with a curved portion (e.g., defined by a radius of curvature, such as a radius of 1, 2, or 3 or more millimeters) connecting the flat portions. Flexing of a curved angular portion will tend to yield a smoother, less film-damaging edge that flexing of a sharply angled portion. As illustrated in Figures 1, 4, 5, 7, and 8, the boundary between the bend region **150** and the spacer **140** may be substantially indistinguishable in practice, and flexion of the spacer **140**, at least at its extent nearest the bend region **150** is expected in the embodiments shown. As illustrated in Figure 8 especially, bending of multiple

portions, including the peripheral-most portion(s), of the spacer **140** can desirably impart a smooth periphery to the articles prepared as described herein.

[0089] In one embodiment (shown in Figure 1), the deflectable flange **160** includes at least three portions, including the bend region **150**, a peripheral flange **120**, and an elbow **130** positioned therebetween. The bend region **150** is connected to the remainder of the article **100**, optionally by way of an extension **50**. The peripheral flange **120** is connected to the bend region **150** by way of the elbow **130**, optionally with a spacer **140** interposed between the bend region **150** and the elbow **130**. A prototypical deflectable flange **160** having each of these portions is illustrated (attached to the body **10** of an article **100**) in Figure 1A.

[0090] In this embodiment, the bend region **150** is situated anti-peripherally (nearer the body **10**) than at least the peripheral-most portion of the peripheral flange **120**. The function of the bend region **150** is to deflect when the peripheral flange **120** is deflected inwardly (i.e., anti-peripherally, such as by pressing the periphery of the article against a solid object). Deflection of the bend region provides a smooth surface because the peripheral edge **110** of the thermoplastic sheet is not located within the bend region; it is located on the peripheral flange **120**. The angle formed by the bend region (for example, approximately 90 degrees over the bend region **150** shown in Figure 1A) is not critical, and can be selected for ease of manufacture. It can, for example, be an obtuse angle, a right angle, or even an acute angle. When this angle is an acute angle, it can be difficult to remove the thermoformed (pre-roll-over) article from its thermoforming mold (because the peripheral portion of the spacer must be deflected to remove the article from the mold), and acute angles are disfavored for that reason (even though such articles can still be made). The radius of curvature of the bend region **150** is also not critical, although it is preferably substantially greater than the radius of curvature of the elbow **130**.

[0091] The bend region **150** preferably has the conformation of a smooth curve, as shown in Figure 1A, with a substantial radius of curvature (e.g., 0.5 millimeters to several millimeters or more), so that inward deflection of the deflectable flange **160** yields a smooth periphery to the article. However, it is critical that the bend region **150** simply not be sharp or pointed; a non-sharp crease can suffice, for example. Fragile materials, such as thin plastic films or

animal skin, which contact that smooth periphery are much less likely to be damaged than when the same fragile materials contact the peripheral edge **110** of the thermoplastic sheet.

[0092] The bend region **150** can be connected with the remainder of the article **100** by way of an extension **50**. The extension **50** can be discretely discernible from the bend region **150** (e.g., a flat region distinct from a curved bend region **150**) or substantially indistinguishable (e.g., a slightly curved region not readily distinguished from the curvature of the bend region **150**). The dimensions of the extension region are not critical; it can range from non-existent (i.e., the bend region **150** commences at the edge of a body **10** of the article **100**), to a fraction of a millimeter, to several millimeters or longer. One function of the extension **50** is to separate the bend region **150** (at which sheet-softening heat is applied in some embodiments) from other portions of the article **100** at which potential heat-induced deformation is undesirable. Another function of the extension **50** can be to provide a functional surface to the article **100**, such as a surface adjacent the bend region **150** at which a thin plastic film (which can be pressed against the bend region **150** with little danger of damage to the film) can be adhered to or fused with the article **100** (e.g., to cover a cavity formed in the article that is bordered by the deflectable flange **160** of which the extension **50** is part). The extension **50** can also serve a structural function, such as providing support or rigidity to a section of the article (e.g., by forming a relatively rigid "rim" about a cavity in a container to inhibit flexing of the container while lidding is applied). Yet another function of the extension **50** can be to provide a space which the deflectable flange **160** can occupy when it is deflected anti-peripherally. Because the extension **50** and the peripheral flange **120** are situated on opposite sides of the bend region **150**, sufficient flexing of the bend region **150** (e.g., upon insertion of the article **100** within the upper body **200** and insertion of the ram **300** behind the article), the spacer **140**, or both, can cause the peripheral flange **120** (and the spacer **140**) to approach, or even contact, the extension **50**, or to curl or deflect beneath the extension **50** between the periphery of the article and a sidewall of the body of the article (see, e.g., Figure 6E).

[0093] In Figure 1A, the peripheral flange **120** includes the (potentially sharp) peripheral edge **110** of the thermoplastic sheet(s) from which the article is formed. It extends peripherally beyond the bend region **150**, so that it will impinge upon the inner surface **202** of the upper body **200** when the article is inserted into the cavity of the upper body **200**, as shown in Figure

1B. It extends from the elbow **130** to that peripheral edge **110** and extends in a direction from the bend region **150** or the spacer **140**, if present, by an offset angle defined by the elbow **130**. The function of the peripheral flange **120** is to engage with (i.e., impinge upon or be impinged upon by) the inner surface **202** of the upper body **200** when the article is inserted into the cavity of the upper body **200**, thereby causing the deflectable flange **160** to deflect inwardly (anti-peripherally). In addition to displacing the peripheral edge **110** of the sheet anti-peripherally and causing flexing or bending of the deflectable flange **160** in the bend region **150** thereof, this deflection also positions the peripheral flange **120** to be further anti-peripherally deflected when the ram **300** is inserted into the cavity behind the article **100**. When the ram **300** is so inserted, it impinges upon the peripheral flange **120** and, upon further advancement of the ram into the cavity, causes both additional flexing or bending of the deflectable flange **160** in the bend region **150** thereof, and additional anti-peripheral deflection of the peripheral edge **110**.

[0094] The length (elbow-to-peripheral-edge) of the peripheral flange **120** is not critical, but should be selected to facilitate engagement of the ram **300** by the peripheral flange **120** and displacement of the peripheral flange **120** by the ram **300** as the ram advances within the interior of the upper body **200**. Frequently, the length of the peripheral flange **120** is influenced, at least in part, by the ability to cut articles from a material in which the article is formed. The elbow **130** can function, in part, to position the thermoplastic sheet at a location at which it can be conveniently cut to free the shaped article from a precursor sheet. Because the peripheral edge **110** formed by such cutting is a source of sharpness or roughness at the periphery of the article prior to 'rolling over' the deflectable flange **160**, it can be beneficial to cut the sheet as near to the elbow **130** as possible (i.e., to make peripheral flange **120** as small as possible) so as to reduce the bulk of thermoplastic material that must be displaced in order to displace the sharp or rough peripheral edge **110** from the periphery of the article. As illustrated, for example, in Figure 8H, a larger peripheral flange also reduces contact (and increases spacing) between the upper surface of a ram which impinges the deflectable flange, and therefore reduces heat transfer from the ram to peripheral portions of the deflectable flange. Because the methods described herein depend upon heating those portions above their glass transition temperature, deflecting them to a desired conformation, and then cooling the portions

below that temperature, larger peripheral flanges increase the heat input and/or time required for such processing and are disfavored for that reason as well.

[0095] The elbow **130** is interposed between the bend region **150** and the peripheral flange **120**, and its function is to connect and transfer forces between them. That is, compressive forces applied to the peripheral flange **120** by impingement thereupon by the upper body **200** or the ram **300** are translated through the elbow **130** (and the spacer **140**, if present) to torsional force applied to the bend region **150**. This translation of compressive force to torsional force ensures that the bend region **150**, the spacer **140**, or both flex when force is applied to the peripheral flange **120**. Thus, application of force to the peripheral flange **120** by the upper body **200** and/or ram **300** both deflects the peripheral edge **110** anti-peripherally (i.e., displacing the potentially sharp edge away from the periphery of the article) and induces bending of the bend region **150**, the spacer **140**, or both (i.e., yielding a smooth periphery formed by flexed thermoplastic sheet at the periphery of the article), yielding an article which has a smooth periphery, even if the article was formed by a process that yields a sharp peripheral edge at an intermediate step. In effect, the elbow causes forces applied to the peripheral flange **120** to induce the deflectable flange **160** to "roll over" the periphery of the article, effectively "hiding" the sharp edge of the thermoplastic sheet from materials at the periphery of the article.

[0096] A spacer **140** can be interposed between the bend region **150** and the elbow **130**. The spacer **140** can be discretely discernible from the bend region **150** (e.g., a flat region distinct from a curved bend region **150**) or substantially indistinguishable (e.g., a slightly curved region not readily distinguished from the curvature of the bend region **150**). The dimensions of the extension region are not critical; it can range from non-existent (i.e., the bend region **150** commences at the elbow **130**), to a fraction of a millimeter, to a few millimeters or longer. One function of the spacer **140**, if present, is to act as a 'lever' by which force applied at the elbow **130** (e.g., by impingement between the peripheral flange **120** and one or both of the upper body **200** and the ram **300**) is transmitted to the bend region **150**. Another function of the spacer **140**, if present, can be to position the peripheral flange **120** suitably to engage one or both of the upper body **200** and the ram **300**. Yet another function of the spacer **140**, if present, is to increase the distance by which the potentially sharp peripheral edge **110** of the thermoplastic sheet can be displaced anti-peripherally from the periphery of the article upon

flexing of the bend region **150**. All else being equal, the longer the spacer **140** is, the farther from the article's periphery that potentially sharp edge will be when the article is made as described herein. A deflectable flange including the spacer **140**, but lacking the elbow **130** and peripheral flange **120** can be used, as shown for example in Figures 8A-8D.

[0097] A longer spacer **140** facilitates formation of one or more portions of the "rolled edge" that is taller than other "rolled" portions of the edge, yielding a structure useful as a stacking lug (e.g., to facilitate selectable spacing between the rolled edges of adjacent nested, stacked articles). In one embodiment, the size of the spacer and the compressive force applied to the spacer (i.e., the force transmitted to the spacer from the extension region, balanced by resistive force applied to the spacer on account of its impingement upon the ram) can cause the spacer to flex outwardly (i.e., peripherally away from the body of the article), forming a smooth bulge that, upon cooling, forms the outer periphery of the article.

[0098] Regardless of whether the bend region **150**, the spacer **140**, or both are bent in the operations described herein, and further regardless of whether material that was originally part of the bend region **150**, the spacer **140**, or both ultimately form the outer periphery of the articles described herein, what is important is that that outer periphery be free (or, less favorably, substantially free) of sharp, pointed, rough, or abrasive edges that might damage thin plastic films, human tissues, or other fragile materials which might contact that outer periphery.

[0099] Thermoplastics

[0100] The methods and articles described herein can be performed and made with substantially any thermoplastic material. What is important is that the material be capable of being softened by heating and re-stiffened upon cooling, at least in the deflectable flange **160** described herein. Substantially all thermoplastics exhibit a characteristic temperature above which they soften and become flexible or workable and below which they become more rigid and retain their shape. Desirable thermoplastics for the articles and methods described herein retain their shape under normal conditions of the anticipated end use of the container. It is also desirable to use thermoplastics which can be softened under conditions that are readily attainable in a manufacturing environments. Examples of suitable thermoplastics include polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), and polyvinyl

chloride (PVC). Other suitable thermoplastics are apparent to skilled workers in this field, and substantially any of these can be used. Also potentially useful are flexible plastics having deformable materials such as metal foils bound to their surface.

[0101] The thermoplastic article includes a thermoplastic material, including at at least the portions of the article at which the deflectable flange **160** described herein is formed or present. The identity of the thermoplastic material is not critical, nor is the presence or absence of non-thermoplastic materials. Where non-thermoplastic materials are present (e.g., in a thermoplastic sheet to which a metal foil or a paperboard layer is laminated), the rigidity imparted to the article by the thermoplastic material in its non-softened, non-molten state is preferably sufficient to define the conformation of the article, even when the non-thermoplastic material is bent. The article can include one or more peelable layers, for example as described in co-pending U.S. patent application 13/415,781. When one or more peelable layers is present, it is substantially unimportant whether those layers are "rolled over" at the peripheral edge of the shaped article (rather than the edges of the peelable layers peeling from the underlying substrate). Both for aesthetic reasons and to promote sealing, it can be preferable that any peelable layers remain adhered. When peelable layers are present and adherence is to be promoted, the working temperature should be selected both to be suitable for deflection of the deflectable flange as described herein and for working the substrate and peelable layers of the shaped article without causing delamination of the peelable layers.

[0102] The Upper Body **200**

[0103] The upper body **200** performs a number of functions. Overall, its function is to contain the deflectable flange **160** described herein within a cavity in the upper body **200** while heat is applied to one or more portions of the bend region **150** thereof. This containment function can prevent non-desired deformation (or guide desired deformation) of the deflectable flange **160** or portions of it during the periphery-smoothing operations described herein. The shape of the interior cavity of the upper body **200** can also affect the shape of the deflectable flange as it bends, particularly as it is softened. By way of example, in Figure 1B, the upper body **200** includes a cavity with an internal right angle into which a portion of the bend region **150** is forced; the right-angle shape of this portion of the cavity will tend to cause the bend

region **150** to conform to a right-angle shape, especially as the bend region **150** softens. The heat source can be a part of the upper body **200**, applied to the upper body **200** for conduction of heat therethrough, for example. The upper body **200** also impinges upon and is impinged upon the peripheral flange **120** of the deflectable flange **160** when it is inserted into that cavity. When a ram **300** is used, the upper body **200** also serves to prevent the deflectable flange **160** from being forced out of the cavity, and it can also limit deflection of the bend region **150** when the deflectable flange **160** is being compressed by the ram **300**.

[0104] The materials from which the upper body is constructed are not critical, other than that they should be suitable to withstand the manufacturing conditions described herein. That is, they should not melt or degrade at the temperatures used in the processing. A wide variety of metal, ceramic, stone, and polymeric materials can be used.

[0105] It is important that the shape of the upper body **200** be selected so that impingement between the interior of the cavity in the upper body **200** and the peripheral flange **120** will occur when the article **100** described herein is inserted into the cavity in the upper body. The upper body can have a shape sufficient to simultaneously impinge multiple peripheral flanges **120** on an article, or to impinge upon most or all of a single peripheral flange **120** that occurs upon an article (e.g., one which occurs about the entire peripheral edge of an article). As illustrated in Figure 2, the upper body **200** can be formed of a solid block of material that covers an entire face of an article while impinging peripheral flange(s) **120** that occur on one or more portions of the article. The upper body **200** depicted in Figure 2, for example, is designed to impinge upon the single peripheral flange **120** that extends completely around the periphery of an article having the shape of a rectangular tray-type container having rounded corners.

[0106] The bend region **150** of the articles described herein will typically be within the cavity of the upper body **200** when heat is applied to that bend region **150**. For that reason, the upper body should be constructed in a way that facilitates application of such heat. The upper body **200** can, for example, include a heat source (e.g., electrically operated heating plates or rods) within it, applied to it, or fluidly connected with it. Alternatively, the upper body **200** can include one or more ports through which a heated fluid (e.g., a heated gas or liquid) can pass from a source into the interior of the cavity therein. The method selected to deliver heat to the bend region **150** (and/or other portions of the peripheral flange, such as the spacer **140**, the

elbow **130**, and the peripheral flange **120**) is not critical, and any of a variety of well-known heat delivery methods and equipment can be used. If the upper body **200** is able to conduct heat and is cooled, then heat that is present in the deflectable flange **160** during its shaping can flow to the upper body **200**, and this heat flow can serve to cool and thereby stiffen the deflectable flange **160** in its deflected position upon its compression between the upper body **200** and the ram **300**, for example.

[0107] As shown, for example in Figures 5 and 8, the deflectable flange can be deflected using a ram **300** alone, with or without use of an upper body **200**. The upper body can be used both to partially deflect the deflectable flange and to apply force to the article so as to impinge the deflectable flange thereof against the ram. When the upper body **200** is not used, some alternate means of applying force to the article to cause impingement between the ram and the deflectable flange must be used. In Figure 8D, for example, this alternate means is depicted simply as object **403** (optionally coordinated with object **402**). The orientation of the parts relative to gravity is not important, the "downward" force (open arrow in Figure 8D) need only be directed so as to urge the deflectable flange **160** against the ram **300** to cause impingement between the two. It is also immaterial to which of the article and the ram (or both) force is applied in order to cause such impingement. What is important is that impingement of the deflectable flange **160** against the ram **300** (and/o the upper body **200**, if used) induces deflection of the peripheral edge **110** of the deflectable flange to a position where it is not readily accessible at the periphery of the article. Thus, in one embodiment, the upper body **200** can be a simple flat plate which can be applied against a flat portion (e.g., the extension **50** of the deflectable flange **160** depicted in Figure 8D) of the article to drive the deflectable flange in the direction of, and ultimately against, the ram.

[0108] The Ram **300**

[0109] The primary function of the ram **300** is to induce deflection in the deflectable flange. The ram can be used with or without a corresponding upper body **200**, but such an upper body can serve to contain and control the article as it is contacted with the ram. The method and mechanism(s) used to impart relative motion between the article and the ram are not critical. When an upper body is employed, the ram is used to impinge upon and apply compressive

force to the peripheral flange **120** of the deflectable flange **160** when the article is disposed in the upper body **200**. This compressive force tends to drive the peripheral flange **120** upwardly toward the bend region **150** and the extension **50**, if present, and anti-peripherally, thereby moving the potentially sharp peripheral edge **110** of the thermoplastic sheet away from the periphery of the article so formed. Accordingly, the design of the ram **300** is not particularly critical, so long as such compressive force is applied. As illustrated in Figures 1C and 4, a ram **300** having an angled upper face **302** will tend to direct the peripheral flange **120** in the direction along that angle as it compresses the peripheral flange **120**. Thus, it can be beneficial to shape the upper face **302** of the ram **300** in a conformation that deflects or "pushes" the peripheral flange **120** and/or the peripheral edge **110** anti-peripherally as compression occurs.

[0110] Like the upper body **200**, the materials from which the ram **300** is made are not critical. Metals, ceramics, stones, and polymeric materials capable of withstanding the temperatures and pressures of operation are suitable and readily selectable by a skilled artisan. If the ram **300** is able to conduct heat and is cooled, then heat that is present in the deflectable flange **160** during its shaping can flow to the ram **300**, and this heat flow can serve to cool and thereby stiffen the deflectable flange **160** in its deflected position upon its compression between the upper body **200** and the ram **300**, for example. Heat can likewise be provided by the ram **300** to one or more portions of the deflectable flange in conventional ways, such as by using a heated ram or incorporating a heating element into or onto the ram.

[0111] In an embodiment illustrated in Figure 2, a single ram **300** can be constructed to impinge upon substantially all peripheral flanges **120** of an article simultaneously. The ram **300** depicted in Figure 2, for example, is designed to impinge upon and apply compressive force to the single peripheral flange **120** that extends completely around the periphery of an article having the shape of a rectangular tray-type container having rounded corners.

[0112] In an alternative embodiment illustrated in Figure 5, the deflectable flange **160** of an article is heated to softening and impacted against a ram **300** in the absence of an upper body **200** of the type described herein. The absence of an upper body **200** may lead to distortion or deflection of softened portions of the deflectable flange **160**, at least if the other portions (e.g., the extension **50** or parts of the body **10** of the article **100** that are adjacent the deflectable flange **160** are insufficiently rigid to prevent such distortion or deflection. However, if such

rigidity is present, or if such distortion or deflection is tolerable in the final product, the methods described herein can be used without an upper body **200**.

[0113] Figure 5 also illustrates the significance of the length (measured from the elbow to the peripheral edge) of the peripheral flange. The peripheral edge contacts the ram. Force imparted upon the peripheral edge by the face **302** of the ram induces deflection of the deflectable flange **160** toward the body **10** of the article **100**. When the deflectable flange **160** includes a peripheral flange **120** that is offset from the spacer portion **140** by a ninety-degree elbow **130**, as shown in Figures 5A and 5B, the length of the peripheral flange will influence the degree of deflection of the deflectable flange. Comparing Figure 5C (a deflectable flange in which the "length" of the peripheral flange is zero; i.e., a deflectable flange lacking a peripheral flange) with Figure 5B, it can be seen that the presence of the peripheral flange induces greater deflection of the deflectable flange in the configuration shown. Moreover, looking to Figure 5A, increasing the length of the peripheral flange increases the degree of deflection induced by the ram. Thus, although the elbow and peripheral flange are optionally not present, their presence enhances deflection and can enhance the "rolling" effect that can be achieved.

[0114] Figure 10 depicts an embodiment of the ram **300** described herein for rolling over the edge of a shaped article having a deflectable flange **160**. Figure 10A depicts a ram **300** having at least two positions for accepting articles **100** having deflectable flanges as described herein. The upper portion of the figure shows a position that bears an article **100**. Because it does not bear an article, the position partially shown in the lower right of the figure reveals the upper surface **302** upon which the article is borne when present. The position in which an article is borne in the figure has an identical upper surface **302**, but it is obscured by the spacer **140** and peripheral flange **120** of the article **100** borne therein. This figure also illustrates how the extension **50** spaces the body **10** of the article away from the spacer and away from the ram, providing space (visible through the clear material that forms the extension) into which the spacer and peripheral flange can be deflected, bent, or curled.

[0115] Figures 10B and 10C show details of the upper surface **302** of the ram **300**, including a curved portion (at approximately D in Figure 10C) which will deflect the peripheral edge **110** of the deflectable flange when urged against it at a softened temperature. Figure 10B is a close-up image of the upper surface, and Figure 10C is a cross-sectional diagram

illustrating the approximate shape of that upper surface. In operation, the ram is used by impinging the peripheral edge **110** of the deflectable flange against the upper surface **302** (from the 'downward' direction indicated by the open arrow in Figure 10C) at a position anywhere between positions B and D, and then applying further downward force to drive the peripheral portion of the deflectable flange further against the ram. This further force induces the peripheral edge to slide, scrape, or skip across the upper surface and induces the deflectable flange to deflect inwardly (i.e., toward the body of the article which, in this embodiment, is located closer to the E position than to any of A-D). When the deflectable flange is heated above its softening point (i.e., glass transition temperatures), this deflection will be non-elastic and will be reflected in the shape of the deflectable flange if it is thereafter cooled to a temperature below its softening point.

[0116] The curved portion of the upper surface **302** of the ram **300** between positions C and E in Figure 10C induces the softened portion of the deflectable flange to roll or curve, and the degree of curvature induced is controlled by the extent to which the deflectable flange is impinged against the ram. Thus, for example, only the peripheral-most portion of the deflectable flange might be deflected if the deflectable flange is caused to impinge only slightly against the upper surface after softening, the peripheral edge will be pointed approximately toward the body if a softened portion of the deflectable flange is impinged to the extent of position D, and the peripheral edge of the deflectable flange will be effectively "rolled over" (i.e., the plane of the deflectable flange at its peripheral edge extends to intersect the underside **161** of the deflectable flange) if a softened portion of the deflectable flange is impingingly extended beyond position D (as shown in Figures 8G and 8K, for example). Depending on the material from which the deflectable flange is made, the deflectable flange can substantially retain its shape as it cools in the 'rolled over' configuration (e.g., PET and PVC materials tend not to slump or droop when acted upon by gravity in a softened state, while PE and PP materials can be bent substantially by gravity alone when softened). Even when this is not so, so long as the peripheral edge of a deflectable flange that droops or slumps does not expose the peripheral edge at the periphery of the article, such bending is acceptable (e.g., when the rolled-over edge is rolled over sufficiently that any drooping occurs in the interior space of the roll).

[0117] Sealing Films

[0118] An important advantage of articles having peripheries treated in the manner described herein is that such treatment renders the articles suitable for sealing with thin plastic films. Sealing articles with thin plastic films is a well-known process, and many suitable films are known (e.g., thin monolayer or multilayer sheets made of materials such as polyethylene or polyvinylidene chloride, optionally including polymer layers which inhibit passage of moisture or certain gases). Articles can be sealed with plastic films, for example, by completely enveloping the article in the film and sealing the film to itself. Alternatively, articles can be sealed by sealing a film about the periphery of a concavity, compartment, or other orifice defined by an article and, if desired, thereafter trimming the portion(s) of the film beyond that periphery. All technologies for sealing articles with thin plastic films are believed to involve at least intermittent contact between peripheral areas of the article and the film used for sealing.

[0119] It is therefore beneficial for an article to be sealed with a thin plastic film to be free, or at least substantially free, of sharp, pointed, rough, jagged, or abrasive structures, at least at areas of the article which contact the film. It is particularly important that such structures be absent from the surface of the article which will necessarily contact sealing films, and highly desirable that these structures are also absent from article surfaces which are likely to contact sealing films, whether during the sealing process, or whether during further packaging, shipping, unpackaging, or retail display of the film-sealed article. Still more preferably, articles to be wrapped with a thin film bear no such structures at surfaces at which there is a substantial likelihood of contact between the surface and the film during any of these processes. Ideally, the articles bear no such surface at any position at which a film used for sealing might reasonably be expected to contact the surface position during these processes.

[0120] A wide variety of thin plastic films are known to be useful for sealing containers, and substantially any of these films can be used to seal the shaped articles described herein (or compartments thereof). Selection of sealing films (and materials for making shaped articles compatible with such sealing films) is well known in the art, and substantially any known combination of materials can be adapted for use with the shaped articles described herein. By way of example, when a sealing film is to be removably sealed about a shaped article described herein (e.g., an overwrap film that is sealed to itself but not to the wrapped article), the

materials used to make the shaped article should be selected such that it will not fuse with the film under the sealing conditions to be used. By contrast, when a sealing film is to be substantially permanently sealed to a shaped article (e.g., about the perimeter of a compartment defined by the article), the material(s) used to make the article should be selected to facilitate formation of a substantially permanent seal under practical processing conditions. Similarly, combinations of sealing and container materials and operating conditions that yield containers sealed with material that is peelable therefrom are known and can be used.

[0121] One highly desirable embodiment of the articles described herein is a tray-shaped article that is made by thermoforming (and that therefore possesses potentially sharp peripheral edges prior to the edge-rolling treatment described herein) such that it possesses about its entire periphery the deflectable flange described herein and for which the peripheral edge is deflected beneath the extension and behind the spacer and bend region of the deflectable flange, about the entire periphery of the tray, sufficiently that the peripheral edge cannot be touched by a human fingertip that is swiped along the gap between the deflected peripheral flange and the body of the tray, even if that fingertip is swiped along this gap around the entire periphery of the tray. Such a tray will bear no sharp, pointed, rough, jagged, or abrasive edge at any position that can reasonably be expected to contacted by a sealing film, regardless of whether OW, VSP, or MAP technology is used in the sealing process. A tray suitable for use with all of these sealing technologies is highly desirable and believed to be unavailable prior to the disclosure of the subject matter described herein.

[0122] Many plastic films used for sealing of articles are flexible and do not thermoset over the range of temperatures ordinarily employed during sealing and subsequent handling. Flexible films that are sealed to surfaces are sometimes difficult to remove in a single piece from the sealing surface. For example, a flexible film that is sealed about the flat periphery of a tray may tear or split when one portion of the film is pulled away from the tray, potentially requiring a user to remove the film in multiple passes or many strips or pieces. Such difficulties may be particularly acute in situations in which the sealing surface is broad, such as in a VSP-sealed package in which a sealing film may be adhered to or fused with a relatively large area of a tray on which an item has been sealed between the film and the tray. The technology described herein can be used to reduce or overcome this difficulty as follows.

[0123] The shaped articles described herein (e.g., a tray-shaped article having a smooth periphery) can be sealed with a thermosettable (i.e., thermoformable) film to yield an article in which the thermoformable sealing film is heated above its glass transition temperature to soften it and applied against the smooth periphery of the shaped article. A thermoformable film that is heated above the glass transition temperature of the material of which it is made and thereafter cooled below that temperature will retain whatever conformation the film has (e.g., a conformation imposed upon it) when the temperature falls below its glass transition temperature. Thus, if a thermoplastic film is formed "around" (i.e., extending more than about 90 degrees about) the smooth outer periphery of an article described herein, the film will be held to the article not only by whatever attraction or adhesion may exist between the film and the article surface, but also by mechanical forces (i.e., the film's resistance to deflection about the smooth outer periphery), forming a structure analogous to a "snap off" lid.

[0124] Even though softened thin plastic films can be extremely delicate (e.g., liable to be damaged by sharp, pointed, rough, jagged, or abrasive surfaces), the smooth periphery of the shaped articles described herein permits even such delicate films to be applied thereto. In one example, a shaped article in the form of a tray having a smooth periphery can be VSP-sealed to encase an article between a softened thermoplastic sealing film and the tray, with little or no gas included within the sealed portion. Furthermore, the smooth periphery of the articles described herein permits a softened film to be drawn, pressed, or formed around the smooth periphery – that is, contacting not only the top portion of the periphery (i.e., analogous to the extension **50** of the article edge depicted in Figure 9B), but around the bend region **150** of the deflectable flange, and along the spacer **140** and any bent or rounded portions thereof (such as to or around the rounded underside **145** of the spacer depicted in Figure 9B) and thereafter set by reducing the temperature of the sealing film below its glass transition temperature. Such a seal will form a relatively rigid "lid" and, even if the film is not adhered or fused to the shaped article where the film intersects the article, frictional forces or the shape of the "lid" (e.g., turned about the rounded underside **145** of the spacer depicted in Figure 9B, such that the "lid" must be stretched or expanded to disengage it from the rolled over peripheral flange **160**) can hold the sealing film in place on the article. Furthermore, because softened thermosettable film can be substantially thicker, therefore stronger, and/or more rigid than thin flexible sealing films, a

thermosettable sealing film can form a seal or "lid" that can tend to be more likely removable in a single piece.

[0125] In one embodiment of the shaped articles described herein, for example, the article is a tray having a food item placed thereon, with a thermosettable film draped across the food item and the periphery of the tray while the film is in a softened state; gas between the film and the tray is withdrawn to form a VSP-type seal (with the film closely opposed against the food item and the tray surface upon which the food item rests); and the film is draped around (from the top, to or around, the bottom of the periphery), optionally sealed or fused to the tray, trimmed about the bottom of the tray periphery, and cooled. In the finished tray, the "lid" formed upon cooling of the film must be "snapped off" the tray by stretching the edge of the lid around the periphery of the tray, but once this operation is performed, the entire lid can be removed from the tray in a single piece.

[0126] In another embodiment, a shaped article described herein is sealed (after its smooth outer periphery has been formed) using a thermoformable plastic film that is extended across a compartment defined by the article and at least about 90 degrees about opposed smooth peripheral sides of the article (i.e., opposite ends of a rounded rectangular tray). The film is heated above its glass transition temperature and cooled below that temperature while extended about the opposed smooth peripheral sides. If desired, a vacuum or modified atmosphere can be applied to the compartment during such sealing. The resulting article has a thermoset film cover that must be stretched (or "snapped") around at least one peripheral side of the article in order to remove the film from the article (in addition to any other seal that may exist between the film and the article).

[0127] The shaped article described herein can be used in ways which are believed to be not possible using previously-known trays. Typically, others have used containers especially designed and made for each of the various sealing technologies described herein (e.g., OW, VSP, and MAP technologies) for sealing containers with thin plastic films. That is, food trays designed for OW-sealing have been generally considered unsuitable for VSP- and MAP-wrapping (e.g., owing to the lack of surfaces suitable for sealing in VSP- and/or MAP-technologies). Similarly, the sharp edges of many containers designed for use with VSP- and

MAP-sealing technologies render those containers unsuitable for overwrapping with fragile polymer films. The shaped articles described herein can be used to make shaped articles that can suitably be used as containers for sealing by any of OW, VSP and MAP technologies. Because the shaped articles are thermoformed, container surfaces suitable for VSP- and/or MAP-sealing can be included in the shape of the articles. Using the methods described herein, any edges of a shaped article which might provide a risk of tearing sealing films (or, alternatively, all edges of the shaped article) can be made to have a smooth conformation, such as by forming a rolled-over edge or by smoothing the shape of the mold used for thermoforming the precursor article. Thus, unlike previously-known trays, the shaped articles described herein can be used with substantially any film-sealing technology.

[0128] Other advantageous uses of the shaped articles described herein relate to the smoothness of their edges. The articles can be used in substantially any environment in which it is desirable or necessary that a solid object exhibit smooth edges. By way of example, instruments used in surgical procedures are typically packaged in openable containers (to permit reuse and sterilization between uses) that are opened by personnel wearing easily-torn surgical gloves during medical surgery procedures. Thermoformed articles (e.g., so-called "clam-shell" type snap-open packages of known design) can be made as described herein, with those articles being initially made having a deflectable flange wherever they are cut from the web of thermoformed material, and thereafter rolling over that deflectable flange to yield the smooth edge described herein. Articles made in this manner will present smooth edges to users, reducing the likelihood that surgical gloves will be torn by opening such packages during surgery procedures. Similarly, thermoformed packages of known design that are employed to facilitate handling, to inhibit theft, or to achieve other ends can be adapted (e.g., by including a deflectable flange in their design and rolling it over) to take advantage of the edge-smoothing technology described herein.

[0129] System for Forming Articles

[0130] As described above, precursors of the shaped articles described herein can be formed by standard thermoforming methods, using standard thermoforming equipment. To do so, a thermoforming mold is used to make a precursor article by imposing upon a thermoplastic

sheet the desired conformation of the finished article, except that the deflectable flange described herein is included at the peripheral edge(s) at which the smooth periphery is to be formed. Upon cutting the precursor article from the web of thermoplastic sheet, the edge-smoothing operations described herein can be performed by impinging the deflectable flange upon the ram (optionally with the aid of an upper body).

[0131] Newly-thermoformed precursor articles will tend to emerge from the thermoformer at a temperature close to (but below) the glass transition temperature of the thermoplastic. Impinging the deflectable flange and the ram shortly after removing the precursor article from the thermoformer can reduce the quantity of heat energy which must be supplied to one or more portions of the deflectable flange in order to achieve the desired deflection (or "rolled over" edge effect) of the deflectable flange described herein. For this reason, it can be desirable to combine the thermoformer, the ram, and an impingement mechanism into a single system or a single piece of equipment. Such a system or piece of equipment should include i) a thermoformer module capable of forming the precursor article; ii) a cutter for cutting the precursor article from a thermoplastic sheet or roll from which it was formed; iii) the ram; and iv) a mechanism for positioning the precursor article against the ram (i.e., so that the deflectable flange portions line up with the corresponding ram portions) and impinging the precursor article and the ram together. The heat required during the deflectable flange-deflection operations described herein can be provided by the ram, by the cutter (e.g., using a heated cutting blade to heat the peripheral edge and an adjacent peripheral portion of the deflectable flange above the softening temperature of the thermoplastic), by a separate heater (e.g., a radiant heating element disposed in close opposition to the ram when it is engaged against the deflectable flange), or by a combination of these. The precise selection, orientation, order, and construction of these pieces of equipment are not critical and can be selected by a skilled artisan in light of the requirements and processing steps described herein. The system or equipment can also include the plug described herein for insertion within a void in the precursor article prior to impingement of the deflectable flange against the ram.

[0132] Example

[0133] The subject matter of this disclosure is now described with reference to the following Examples. These Examples are provided for the purpose of illustration only, and the subject matter is not limited to these Examples, but rather encompasses all variations which are evident as a result of the teaching provided herein.

[0134] Example 1

[0135] Figures 6A and 6B illustrate a thermoplastic tray which was thermoformed from a flat sheet of thermoplastic material and then cut from the sheet. The sharp edge formed by the cutting process is shown in each of these figures, with a finger touching the sharp edge. After the smoothing process described herein was performed on these trays, the appearance of the trays was approximately that shown in Figure 3, in which the sharp edge has been "rolled over" such that it faces the body of the tray and a smooth portion, formed by flexing at least the bend region of the deflectable flange and heating and cooling it to yield a smooth outer periphery to the tray which will not impact either upon a thin plastic film attached to the rim of the tray or upon a thin plastic film which is snugly wrapped about the entirety of the tray.

[0136] Example 2

[0137] This example is provided for the sake of explaining formation and sealing of a shaped article as described herein. In this example, formation, filling, and sealing of a container containing a cut of fresh fish is described.

[0138] A shaped article for receiving the fish is formed by traditional thermoforming methods. A thermoformable material (e.g., PET) in sheet form is heated above its glass transition temperature and urged against a mold using traditional thermoforming techniques (using either a male or female mold, with or without the application of positive and/or negative pressure to urge portions of the sheet against portions of the mold). Such themoforming yields a tray-shaped container having a rounded rectangular shape overall and including a concave interior portion for receiving the cut of fish. The rounded rectangular overall shape of the container is defined by a deflectable flange that surrounds the interior portion about the entire perimeter of that interior portion. The deflectable flange has the configuration shown in Figure 1A, and the tray has the approximate shape of the tray shown in Figure 6D upon cutting the

thermoformed tray from the sheet at peripheral edge **110** of the deflectable flange **160**. The die used to cut the tray from the sheet is heated so that the peripheral edge of the tray is at or near its glass transition temperature.

[0139] A plug having a shape that substantially fills the interior portion of the tray at the portions adjacent the extension **50** of the deflectable flange **160** is inserted into the interior portion (approximately as shown in Figure 8Dii). The plug-filled tray is then inserted into a ram **300** (approximately as shown in the upper position in Figure 10A, except that no plug is present in Figure 10A), so that the peripheral edge **110**, the spacer **140**, or both contact the upper surface **302** of the ram **300** at substantially all portions of the deflectable flange. Downward pressure (referring to Figure 10A, the force being applied downwardly from the top of the image) is applied to the extension **50** of the deflectable flange **160** about the entire periphery of the interior, driving the spacer **140** and/or peripheral edge **110** portions of the deflectable flange **160** against the ram. The deflectable flange is driven against the ram to a position analogous to that shown in cross-section in Figure 8H, and the parts are held in this position for a period of time sufficient for at least the portion of the deflectable flange indicated by "B" in Figure 8 J to attain a temperature above its glass transition temperature by virtue of heat conducted or radiated thereto from the ram. The deflectable flange is thereafter urged (by the force applied to the extension **50**) further against the ram so that the peripheral edge **110** slides, scrapes, or skips across the inner surface **302** of the ram **300** and the deflectable flange advances to approximately the position shown in Figure 8J. If desired, the deflectable flange can be further advanced to the position shown in Figure 8K, optionally upon pausing to permit additional portions of the deflectable flange to achieve a temperature above its glass transition point. Also, if desired, a coolant such as ambient air can be injected (e.g. at the position occupied by element 120 in Figure 8K) to reduce the temperature of the deflectable flange at the injection point, in order to prevent further irreversible deflection of such portion. The deflectable flange is urged against the ram sufficiently that the peripheral edge is not readily accessible to films or other materials present at the periphery of the tray.

[0140] The force urging the deflectable flange against the ram is discontinued, and the article is removed from contact with the ram, whereby the material of the deflectable flange cools below its glass transition temperature and retains its shape in the absence of applied force.

At this point, a shaped article in the shape of the desired tray has been formed, the tray having a smooth periphery. The tray can be used immediately for packaging the cut of fish or, more typically, it can be stacked with other such trays and shipped to a fish processor.

[0141] Whether the tray is used immediately after formation or retrieved by de-nesting the tray from a stack of trays, the cut of fish can now be deposited within the interior compartment of the tray, together with any other materials (e.g., sauce, an absorbent pad, vegetable, or seasonings) to be packaged therewith in preparation for sealing. Any of a number of known sealing technologies can be used to seal the container and the fish.

[0142] The tray can simply be over-wrapped with a thin plastic film (the film extending across the opening of the compartment between extensions **50** on opposite sides of the compartment, around smoothly-bent bend region **150** and/or spacer **140** of the deflectable flange **160**), and the terminus of the film can be sealed to a portion of the film overlaying the tray, for example by application of a heated pad against the terminus and the portion, followed by heat-shrinking of the film to yield a visually pleasing taut film surface. Because the tray has no sharp or rough edges at its periphery, the overwrapped film is not torn during sealing, nor do such edges tear, snag, or abrade other sealed packages during shipping. The over-wrapped, fish-containing container can be packaged (e.g., in a box with other such containers or in a plastic bag containing both a selected gas or liquid phase and other such containers), and shipped to a wholesaler, retailer, or customer.

[0143] Rather than sealing the package using an over-wrap that is sealed to itself, the container can be sealed after filling with a film that does not envelop the tray, but instead seals the compartment at the extension **50** about the periphery of the compartment. Such a seal can be generated by simply sealing a film (using any one or combination of heat, pressure, and an adhesive) to the extension **50** and, preferably, trimming the film about the periphery of the seal (e.g., by trimming the film at approximately the peripheral extent of the container). If desired, any free ends of the film seal can be shrunk using heat. Prior to sealing, a vacuum can be applied to withdraw gases from the interior of the compartment and to draw the film against the contents of the compartment, and a selected gas or gas mixture can optionally be injected prior to sealing.

[0144] The disclosure of every patent, patent application, and publication cited herein is hereby incorporated herein by reference in its entirety.

[0145] While this subject matter has been disclosed with reference to specific embodiments, it is apparent that other embodiments and variations can be devised by others skilled in the art without departing from the true spirit and scope of the subject matter described herein. The appended claims include all such embodiments and equivalent variations.

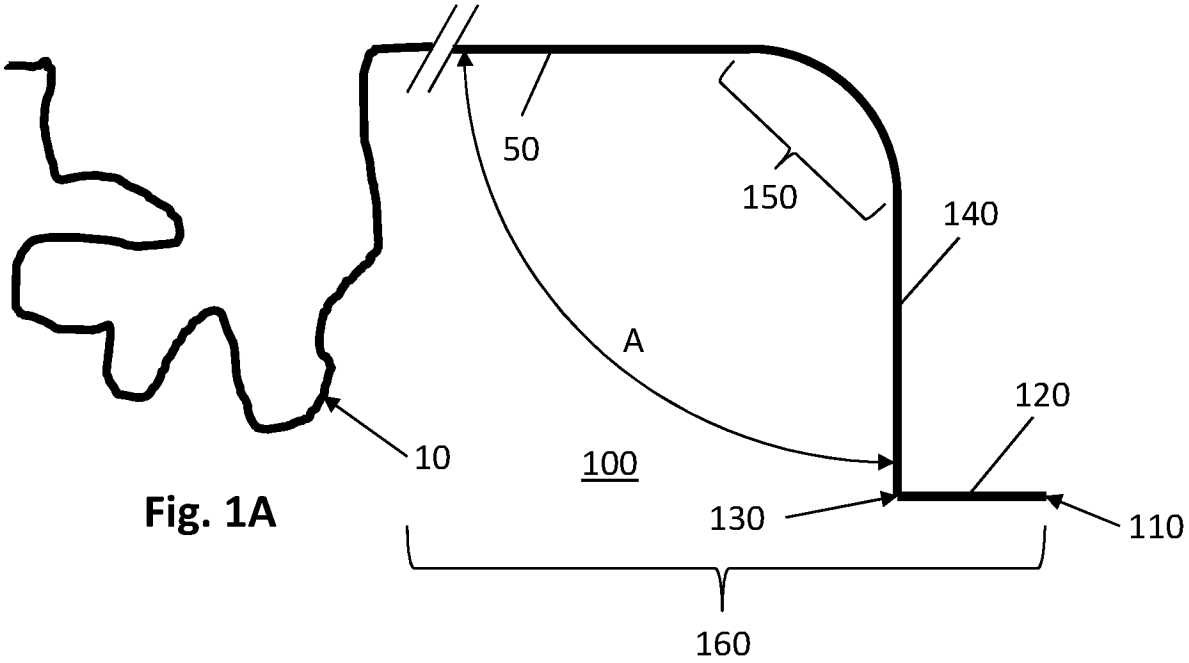


Fig. 1A

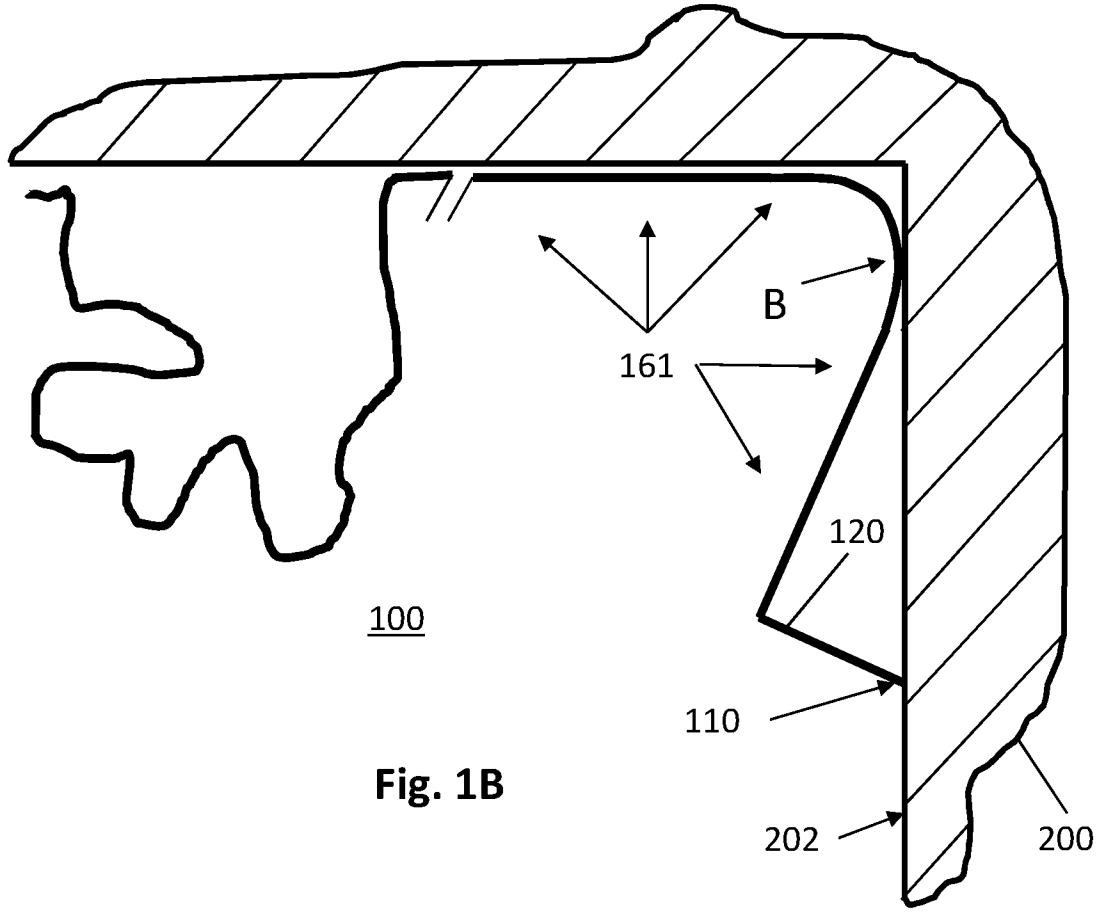


Fig. 1B

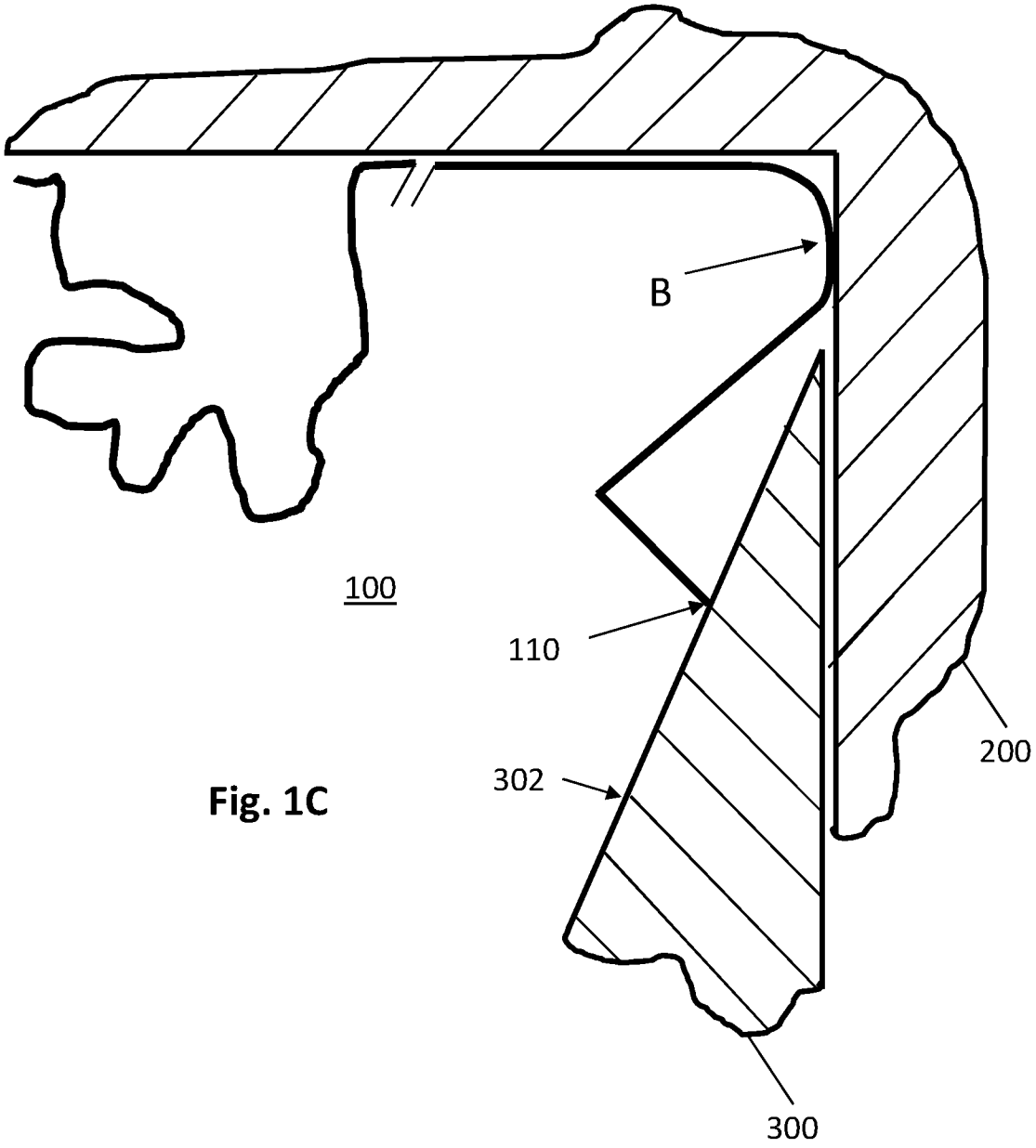


Fig. 1C

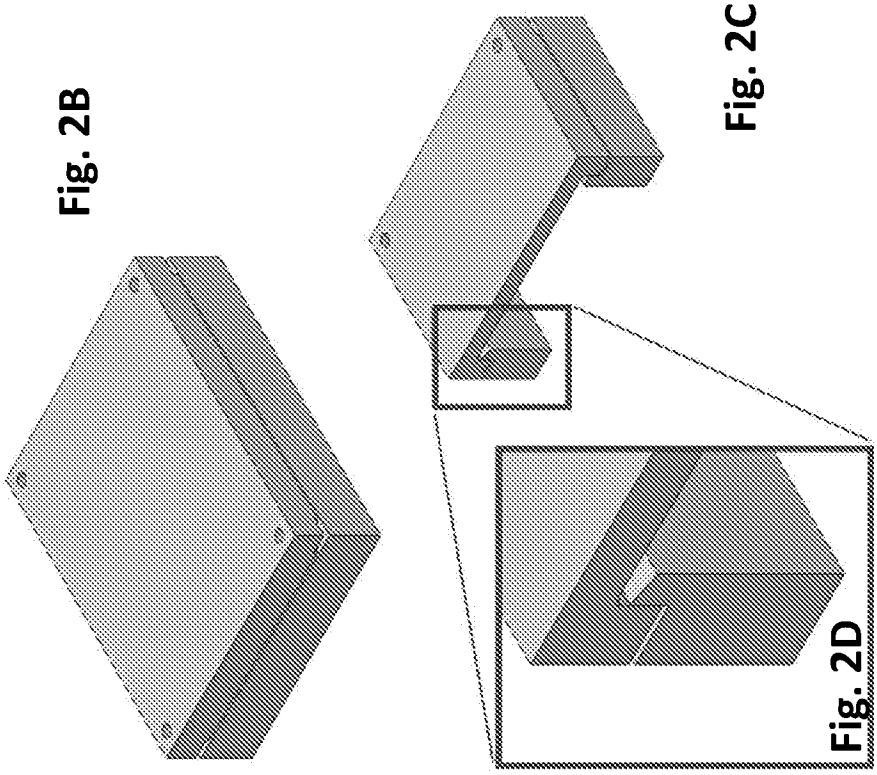


Fig. 2B

Fig. 2C

Fig. 2D

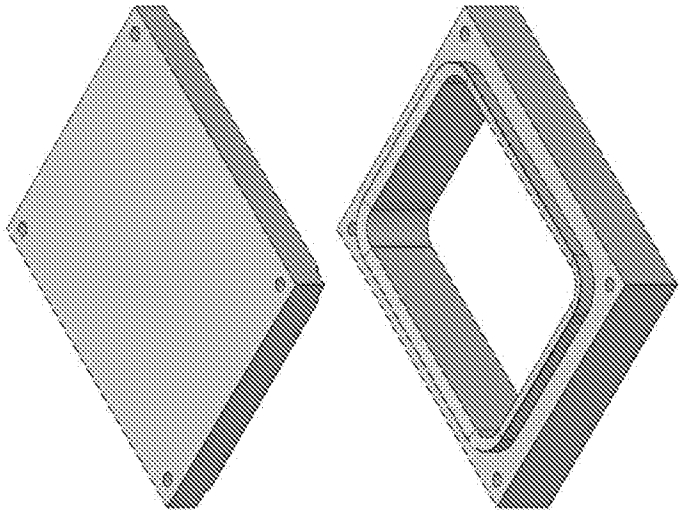


Fig. 2A

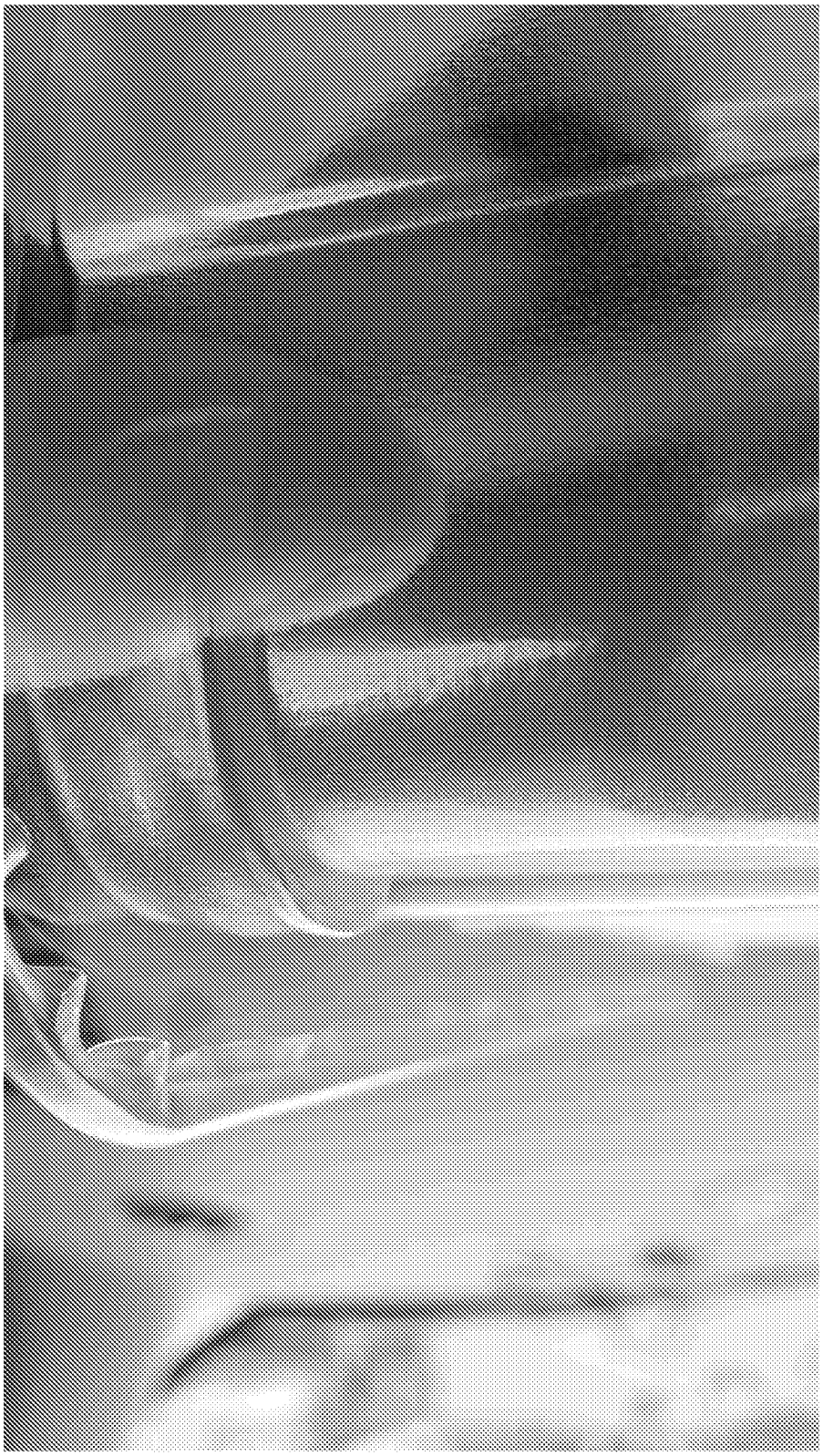


Fig. 3A

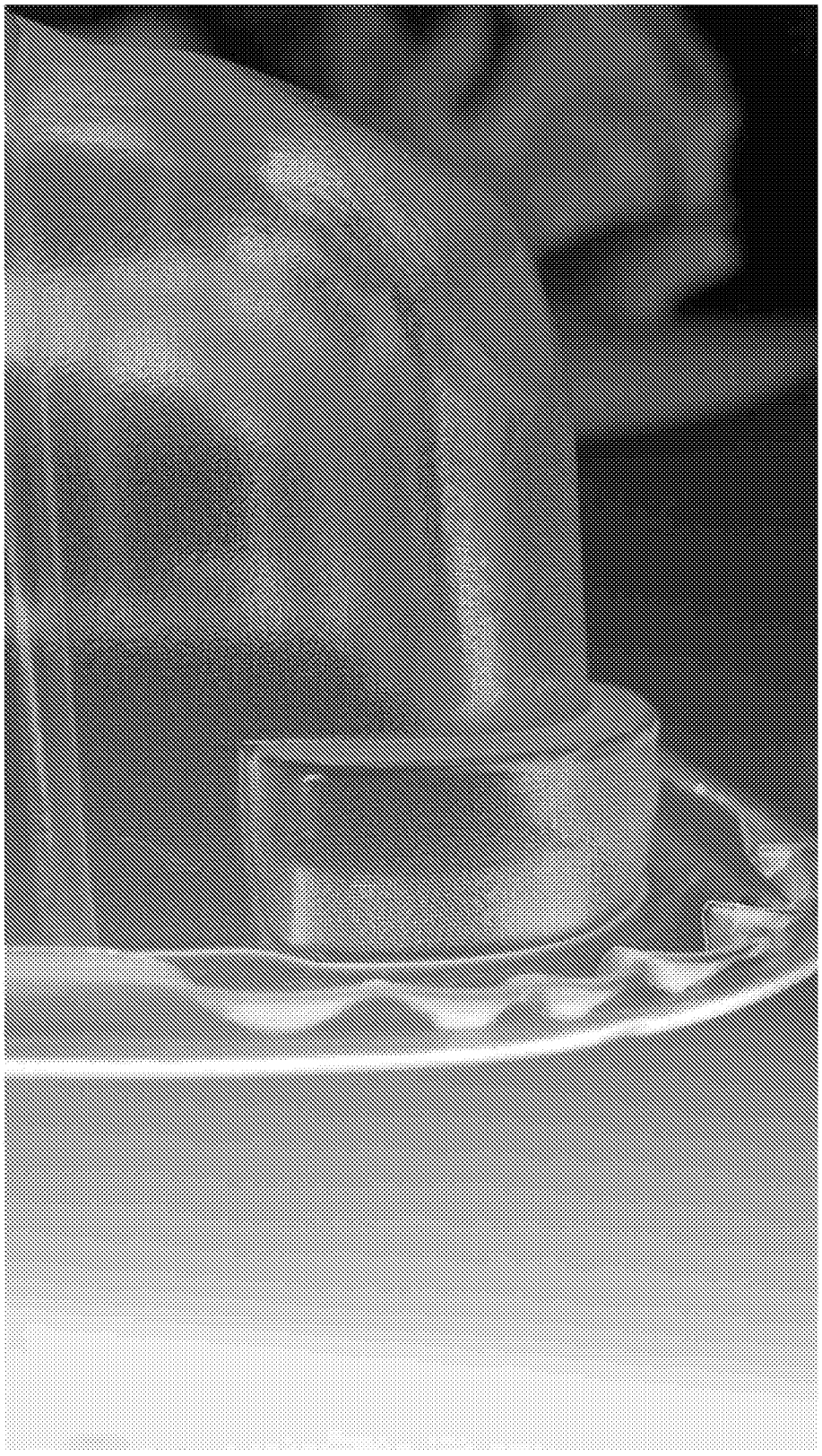


Fig. 3B

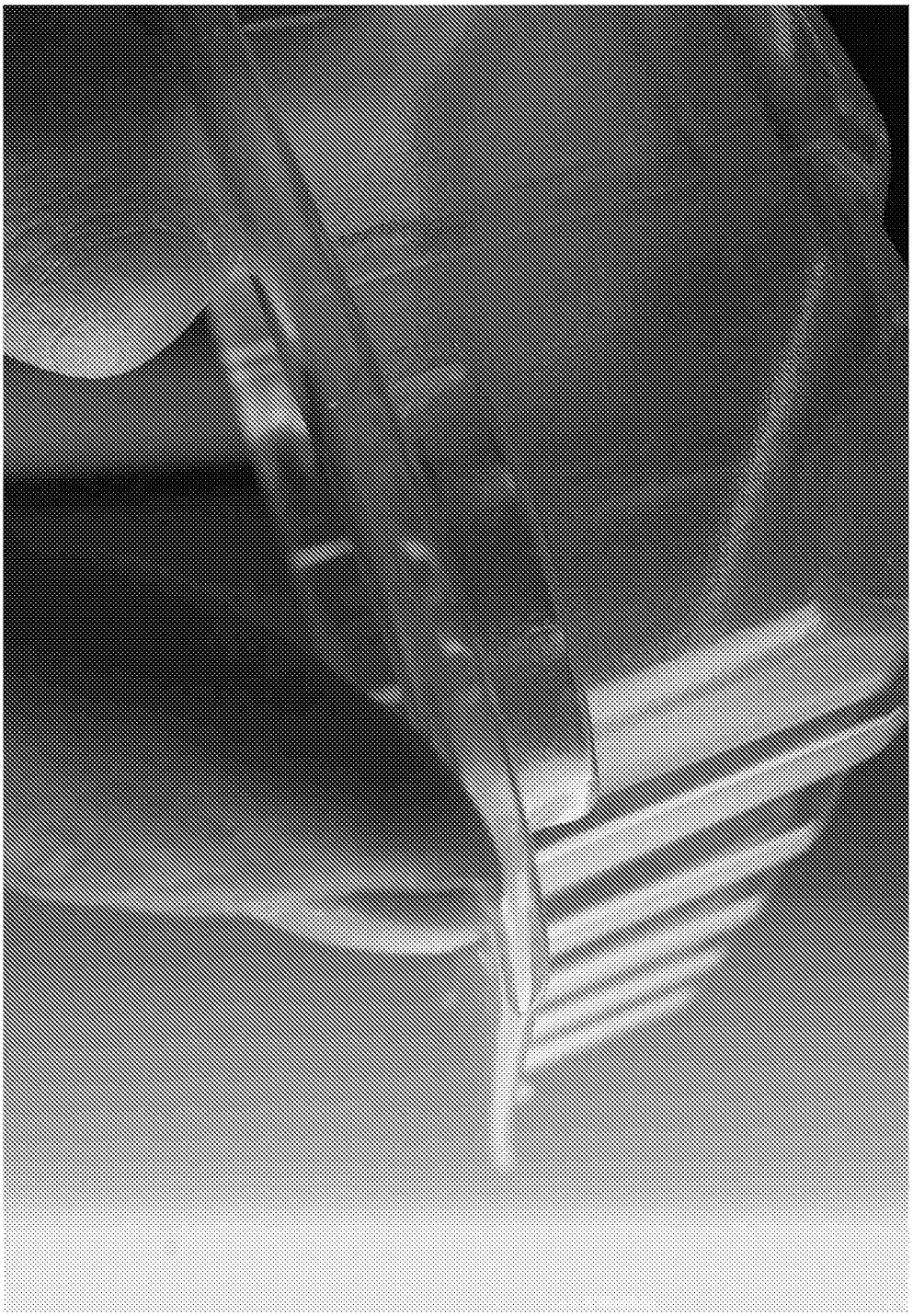


Fig. 3C

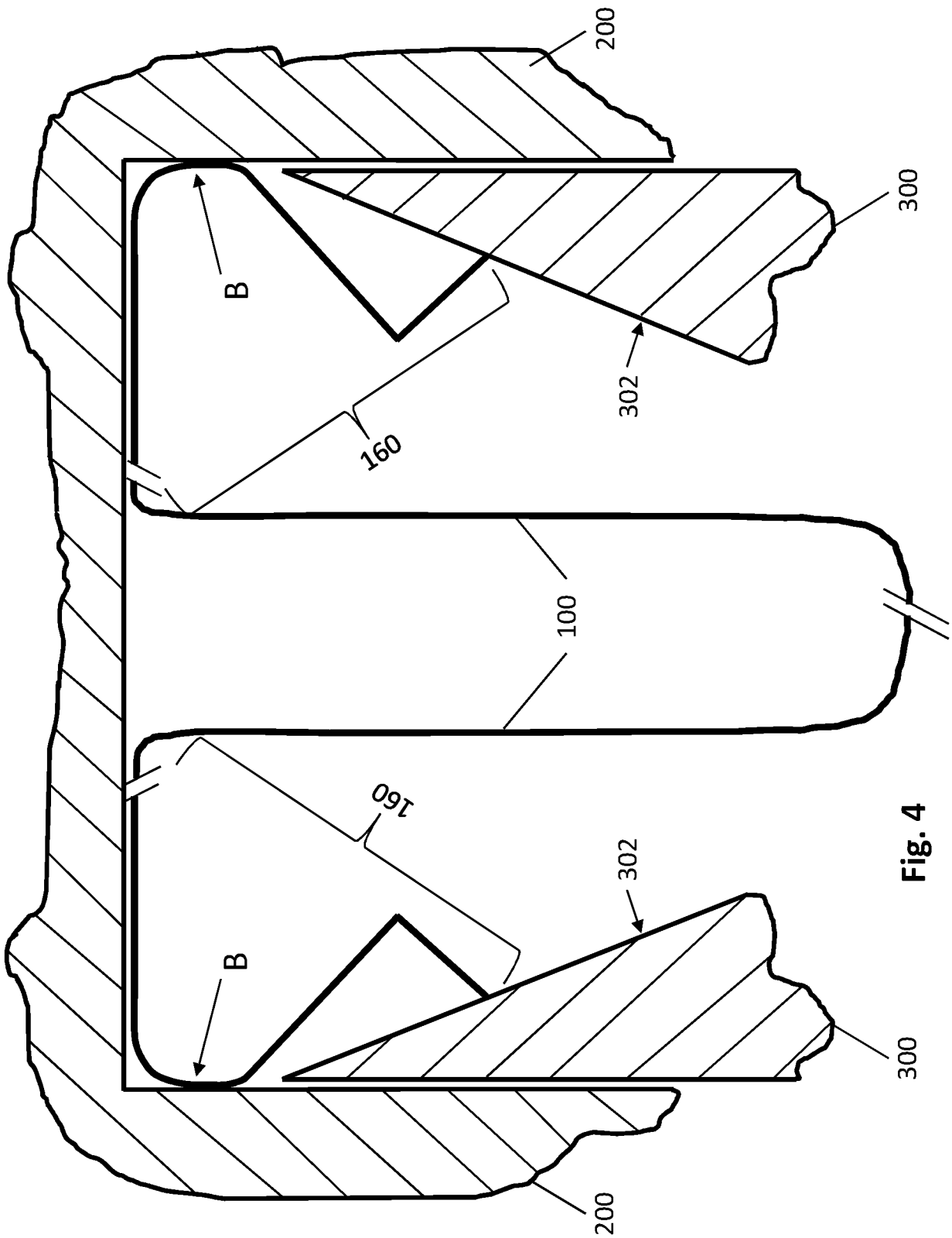


Fig. 4

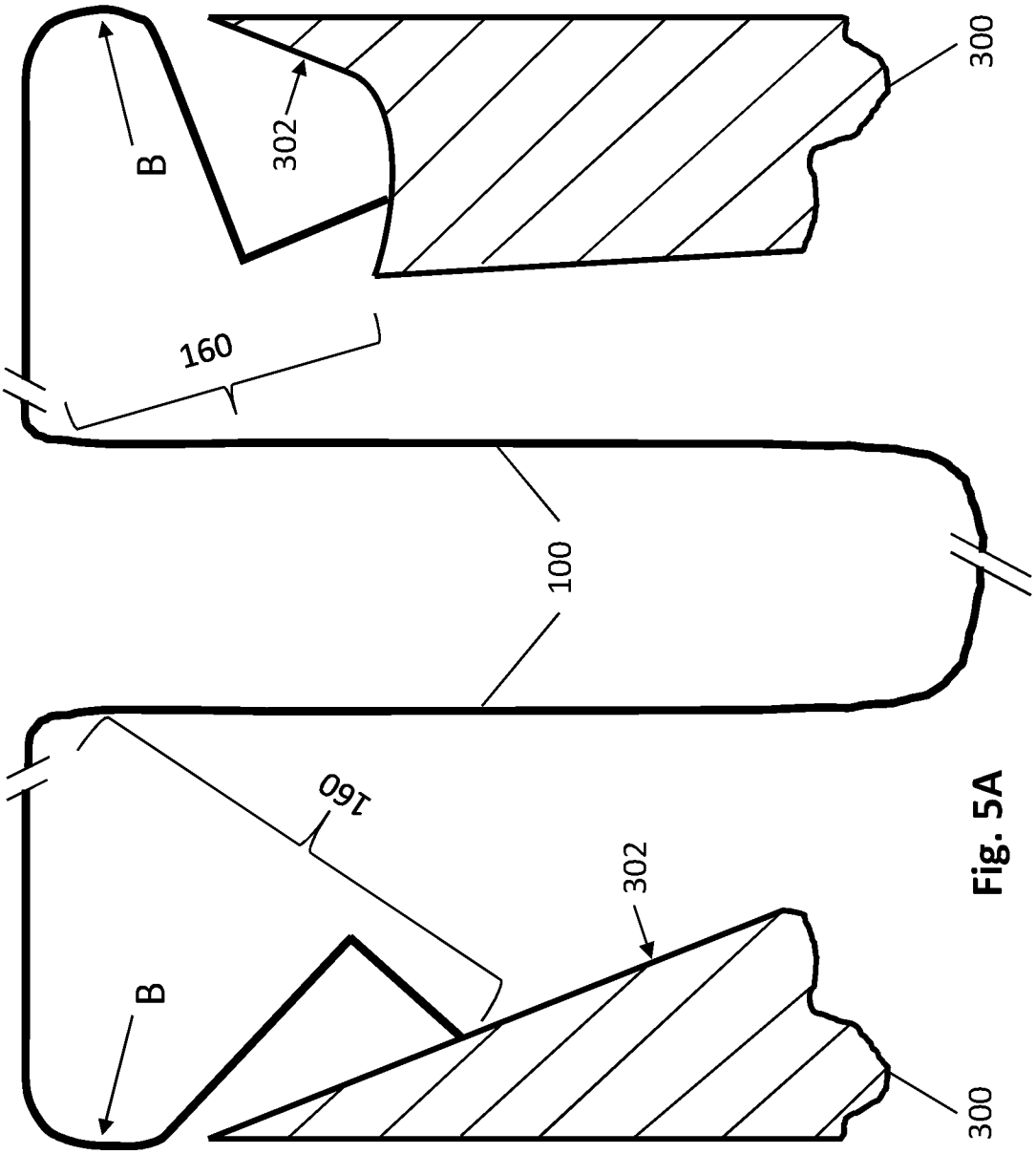


Fig. 5A

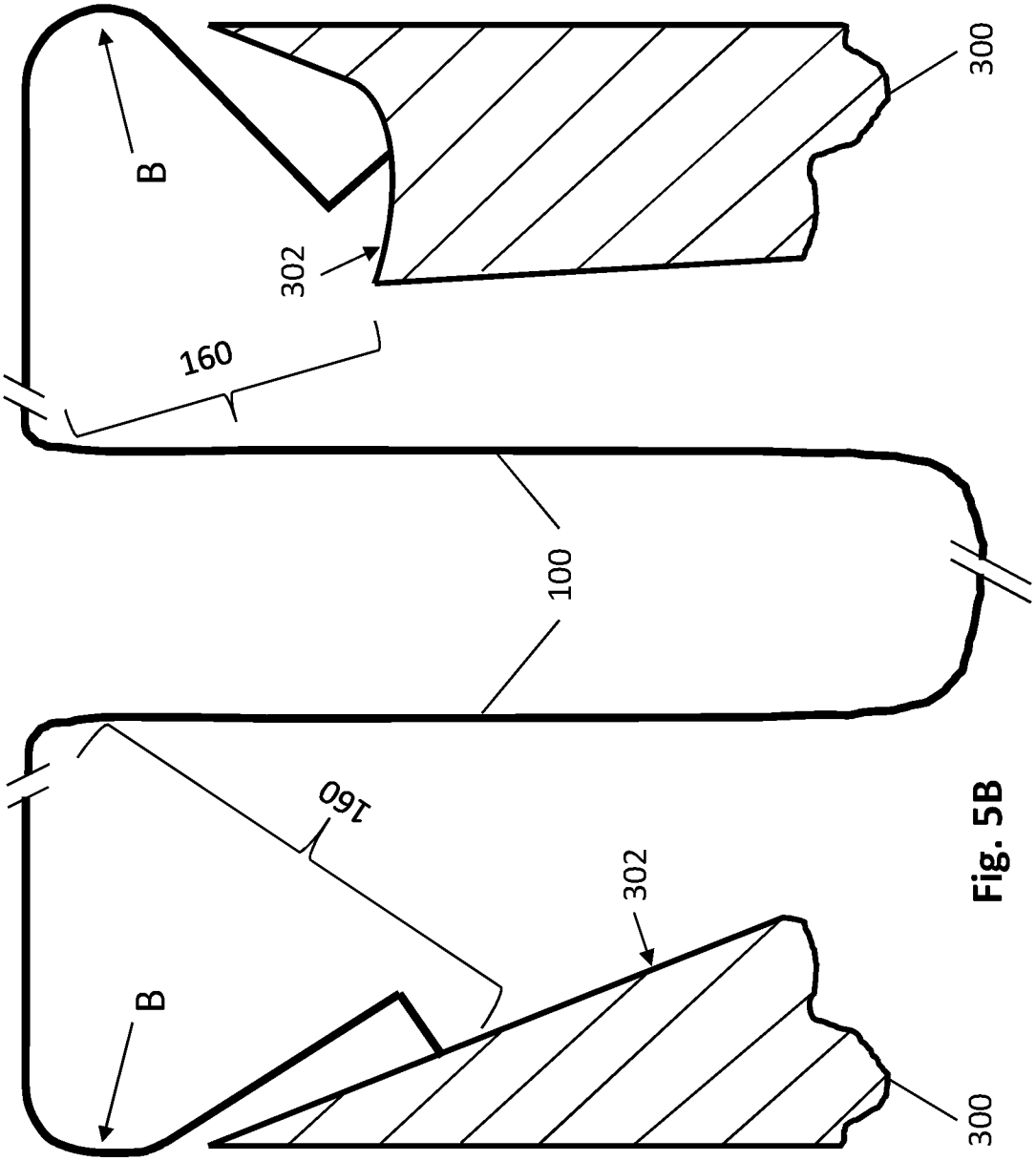


Fig. 5B

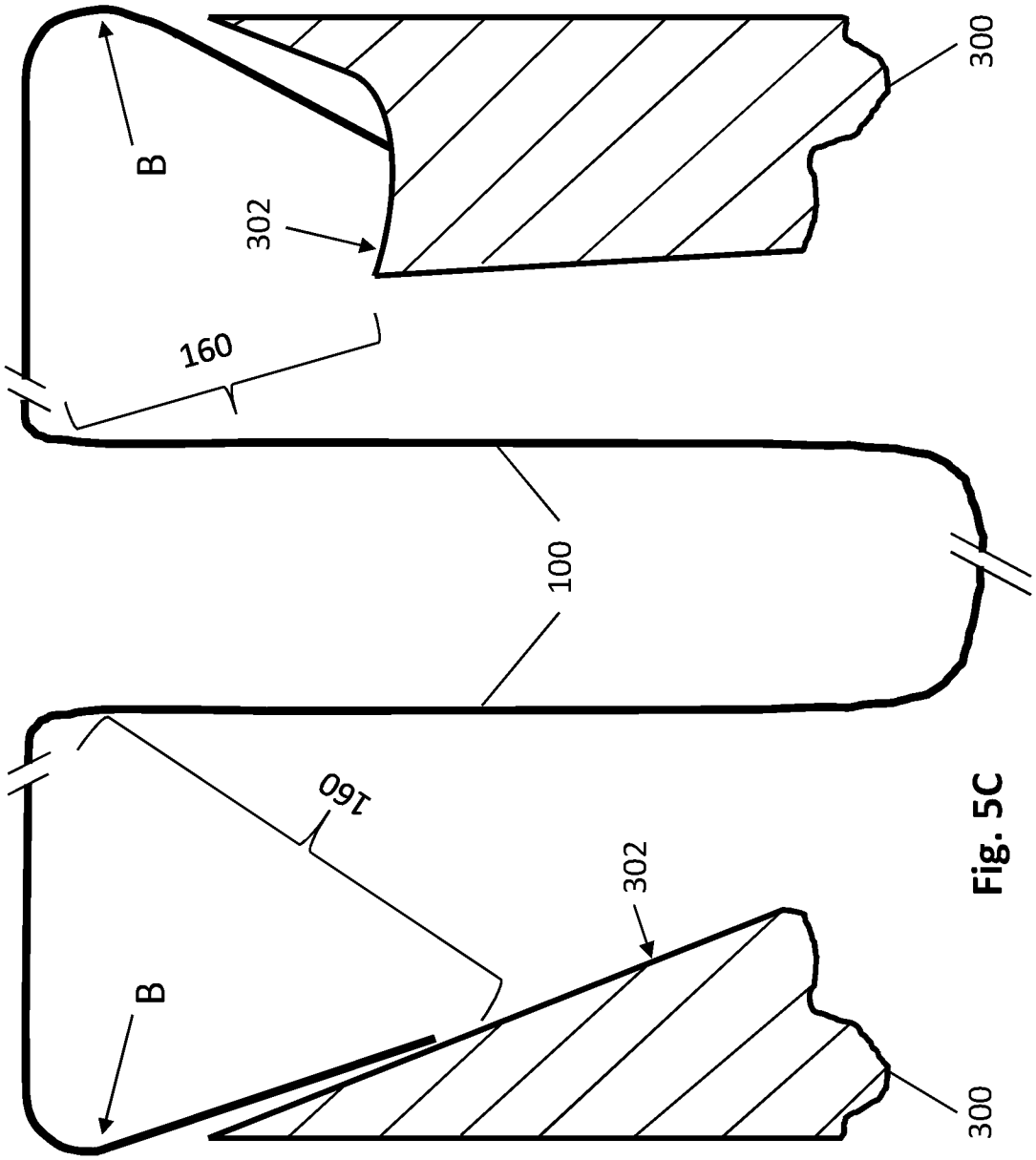


Fig. 5C

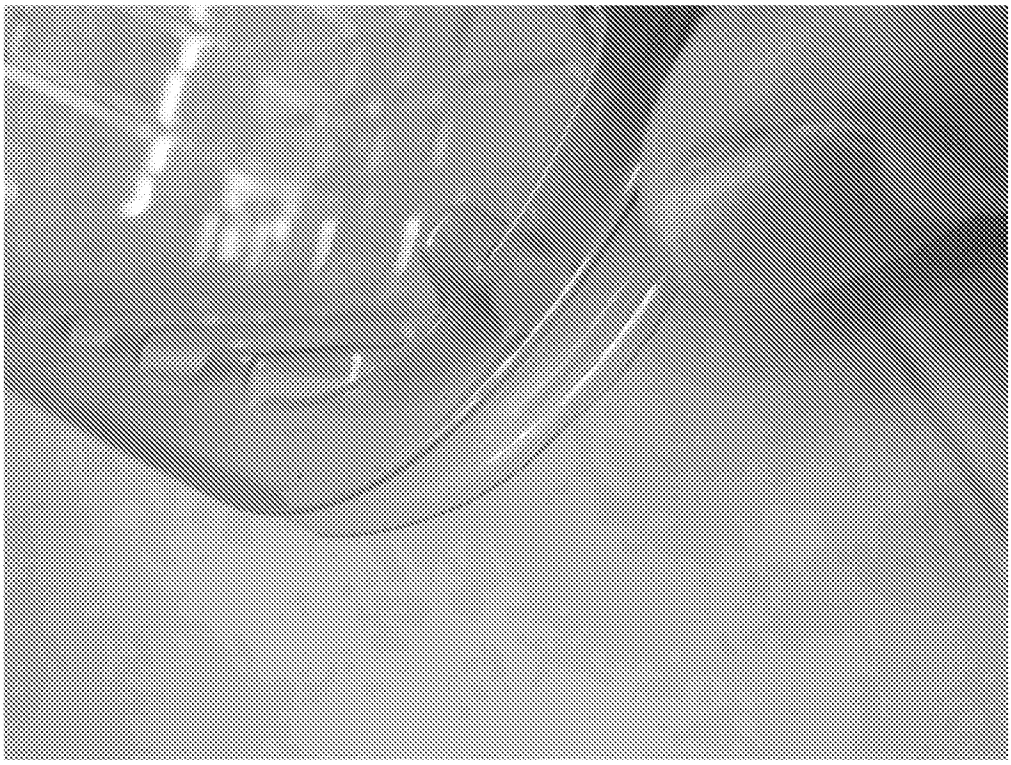


Fig. 6A



Fig. 6B



Fig. 6C



Fig. 6D

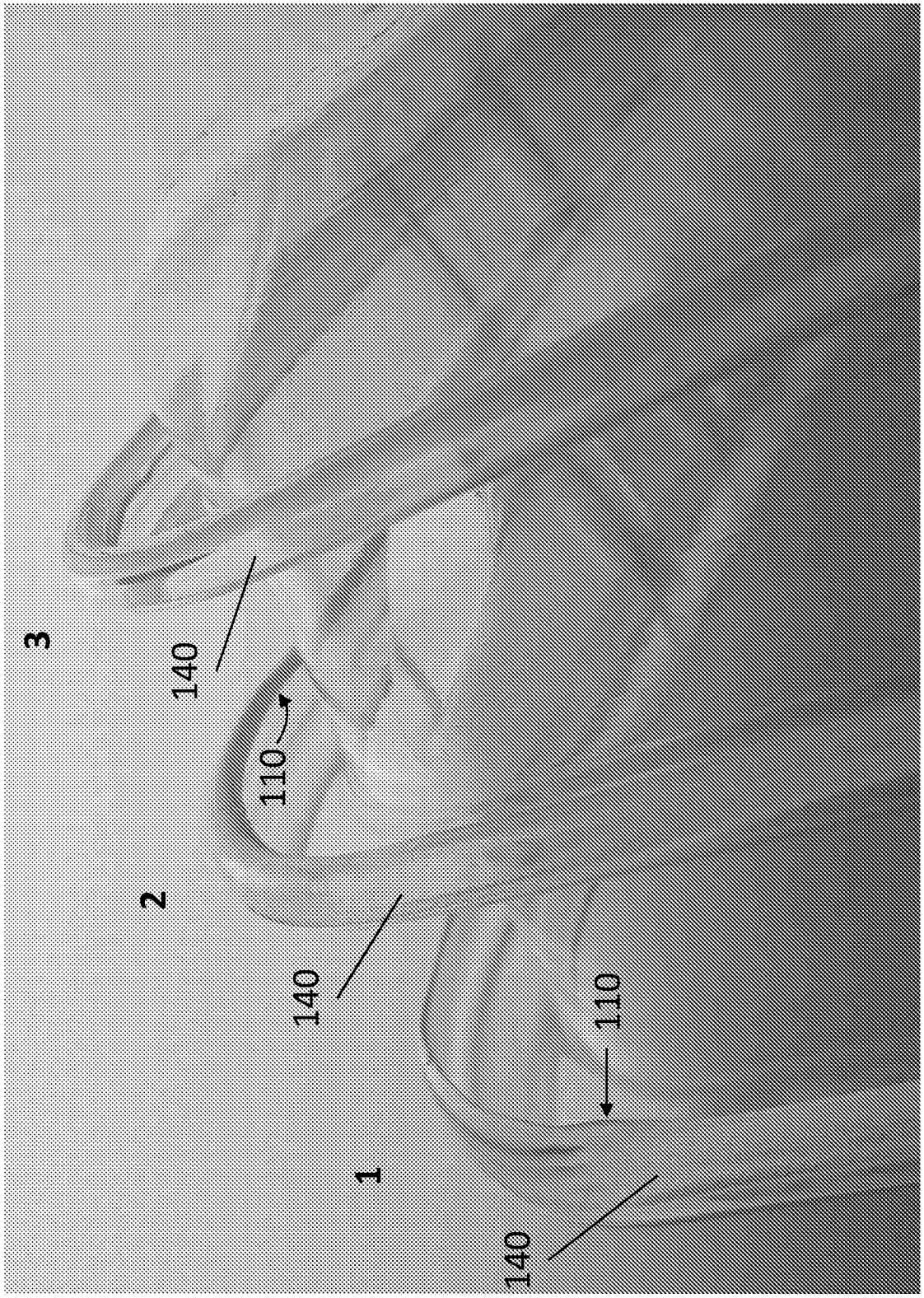


Fig. 6E

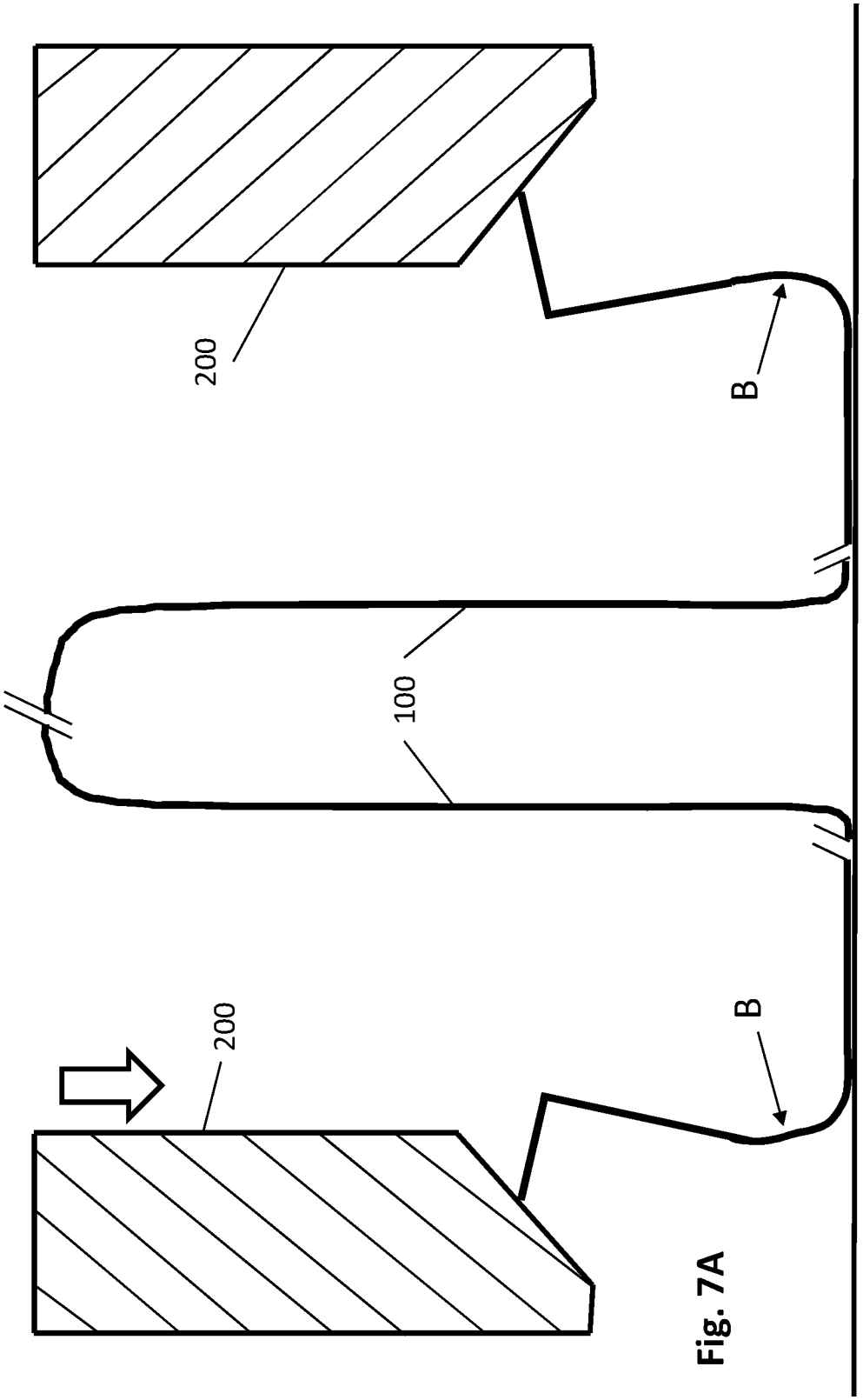


Fig. 7A

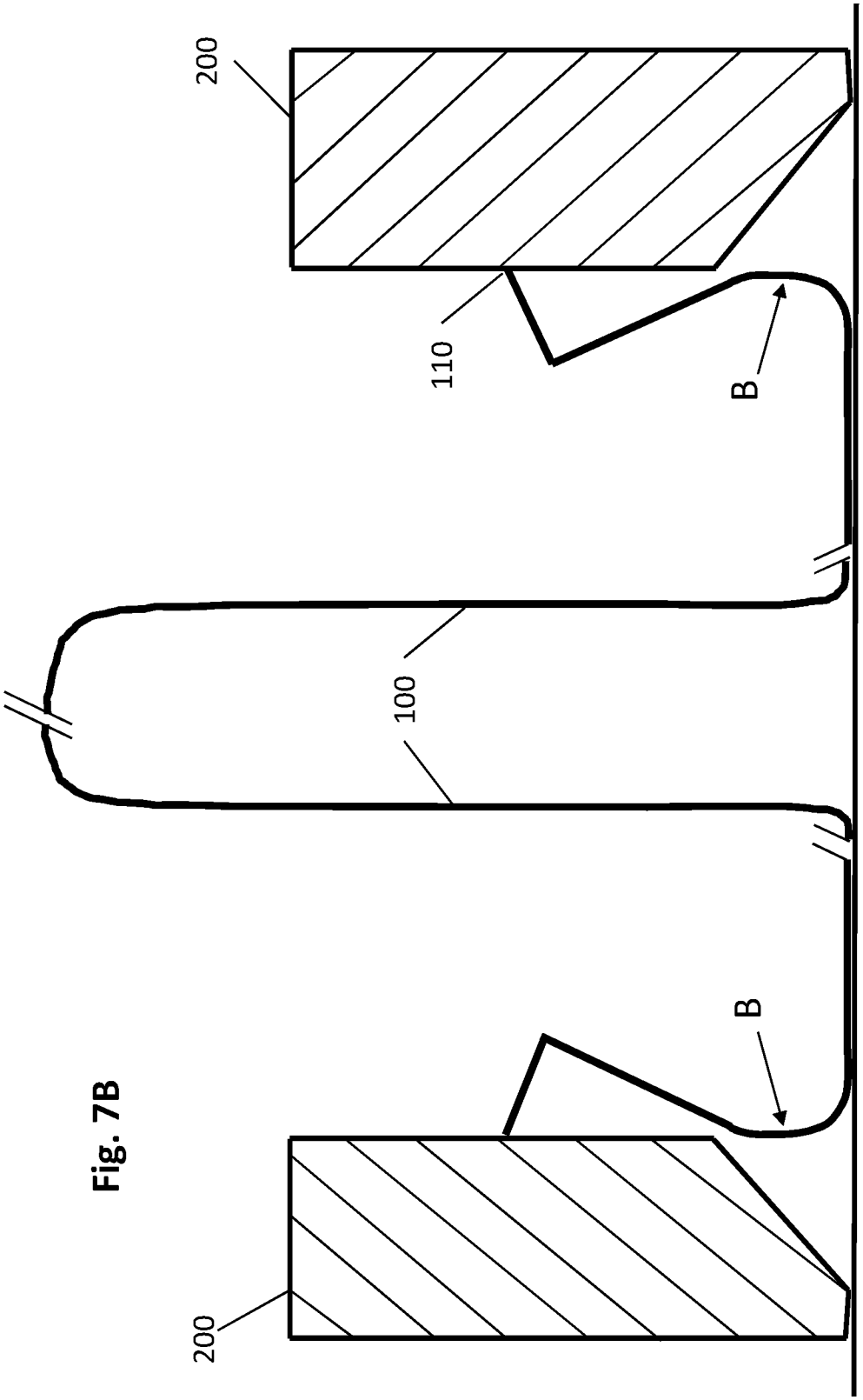


Fig. 7B

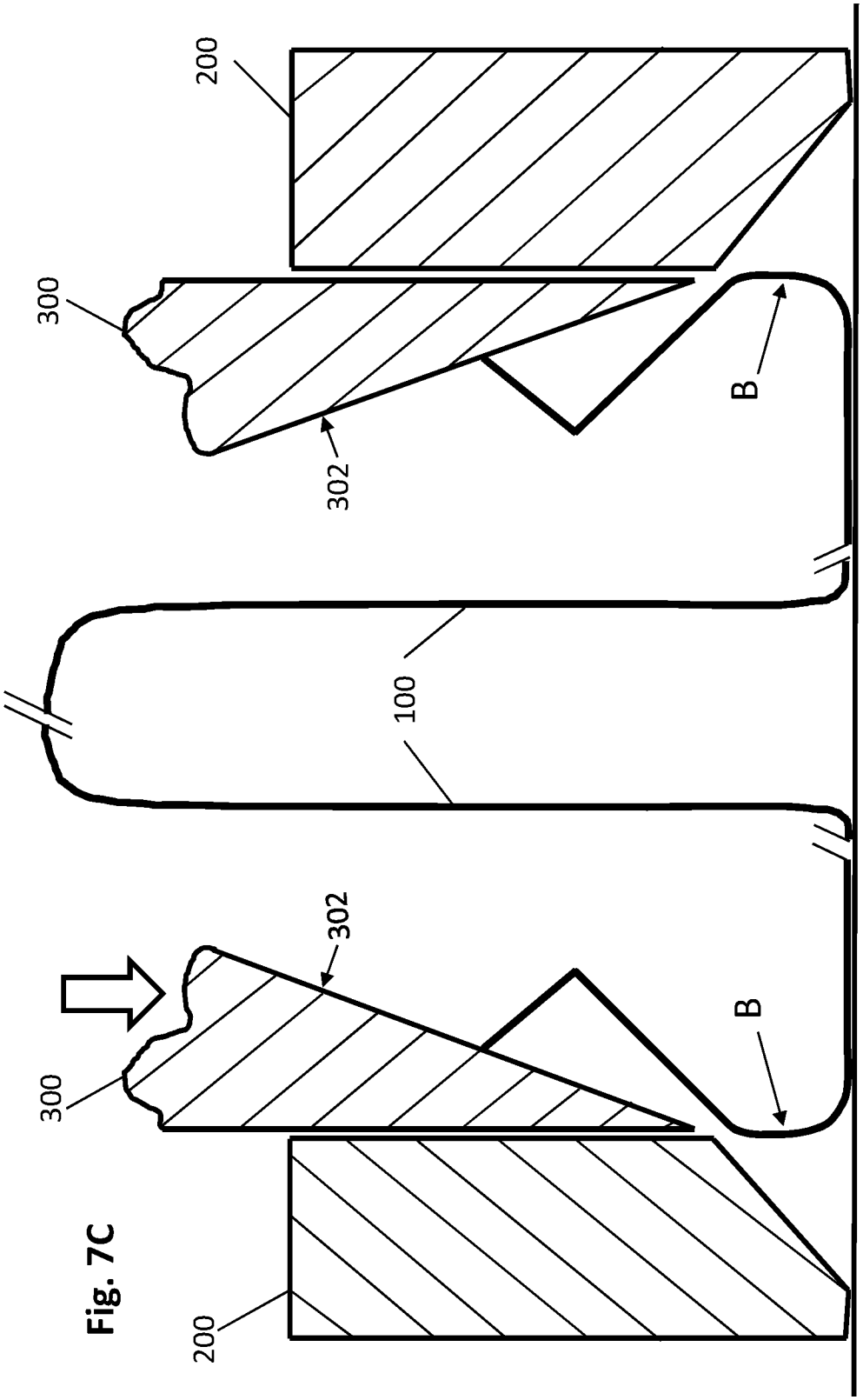
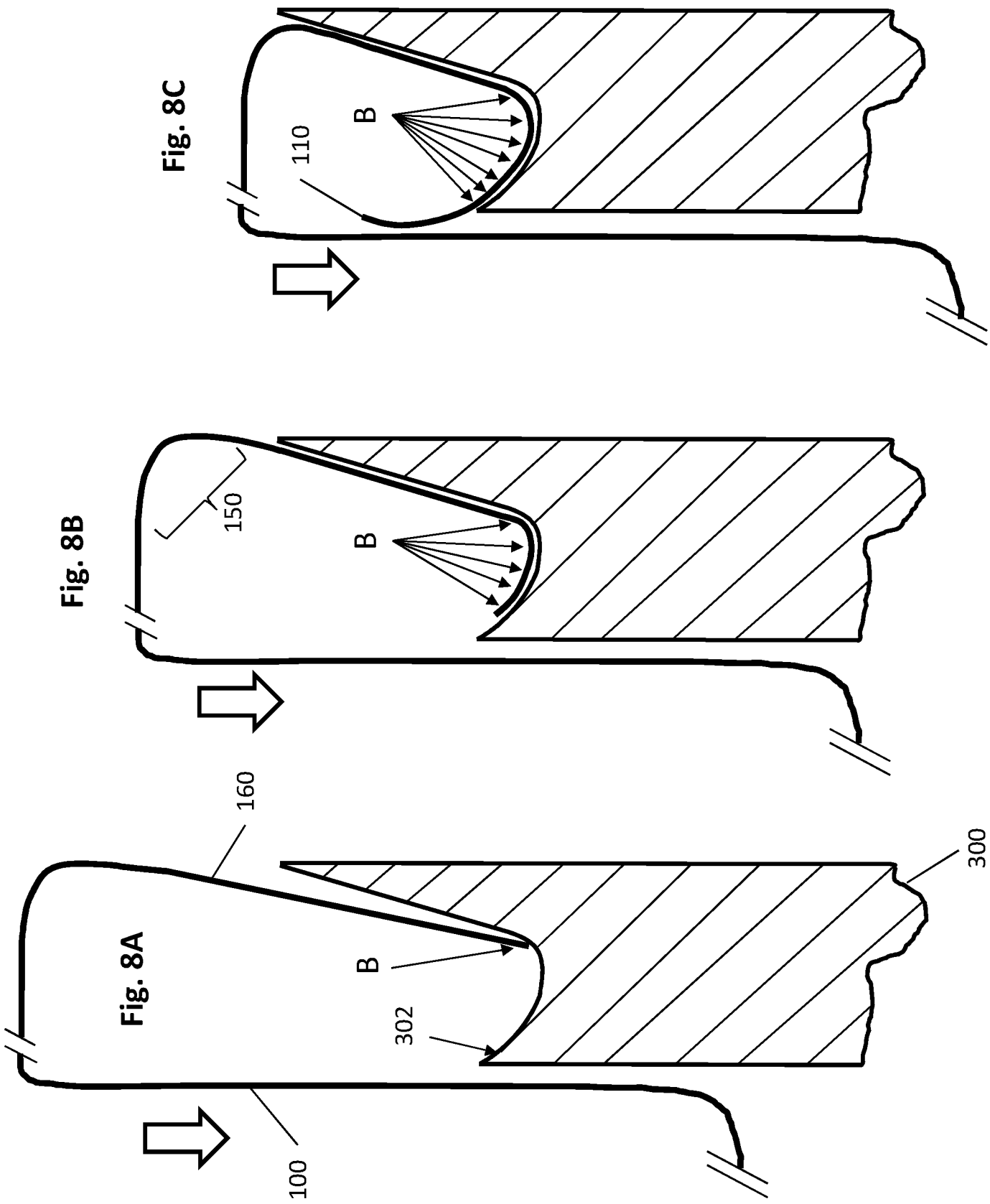


Fig. 7C


Fig. 8C
110
B
Fig. 8B
150
B
Fig. 8A
160
300
B
302
100

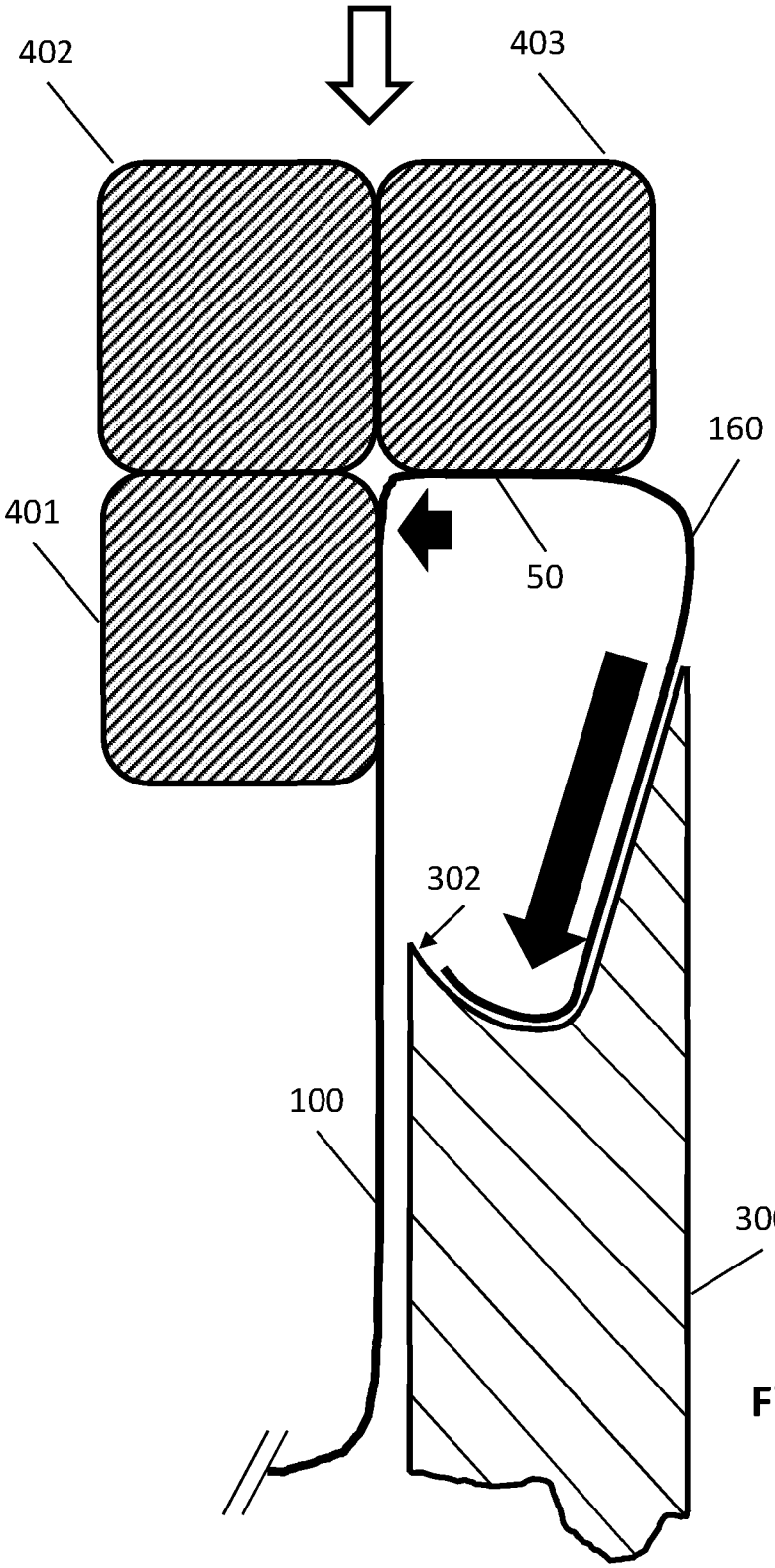


Fig. 8D

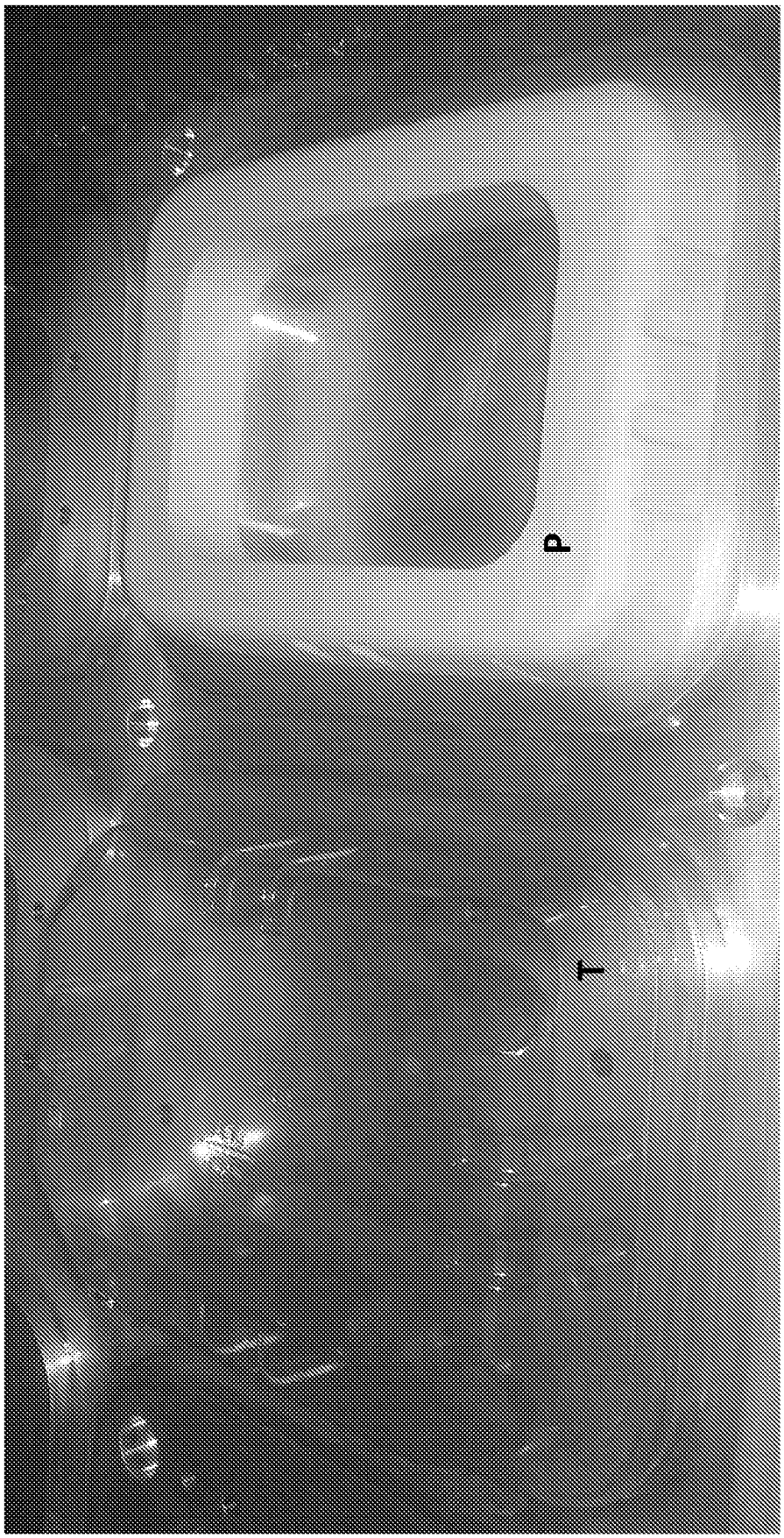


Fig. 8Di

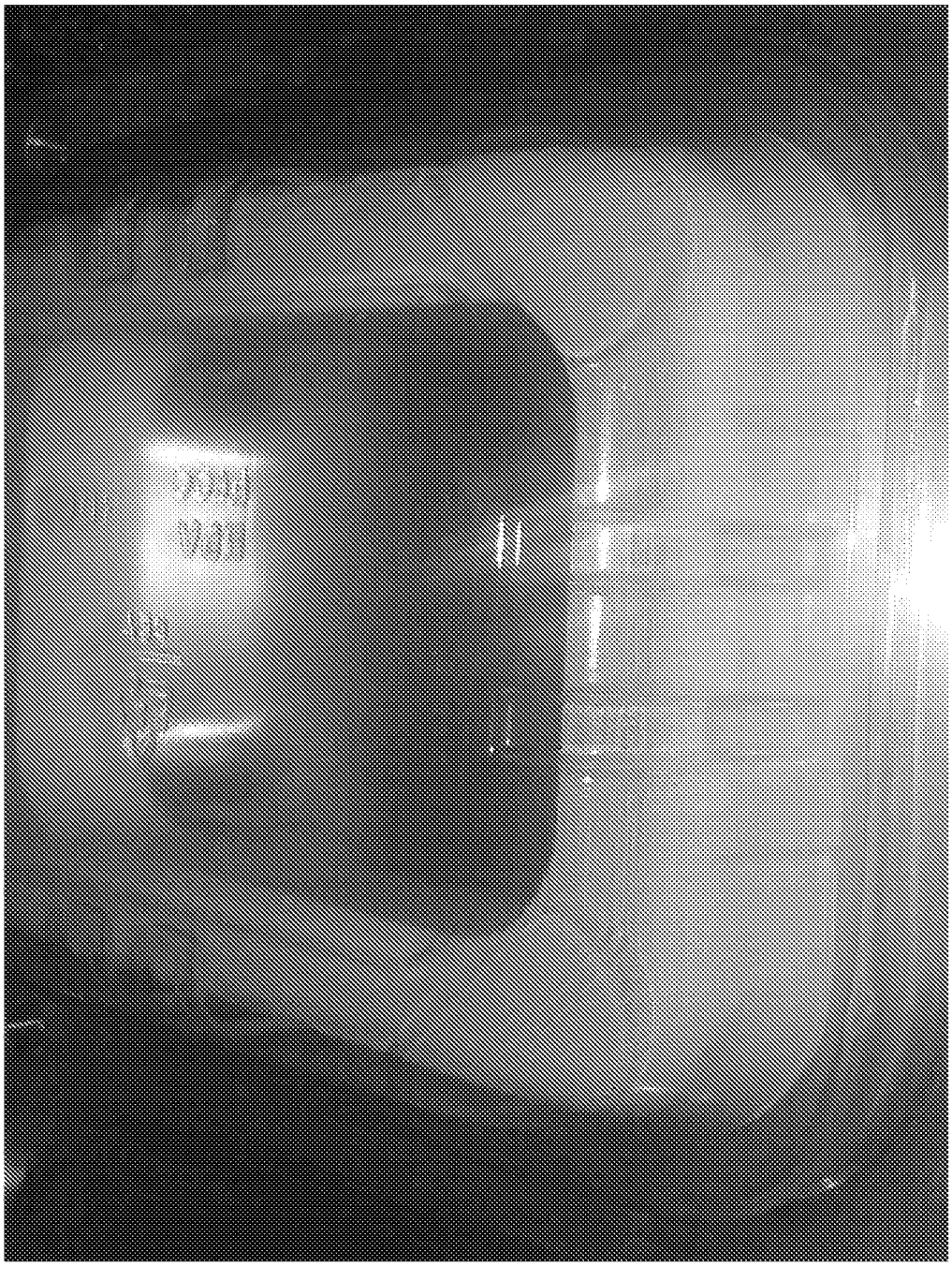
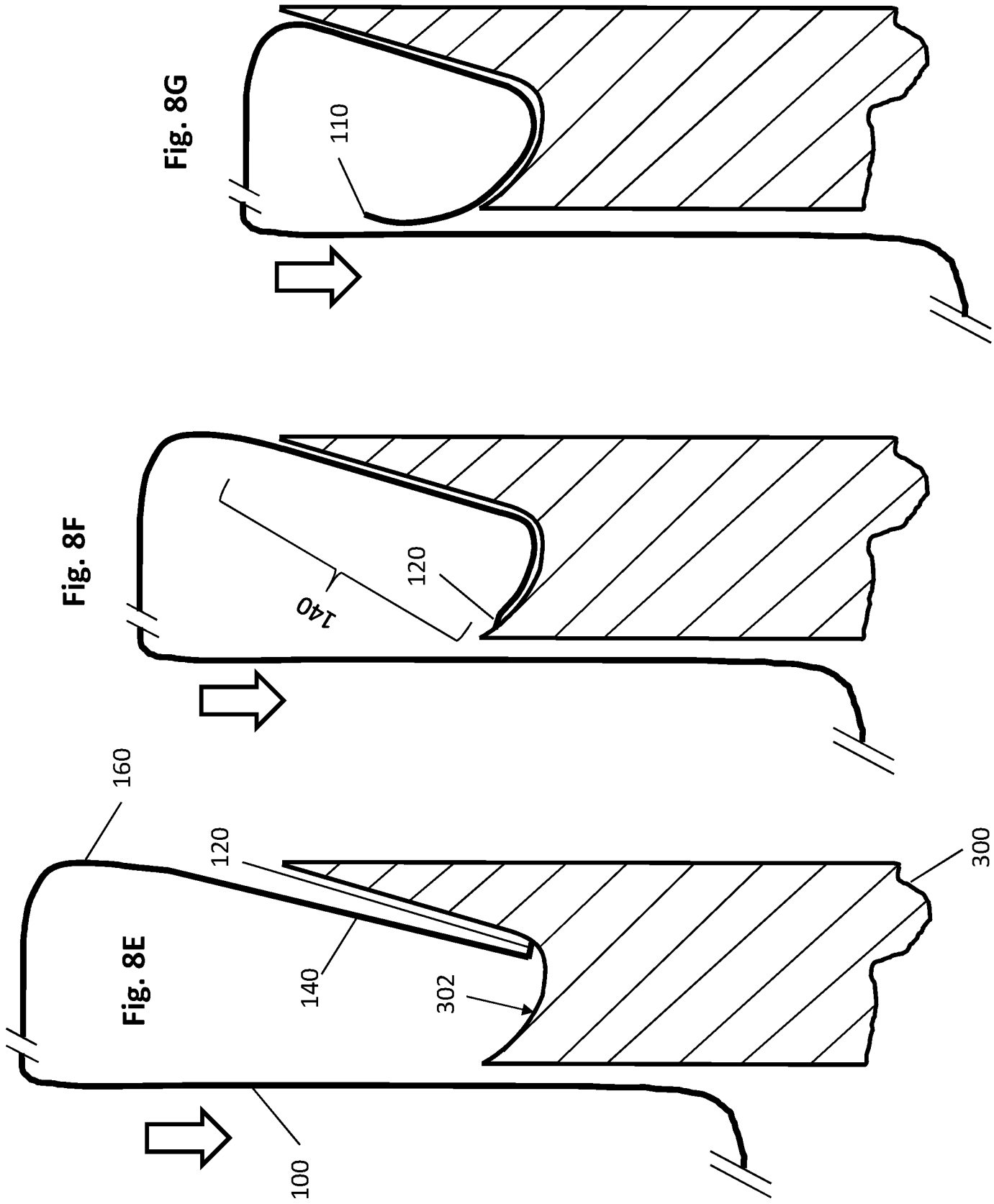
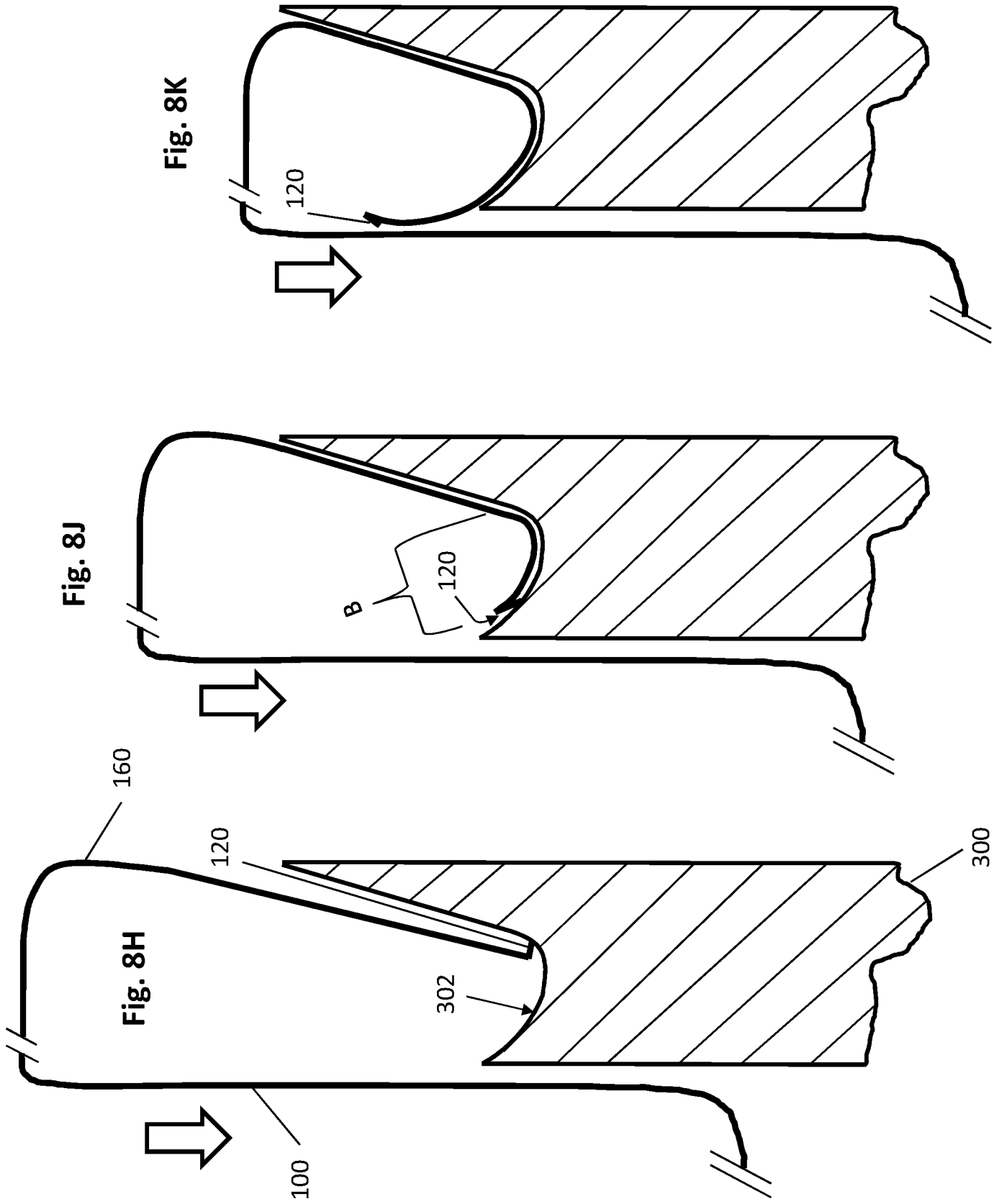


Fig. 8Dii


Fig. 8G
110
Fig. 8F
140
120
Fig. 8E
160
120
300
140
302
100


Fig. 8K
120
Fig. 8J
B
120
160
120
300
Fig. 8H
302
100

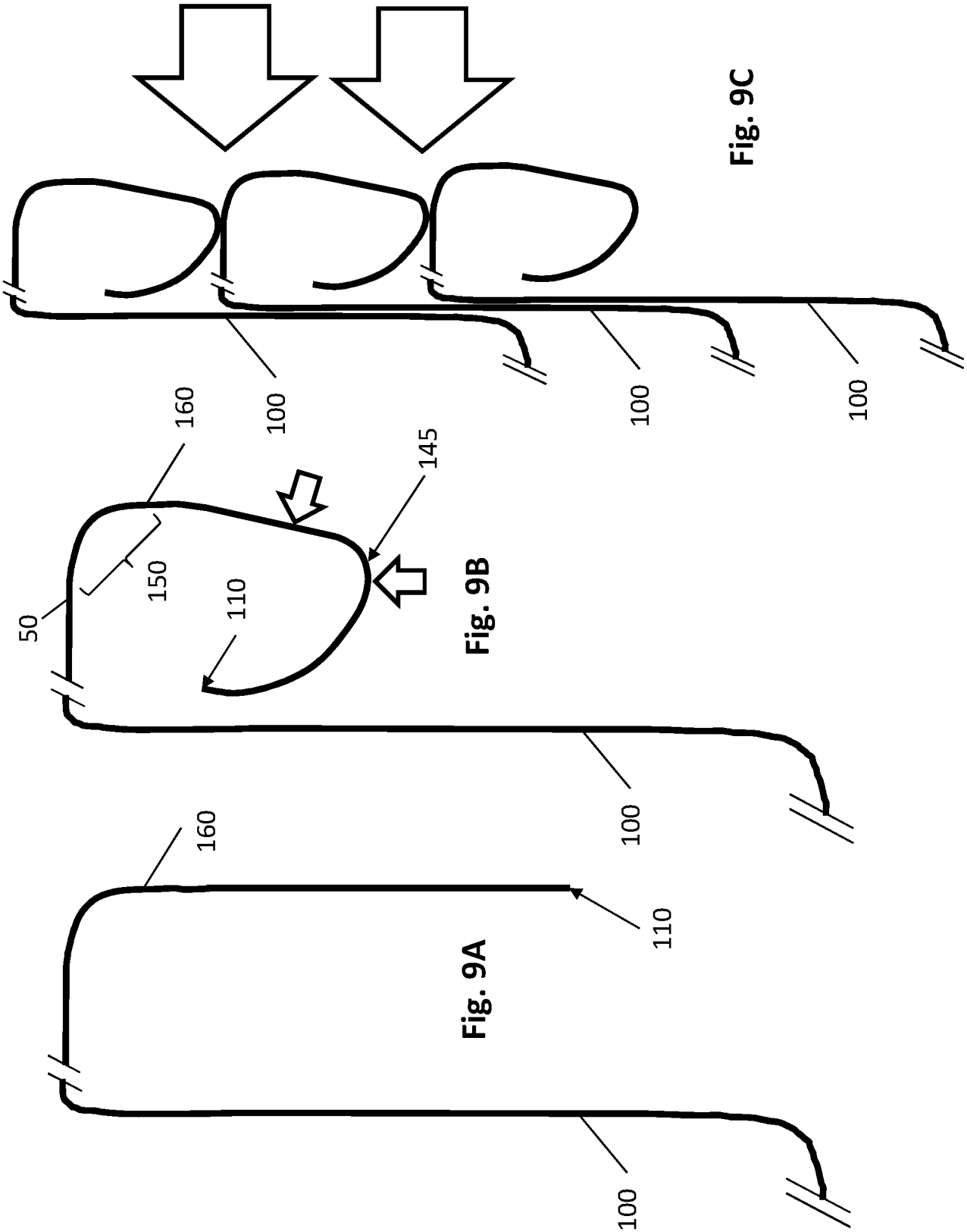


Fig. 9C

Fig. 9B

Fig. 9A

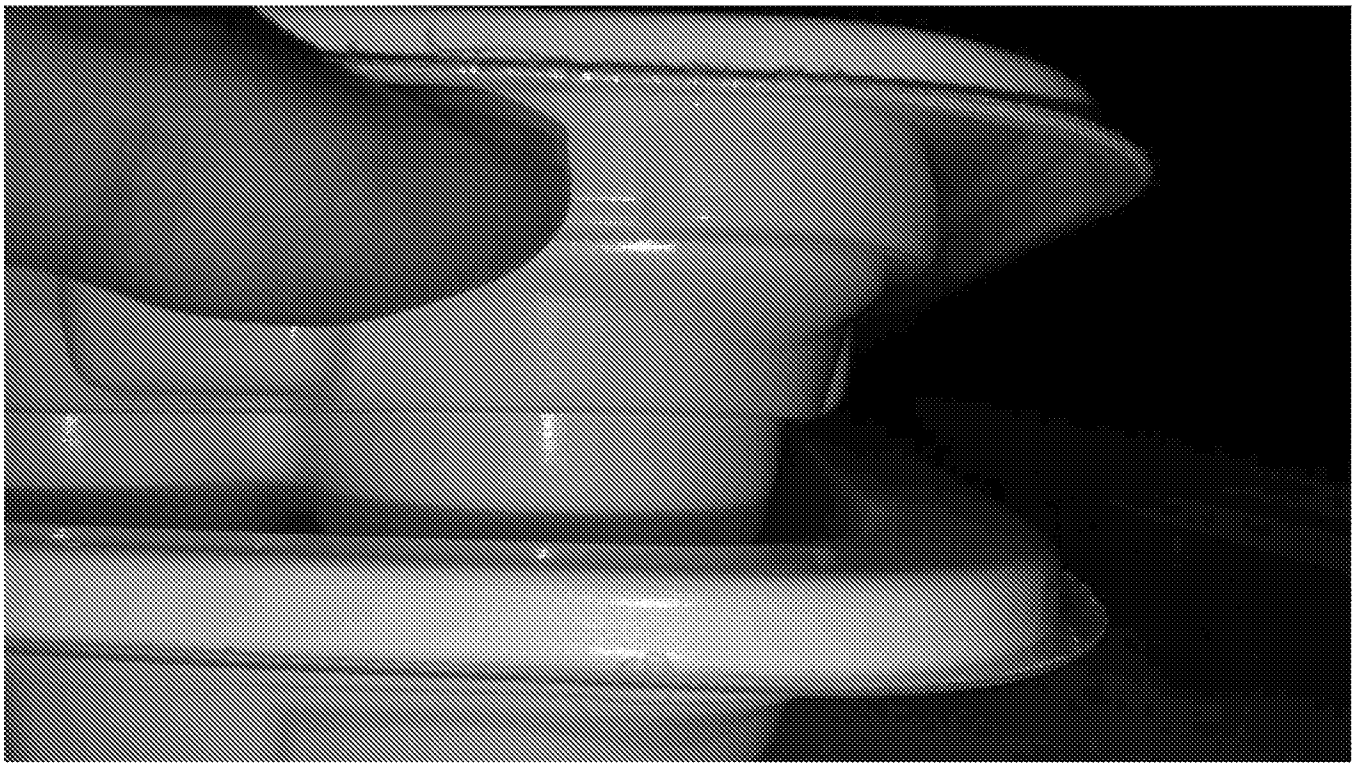


Fig. 9D

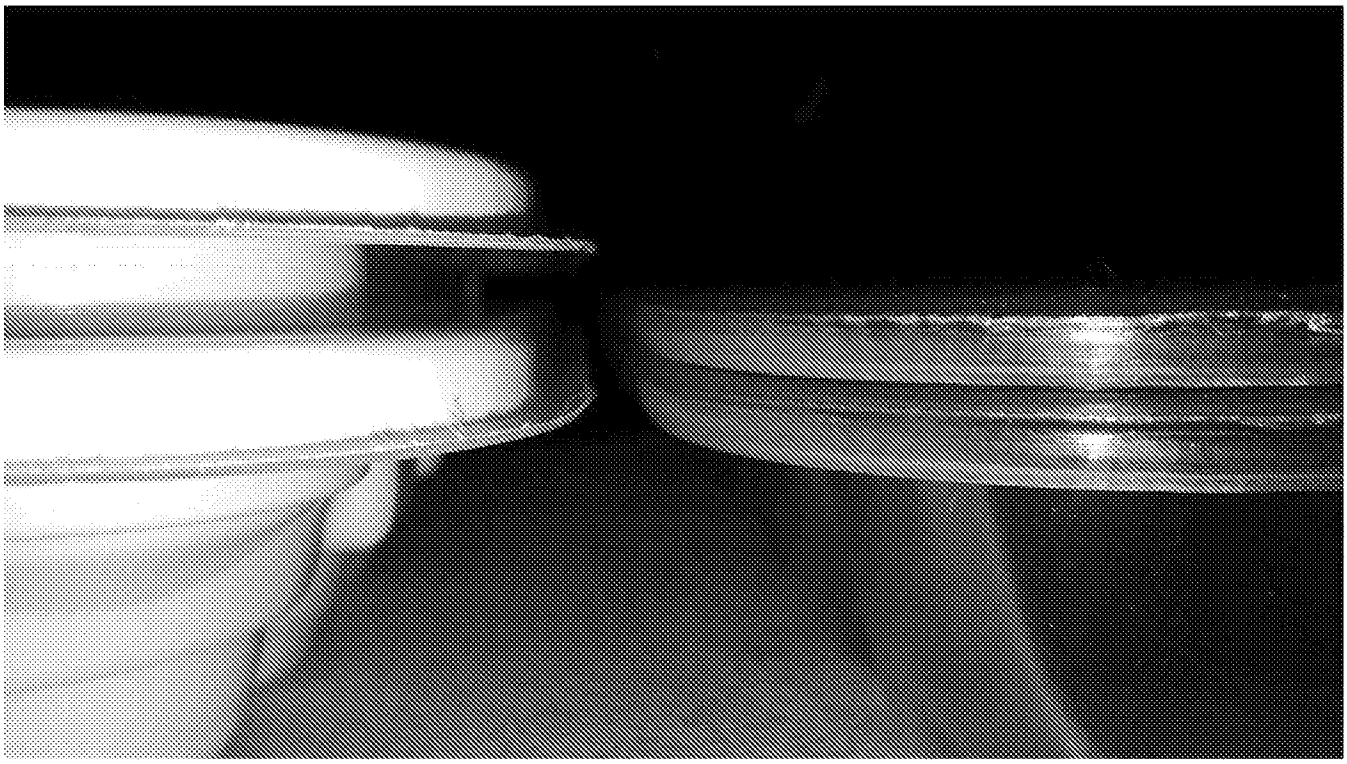


Fig. 9E

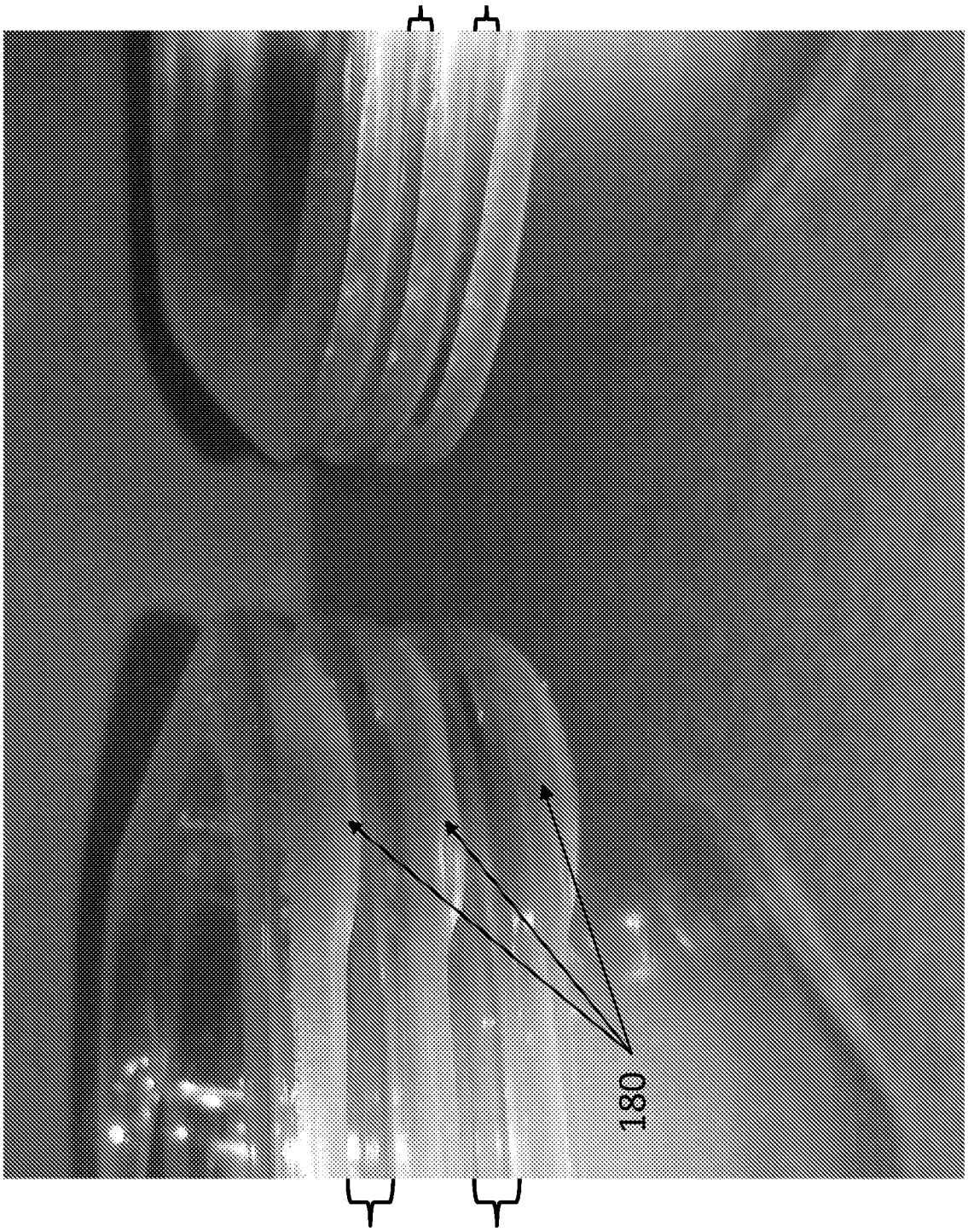


Fig. 9F

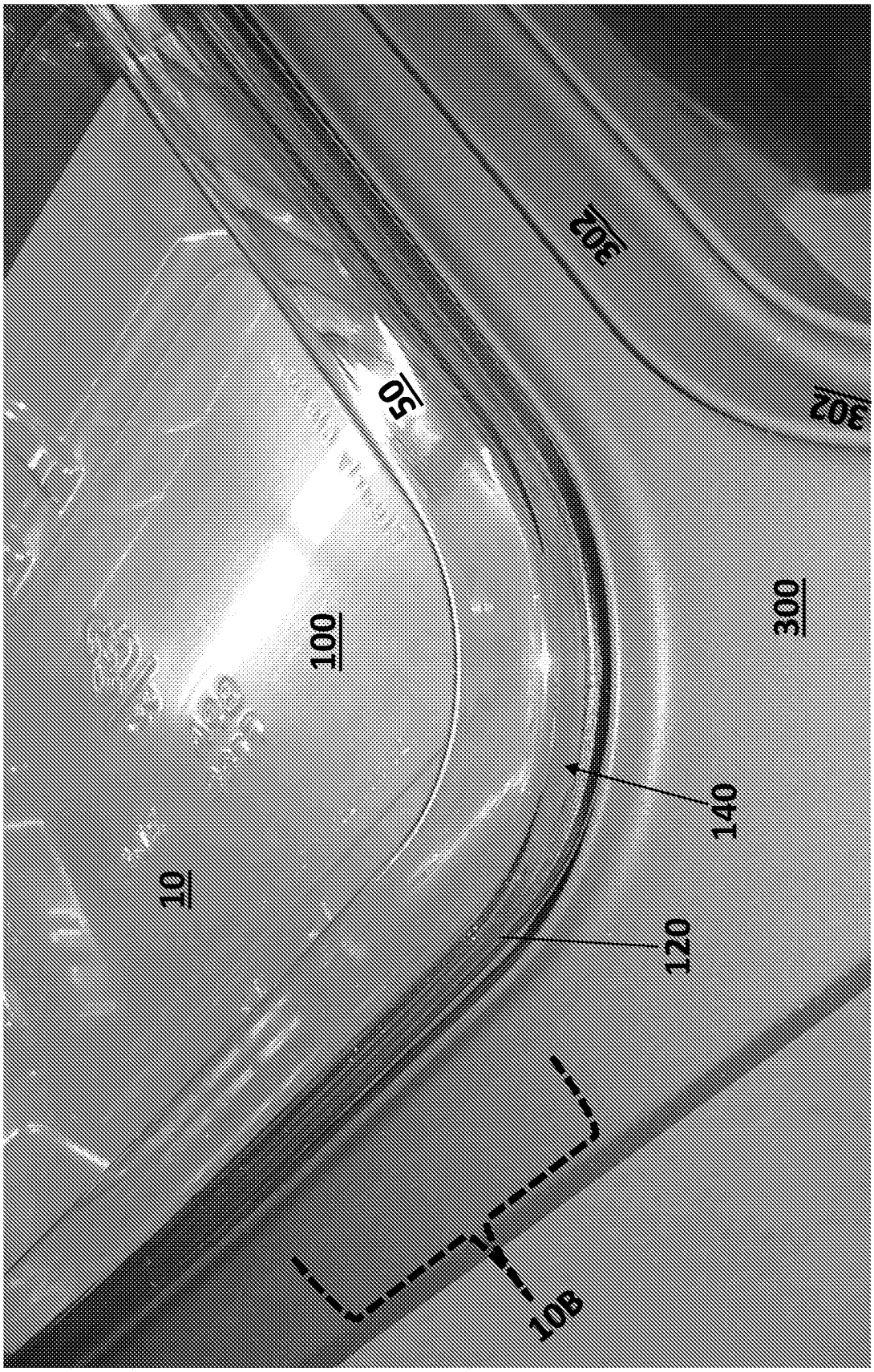


Fig. 10A

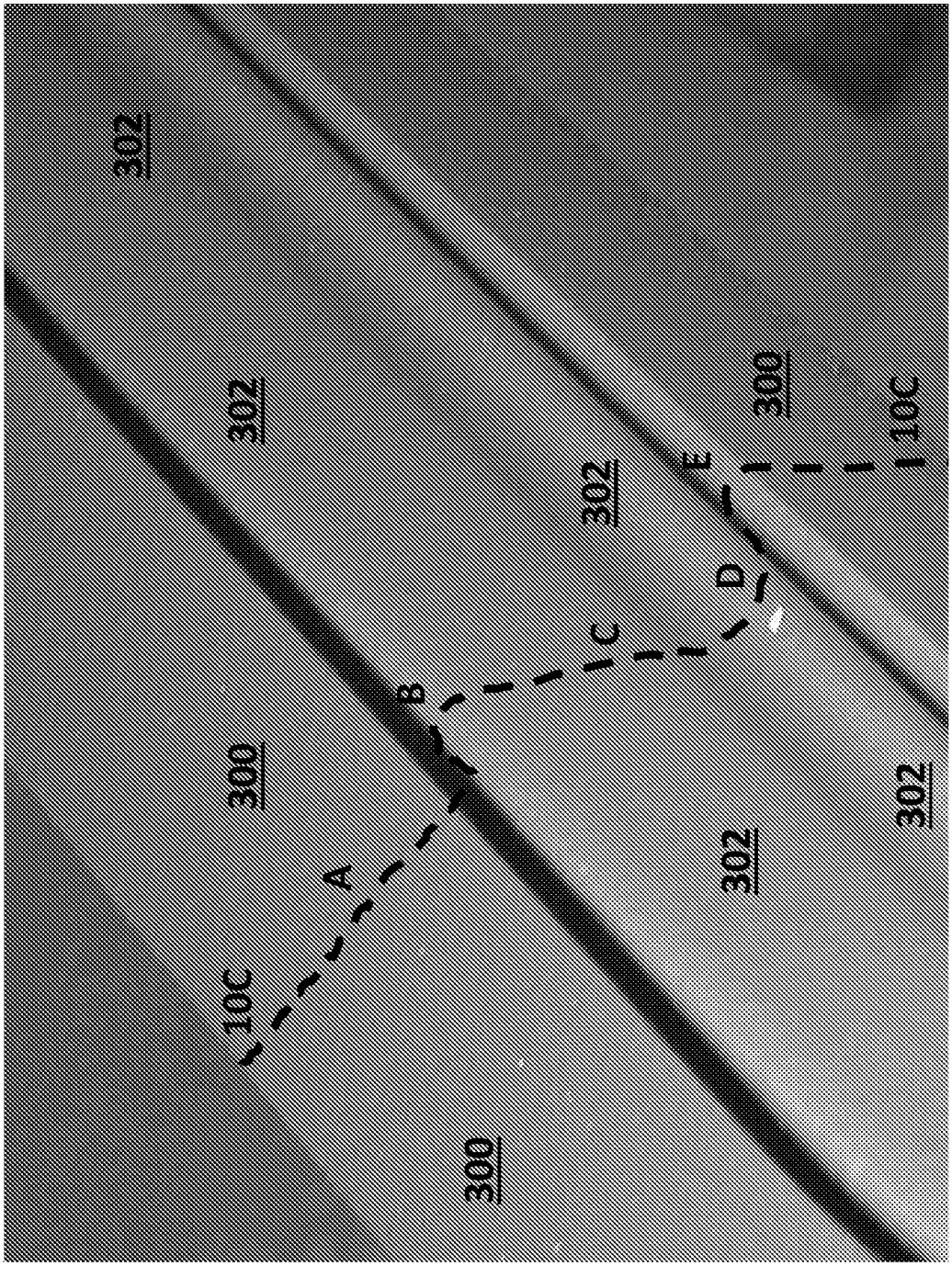


Fig. 10B

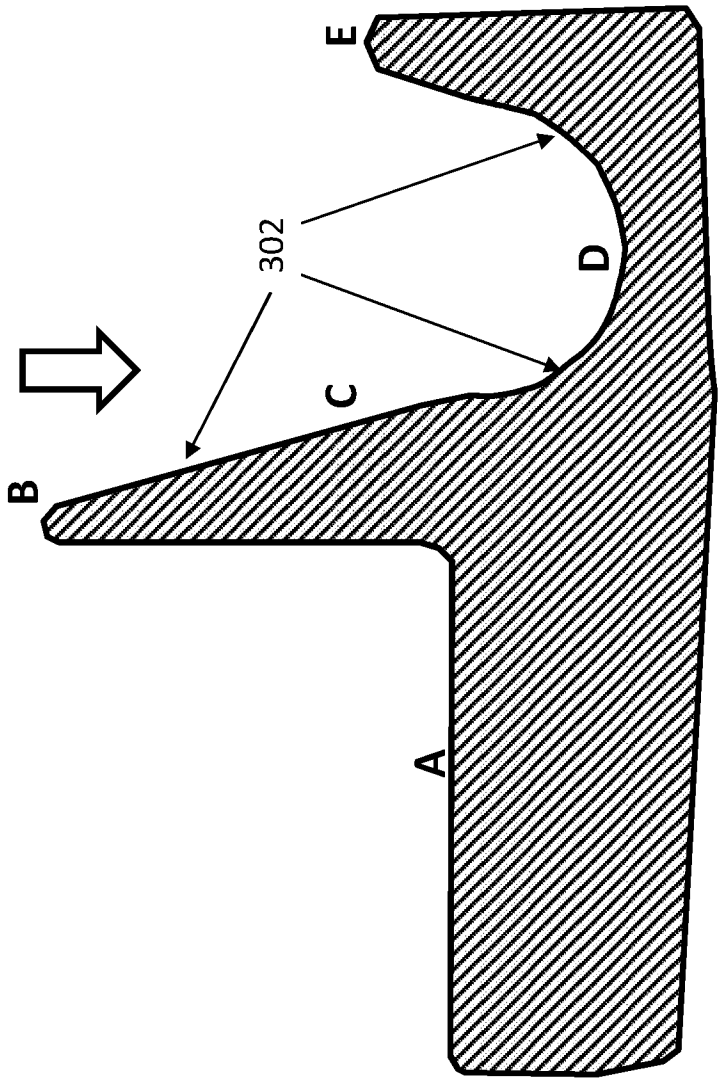


Fig. 10C

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	17-1040 (MW-12CP1)
	Application Number	
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Millard	F	WALLACE	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Orwigsburg	State/Province	PA	Country of Residence	US

Mailing Address of Inventor:

Address 1	555 Ridge Road		
Address 2			
City	Orwigsburg	State/Province	PA
Postal Code	17961	Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	27730		
Email Address	gcolby@dilworthlaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	Formed Thermoplastic Article Having Smooth Edges		
Attorney Docket Number	17-1040 (MW-12CP1)	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	29	Suggested Figure for Publication (if any)	8D

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	17-1040 (MW-12CP1)
	Application Number	
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	27730		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation in part of	PCT/US16/49692	2016-08-31
Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/US16/49692	Claims benefit of provisional	62212367	2016-08-31

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR ~~1.55~~(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	17-1040 (MW-12CP1)
	Application Number	
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Remove

Additional Foreign Priority Data may be generated within this form by selecting the **Add**button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.
In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	17-1040 (MW-12CP1)
	Application Number	
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

○ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor

◉ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	Converter Manufacturing, Inc.

Mailing Address Information For Applicant:

Address 1	555 Ridge Road		
Address 2			
City	Orwigsburg	**State/Province**	PA
Country	US	Postal Code	17961
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	17-1040 (MW-12CP1)
	Application Number	
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Organization Name	Converter Manufacturing, Inc.		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	555 Ridge Road		
Address 2			
City	Orwigsburg	**State/Province**	PA
Country i	US	Postal Code	17961
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature	/Gary D. Colby/			Date (YYYY-MM-DD)	2017-02-28
First Name	Gary D.	Last Name	COLBY	Registration Number	40961

Additional Signature may be generated within this form by selecting the Add button.

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, A 22313-1450.**

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Formed Thermoplastic Article Having Smooth Edges

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____

  filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Millard F. WALLACE Date (Optional): 28 February 2017

Signature: Millard F. Wallace

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Remarks

Claims 1-4, 8-12, 15, 18, 19, 22, 24-26, 34, 37, 44, 50, and 52 are pending in this application following entry of this Preliminary Amendment. Claims 5-7, 13, 14, 16, 17, 20, 21, 23, 27-29, 30-33, 35, 36, 38-43, 45-49, 51, and 53-59 have been canceled without prejudice to including claims directed to subject matter recited therein in one or more later-filed applications. Claims 12 and 44 have been amended. Claims 1, 50, 52, are the only independent claims pending after entry of this Preliminary Amendment.

The new claims include no new subject matter, as set forth below. Claims were canceled to reduce the filing fee. Claim 12 was amended to correct dependency and claim 44 was amended to eliminate dependency from a canceled claim.

Summary

The Applicants respectfully believe that each of claims 1-4, 8-12, 15, 18, 19, 22, 24-26, 34, 37, 44, 50, and 52 is in condition for allowance. Consideration and allowance of the claims are respectfully requested at the earliest possible time.

Respectfully submitted,

Millard F. WALLACE

28 February 2017
(Date)

By: /Gary D. Colby/

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Amendments to the Claims

Please amend the claims to read as shown in the following listing of the claims.

1. (Original) A method of making a shaped article having a body with a smooth periphery, the method comprising

forming a thermoplastic into a shape comprising the body and a deflectable flange at a peripheral portion of the body,

the deflectable flange comprising a spacer bearing a peripheral edge of the thermoplastic, the spacer being connected to the body by way of an extension that extends peripherally away from the body and a bend region interconnecting the spacer and the extension,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic; and

disengaging the ram from the spacer, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement to yield the body with a smooth periphery.

2. (Original) The method of claim 1 wherein the bent portion is cooled below the glass transition temperature prior to disengaging the ram from the spacer.

3. (Original) The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle not less than 75 degrees, but less than 105 degrees.

4. (Original) The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle of about 87-93 degrees.

5-7. (Canceled)

8. (Original) The method of claim 1, wherein the thermoplastic is formed into a shape comprising the body and having the deflectable flange about its entire periphery.

9. (Original) The method of claim 1, wherein the thermoplastic is formed into a shape comprising a boding having a concave compartment with an opening and the deflectable flange about the entire periphery of the opening.

10. (Original) The method of claim 9, further comprising sealing the compartment using a film that contacts the smooth periphery of the body about the entire periphery of the opening.

11. (Original) The method of claim 10, wherein the compartment is sealed by over-wrapping the body with the film and sealing the film to itself to envelop the body.

12. (Currently Amended) The method of claim 10 ~~11~~, wherein the compartment is sealed by applying the film across the opening of the compartment and sealing the film about the periphery of the opening.

13-14. (Canceled)

15. (Original) The method of claim 12, wherein the film is thermoformable and is disposed in a softened state around the smooth periphery of the body and cooled below its softening temperature such that the film that must be stretched outwardly about the smooth periphery of the body in order to displace the film from the opening.

16-17. (Canceled)

18. (Original) The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge away from the periphery of the shaped article sufficiently that a flexible film that tautly over-wraps the shaped article after cooling the bent portion does not contact the peripheral edge.

19. (Original) The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge sufficiently that the peripheral edge points at the body after cooling the bent portion.

20-21. (Canceled)

22. (Original) The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge to a position at which a plane through the thermoplastic at the peripheral edge is offset from the plane of the extension by an angle of not less than 180 degrees after cooling the bent portion.

23. (Canceled)

24. (Original) The method of claim 1, wherein the deflectable flange is deflected to differing degrees at selected portions of the ram, whereby the height of the deflected peripheral flange

differs at peripheral portions corresponding to the selected portions after cooling the bent portion, yielding at least one portion useable as a stacking extension.

25. (Original) The method of claim 1, wherein the ram is impinged against the spacer sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be directly viewed from the exterior of the shaped article after cooling the bent portion.

26. (Original) The method of claim 1, wherein the ram is impinged against the spacer sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be perceived by a person running a finger along the periphery of the shaped article after cooling the bent portion.

27-33. (Canceled)

34. (Original) The method of claim 33, wherein the extension extends laterally in a plane about the entire periphery of the opening of a concave compartment in the body and wherein a plug that substantially fills the opening is inserted therein prior to urging the ram against the spacer, whereby the plug inhibits inward displacement of the deflectable flange into the opening.

35-36. (Canceled)

37. (Original) The method of claim 1, wherein after impinging the ram against the spacer and heating the bent portion to at least the glass transition temperature, the ram is further impinged against the spacer to further deflect the spacer toward the extension prior to disengaging the ram from the spacer.

38-43. (Canceled)

44. (Currently Amended) The method of claim 40 ~~42~~, wherein the upper face is curved sufficiently that increasing impingement of the spacer against the ram turns the peripheral edge at least about 180 degrees relative to its orientation prior to the impingement.

45-49. (Canceled)

50. (Original) A method of forming a smooth periphery on a thermoformed article that is made from a thermoplastic and that has a sharp peripheral edge, the method comprising

forming a deflectable flange about the peripheral edge of the article,

the deflectable flange comprising a spacer including peripheral edge of the article, the spacer being connected to the article by way of an extension that extends peripherally away from the article and a bend region interconnecting the spacer and the extension,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic;

cooling the bent portion below the glass transition temperature, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement; and

disengaging the ram from the spacer to yield the article with a smooth periphery.

51. (Canceled)

52. (Original) A thermoformed article having a smooth periphery, the article comprising a body made from a thermoplastic and having a smooth bend region connected to the periphery of the body by an extension of the thermoplastic, the bend region connecting the extension with a spacer bearing the peripheral edge of the thermoplastic at a position peripheral to the bend region, and a spacer having a rolled-over conformation formed by softening at least a portion of the spacer, bending the spacer toward the extension, and cooling the softened portion to retain the peripheral edge turned away from the periphery of the article.

53-59. (Canceled)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Appln of:	Millard F. WALLACE		
Appln. No.:	Not Yet Assigned	Group Art Unit:	Not Yet Assigned
Examiner:	Not Yet Assigned	Conf. No.:	Not Yet Assigned
Filing Date:	Herewith	Attorney Docket No.:	17-1040 (MW-12CP1)

Title: Formed Thermoplastic Article Having Smooth Edges

PRELIMINARY AMENDMENT

This Preliminary Amendment is submitted upon filing of the application referenced above, which is a continuation in part of international application PCT/US16/19692.

Please amend the application as follows prior to calculation of the filing fee.

Amendments to the Claims are shown in the listing that begins on page 2.

Remarks begin on page 8.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Formed Thermoplastic Article Having Smooth Edges
First Named Inventor/Applicant Name:	Millard F WALLACE
Filer:	Gary David Colby
Attorney Docket Number:	17-1040 (MW-12CP1)

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	1	40	40
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**770**

Electronic Acknowledgement Receipt

EFS ID:	28489478
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	Formed Thermoplastic Article Having Smooth Edges
First Named Inventor/Applicant Name:	Millard F WALLACE
Customer Number:	27730
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	17-1040 (MW-12CP1)
Receipt Date:	28-FEB-2017
Filing Date:	
Time Stamp:	16:15:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$770
RAM confirmation Number	030117INTEFSW16171000
Deposit Account	601033
Authorized User	Danielle Diamond-Wood

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	Transmittal.pdf	58580 d821b0764fe0f3ead74a5752ae09a1f6feef32e7	no	1
Warnings:					
Information:					
2		Specification.pdf	284923 6a3f9e4be46ca436594528b596f93a6b6fdd6019	yes	67

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Abstract	67	67
	Claims	56	66
	Specification	1	55

Warnings:					
Information:					
3	Drawings-only black and white line drawings	Drawings.pdf	2007650 e5aec901ef62de305d2da75a165cef646676228f	no	29
Warnings:					
Information:					
4	Application Data Sheet	ADS.pdf	65245 82f8b445255cbde9dcfcea7ba8385a1be06b8e0e	no	5
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					

5	Oath or Declaration filed	declaration_Exec.pdf	329341 38480d279c9e2ccf7d96fc54c3b612f6220f3ba2	no	2
Warnings:					
Information:					
6		PM_AM.pdf	39691 ff514fa0ec56ceac6140f73418fd736e635a8289	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	8	8
	Claims	2	7
	Preliminary Amendment	1	1

Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	36612 cdc2c08010d184b6128957afd1ee15ae58f8245b	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	2822042	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

SCORE Placeholder Sheet for IFW Content

Application Number: 15445220 Document Date: 02/28/2017

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

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Form Revision Date: September 30, 2013

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/445,220	Filing Date 02/28/2017	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 02/28/2017

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 21	Minus	** 21	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
ANNIE C. SINGLETON

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/445,220	02/28/2017	2812	770	17-1040 (MW-12CP1)	21	3

CONFIRMATION NO. 9924

27730
DILWORTH PAXSON LLP
1500 Market Street
Suite 3500 E
PHILADELPHIA, PA 19102

FILING RECEIPT

OC000000089715173

Date Mailed: 03/09/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Millard F. WALLACE, Orwigsburg, PA;

Applicant(s)

Converter Manufacturing, Inc., Orwigsburg, PA

Assignment For Published Patent Application

Converter Manufacturing, Inc., Orwigsburg, PA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of PCT/US2016/049692 08/31/2016
which claims benefit of 62/212,367 08/31/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 03/07/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/445,220**

Projected Publication Date: 06/15/2017

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Formed Thermoplastic Article Having Smooth Edges

Preliminary Class

438

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/445,220

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	21 minus 20 =	* 1	x 40 =	40	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	770		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/445,220	02/28/2017	Millard F. WALLACE	17-1040 (MW-12CP1)

CONFIRMATION NO. 9924

PUBLICATION NOTICE

27730
DILWORTH PAXSON LLP
1500 Market Street
Suite 3500 E
PHILADELPHIA, PA 19102

OC00000092107170

Title: Formed Thermoplastic Article Having Smooth Edges

Publication No.US-2017-0165896-A1
Publication Date:06/15/2017

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Ningbo Linhua Plastic Ex. 1002, p. 124

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Lan YAN
Attorney Docket Number	17-1040 (MW-12CP1)

U.S.PATENTS

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15445220
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	First Named Inventor	Millard F. WALLACE
	Art Unit	1782
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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2017-08-18
Name/Print	Gary D. Colby, Ph.D., J.D.	Registration Number	40961

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DESCRIPTION FR2424805

The invention relates to a method for producing a panel for covering the visible face of an element. It relates also to the packing panel obtained according to this method, which applies more particularly but not exclusively to the panels of Packing of the interior of a vehicle and more specifically to the said panels doubling internally the doors of this vehicle.

L'invention se rapporte à un procédé de fabrication d'un panneau de garnissage de la face apparente d'un élément Blle se rapporte également au panneau de garnissage obtenu selon ce procédé, qui s'applique plus particulièrement mais non exclusivement, aux panneaux de garnissage de l'intérieur d'un véhicule et plus spécialement auxdits panneaux doublant interieurement les portières de ce véhicule.

Currently, the lining of a door generally consists of a thin rigid plate, for example of compressed fibers, on which, after interposing a layer of compressible material, such as foam, is fixed, by high-frequency welding or By any other means, the flexible sheet which will dictate the appearance of the lining, whether this sheet is of textile or plastic material or a complex of these materials.

Actuellement, la garniture d1 une portière est généralement constituée d'une fine plaque rigide, par exemple en fibres comprimées, sur laquelle, après interposition d'une couche de matériau compressible, tel de la mousse, est fixée, par soudure à haute fréquence ou par tout autre moyes, la feuille souple qui dictera l'aspect de la garniture et ce, que cette feuille soit de nature textile, en matière plastique ou soit un complexe de ces matières.

For the blind fastening of this assembly to the door, the rigid plate carries fasteners which are shaped in such a way that they can be pressed transversely transversely in order to be able to pass through holes made for this purpose in the front door To resume their shape elastically

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beyond the orifices in order to anchor energetically behind said sheet.

Pour la fixation en aveugle de cet ensemble sur la portière, la plaque rigide porte des attaches qui sont conformées de manière telle que par simple pression, elles se compriment transversalement pour pouvoir traverser des orifices exécutés à cet effet dans la tSIe de la portière, avant de reprendre élastiquement leur forme au-delà des orifices pour s'ancrer-énergiquement derrière ladite tôle.

After this, this fitting still generally calls for accessories such as ashtrays, armrests which must then be made separately and then fastened to this filling, which obviously multiplies the manufacturing and assembly operations and thus increases the cost price.

---

après cela, cette garniture appelle encore généralement des accessoires tels des porte-cendriers, des accoudoirs qu'il faut alors confectionner séparément puis fixer sur cette garniture, ce qui évidemment multiplie les opérations de fabrication et de montage et majore donc le prix de revient.

Indeed, regardless of the thickness of the layer of compressible material interposed between the rigid plate and the flexible sheet, the lining obtained according to this conventional method can never exhibit local bulges sufficient to produce said accessories. Furthermore, this lining Can not possibly have well-rounded shapes, with large curves, massive shapes, yet highly sought after by aestheticians and users for the impression of great solidity and comfort that such forms provide.

En effet, quelle que soit l'épaisseur de la couche de matériau compressible, interposée entre la plaque rigide et la feuille souple, la garniture obtenue selon ce procédé traditionnel ne peut jamais présenter des renflements locaux suffisants pour réaliser lesdits accessoires De plus, cette garniture ne peut lamais avoir des formes avantageusement rebondies, avec de larges galbes, formes massives pourtant très recherchées par les esthéticiens et par les usagers pour l'impression de grande solidité et de grand confort que de telles formes procurent.

One technique which could lead to obtaining such bulging shapes and such local bulges would be the so-called thermoforming technique, according to which a matrix is provided which supports the impression of the part to be obtained in a hollow or embossed shape and on which matrix A sheet of plastics material which is exposed to the heat so as to be softened and to follow this imprint generally placed in a vacuum, is pressed over the entire periphery of this cavity.

Une technique qui pourrait conduire à l'obtention de telles formes rebondies et de tels renflements locaux serait la technique dite du thermo formage, selon laquelle on réalise une matrice portant en

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creux ou en relief l'empreinte de la pièce à obtenir, sur laquelle matrice on presse et cet sur tout le pourtour de cette empreinte, une feuille de matière plastique qu r on expose à la chaleur pour qu'elle se ramollisse et vienne épouser ladite empreinte généralement placée en dépression.

Unfortunately, after hardening of the plastic material and demoulding of the part, the latter remains integral with a collar constituted by the part of the sheet which had been pressed onto the matrix.

Malheureusement, après durcissement de la matière plastique et démoulage de la pièce, celle-ci reste solidaire d'une collerette constituée par la partie de la feuille qui avait été pressée sur la matrice.

Apart from the fact that a trimming operation to eliminate this collar increases the cost price of the trimming, after clipping, the edge of the piece remains apparent, which is unsightly and must be masked.

Outre qu'une opération de détourage pour éliminer cette collerette majore le prix de revient de la garniture, après détourage, le chant de la pièce reste apparent, ce qui est inesthétique et doit etre masqué.

Moreover, due to the rounded shapes of the fastener, the blind fastening fasteners must be carried by intermediate intermediate means which are difficult to put in place by welding without altering the visible face of the panel and may weigh a play which can cause Vibrations which are detrimental to comfort For all these reasons, the gasket manufacturers have always shown an unfavorable prejudice for this thermoforming technique which they consider to be inapplicable to their product.

Par ailleurs, du fait des formes rebondies de la garniture, les attaches de fixation en aveugle doivent être portées par des moyens intermédiaires rapportés, difficiles à mettre en place par soudure sans altérer la face apparente du panneau et risquent de pesenter un jeu pouvant provoquer des vibrations nuisibles au confort Pour toutes ces raisons, les fabricants de garniture ont tou- jours manifesté un préJuge défavorable pour cette technique du thermo formage qu'ils considèrent comme inapplicable à leur produit.

A result which the invention aims to achieve is a filling which can have all the rounded shapes and all the desired local bulges, the edge of which has an excellent appearance and which, despite the depth of the shapes, can be fixed blindly easily by Fasteners without resorting to intermediate means and without admitting any play which could have tolerated vibrations.

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Un résultat que ltinvention vise à obtenir est une garniture pouvant présenter toutes les formes rebondies et tous les renflements locaux souhaités, dont le chant possède un excellent aspect, et qui, malgré la profondeur des formes, peut être fixée, en aveugle, facilement par des attaches sans faire appel à des moyens intermédiaires et sans admettre de jeu qui aurait pu tolérer des vibrations.

To this end, the subject of the invention is a method for manufacturing a lining, in which method, inter alia, the technique of thermoforming is used, that is to say, The imprint of the lining to be obtained is obtained over the entire periphery of this cavity on the support plane of the die, a thermoplastic sheet is then pressed by means of a blank holder, The heat to soften and come to conform to the said imprint generally placed under a negative pressure, the sheet is finally cooled for which hardening before demoulding of the part thus obtained which, apart from the median part, which alone will be apparent after mounting of the Comprises a collar constituted by the part of the sheet which has been pressed under the blank holder.

Pour cela, l'invention a pour objet un procédé de fabrication d'une garniture, dans lequel procédé on utilise entre autres la technique du thermoformage, c'est-à-dire, qu'on réalise tout d'abord une matrice portant en creux l'empreinte de la garniture à obtenir, sur tout le pourtour de cette empreinte, sur le plan d'appui de la matrice, on presse ensuite au moyen d'un serre-flan une feuille thermoplastique qu'on expose alors à l'action de la chaleur pour qu'elle se ramollisse et vienne épouser ladite empreinte généralement placée en dépression, on refroidit enfin la feuille pour quelle durcisse avant démoulage de la pièce ainsi obtenue qui, outre la partie médiane, qui seule sera apparente après montage de la garniture, comprend une collerette constituée par la partie de la feuille qui a été pressée sous le serre-flan.

This process is characterized, in particular, in that, after exposure of the thermoplastic sheet to heat, a punch having shapes complementary to those of the impression is lowered into the front of the die and then, when the punch is thus lowered, The thermoplastic sheet is compressed in a non-elastic manner by acting on its face which will make the back side of the lining along a line along the contour of the median part and in that, after demolding, instead of trimming this part Median, the peripheral excess of material is simply folded over the back of the median part, thereby benefiting from the flexibility given to the material by the non-elastic compression action on the corresponding line.

Ce procédé est notamment caractérisé en ce que, après exposition de la feuille thermoplastique à la chaleur, on descend dans ltem- preinte de la matrice un poinçon présentant des formes complémentaires à celles de l'empreinte, puis, lorsque le poinçon est ainsi descendu, on comprime de manière non élastique la feuille thermoplastique en agissant sur sa face qui réalisera

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le verso de la garniture et ce au long d'une ligne suivant la contour de la partie médiane et en ce que, après démoulage, au lieu de détourer cette partie médiane, on rabat simplement sur le verso de la partie médiane l'excédent périphérique de matière en bénéficiant pour cela de la souplesse donnée à la matière par l'action de compression non élastique sur la ligne correspondante.

The subject of the invention is also the filling obtained with the aid of this process.

L'invention a également pour objet la garniture obtenue à l'aide de ce procédé.

BRIEF DESCRIPTION OF THE DRAWINGS It will be well understood with the aid of the following description given, by way of non-limiting example, with reference to the illustrated drawing which represents FIG. 1 and 2: two distinct phases of the manufacturing process, FIG. 3: the lining viewed in isolation, FIG. 4: the packing prepared for mounting, - Fig. 5: the lining mounted on a sheet, - Fig. 6: on a large scale, a detail of this trim.

Elle sera bien comprise à l'aide de la description ci-après faite, à titre d'exemple non limitatif, en regard du dessin ciannexé qui représente - Fig. 1 et 2 : deux phases distinctes du procédé de fabrication, - Fig, 3 : la garniture vue isolément, - Fig. 4 : la garniture préparée en vue de son montage, - Fig. 5 : la garniture montée sur une tôle, - Fig. 6 : à grande échelle, un détail de cette garniture.

According to one characteristic of the invention, in spite of the unfavorable prejudices mentioned above, the technique used is, inter alia, that of thermoforming, that is to say firstly a matrix 1 carrying a recess 1 ' The filling 2 of the filling to be obtained (fiv; 1); On this matrix 1, a thermoplastic sheet 4 is pressed over the entire periphery 3 of the impression 2, for example by means of a blank holder 5.

Selon une caractéristique de l'invention, malgré les préjugés défavorables évoqués plus haut, la technique utilisée est entre autres celle du thermo formage,c'est-à-dire qu'on réalise tout d'abord une matrice 1 portant en creux 1 'empreinte 2 de la garniture à obtenir (fiv;1); sur cette matrice 1 on presse ensuite, et ce sur tout le pourtour 3 de 1' empreinte 2, une feuille thermoplastique 4, par exemple au moyen d'un serre-flan 5.

The sheet 4 is then exposed to heat so that it softens and comes to conform to said cavity 2 that is generally placed under a vacuum (FIG. 2).

On expose alors la feuille 4 à la chaleur pour qu'elle se ramollisse et vienne épouser ladite

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empreinte 2 généralement placée en dépression (fig.2).

After hardening, caused by cooling of the die and demolding of the part (FIG. 3), the latter remains integral with a flange 6 constituted by the part of the sheet 4 which had been pressed under the blank holder 5.

Après durcissement, provoqué par un refroidissement de la matrice et démoulage de la pièce (fiv.3), celle-ci reste solidaire d'une collerette 6 constituée par la partie de la feuille 4 qui avait été pressée sous le serre-flan 5.

The sheet 4 according to the invention is a complex formed of a plastic sheet 7 and a flexible sheet 8 of decorative material which preferably is of textile nature extensible in two perpendicular directions.

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la feuille 4, selon l'ihvention, est un complexe formé d'une plaque de matière plastique 7-et d'une feuille souple 8 de matériau décoratif qui de préférence est de nature textile extensible dans deux directions perpendiculaires.

Between the plate 7 and the sheet 8 there can be interposed a layer (not shown) of compressible material, such as soft.

Entre la plaque 7 et la feuille 8 peut être interposée une couche (non représentée) de matériau compressible, tel de la mous se.

According to an essential characteristic of the invention, the plastic material constituting the plate 7 is chosen from those, such as polypropylene, offering, in the normal state, excellent stiffness, after local elastic compression, very great flexibility and high strength To fatigue by bending, in its part thus compressed.

Selon une caractéristique essentielle de lrinvention, la matière plastique constituant la plaque 7 est choisie parmi celles, telles le polypropylène, offrant - à 11 état normal, une excellente rigidité, - après compression non élastique locale, une très grande sou plesse et une grande résistance à la fatigue par flexion, en sa partie ainsi comprimée.

According to another characteristic of the invention, after fixing the sheet 4 on the matrix 1 by the blank holder 5 and after exposure to heat, a punch 9 having shapes 10 Complementary to that of

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the imprint 2 of the matrix, with which thermoforming is assisted, and the equitable distribution of the extension that the sheet 4 must undergo in order to conform to the imprint 2 is favored.

Selon une autre caractéristique de l'invention, après fixation de la feuille 4 sur la matrice 1 par le serre-flan 5 et après exposition à la chaleur, on fait descendre dans l'empreinte de la matrice 1 un poinçon 9 présentant des formes 10 complémentaires à celle de l'empreinte 2 de la matrice, grâee auquel - on assiste le thermoformage et - on favorise la répartition équitable de l'extension que la feuille 4 doit subir pour venir épouser l'empreinte 2.

Then, when the punch 9 is lowered into the matrix 1, the plastics material 7 is compressed in a non-elastic manner along a line II along the contour of the median portion which will be visible on the packing after its assembly carried out as explained below.

Ensuite, lorsque le poinçon 9 est descendu dans la matrice 1, on comprime de manière non élastique la matière plastique 7 au long drune ligne II suivant le contour de la partie médiane qui sera apparente sur la garniture après son montage opéré comme exposé plus loin.

For this local compression, the punch 9 carries blades 12 which strongly imprint their edge 13 in the plastic material 7.

Pour cette compression locale, le poinçon 9 porte des lames 12 venant imprimer fortement leur arête 13 dans la matière plastique 7.

Obviously, since these edges 13 would be undercut and would impede demoulding, they are retractable in their housing 14 from which they only emerge when, for example, they are pneumatically pressed against the plastics material.

Evidemment, étant donné que ces arêtes 13 seraient en contre dépouille et feraient obstacle au démoulage, elles sont rétractables dans leur logement 14 dont elles ne sortent qu'au moment où, par exemple pneumatiquement, elles doivent être énergiquement pressées sur la matière plastique.

Because of this local compression along line II, the peripheral excess of material can be easily folded over the back of the packing without the need for trimming.

Du fait de cette compression, locale au long de la ligne il, l'excédent périphérique de matière peut être aisément rabattu sur le verso de la garniture sans nécessiter de détourage.

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Another characteristic of the method according to the invention is that of making an impression 2 that is deeper than the thickness of the lining so that it is reserved in the matrix between the aforesaid line 11 and the support plane of the holding- On the periphery 3 of the impression, a peripheral strip 15 forming with the collar a certain angle n 8 "for example of the order of one hundred and thirty five degrees. As a result, on the part obtained with this matrix, after folding the peripheral excess of material (FIG. 4) on the back of the lining, when the strip 16 comes to rest on this back, the flange 6 is largely in Projecting towards the rear and then produces a resilient element on the plane 17, for example of the sheet 18, intended to receive the lining. This elastic element is able to absorb any mounting play and it is therefore understood that any vibration is prohibited.

Est également une autre caractéristique du procédé selon l'invention, le fait de réaliser une empreinte 2 plus profonde que 1' épaisseur de la garniture afin que soit réservé dans la matrice, entre la ligne 11 précitée et le plan d'appui du serre-flan sur le pourtour 3 de l'empreinte, un bandeau périphérique 15 formant avec la collerette un certain angle n 8 " par exemple de l'ordre de cent trente cinq degrés. De ce fait, sur la pièce obtenue avec cette matrice, après rabattement de l'excédent périphérique de matière (fig.4) sur le verso de la garniture, lorsque le bandeau 16 vient en appui sur ce verso, la collerette 6 est largement en saillie vers l'arrière et réalise alors un élément élastique d'ap pui sur le plan 17, par exemple de-la tôle 18, destinée à recevoir la garniture. Cet élément élastique est apte à absorber tout jeu de montage et on comprend donc que toute vibration est interdite.

For the blind fastening of the lining on the tale 8, it is pierced with holes 19 and the lining is provided with fasteners 20 for example in the shape of a finger provided with relatively flexible radial lamellae but capable of ensuring its energetic anchoring In the sheet 18.

Pour la fixation en aveugle de la garniture sur la tale ~8, celle-ci est percée de trous 19 et la garniture est pourvue d'attaches 20 par exemple en forme de doigt pourvu de lamelles radiales relativement souples mais aptes à assurer son ancrage énergique dans la tôle 18.

Instead of requiring intermediate means, these fasteners 20 may advantageously be carried directly by the overlapping peripheral overhang on the back of the middle part and preferably by the strip 16 in order to allow the flange 6 to play its entire ribbon mentioned above in Which concerns the absorption of the mounting clearances.

Au lieu de nécessiter des moyens intermédiaires, ces attaches 20 peuvent avantageusement être portées directement par l'excédent périphérique rabattu au verso de la partie médiane et de

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préférence par le bandeau 16 afin de laisser jouer à la collerette 6 tout son rible évoqué plus haut en ce qui concerne l'absorption des jeux de montage.

For the association to the strip 16 of these fasteners, holes 21 are drilled in which the fasteners are engaged as far as pinching between their head 22 and the first radial lamellae of the finger.

Pour l'association au bandeau 16 de ces attaches, sont percés des trous 21 dans lesquels les attaches sont engagées jusqu'à pincement entre leur tête 22 et les premières lamelles radiales du doigt.

In order to facilitate the insertion of the fasteners into the holes 19 of the sheet, it is desirable that the head 22 bears against the back of the median part of the piece.

Afin de faciliter l'enfoncement des attaches dans les trous 19 de la tôle, il est souhaitable que -la tête 22 appuie au verso de la partie médiane de la pièce.

To guarantee this position, after engagement of the finger in the strip 16, the tee of the fastener can be fixed to this back, for example by adhesive bonding, which will otherwise have the advantage of keeping the peripheral edge properly folded on this back, Which will then facilitate assembly.

Pour garantir cette position, après engagement du doigt dans le bandeau 16, la tee de l'attache peut être fixée sur ce verso, par exemple par collage, ce qui par ailleurs aura l'avantage de maintenir llexcédent périphérique correctement rabattu sur ce verso, ce qui facilitera ensuite le montage.

In order also to place said head 22 in abutment on the back of the middle part without requiring this head to be too high, but also in order to reserve a margin 23 for clamping the lining during assembly, the impression 2 of the matrix preferably comprises between the strip 15 and the line II a return 24 of width slightly less than the depth P of the step of the lining to be produced and forming with the strip an angle B that is sufficiently closed. The same return will then be found on the molded part.

En vue également de placer ladite tête 22 en appui sur le verso de la partie médiane sans nécessiter de donner à cette tête une hauteur trop importante, mais aussi en vue de réserver une marge 23 de serrage de la garniture lors du montage, l'empreinte 2 de la matrice comportera de préférence, entre le bandeau 15 et la ligne II, un retour 24 de largeur légèrement inférieure à la

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profondeur P du décrochement de la garniture à réaliser et formant avec le bandeau un angle B assez fermé. Le même retour 25 se retrouvera alors sur la pièce démoulée.

When the strip 16 is retracted on the back of the middle part, this return 25 will then follow substantially the step, which will bring back the strip 16 near the back of this median part.

Lors du rabattament du bandeau 16 au verso de la partie médiane, ce retour 25 suivra alors sensiblement le décrochement, ce qui ramènera donc le bandeau 16 près du verso de cette partie médiane.

Independently of the forms dictated by the process and described above, thanks to the thermoforming technique, the lining may comprise all the desirable forms, including for making accessories such as an ashtray holder, an armrest, etc.

Indépendamment des formes dictées par le procédé et décrites ci-dessus, grâce à la technique du thermoformage, la garniture peut comporter toutes les formes souhaitables, y compris pour réaliser des accessoires tels un porte-cendrier, un accoudoir, etc...

Thermoforming, carried out on a recessed recess in the foregoing description, can of course be practiced on a relief shape by means of a suitable adaptation of the tooling.

Le thermo-formage, réalisé sur une empreinte en creux, dans la description qui précède, peut, bien entendu, être pratiqué sur une forme de relief moyennant une adaptation convenable de l'outillage.

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CLAIMS FR2424805

R $ VE ATIONS

R$VE ATIONS

1

A method of manufacturing a panel for trimming the visible face of an element and more particularly, but not exclusively, of a packing panel of the interior of a vehicle and more specifically to said panel internally lining the doors Of this vehicle, in which method, inter alia, the technique of thermoforming is used, that is to say, firstly a matrix bearing: the imprint of the nitride to be obtained, over the entire periphery of this cavity , A thermoplastic sheet is then pressed onto the support plane of the matrix by means of a tightening-up, which is then exposed to the action of the heat so as to soften and to conform to the said imprint generally placed under vacuum , The sheet is finally cooled to harden before demolding the part thus obtained which, apart from the middle part, which alone will be apparent after assembly of the lining, comprises a flange constituted by the pa Characterized in that after exposure of the thermoplastic sheet to heat, a stamp having a cokiean shape is inserted into the die template X and then, when the punch is thus retracted, the thermoplastic sheet is compressed in a non-elastic manner by acting on its face which will produce the back of the filling and this along a line along the contour of The middle part and in that, in the event of demolding, instead of cutting off this median part, the peripheral excess of material is simply folded over the back of the median part, thereby benefiting from the flexibility given to the material By the non-elastic compression action on the corresponding line.

- Procédé de fabrication d'un panneau de garnissage de la face apparente d'un élément et plus particulièrement, mais non exclusivement, d'un pannneau de garnissage de l'intérieur d'un véhicule et plus spécialement au dit panneau doublant intérieurement les portières de ce véhicule, dans lequel procédé on utilise entre autres la technique du thermoformage, c'est-à-dire luron

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réalise tout d'abord une matrice portant : l'empreinte de la gar nitrure à obtenir, sur tout le pourtour de cette empreinte, sur le plan d'appui de la matrice, on presse ensuite au moyen d'un serreflan une feuille thermoplastique qu'on expose alors à l'action de la chaleur pour qu'elle se ramollisse et vienne épouser ladite empreinte généralement placée en dépression, on refroidît enfin la feuille pour qu'elle durcisse avant démoulage de la pièce ainsi obtenue qui, outre la partie médiane, qui seule sera apparente après montage de la garniture, comprend une collerette constituée par la partie de la feuille qui a été pressée sous le serre-flan, ce procédé étant c a r a c t é r i s é en ce que, après exposition de la feuille thermoplastique à la chaleur, on in trodutL dan# ltempreinte de la matrice un poinçon présentant des formes cokiéenFaireS X celles de l'empreinte, puis, lorsque le poinçon est ainsi rentré~/ on comprime de manière non élastique la feuille thermoplastique en agissant sur sa face qui réalisera le verso de la garniture et ce au long d'une ligne suivant le contour de la partie médiane et en ce que,a#rès démoulage, au lieu de détourer cette partie médiane, on rabat simpléuent sur le verso de la partie médiane l'excédent périphé- rique de matière en bénéficiant pour cela de la souplesse donnée à la matière par l'action de compression non dlastique sur la ligne correspondante.

2

A method according to claim 1, characterized in that the sheet is a complex of at least one plastic plate chosen from those offering in the normal state an excellent rigidity, whereas after non-elastic compression it offers a very large Flexibility and high resistance to bending fatigue, a flexible sheet of decorative material extensible in two perpendicular directions.

- Procédé selon la revendication j caractérisé en ce que la feuille est un complexe d'au moins - une plaque de matière plastique choisie parmi celles offrant à l'état normal une excellente rigidité, alors qu'après compression non élastique elle offre une très grande souplesse et une grande résistance à la fatigue par flexion, - une feuille souple de matériau décoratif extensible dans deux directions perpendiculaires.

3

Process according to claim 2, characterized in that the plastic material is polypropylene

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- Procédé selon la revendication 2 caracterisé en ce que la matière plastique est du polypropylène

4

Method according to any one of claims 1 to 3, characterized in that in the matrix, a recess is made deeper than the recess of the lining in order to reserve, between the line following the periphery of the median part and the flange, a With the collar forming a certain angle.

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- Procédé selon l'une quelconque des revendications 1 à 3 caractérisé en ce que dans la matrice on réalise une empreinte plus profonde que le décrochement de la garniture afin de réserver, entre la ligne suivant le pourtour de la partie médiane et la collerette, un bandeau périphérique formant avec la collerette un certain angle.

5

- A method according to any one of claims 1 to 4, characterized in that, for fastening of the lining to the element to be lined, fasteners are associated directly with the peripheral excess folded over on the back of the part median.

- Procédé selon l'une quelconque des revendications 1 à 4 caractérisé en ce que, en vue de la fixation de la garniture sur l'élément à garnir, on associe des attaches directement à l'excé- dent périphérique rabattu au verso de la partie médiane.

6

The method as claimed in claim 5, characterized in that the fasteners are engaged in bores of the strip and this until the strip is wedged between the head and the elastic anchoring members presented for this purpose by the fastener.

- Procédé selon la revendication 5 caractérisé en ce qu'on engage les attaches dans des perçages du bandeau et ce jusqu'à coincement de ce bandeau entre la têtE et les organes d'ancrage élastique présentés à cet effet par l'attache.

7

Method according to claim 6, characterized in that the fastening of the fasteners is fixed to the back of the middle part of the filling.

- Procédé selon la revendication 6 caractérisé en ce qu'on fixe la tette des attaches au verso de la partie médiane de la garniture.

8

A method according to any one of claims 4 to 7, characterized in that in the matrix between the strip and the compression line a return of width slightly less than the step of the lining is reserved and forms a very closed angle with headband.

- Procédé selon l'une quelconque des revendications 4 à 7 caractérisé en ce que, dans la

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matrice, entre le bandeau et la ligne de compression, on réserve un retour de largeur légèrement inférieure au décrochement de la garniture et formant un angle très fermé avec le bandeau.

9

- A packing panel characterized in that it is obtained by the method according to any one of claims 1 to 8.

- Panneau de garnissage caractérisé en ce qu'il est obtenu à l'aide du procédé selon l'une quelconque des revendications 1 à 8.

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Fig. 1

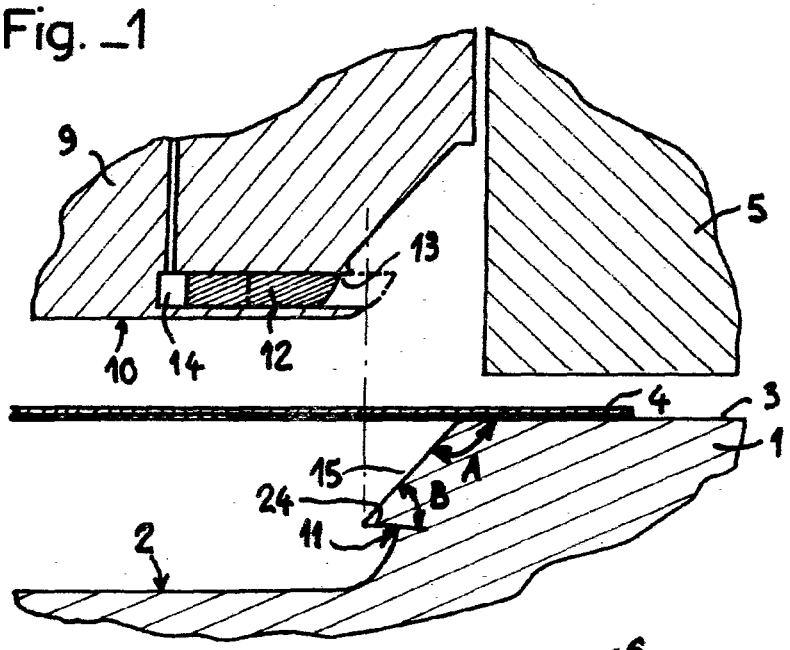


Fig. 2

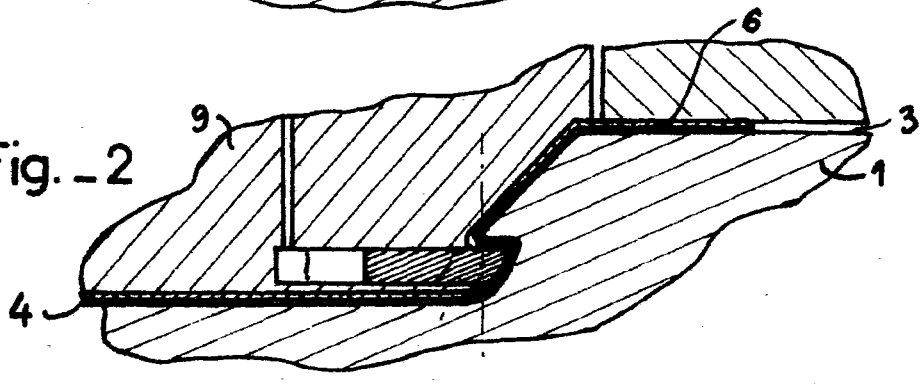


Fig. 3

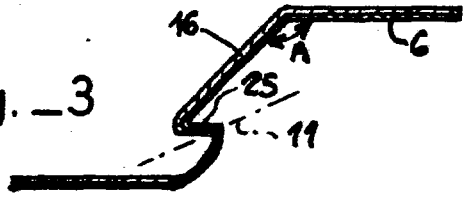


Fig. 4

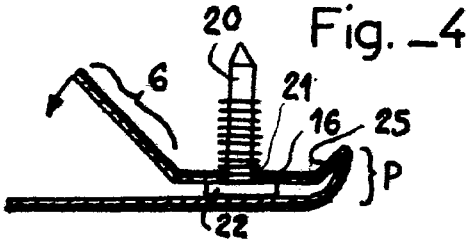


Fig. 5

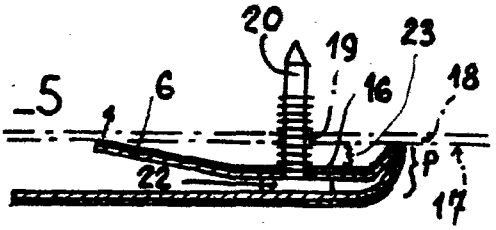
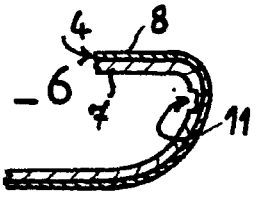


Fig. 6



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(54) **Title**: MOLDABLE CONTAINER LINER HAVING BARRIER PROPERTIES

(57) **Abstract**: The disclosure relates to a liner for containers or packages. The liner includes several polymer layers, exhibits a barrier function (e.g., gas or moisture barrier function), and is peelably attachable to one or more container/package surfaces. When the liner lines a package or container the package or container exhibits the liner's barrier function, and the liner can be peeled from the package or container to facilitate recycling or disposal. The liner is thermoformable, and can thus be either shaped to conform to the shape of a pre-formed container or shaped simultaneously with formation of the container from a precursor material to which the liner is peelably bound, either prior to or during container formation.

TITLE OF THE DISCLOSURE

[0001] Moldable Container Liner Having Barrier Properties

BACKGROUND OF THE DISCLOSURE

[0002] The invention relates generally to the field of packaging, and more specifically to packages which inhibit passage therethrough of moisture, gases, or other compounds.

[0003] Packaging of products is nearly ubiquitous. Packages contain discrete units of products, and can identify and protect packaged products from harm during storage, shipping, and sale. The ubiquity of packaging results in enormous quantities of spent packaging, much of which is discarded after being separated from packaged products.

[0004] Only a relatively small proportion of packaging materials are recyclable. Practically recyclable packaging materials are generally formed of a single type of material (e.g., paper pulp, metal foil, or a single type of plastic). Packaging materials which include numerous materials must be separated into their component materials in order to facilitate recycling of those materials. As the difficulty of separating a package into discrete materials increases, the likelihood that any portion of the package will be recycled decreases.

[0005] Many packages include multiple materials because those packages must serve numerous functions. In addition to containing the product and bearing information sufficient to identify the contents, containers for some products must i) have specific shapes to adequately contain and protect the product during shipping and/or storage, ii) exhibit the ability to exclude undesirable substances (e.g., moisture, dirt, or reactive gases such as oxygen) from the packaged product, iii) retain volatile, diffusable, or flowable components (e.g., liquids, flavors, or aromas) within the packaged product, or iv) combinations of these. It is because packages must serve such diverse functions that many packages include multiple materials that cannot be recycled in a single stream.

[0006] The enormous bulk of packaging materials that are discarded (e.g., in landfills or by incineration) could be reduced if there were packages in which components that are not practically recyclable could be contained in a relatively small portion of the package, especially

if that non-recyclable portion could be easily separated from the recyclable component(s) of the packaging. The subject matter described herein provides such packages.

BRIEF SUMMARY OF THE DISCLOSURE

[0007] The invention relates to a thermoformable sheet for lining a container composed of a substrate. The thermoformable sheet is a bonded stack of sheets that includes a substrate binding layer, a sealing layer, and, interposed between the substrate binding layer and the sealing layer in any order, a moisture barrier layer and a gas barrier layer. The substrate binding layer includes at least a first polyethylene, and should be selected so that the substrate binding layer binds with the substrate when the thermoformable sheet is urged against the substrate in a heat-softened state (i.e., the substrate binding layer facing the substrate). The thermoformable sheet should thereafter be peelable from the substrate at 20 degrees Celsius. The sealing layer includes a second polyethylene which can, but need not, be identical to the first. At least one moisture barrier layer includes a polyolefin, such as a layer made completely of the polyolefin (e.g., polypropylene). At least one gas barrier layer should include a polymer (e.g., an ethylene vinyl alcohol layer) that resists permeation by at least one gas (e.g., oxygen) and that polymer can be adjacent a thermoformable nylon layer (or sandwiched between two such layers) to provide physical support to the polymer during shaping operations. All of the layers of the thermoformable sheet are preferably bonded to their adjacent layers to yield the finished thermoformable sheet.

[0008] Polyethylenes that are useful in the substrate barrier layer include, for example ethylene vinyl acetates (EVAs), low density polyethylenes (LDPEs), linear low density polyethylenes (LLDPEs), and blends of these. By way of example, the substrate binding layer can be a blend of an EVA and a LLDPE. Alternatively, the substrate binding layer can be a blend of an EVA, a LDPE, and a LLDPE.

At least one polyethylene used in the sealing layer is preferably a low-set LLDPE, such as a

[0009] metallocene LLDPE, a cycloolefin/LLDPE copolymer, an EVA, or a combination of these.

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[0010] The outer surface of the sealing layer of the thermoformable sheet can be corona treated.

[0011] The thermoformable sheet can have an overall thickness from 3 to 10 mils, for example, and can be used to line a substrate. By way of example, described herein is an assembly that includes a container made from a substrate and defining a concave surface. The thermoformable sheet can be peelably bound to the concave surface of the container. Furthermore, the assembly can further include a lidding material that is bound to the sealing layer of the thermoformable sheet about the periphery of the concave surface, thereby defining a closed compartment defined by the thermoformable sheet and the lidding. The thermoformable sheet described herein can be used to line a container, such as one that is made of a recyclable material. By peeling the thermoformable sheet (which contains a variety of materials, and can therefore be inappropriate for recycling) from the container, the bulk of the container can be recycled. Such thermoformable sheet-lined containers can be made by binding the thermoformable sheet to the substrate after it has been formed into a desired shape, during such shaping operations (e.g., by simultaneously shaping a substrate sheet and a thermoformable sheet applied against it) or before shaping operations (e.g., by binding flat substrate and thermoformable sheets and thereafter shaping the unitary bound sheet).

DETAILED DESCRIPTION

[0012] The disclosure relates to a thermoformable liner material designed to form a portion of a product package (e.g. an open-top container), such that the liner can be removed from the container, for example, to facilitate recycling of the container. The liner can be selected to provide favorable barrier properties, such as an extremely low oxygen transmission rate (OTR) and/or moisture vapor transmission rate (MVTR). Other favorable properties of liners are that materials used to make the liners (or at least the portions which contact a product) can be sele cted to minimize release of liner components into the product (e.g., to miminize diffusion from a plastic layer of components such as bisphenol A, a common plasticizer; this phenomenon is commonly known as “extraction” or “leaching” of liner components into a product) and/or to minimize uptake into liner components of components originating in the product (e.g., to

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minimize absorption by the liner of molecules which confer flavor or aroma to a packaged foodstuff; this phenomenon is commonly known as "scalping").

[0013] The liner material can be peeled off from substrates to which it is applied in order to enhance recyclability of that substrate after the container has served its intended purpose. Alternatively, the liner can be left in place on the container after its use, and the composite structure can be discarded with ordinary trash. Because the liner is relatively thin (e.g., about 4-8 mils, equivalent to 0.004-0.008 inches in thickness), relatively little plastic resin is required to make it, and its discard results in relatively little trash. Being composed of a mixture of plastic resins, the liner itself will usually be practically non-recyclable. However, the ability to peel the liner from a bulkier container (e.g., a plastic tray, paperboard, or pressed paper fiber container) means that the bulkier container can be recycled, while only the relatively small liner need be discarded (or incinerated) as trash. In this way, the liner (and packages lined with it) described herein can significantly decrease the quantity and volume of refuse which must be landfilled, incinerated, or otherwise disposed of.

[0014] Notable characteristics of the liner is that it is thermoformable, and that all of the plastic resins selected for inclusion in the liner are selected to exhibit relatively little shrink upon heating, forming, and cooling. Thus, the liner can be mated with other components (e.g., a plastic or paper fiber sheet) prior to formation of a finished container, during such formation, or even after a finished (but non-lined) container has been made. By way of example, the liner can be laminated against a flat sheet of polyethylene terephthalate (PET) prior to thermoforming the liner-PET into a shaped container, such as a tray. By way of an alternative example, a flat sheet of the liner can be softened by heat and formed and sealed against the interior of a pre-formed tray-shaped container (e.g., a plastic container or one formed from a wood pulp slurry); if desired, a lidding can be applied across the periphery of the concave side of the tray and sealed against the sealing layer of the liner, thereby creating a sealed compartment suitable for use in modified atmosphere packaging (MAP), for example. By way of yet another alternative example, both the liner and another material (e.g., a paper pulp) can be pre-formed into nestable shapes (e.g., a common 12-egg carton), the shaped liner can be nested within the shaped material, and application of heat can seal the liner to the interior of the material, yielding a peelably lined egg carton. In any of these examples, the liner can confer

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important barrier properties to the container and can be peeled from the other, recyclable container materials when the container is no longer needed.

[0015] Another notable characteristic of the liner is that the liner exhibits significant barrier properties. The liner is thus suitable for lining packaging intended for use with materials (e.g., foodstuffs and electronics) which must be shielded from environmental factors (e.g., oxygen or moisture) which are capable of adversely affecting the contents of the packaging. The barrier properties of the liner (or one or more layers of the liner, such as the layer nearest a product packaged adjacent the liner) can also prevent migration of components between the product and the liner (or the substrate to which the liner is attached). The barrier properties conferred to the container result from the selection of liner components which exhibit those properties. By way of example, ethylene vinyl alcohol (EVOH) exhibits significant resistance to passage of oxygen and other gases, and polyolefins (especially polypropylene and high density polyethylene (HDPE)) exhibit significant resistance to passage of moisture. Thus, including an EVOH layer within the liner will cause the liner (and any container it lines) to resist transmission of oxygen therethrough, and including a polypropylene or HDPE layer within the liner will cause the liner (and any container it lines) to resist transmission of moisture therethrough. Similarly, selection of sealing layer components (e.g., mLLDPE and COC-LLDPE materials described herein) that are highly resistant to infiltration by flavor and aroma components of packaged foodstuffs will cause the liner to resist "scalping" (i.e., absorption by the packaging) or loss to the environment of such flavor or aroma components.

[0016] The liner described herein is suitable for lining containers intended to contain a wide variety of products. In an important embodiment, the containers are intended to contain dry goods such as delicate electronic components or particulate foodstuffs (e.g., ground coffee, coffee beans, tea, spices, cereals, or grains) which must be shielded from environmental moisture and/or oxygen (i.e., the liner is intended to exclude from the interior of the container materials which normally occur on the exterior of the container). In another important embodiment, the containers are intended to retain within the container components of the packaged product, such as moisture, flavors, and odors of packaged foodstuffs (e.g., packaged meats, cheeses, coffee, tea, or spices). Containers including the liner described herein can, of

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course, be intended both to exclude undesirable environmental components and to retain desirable product components.

[0017] The liners described herein are thermoformable, meaning that they can be shaped upon application to the liner of heat. Thermoformability confers to the liners the important characteristic that they can be adapted to conform to the shape of substantially any package or container. The liner can thus be substantially indistinguishable from the remainder of the package, both to a packager and to a consumer of the packaged articles, eliminating the inconvenience of forming and opening a "package within a package." Despite being conformable to the shape of (e.g., the interior of) a package, the liner can nonetheless be peeled or stripped from the remainder of the package (preferably in one piece) and discarded, facilitating recycling of the remainder of the package if desired.

[0018] In addition to being conformable to a package, at least some embodiments of the liners described herein are sealable. That is, in addition to being attachable to a packaging material (yielding a package having an open portion), the liner can be attached to a sealing material that seals the open portion of the package and yields a compartment bounded by the liner and the sealing material. The sealing material can be another piece (or a flap of the same piece) of the liner that lines the package, in which embodiment the compartment is bounded solely by the liner.

[0019] Further details regarding the composition of the liner, ways of making it, and ways of using it are described in the following sections.

[0020] The Liner

[0021] The liner is composed of several polymer layers, bonded together into a thermoformable sheet. The liner includes a substrate binding layer on one face and a sealing layer on the opposite face of the liner. Between these two sheets are at least one polyolefin (preferably polypropylene or HDPE) moisture barrier layer and at least one 'sandwich' that includes a gas barrier layer interposed between a pair of thermoformable nylon layers. In one embodiment, those layers include the following six (optionally, and preferably, seven) layers, listed in order from the exterior (packaging) face of the liner toward the interior (product) face of the liner:

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[0022] 1. A substrate binding layer.

[0023] 2. An outer moisture barrier layer.

[0024] 3. An outer nylon layer.

[0025] 4. A gas barrier layer.

[0026] 5. An inner nylon layer.

[0027] 6. (Optional, but preferable) An inner moisture barrier layer.

[0028] 7. A sealing layer.

[0029] The inner and outer moisture barrier layers in the foregoing embodiment inhibit migration of moisture from corresponding faces of the liner to the gas barrier layer, and thereby facilitate use in the gas barrier layer of materials (e.g., EVOH) which are known to exhibit greater gas barrier properties in an anhydrous state.

[0030] In another embodiment, the liner include the following nine layers, listed in order from the exterior (packaging) face of the liner toward the interior (product) face of the liner:

[0031] 1. A substrate binding layer.

[0032] 2. A first outer nylon layer.

[0033] 3. A first gas barrier layer.

[0034] 4. A first inner nylon layer.

[0035] 5. A moisture barrier layer.

[0036] 6. A second outer nylon layer.

[0037] 7. A second gas barrier layer.

[0038] 8. A second inner nylon layer.

[0039] 9. A sealing layer.

[0040] It is important that the gas barrier layer be sandwiched between a pair of nylon layers (less preferably, bound to just one adjacent nylon layer), in order to provide physical support to the gas barrier layer during thermoforming or other shaping while the liner is in a heat-softened form. If the sandwich containing the gas barrier layer is susceptible to moisture transmission therethrough and the gas-transmission-inhibiting function of the gas barrier layer is susceptible to degradation in the presence of moisture, it can also be important that the gas barrier layer lie between a pair of moisture barrier layers, as well.

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[0041] In short, it is important that the liner include both a moisture barrier layer (such as a polypropylene layer or an HDPE layer) and a functional gas-transmission-inhibiting layer, such as the sandwich including the gas barrier layer sandwiched between thermoformable nylon layers.

[0042] Substrate Binding Layer

[0043] The liner includes a substrate binding layer that has the important characteristics that i) it binds to the substrate and ii) it is peelable from the substrate at a normal operating temperature (e.g., at room temperature or 20 degrees Celsius, or at the temperature of hot coffee grounds in a container that has the liner described herein peelably bound thereto). In one embodiment, the substrate binding layer includes at least one polyetheylene (PE), and preferably is a blend of one or more components selected from among EVAs and polyolefins. (Note, however, that if the substrate were a PE or a polypropylene (PP), for example, the substrate binding layer would preferably not be a polyolefin, because the two polyolefin layers may become non-peelably bound to one another if subjected, for example, to sufficient heating to fuse the substrate and the substrate binding layer. In such a situation, the substrate binding layer might include a PET or a PVC, rather than a PE, to bind with the PE or PP substrate.) Preferably, the substrate binding layer is a blend of at least one EVA with with one or more LDPEs and/or with one or more LLDPEs. It can, for example, be a blend of EVAs, LDPEs, and LLDPEs.

[0044] The function of the substrate binding layer is to peelably bond the liner to a surface of a substrate, such as a plastic or wood/paper fiber surface. Owing to the selection of the polymer blend selected for the substrate binding layer, it will peelably bind to most surfaces (other than surfaces composed of the same, or miscible polymers, to which surfaces it will instead weld or merge), including the surfaces of common packaging materials such as paper, cardboard, thickened wood fiber slurry (e.g., common egg cartons), polyvinylchloride (PVC), and PET. The selection of the polymer blend permits this binding to occur at relatively low processing temperatures – well within the range of temperatures which common packaging materials can endure without significant degradation. What is important in selecting polymer resins for the substrate binding layer is that, when softened, the substrate binding must adhere

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to the substrate, but must (upon cooling) remain peelable from the substrate. If the polymer blend of the substrate binding layer were miscible with the polymer composition of the substrate, then the liner would not be peelable from the substrate upon cooling.

[0045] The precise blend of polymers (e.g., EVA and LDPE/LLDPE) used for the substrate binding layer is not critical, and design of such low-melting or low-softening materials from these components is well known in the art. Increasing the content of EVA will tend to increase the adherence of the melted or softened material to the substrate surface and lower the melting/softening temperature of the substrate binding layer, but will also tend to increase the force required to peel the substrate binding layer from the substrate. Increasing the content of LDPE and/or LLDPE will tend to stiffen and strengthen the substrate binding layer. Selection of an appropriate blend of EVA and LDPE/LLDPE, for example, is within the level of skill of an ordinary artisan, in view of the guidance and goals set forth herein. Suitable EVA content of the substrate binding layer is, for example from 2% to 95% by weight, depending on the nature of the substrate and the desired tenacity of binding between the substrate and the substrate binding layer. Examples of suitable EVA contents are about 12 wt% when the substrate is a coarse fiber slurry product (e.g., a common paper egg carton), about 20 wt% when the substrate is a smooth, low porosity paper or cardboard, and about 8 wt% when the substrate is smooth plastic surface such as PVC or PET.

[0046] Moisture Barrier Layers

[0047] A moisture barrier layer inhibits or prevents migration of water through the layer. Polyolefins are highly moisture-resistant, and polypropylenes are particularly effective moisture barriers. Conventional high density polyethylenes (HDPEs) are also effective moisture barriers. In addition, polypropylene (and other thermoformable polyolefins) tend to be inexpensive, simple to process in the methods described herein, and readily available. The moisture barrier layer(s) of the liners described herein are therefore primarily or entirely composed of polypropylenes, preferably an impact grade polypropylene resin, or of HDPE. Although other polymers that resist the passage of water can be used, the combination of favorable

characteristics of polypropylene make it a preferred material. Blends of HDPE and polypropylene (e.g., 80:20 or 20:80 by weight) are also suitable.

[0048] Nylon Layers

[0049] The function of the nylon layers is to provide physical support to (i.e., prevent tearing or development of holes in) one or more gas barrier layers. Gas barrier layer materials such as EVOH tend to be brittle and to crack or develop pin-holes during thermoforming operations unless supported by other materials. It is this support which one or more nylon layers provide. Preferably, each gas barrier layer is sandwiched between (preferably in direct contact with each of) a pair of nylon layers. However, as few as a single nylon layer adjacent a gas barrier layer will suffice to support the integrity of the gas barrier layer during liner softening and shaping.

[0050] The nylon selected for the nylon layers should be a thermoformable nylon, such as the product commonly referred to in the field as "PA-6." PA-6 has the lowest glass transition of the 3 nylons so it is easier to process and less expensive than other common nylons.

[0051] Gas barrier Layers

[0052] The function of a gas barrier layer is to prevent transmission of gases (e.g., oxygen, carbon dioxide, water vapor) across the layer. A wide variety of gas barrier polymers is known, and substantially any gas barrier polymer capable of withstanding the stresses and conditions of fitting the liner described herein snugly against surfaces of a container can be used. A preferred gas barrier layer is EVOH (which substantially inhibits transmission of oxygen), which is a well-known gas barrier polymer available in a variety of forms and grades. For the purposes described herein, EVOH polymers formulated to be suitable for operations such as thermoforming (especially for thermoforming involving deep draw) are especially preferred. An example of such a suitable EVOH polymer is the product known by the trade name EVAL, available from Kuraray Polymers (Antwerp, Belgium). Other polymers having gas barrier properties include polyvinyl chlorides, polyvinylidene chlorides, and polyethylene terephthalate, for example.

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[0053] The gas barrier layer should be used in a thickness equivalent to ordinary uses of such polymers (i.e., per manufacturer instructions). An important characteristic of the liners described herein is that each gas barrier layer is sandwiched between (preferably with no intervening polymer layers) two nylon layers. The nylon layers improve the stability of the gas barrier layer, preventing cracks and holes which could decrease the barrier functionality of the gas barrier layer.

[0054] The Sealing Layer

[0055] The liners described herein include at least one sealing layer (and preferably only one sealing layer), preferably situated on the face of the liner opposite the substrate binding layer. The function of the sealing layer is to permit a seal to be formed between the sealing layer and either itself (e.g., in a container that is folded upon itself) or a lidding material (e.g., a transparent polymer film which can optionally exhibit barrier properties similar or identical to those of the liner). By way of example, if the surface of a concavity within a container (e.g., the interior of a bowl) is coated with the liner (i.e., the liner is bound by way of its substrate binding layer along the entirety of the surface of the concavity up to the edge of the orifice of the concavity, but the orifice is open), then binding a lidding to the sealing layer about the periphery of the concavity will create a completely sealed compartment bounded by the liner (within the concavity) and the lidding (covering the orifice of the concavity). Such arrangements are often used to contain liquids or in modified atmosphere packaging (MAP) applications.

[0056] The lidding or other material to which the sealing layer binds preferably has a composition (at least at the surface which contacts the sealing layer) similar or identical to the composition of the sealing layer, to facilitate formation of a strong bond between the material and the liner. In one embodiment, the material is a piece of the same material used as the liner (e.g., a flap of the liner that is not attached to the substrate and can be folded to cover an orifice defined by the substrate and about the periphery of which the liner is attached to the substrate; alternatively, a discrete piece of the liner material). In another embodiment, the substrate is folded back on itself, so that the sealing layer (i.e., the face of the liner opposite the substrate

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binding face) on different parts of the liner are opposed against, and sealed to, each other. In yet another embodiment, the material is a lidding composed of a commercially available lidstock material, selected such that an outer layer of the lidstock has a composition that is, when melted, miscible with the molten sealing layer, so that a strong seal can be made by urging the molten sealing layer and outer lidstock layer against one another.

[0057] Because the sealing layer is situated opposite the substrate binding face of the liner, it is foreseeable that the sealing layer will sometimes contact the product contained within the container formed by the substrate to which the liner is bound. In such situations, it is important to select the sealing layer that is non-reactive with the product (i.e., the sealing layer material does not participate in chemical reactions with the product nor leach into the product any sealing layer component that is inappropriate in the product, nor leach from the product any product component desired to be maintained in the product).

[0058] It is also important that the composition of the sealing layer be selected to facilitate sealing of the seal to the liner. Materials which form a good seal quickly under conditions of low heating are preferred, for example. Low-set polyethylenes (e.g., mLLDPEs, COC-LLDPEs, and EVAs) and their blends soften or melt sufficiently to merge with miscible polymers or blends at reasonable sealing temperatures (i.e., temperatures at which the liner will not completely melt or degrade, such as temperatures not greater than about 300 degrees Fahrenheit) are suitable materials for the sealing layer.

[0059] There are at least two materials which are believed to exhibit particularly favorable combinations of characteristics as sealing materials: LLDPE/cycloolefin copolymers (COC-LLDPEs) and LLDPEs made using metallocene catalysts (mLLDPEs).

[0060] Very thin layers of mLLDPEs can be used as sealing layers and yield a good seal quickly at low sealing temperatures. Corona surface treatment of mLLDPEs can reduce the propensity of mLLDPEs (like all other polyethylenes) to absorb compounds (e.g., flavors or aromas) from a product that contacts the mLLDPE. mLLDPEs are well known in the art, as are their properties and methods of manufacture.

[0061] COC-LLDPEs are similarly known in the art. COC-LLDPEs are known, for example, to exhibit low leaching of compounds from or to products they contact. They also are known to exhibit excellent tensile strength and sealability at moderate temperatures and, like

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mLLDPEs, exhibit excellent barrier characteristics and thermoforming properties. Because the density of COC-LLDPEs is relatively low, they will float on water, facilitating separation of liners containing LLDPEs from denser-than-water components in recycling processes.

[0062] mLLDPEs and COC-LLDPEs are not the only materials for use as or in the sealing layer of the liners described herein. Substantially any polymer that exhibits sufficient post-sealing tensile strength to resist tearing of the seal can be used. Preferably, the material softens or melts sufficiently to seal at as low a temperature as possible (preferably at a temperature in the range from 150-300 degrees Fahrenheit). Selection of a material that tends not to leach components into, nor extract components from, a product that contacts the sealing layer can be important, depending on the identity and nature of the product.

[0063] The sealing layer can also include one or more EVAs, in addition to one or both of mLLDPEs and COC-LLDPEs. As is known in the art, inclusion of EVAs (e.g., 2%-95% by weight) in such a polymer blend can positively affect the melting point, tackiness, and seal strength of the sealing layer. The composition of the sealing layer should be selected to be miscible with at least the outermost layer of any lidding material with which the sealing layer is intended to bond.

[0064] Making the Liner

[0065] The liner is essentially a multi-layer polymer sheet. Substantially any known method for making multi-layer polymer sheet can be used to produce the liner described herein. Suitable techniques include co-extrusion of the various plastic resins (and any required tie layers), followed by casting or blowing. Other suitable techniques include lamination of various homopolymer sheets or multi-polymer sheets (and any required tie layers), followed by heating to bond the adjacent sheets to one another. The method by which the liner is made is not critical, so long as a polymer sheet having the various layers described herein is formed. A skilled artisan is able to select among known polymer processing methods a variety of appropriate production methods that will yield the liners described herein.

[0066] Preferably, the liner is made in the form of the multi-layer polymer sheet described herein and distributed in that form to product packagers or to package manufacturers. In this form, the liners can be supplied as discrete sheets (e.g., sized and shaped to fit a particular

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package), or as larger sheets or rolled sheets to be cut and fit by a packer or package manufacturer.

[0067] In an alternative embodiment, the liner is provided in a not-yet-assembled form, the component parts of the liner to be assembled by an end user. By way of example, the substrate binding layer and sealing layer can be supplied as separate sheets or separate rolled materials. Similarly, the moisture barrier layer(s) can be supplied separately. The gas barrier layer is preferably supplied in a form in which it is already sandwiched between nylon layers (or attached or adjacent to at least one nylon layer). By supplying these materials in separated forms, the number and arrangement of moisture barrier and gas-barrier layers in the liner can be selected by the end user. To do so, the end user forms a liner by interposing one or more moisture barrier layers and one or more gas-barrier layers between the substrate binding layer and the sealing layer and forming the liner (e.g., by simultaneously thermoforming the various layers, optionally together with the substrate material to which the liner is to be bound). When the discrete layers are to be separately supplied to an end user, they should be supplied in a state that facilitates assembly of the liner by the end user (e.g., with any tie layers necessary to bind adjacent layers already affixed to one or more of the layers). By way of example, the discrete layers can be supplied as layers intended to be laminated by the end user, for example before or while conforming the materials to the substrate to which the liner is to be attached.

[0068] Using the Liners

[0069] The liners are intended to serve as a removable part of a container, separable from other parts of the container. In particular, the liner are intended to confer particular barrier characteristics to a container, using only a small amount of (generally non-recyclable) packaging materials, while other characteristics and functions of the container are conferred by recyclable materials that can be readily separated from the liner. The liners can therefore greatly reduce the quantity of non-recyclable solid waste attributable to product packaging, while retaining the characteristics and functions of traditional packaging.

[0070] The liners perform this role by binding to one or more surfaces of a packaging substrate and, optionally, forming a closed compartment about a product by sealing the liner

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about the product or, alternatively, by sealing to one or more seals (e.g., a metal foil, or a plastic-coated metal lid) that form part of the periphery of the closed compartment.

[0071] The method by which the liner is bound to the packaging substrate is not critical. In one embodiment, a package (or a portion thereof) is pre-formed, and the liner is bound to the preformed package (or portion). By way of example, a common 12-egg carton can be formed by pressing a wood/paper-fiber slurry between halves of a mold and drying the shaped fiber mass to yield a pre-formed egg carton. A liner sheet, as described herein, can be heated so that at least the substrate binding layer thereof is softened sufficiently that when that layer is urged against the interior of the egg carton (e.g., by application of a vacuum through the carton material, drawing into the interior of the carton a softened liner sheet applied above the interior of the carton with its substrate binding layer facing the carton), the substrate binding layer conforms to the shape of and binds against the interior of the egg carton, resulting in a carton lined with the liner sheet. Any portion of the liner sheet that overhangs an edge of the carton can be trimmed away, and a portion of such overhang can be retained for use as a tab to initiate peeling of the liner from the carton after use. The liner can be discarded after peeling, and the fiber carton remains suitable for recycling, even if one or more eggs that were contained therein broke (since the spilled egg contents would be prevented by the liner from contacting the fiber portion of the carton).

[0072] In another embodiment, the liner is attached to a precursor (e.g., a flat piece of paperboard or a flat plastic sheet) from which the package is subsequently formed. By way of example, a liner sheet can be adhered to a flat sheet of PVC, and the PVC sheet, with the liner attached, can subsequently be thermoformed into the shape of a tray for containing a cut of meat, with any excess PVC or liner material beyond the rim of the tray trimmed away. After placing a cut of meat within the concavity of the tray (i.e., the liner being attached to the concave face of the PVC sheet; that is, lining the concavity), a clear plastic lidstock material can be sealed to the liner about the periphery of the concavity, forming a closed compartment that contains the cut of meat and any juices which emanate from it. The liner can be peeled from the tray (before or after breaching the closed compartment), yielding a clean PVC tray suitable for recycling and a soiled liner (and lidstock) suitable for discarding. Because the liner and lidstock can constitute a very small proportion of the material used to form the container,

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the clean PVC that is recyclable can represent a large proportion of that material, meaning that a substantial portion of the tray can be recycled.

[0073] It is substantially immaterial how the liner is caused to bind to the substrate surface, other than that at least the substrate binding layer of the liner should be melted or softened sufficiently to facilitate binding of that layer to the substrate. A wide variety of methods can be used to urge the melted or softened substrate-binding layer against the substrate, including application of positive or negative air pressure, physical pressing of the liner against the substrate (e.g., with the assistance of a positive mold or plug applied to the face of the liner opposite the substrate), permitting a softened liner sheet to sag against the substrate surface under the influence of gravity, or any other method of closely opposing the softened or melted substrate binding layer of the liner against the substrate surface.

[0074] Peeling of the liner from the substrate can be facilitated by attaching a tab at or near an edge of the liner, by leaving a piece of liner (i.e., a tab that is unitary with the liner) that extends beyond the substrate (or by cutting away a portion of the substrate, while leaving uncut the corresponding portion of the liner), by treating a portion of the substrate prior to contacting it with the softened or melted substrate binding layer of the liner in such a way that binding between the treated portion of the substrate and the liner is inhibited, or in other ways apparent to skilled artisans in this field (e.g., by using a portion of a lidding sealed to the sealing layer of the liner as a tab). Because the substrate will often be intended to be recycled, the physical state of the substrate will often be immaterial. Thus, peeling of the liner from the substrate can be facilitated by providing a making a portion of the substrate easily torn or bent, so that separation of the substrate and the liner at the torn or bent portion can yield a graspable portion of the liner, so as to facilitate subsequent peeling of the liner from the substrate.

[0075] Definitions

[0076] As used herein, each of the following terms has the meaning associated with it in this section.

[0077] A polymer sheet is "bound" to a surface (e.g., a packaging material surface or another polymer sheet) if it is sufficiently tenaciously fixed to the surface at the intersection(s) of the polymer and the surface that the polymer sheet does not simply fall away from the

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surface under its own weight or with minimal separating force. In the specialized situation of polymer sheets that are "bound" to one another in adjacent layers of the liners described herein, it is known in the art that polymer sheets can be bound to one another in a variety of ways, including by simple adhesion (e.g., that which occurs upon casting or blown co-extrusion or lamination), by including an adhesive or a tie layer between the polymer sheets, or by fusion of the sheets.

[0078] A polymer sheet is "peelably" bound to a surface, as used herein, if the bound sheet can be peeled away from the surface by a human of ordinary strength. Put another way, the sheet is "peelable" if it is sufficiently flexible and has sufficient tensile strength that it can be peeled away from the surface without the polymer sheet tearing. For the peelable liners described herein (i.e., wherein the liner is intended to be discarded, while the surface to which it is bound is intended to be recycled), it is immaterial if a portion of the surface to which the sheet is bound (e.g., the adjacent layer of a paperboard substrate) remains adhered to the liner when the liner is peeled from the substrate, although it is preferable that such tearing of the substrate does not occur upon liner peeling.

[0079] A "tie layer" interposed between two polymers sheets or layers is a material which bonds to each of the two sheets/layers and thereby bonds the two sheets/layers together. The identities of tie layers appropriate for use with the materials described herein will depend on the identity of the materials selected, but is immediately apparent to a skilled worker in this field once those materials are selected. Appropriate tie layers for binding various polymers are well known and described in the art.

[0080] "Linear low density polyethylene" ("LLDPE"), is used herein in its art-accepted sense, meaning copolymers of ethylene with one or more comonomers selected from alpha olefins (preferably C-4 to C-10 alpha olefins such as butene-1 or octene) in which the copolymer molecules are in the form of long chains having few side chain branches or cross-links. This structure is in contrast with conventional low density polyethylenes, which are more highly branched than LLDPE. The density of LLDPE is normally in the range of from about 0.916 to about 0.925 grams per cubic centimeter.

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[0081] "Low density polyethylene" ("LDPE"), is used herein in its art-accepted sense, meaning copolymers of ethylene, optionally with one or more comonomers selected from alpha olefins (preferably C-4 to C-10 alpha olefins such as butene-1 or octene) as minor components. This structure is in contrast with conventional medium density polyethylenes, which are more highly branched than LDPE. The density of LDPE is normally in the range of from about 0.910 to 0.940 grams per cubic centimeter.

[0082] "High density polyethylene" ("HDPE"), is used herein in its art-accepted sense, meaning polymers of ethylene, optionally with one or more comonomers selected from alpha olefins (preferably C-4 to C-l0 alpha olefins such as butene-l or octene) as minor components. The density of HDPE is greater than 0.940 grams per cubic centimeter.

[0083] "Ethylene vinyl acetate" ("EVA"), as used herein, is a known chemical entity and refers to copolymers of ethylene and vinyl acetate monomers. Normally, the ethylene-derived units of the copolymer are present in major amounts, such as between about 60% and 98% by weight and the vinyl acetate derived units in the copolymer are present in minor amounts, such as between about 2% and 40% by weight.

[0084] "Polyolefins," is used herein in its art-accepted sense, meaning polymerized alkenyl compounds, including polyethylene, polypropylene, resinous copolymers of ethylene and propylene, and polymers of ethylene and/or propylene with minor proportions of olefinically unsaturated monomers such as alpha-olefins having from 2 to 8 carbon atoms (e.g., 1-butene, 1-pentene, 1-hexene, 1-heptene, 1-octene and mixed higher alpha-olefins). Polypropylene is a preferred polyolefin for the moisture barrier layers described herein.

[0085] "Nylons," is used herein in its art- accepted sense, meaning polyamides having amide linkages among the molecular chains. Nylons includes polyamides made from a single polymer such as PA-6 (nylon 6) and polyamide copolymers, such as blends of nylon 6 and nylon 12.

[0086] "Metallocene" polymers are produced using single-site metallocene catalysts, which produce polymers with a narrow molecular weight distribution and uniform molecular architecture. That is, metallocene catalysts provide polymers in which the order and orientation of the monomers in the polymer, and the amount and type of branching is essentially the same in each polymer chain. The narrow molecular weight distribution and uniform molecular

architecture provides metallocene polymers with properties that are not available with conventional polymers, and allow polymers to be produced having unique properties that are specifically tailored to a particular application. The desired molecular weight distribution and the molecular architecture are obtained by the selection of the appropriate metallocene catalyst and polymerization conditions.

[0087] "Ethylene vinyl alcohol" ("EVOH"), as used herein, is a known chemical entity and refers to saponified or hydrolyzed ethylene vinyl acetate polymers, and refers to a vinyl alcohol polymer prepared by, for example, hydrolysis of a vinyl acetate polymer, or by polymerization of polyvinyl alcohol. The degree of hydrolysis should be at least 50% and is more preferably at least 85%. EVOH is normally used in the form of a copolymer of EVOH and a polyolefin comonomer (e.g., polyethylene). The polyolefin component can, for example, be present in the range of about 15 to about 65 mole percent, and an EVOH content of about 38 mole percent is generally satisfactory for the uses described herein.

[0088] Example

[0089] The subject matter of this disclosure is now described with reference to the following Example. This Example is provided for the purpose of illustration only, and the subject matter is not limited to this Example, but rather encompasses all variations which are evident as a result of the teaching provided herein.

[0090] Example 1

[0091] The following table indicates the order, layer composition, layer proportion (of total liner composition by weight), and layer thickness values for a liner made as described herein.

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Layer	Composition
A	EVA / LLDPE
B	Tie Layer
C	Polypropylene
D	Tie Layer
E	PA-6
F	EVOH / PE
G	PA-6
H	Tie Layer
I	LLDPE / COC-LLDPE

[0092] The disclosure of every patent, patent application, and publication cited herein is hereby incorporated herein by reference in its entirety.

[0093] While this subject matter has been disclosed with reference to specific embodiments, it is apparent that other embodiments and variations can be devised by others skilled in the art without departing from the true spirit and scope of the subject matter described herein. The appended claims include all such embodiments and equivalent variations.

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CLAIMS

What is claimed is:

1. A thermoformable sheet for lining a container composed of a substrate, the sheet comprising a bonded stack of sheets including

a substrate binding layer comprising at least a first polyethylene , the first polyethylene being selected such that the substrate binding layer binds with the substrate when urged, in a heat-softened state, against the substrate and is thereafter peelable from the substrate at 20 degrees Celsius,

a sealing layer comprising a second polyethylene, and, interposed between the substrate binding layer and the sealing layer in any order:

at least one moisture barrier layer comprising at least one polyolefin and

at least one gas barrier layer comprising an ethylene vinyl alcohol (EVOH) layer adjacent at least one thermoformable nylon layer,

all layers of the liner being bonded to the adjacent layers to yield the thermoformable sheet.

2. The thermoformable sheet of claim 1, wherein the first polyethylene is selected from the group consisting of ethylene vinyl acetates (EVAs), low density polyethylenes (LDPEs), and linear low density polyethylenes (LLDPEs), and blends of these.

3. The thermoformable sheet of claim 2, wherein the substrate binding layer is a blend of an EVA and a LLDPE.

4. The thermoformable sheet of claim 2, wherein the substrate binding layer is a blend of an EVA, a LDPE, and a LLDPE.

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5. The thermoformable sheet of claim 1, wherein the second polyethylene is a low-set LLDPE.

6. The thermoformable sheet of claim 5, wherein the low-set LLDPE comprises a metallocene LLDPE.

7. The thermoformable sheet of claim 5, wherein the low-set LLDPE consists of a metallocene LLDPE.

8. The thermoformable sheet of claim 5, wherein the low-set LLDPE comprises a cycloolefin/LLDPE copolymer.

9. The thermoformable sheet of claim 5, wherein the low-set LLDPE consists of a cycloolefin/LLDPE copolymer.

10. The thermoformable sheet of claim 5, wherein the low-set LLDPE comprises an EVA.

11. The thermoformable sheet of claim 1, wherein at least one moisture barrier comprises a polypropylene.

12. The thermoformable sheet of claim 1, wherein at least one moisture barrier consists of a polypropylene.

13. The thermoformable sheet of claim 1, wherein at least one nylon layer comprises PA-6.

14. The thermoformable sheet of claim 1, wherein at least one nylon layer consists of PA-6.

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15. The thermoformable sheet of claim 1, wherein the EVOH layer of at least one gas barrier layer is sandwiched between two adjacent thermoformable nylon layers.

16. The thermoformable sheet of claim 1, comprising a gas barrier layer in which the EVOH layer is sandwiched between two adjacent thermoformable nylon layers, an outer moisture barrier layer interposed between the substrate binding layer and the gas barrier layer and an inner moisture barrier layer interposed between the sealing layer and the gas barrier layer.

17. The thermoformable sheet of claim 1, wherein the moisture barrier layer is sandiwiched between an outer gas barrier layer in which the EVOH layer is sandwiched between two adjacent thermoformable nylon layers and an inner gas barrier layer in which the EVOH layer is sandwiched between two adjacent thermoformable nylon layers.

18. The thermoformable sheet of claim 1, wherein the outer surface of the sealing layer is corona treated.

19. The thermoformable sheet of claim 1, wherein the overall thickness of the sheet is from 3 to 10 mils.

20. An assembly comprising a container composed of a substrate and defining a concave surface and having the thermoformable sheet of claim 1 peelably bound to the concave surface.

21. The assembly of claim 20, wherein the thermoformable sheet covers the periphery of the concave surface, the assembly further comprising a lidding bound to the sealing layer of the thermoformable sheet about the periphery of the concave surface, thereby defining a closed compartment defined by the thermoformable sheet and the lidding.

22. A thermoformable sheet for lining a container composed of a substrate, the sheet comprising

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a substrate binding layer being a blend of an ethylene vinyl acetate (EVA) and at least one of a low density polyethylene (LDPE) and a linear low density polyethylene (LLDPE), the blend being selected to bind with the substrate when urged, in a heat-softened state, against the substrate and to be peelable from the substrate at 20 degrees Celsius, the substrate binding layer being bound to the outer face of

an outer moisture barrier layer having an outer face and an inner face, comprising at least one polyolefin; the inner face of the outer moisture barrier layer being bound to the outer face of

an outer nylon layer having an outer face and an inner face, comprising a thermoformable nylon, the inner face of the outer nylon layer being bound to the outer face of

a gas barrier layer having an outer face and an inner face, comprising an ethylene vinyl alcohol (EVOH), the inner face of the gas barrier layer being bound to the outer face of

an inner nylon layer having an outer and inner face, comprising a thermoformable nylon, the inner face of the inner nylon layer being bound to the outer face of either

i) a sealing layer having an outer face and an inner face, comprising a low-set LLDPE or

ii) an optional inner moisture barrier layer having an outer face and an inner face, comprising at least one polyolefin; the inner face of the inner moisture barrier layer being bound to the outer face of the sealing layer.

23. The thermoformable sheet of claim 22, wherein the inner face of the inner nylon layer is bound to the outer face of the inner moisture barrier layer and the inner face of the inner moisture barrier layer is bound to the outer face of the sealing layer.

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24. A container comprising a recyclable portion having the substrate binding layer of the thermoformable sheet of claim 22 peelably bound to a surface thereof.

25. The container of claim 24, the container defining a concave interior surface to which the sheet is bound.

26. The container of claim 25, wherein the concave interior surface merges with the e terior of the container at an edge circumscribing the concave interior surface and wherein sheet is bound to the entirety of the concave interior surface, including at the edge.

27. The container of claim 26, wherein the inner face of the sealing layer of the sheet is bound to a seal.

28. The container of claim 27, wherein the inner face of the sealing layer of the sheet is bound to the seal about the entire edge.

29. The container of claim 28, wherein the seal is a portion of the same sheet.

30. The container of claim 28, wherein the seal is a discrete piece of material having the same composition as the sheet.

31. The container of claim 27, wherein the seal is a piece of material having a surface with the same composition as the sealing layer of the sheet.

32. A method of making a partially-recyclable container that e hibits a barrier property, the method comprising peelably binding the thermoformable sheet of claim 1 to a surface of a recyclable material, wherein the sheet e hibits the barrier property and forming a container including the surface.

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34. The method of claim 32, wherein the sheet is bound to the surface after forming the container.

34. The method of claim 33, wherein the sheet is bound to the surface by heat-softening the substrate binding layer of the sheet and urging the substrate binding layer against the surface.

35. The method of claim 32, the formed container defining a concave interior surface to the entirety of which the sheet is bound, the concave interior surface defining a periphery circumscribing it, the method further comprising sealing a seal against the sealing layer of the sheet about the periphery of the concave interior surface.

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Ningbo Linhua Plastic Ex. 1002, p. 172

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 16/53696

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B65D 41/34, B65D 51/30, B29C 70/80 (2016.01)
CPC - B29K 2105/0088, B29K 2105/0041, B29K 2023/063
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B65D 41/34, B65D 51/30, B29C 70/80 (2016.01)
CPC - B29K 2105/0088, B29K 2105/0041, B29K 2023/063

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Patents and non-patent literature (classification, keyword; search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, Google Scholar (NPL), Google Patents; search terms: thermoformable sheet, liner, container, bonded, stack, sheets, polyethylene, barrier, moisture, gaseous

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2013/0142975 A1 (Wallace) 06 June 2013 (06.06.2013) abstract, para [0020], [0022]-[0024], [0032], [0043], [0051], [0066], [0085], [0089], [0096], [0098], [0102], [0109], Fig. 2	1-32, 34a, 34b, 35
Y	US 2006/0172095 A1 (Elsaesser) 03 August 2006 (03.08.2006) para [0023], [0030]-[0036], [0041], [0060]-[0061], Fig. 1	1-32, 34a, 34b, 35
Y	US 2002/0119334 A1 (Shepard et al.) 29 August 2002 (29.08.2002) abstract, para [0051], [0062]	3-4
Y	US 2004/0144482 A1 (Cherpinsky et al.) 29 July 2004 (29.07.2004) abstract, para [0027], [0033]	6-10
Y	US 2004/0043165 A1 (Van Hulle et al.) 04 March 2004 (04.03.2004) para [0012] ,[0020]-[0022], [0033]-[0034], Fig. 1, 2	20-21, 25-31, 35
Y ---- A	US 5,972,447 A (Hata et al.) 26 October 1999 (26.10.1999) abstract, col 14 ln 17-15, ln 50-62, col 16 ln 15-25, col 17 ln 41-51, ln 54 to col 18 ln 45	32, 34a, 34b, 35 ---------- 10

☒ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2016	27 DEC 2016
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 16/53696

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,976,682 A (Eichbauer) 02 November 1999 (02.11.1999) col 2 ln 38-67	6-7
A	US 3,423,231 A (Lutzmann) 21 January 1969 (21.01.1969) col 2 ln 54-66	8-9

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

Electronic Acknowledgement Receipt

EFS ID:	30120597
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	Formed Thermoplastic Article Having Smooth Edges
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	27730
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	17-1040 (MW-12CP1)
Receipt Date:	18-AUG-2017
Filing Date:	28-FEB-2017
Time Stamp:	13:36:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS.pdf	44225 3e628c02f517c2e51ddc4cde735ce3e2540c3011	no	6

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	FR2424805_Machine_Translation.pdf	131065 0ee498f1d158d01d481dbd2b489b98fe6165e57d	no	15
Warnings:					
Information:					
3	Foreign Reference	WO2017053937_Wallace.pdf	1347516 58fa01ca7e8711f31122d1d296623de4d7a2d437	no	29
Warnings:					
Information:					
			Total Files Size (in bytes):	1522806	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/122 (08-12)
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CHANGE OF CORRESPONDENCE ADDRESS
Application

Address to:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	15/445,220
Filing Date	28 February 2017
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf12CP

Please change the Correspondence Address for the above-identified patent application to:

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I am the:

☐ Applicant

☒ Attorney or agent of record. Registration Number 40961.

☐ Registered practitioner named in the application transmittal papers who acts in a representative capacity under 37 CFR 1.34. See 37 CFR 1.33(a)(1). Registration Number _____.

Signature /Gary D. Colby/

Typed or Printed Name Gary D. COLBY, Ph.D., J.D.

Date	Telephone
14 September 2018	617-226-3800

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

AIA GENERAL POWER (AIA/82B Equivalent)

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

I HEREBY APPOINT THE PRACTITIONERS ASSOCIATED WITH

CUSTOMER NUMBER

00207

as my attorneys or agents and to transact all business in the United States Patent and Trademark Office connected therewith for the application identified in the attached transmittal letter.

CHANGE OF CORRESPONDENCE ADDRESS

Please recognize or change the correspondence address for this application to the address associated with the above-identified Customer Number **00207**.

I am the Applicant:

[ ] Inventor or Joint Inventor

[ ] Legal Representative of a Deceased or Legally Incapacitated Inventor

[X] Assignee or Person to Whom the Inventor is Under an Obligation to Assign

[ ] Person Who Otherwise Shows Sufficient *Proprietary* Interest (e.g., a petition under 37 C.F.R. §1.46(b)(2) was granted in the application or is concurrently being filed with this document).

Signature of Applicant for Patent (The individual whose signature and title is below is authorized to act on behalf of the assignee)

By: Millard F. Wallace

Print Name: Millard F. Wallace

Date: 8/18/15

Title: President

Company: Converter Manufacturing LLC

PATENT CLIENT(S)
BRINKS GILSON & LIONE, NCR

13306088.1

AIA
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Converter Manufacturing, LLC

Application No./Patent No.: 15/445,220 Filed/Issue Date: 28 February 2017

Titled: Formed Thermoplastic Article Having Smooth Edges

Converter Manufacturing, LLC corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

☑ The assignee of the entire right, title, and interest.

☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 044573, Frame 0305, or for which a copy thereof is attached.

☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

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The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.
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STATEMENT UNDER 37 CFR 3.73(c)

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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Gary D. Colby/	14 September 2018
Signature	Date
Gary D. COLBY, Ph.D., J.D.	40961
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17 1040 (MW 12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Millard	F.	WALLACE	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Orwigsburg	State/Province	PA	Country of Residence	US

Mailing Address of Inventor:

Address 1	555 Ridge Road		
Address 2			
City	Orwigsburg	State/Province	PA
Postal Code	17961	Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	~~27730~~ 00207		
Email Address	~~gcolby@dilworthlaw.com~~ gcolby@preti.com	Add Email	Remove Email

Application Information:

Title of the Invention	Formed Thermoplastic Article Having Smooth Edges		
Attorney Docket Number	~~17 1040 (MW 12CP1)~~ CnvMf012CP	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	29	Suggested Figure for Publication (if any)	8D

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17-1040 (MW-12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	~~27730~~ 00207		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation in part of	PCT/US16/49692	2016-08-31

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17-1040 (MW-12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US16/49692	Claims benefit of provisional	62/212367	2015-08-31
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.			

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17 1040 (MW 12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17-1040 (MW-12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

○ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
◉ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	~~Converter Manufacturing, Inc.~~ Converter Manufacturing, LLC

Mailing Address Information For Applicant:

Address 1	~~555 Ridge Road~~ 603 Industrial Drive		
Address 2			
City	Orwigsburg	**State/Province**	PA
Country	US	Postal Code	17961
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17-1040 (MW-12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. [x]

Organization Name	~~Converter Manufacturing, Inc.~~ Converter Manufacturing, LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	~~555 Ridge Road~~ 603 Industrial Drive		
Address 2			
City	Orwigsburg	**State/Province**	PA
Country i	US	Postal Code	17961
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Gary D. Colby/			Date (YYYY-MM-DD)	2018-09-14
First Name	Gary D.	Last Name	COLBY	Registration Number	40961

Additional Signature may be generated within this form by selecting the Add button.

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~17-1040 (MW-12CP1)~~ CnvMf012CP
	Application Number	15/445,220
Title of Invention	Formed Thermoplastic Article Having Smooth Edges	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	33727672
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	Formed Thermoplastic Article Having Smooth Edges
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	27730
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	CnvMf012CP
Receipt Date:	14-SEP-2018
Filing Date:	28-FEB-2017
Time Stamp:	15:46:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	CnvMf012CP_Transmittal-.pdf	96354 df8fdbaaffe35916a0edb4c4d58c1203a80494d9	no	2
Warnings:					

Information:					
2	Change of Address	CnvMf012CP_Application_Change_of_Address-.pdf	87586 7c8a0dc3082a94bb0635a286ae35b72062cafba8	no	2
Warnings:					
Information:					
3	Power of Attorney	CnvMf_LLC_General_POA.pdf	809904 be5fa6bc90ce691e5e6691897dd753b958f526bd	no	1
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	CnvMf012CP_3-73c_Statement-.pdf	122119 b415011d7d6dc20bbe07bec2f2608049dfdbea91	no	3
Warnings:					
Information:					
5	Application Data Sheet	CnvMf012CP_Corrected_ADS-.pdf	687042 e0c17beb624297926743ab9f516da59e477c8776	no	8
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
			Total Files Size (in bytes):	1803005	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: TRAN.LET

Document Description: Transmittal Letter

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	

Application Number	15/445,220
Filing Date	28 February 2017
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

ENCLOSURES (*Check all that apply*)

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☑ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☑ Other Enclosure(s) (please Identify below):
  Corrected ADS
  Application Change of Address
  3.73(c) Statement

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	PRETI FLAHERTY BELIVEAU & PACHIOS LLP		
Signature	/Gary D. Colby/		
Printed name	Gary D. COLBY, Ph.D., J.D.		
Date	14 September 2018	Reg. No.	40961

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature			
Typed or printed name		Date	

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/445,220	02/28/2017	Millard F. WALLACE	CnvMf012CP

CONFIRMATION NO. 9924

POA ACCEPTANCE LETTER

207
PRETI FLAHERTY BELIVEAU & PACHIOS LLP
60 State Street
Suite 1100
BOSTON, MA 02109

OC00000102402157

Date Mailed: 09/19/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 09/14/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/ggasgedom/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/445,220	02/28/2017	1782	770	CnvMf012CP	21	3

CONFIRMATION NO. 9924

CORRECTED FILING RECEIPT

207
PRETI FLAHERTY BELIVEAU & PACHIOS LLP
60 State Street
Suite 1100
BOSTON, MA 02109

OC000000102402175

Date Mailed: 09/19/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Millard F. WALLACE, Orwigsburg, PA;

Applicant(s)

Converter Manufacturing, LLC, Orwigsburg, PA

Assignment For Published Patent Application

Converter Manufacturing, LLC, Orwigsburg, PA

Power of Attorney: The patent practitioners associated with Customer Number 00207

Domestic Priority data as claimed by applicant

This application is a CIP of PCT/US2016/049692 08/31/2016
which claims benefit of 62/212,367 08/31/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 03/07/2017

Ningbo Linhua Plastic Ex. 1002, p. 196

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/445,220**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Formed Thermoplastic Article Having Smooth Edges

Preliminary Class

428

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CnvMf012CP	9924

207 7590 01/07/2019

PRETI FLAHERTY BELIVEAU & PACHIOS LLP
60 State Street
Suite 1100
BOSTON, MA 02109

EXAMINER
LAN, YAN

ART UNIT	PAPER NUMBER
1782	

NOTIFICATION DATE	DELIVERY MODE
01/07/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patents@preti.com

Office Action Summary	Application No. 15/445,220	Applicant(s) WALLACE, Millard F.	
	Examiner YAN LAN	Art Unit 1782	AIA Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-4,8-12,15,18-19,22,24-26,50 and 52 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☐ Claim(s) _____ is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☑ Claim(s) 1-4,8-12,15,18-19,22,24-26,50 and 52 are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

Election/Restriction

2. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-4, 8-12, 15, 18-19, 22 and 24-26, 50, drawn to a method of making a shaped article, classified in B29C51/0036.

II. Claim 52, drawn to an article, classified in B65D1/42.

The inventions are independent or distinct, each from the other because:

3. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process, such as, by a process including steps of molding to form the shaped article having a body and a periphery edge, and rim-rolling the periphery edge to form a spacer having a rolled-over conformation.

4. Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because at least the following reason(s) apply:

(a) the inventions have acquired a separate status in the art in view of their

different classification;

(b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;

(c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);

(d) the prior art applicable to one invention would not likely be applicable to another invention;

(e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

5. **Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined** even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention**.

6. The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

7. Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other invention.

8. The examiner has required restriction between product or apparatus claims and process claims. Where applicant elects claims directed to the product/apparatus, and all product/apparatus claims are subsequently found allowable, withdrawn process claims that include all the limitations of the allowable product/apparatus claims should be considered for rejoinder. All claims directed to a nonelected process invention must include all the limitations of an allowable product/apparatus claim for that process invention to be rejoined.

9. In the event of rejoinder, the requirement for restriction between the product/apparatus claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product/apparatus are found allowable, an otherwise proper restriction requirement between product/apparatus claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product/apparatus claim will not be rejoined. See MPEP § 821.04. Additionally, in order for rejoinder to occur, applicant is advised that the process claims

should be amended during prosecution to require the limitations of the product/apparatus claims. Failure to do so may result in no rejoinder. Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to YAN LAN whose telephone number is (571)270-3687. The examiner can normally be reached on Monday - Friday 7AM-4PM.

11. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on 5712721291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/YAN LAN/
Primary Examiner, Art Unit 1782

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/445,220	Filing Date 02/28/2017	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	02/21/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 21	Minus	** 21	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/NICOLE LOVE HENSLEY/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Appln of:	Millard F. WALLACE	:		
Appln. No.:	15/445,220	:	Group Art Unit:	1782
Examiner:	Yan LAN	:	Conf. No.:	9924
Filing Date:	28 February 2017	:	Attorney Docket No.:	CnvMf012CP

Title: Formed Thermoplastic Article Having Smooth Edges

AMENDMENT AND

RESPONSE TO RESTRICTION REQUIREMENT

This Amendment is submitted in reply to the restriction requirement mailed 7 January 2019 and is timely filed.

Please amend the application as follows prior to calculation of the filing fee.

Amendments to the Claims are shown in the listing that begins on page 2.

Remarks begin on page 8.

Amendments to the Claims

Please amend the claims to read as shown in the following listing of the claims.

1. (Currently Amended) A method of making a shaped article having a body with a smooth periphery, the method comprising

forming a thermoplastic into a shape comprising the body and a deflectable flange at a peripheral portion of the body,

the deflectable flange comprising a spacer bearing a peripheral edge of the thermoplastic, the spacer being connected to the body by way of an extension that extends peripherally away from the body and a bend region interconnecting the spacer and the extension,

the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic; and

<u>after impinging the ram against the spacer and heating the bent portion to at least the glass transition temperature, further impinging the ram against the spacer to further deflect the spacer toward the extension prior to</u>

disengaging the ram from the spacer, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement to yield the body with a smooth periphery.

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2. (Original) The method of claim 1 wherein the bent portion is cooled below the glass transition temperature prior to disengaging the ram from the spacer.

3. (Original) The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle not less than 75 degrees, but less than 105 degrees.

4. (Original) The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle of about 87-93 degrees.

5-7. (Canceled)

8. (Original) The method of claim 1, wherein the thermoplastic is formed into a shape comprising the body and having the deflectable flange about its entire periphery.

9. (Currently Amended) The method of claim 1, wherein the thermoplastic is formed into a shape comprising ~~a boding~~ the body having a concave compartment with an opening and the deflectable flange about the entire periphery of the opening.

10. (Original) The method of claim 9, further comprising sealing the compartment using a film that contacts the smooth periphery of the body about the entire periphery of the opening.

11. (Original) The method of claim 10, wherein the compartment is sealed by over-wrapping the body with the film and sealing the film to itself to envelop the body.

12. (Previously Presented) The method of claim 10, wherein the compartment is sealed by applying the film across the opening of the compartment and sealing the film about the periphery of the opening.

13-14. (Canceled)

15. (Original) The method of claim 12, wherein the film is thermoformable and is disposed in a softened state around the smooth periphery of the body and cooled below its softening temperature such that the film that must be stretched outwardly about the smooth periphery of the body in order to displace the film from the opening.

16-17. (Canceled)

18. (Original) The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge away from the periphery of the shaped article sufficiently that a flexible film that tautly over-wraps the shaped article after cooling the bent portion does not contact the peripheral edge.

19. (Original) The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge sufficiently that the peripheral edge points at the body after cooling the bent portion.

20-21. (Canceled)

22. (Original) The method of claim 1, wherein the ram is impinged against the spacer to deflect the peripheral edge to a position at which a plane through the thermoplastic at the peripheral edge is offset from the plane of the extension by an angle of not less than 180 degrees after cooling the bent portion.

23. (Canceled)

24. (Original) The method of claim 1, wherein the deflectable flange is deflected to differing degrees at selected portions of the ram, whereby the height of the deflected peripheral flange differs at peripheral portions corresponding to the selected portions after cooling the bent portion, yielding at least one portion useable as a stacking extension.

25. (Original) The method of claim 1, wherein the ram is impinged against the spacer sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be directly viewed from the exterior of the shaped article after cooling the bent portion.

26. (Original) The method of claim 1, wherein the ram is impinged against the spacer sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be perceived by a person running a finger along the periphery of the shaped article after cooling the bent portion.

27-33. (Canceled)

34. (Currently Amended) The method of claim ~~33,~~ 1, wherein the ram is urged against the spacer by applying force to at least the extension of the deflectable flange in the direction of the ram, wherein the extension extends laterally in a plane about the entire periphery of the opening of a concave compartment in the body and wherein a plug that substantially fills the opening is inserted therein prior to urging the ram against the spacer, whereby the plug inhibits inward displacement of the deflectable flange into the opening.

35-43. (Canceled)

44. (Currently Amended) The method of claim ~~40,~~ 1, wherein the ram impinges against the spacer at an upper face of the ram, the upper face having contour that deflects inwardly toward the body, whereby greater impingement of the spacer against the upper surface of the ram

deflects the peripheral edge increasingly toward the body, and wherein the upper face is curved sufficiently that increasing impingement of the spacer against the ram turns the peripheral edge at least about 180 degrees relative to its orientation prior to the impingement.

45-49. (Canceled)

50. (Currently Amended) A method of forming a smooth periphery on a thermoformed article that is made from a thermoplastic and that has a sharp peripheral edge, the method comprising

forming a deflectable flange about the peripheral edge of the article,

> the deflectable flange comprising a spacer including peripheral edge of the article, the spacer being connected to the article by way of an extension that extends peripherally away from the article and a bend region interconnecting the spacer and the extension,
>
> the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension;

impinging a ram against the spacer to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic;

after impinging the ram against the spacer and heating the bent portion to at least the glass transition temperature, further impinging the ram against the spacer to further deflect the spacer toward the extension prior to

cooling the bent portion below the glass transition temperature, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement; and

disengaging the ram from the spacer to yield the article with a smooth periphery.

51-59. (Canceled)

60. (New) The method of claim 1, wherein sequential portions of the spacer are softened by impinging the sequential portions against the ram in a plurality of discrete, incremental advances.

61. (New) The method of claim 1, wherein sequential portions of the spacer are softened by impinging the sequential portions against the ram in a single smooth motion.

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PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Converter Manufacturing, LLC

Application No./Patent No.: 15/445,220 Filed/Issue Date: 28 February 2017

Titled: Formed Thermoplastic Article Having Smooth Edges

Converter Manufacturing, LLC, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 044573, Frame 0305-0310, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Gary D. Colby/	21 February 2019
Signature	Date
Gary D. COLBY, Ph.D., J.D.	40961
Printed or Typed Name	Title or Registration Number

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 160330

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 160330

OR

☐	Firm or Individual Name		
	Address		
	City	State	Zip
	Country		
	Telephone	Email	

Assignee Name and Address: Converter Manufacturing, LLC
603 Industrial Drive, Orwigsburg PA 17961

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Millard Wallace	Date	20 February 2019
Name	Millard F. Wallace	Telephone	570-968-4635
Title	President, Converter Manufacturing, LLC		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	35216313
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	Formed Thermoplastic Article Having Smooth Edges
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	207
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	CnvMf012CP
Receipt Date:	21-FEB-2019
Filing Date:	28-FEB-2017
Time Stamp:	16:26:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		AM_and_RN_to_RK_RU.pdf	52143 dfef4f05ff5414bf1e9d38a8d737a9c25b9222ae	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Preliminary Amendment	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	8
	Response to Election / Restriction Filed	9	10

Warnings:					
Information:					
2	Assignee showing of ownership per 37 CFR 3.73	3_73_c_Statement.pdf	69770 8bc8ed487540ea28f49533bf5a06bda297483822	no	2
Warnings:					
Information:					
3	Power of Attorney	Executed_General_Power_of_Attorney_for_Converter_Manufacturing_LLC.pdf	615897 29208ecc77e3c558784777c662319a23aa6f940b	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	737810		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Remarks

Claims 1-4, 8-12, 15, 18-19, 22, 24-26, 34, 44, 50, and 60-61 are pending in this application following entry of this Amendment. Claims 37 and 52 are canceled herein and claims 5-7, 13, 14, 16, 17, 20, 21, 23, 27-29, 30-33, 35, 36, 38-43, 45-49, 51, and 53-59 were previously canceled. Claims 1, 9, 34, 44, and 50 have been amended. Claims 60 and 61 have been added. Claims 1 and 50 are the only independent claims pending after entry of this Amendment.

Each of independent claims 1 and 50 has been amended merely by incorporating the recitations of claim 37, as originally filed, therein (with non-substantive grammatical changes made to achieve proper English grammar).

Claim 9 has been amended to correct an obvious typographical error. That "a boding" was intended to read "the body" is apparent from paragraphs **[0021]** and **[0022]** and claim 55 of the specification as filed.

Each of claims 34 and 44 has been amended to add, verbatim, recitations of now-canceled claims from which they originally depended. These amendments do not include new matter.

> Claim 34 originally depended from claim 33, which depended from claim 32, which depended from claim 1. All recitations of now-canceled claims 32 and 33, as originally filed, have been incorporated into amended claim 34, which depends from amended claim 1. The preposition "in" has been inserted before "the direction of the ram" in amended claim 34 (and was missing in originally-filed claim 32). That the preposition "in" is the missing word is confirmed, for example, at the end of paragraph **[0107]** of the specification.
>
> Claim 44 originally depended from claim 42, which depended from claim 40, which depended from claim 1. All recitations of now-canceled claims 40 and 42, as originally filed, have been incorporated into amended claim 44, which depends from amended claim 1.

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New claims 60 and 61 include no new subject matter, because both recite, essentially verbatim, subject matter that is disclosed in the final sentence of paragraph **[0068]** of the specification as filed.

No additional claim fee are believed to be due, because two claims were canceled and only two dependent claims were added.

The Examiner's indulgence of the amendments to the claims is respectfully requested. Since the time this application was filed with a preliminary amendment, no fewer than six related prioritized applications have been filed, of which four have issued as patents, rendering several of the claims duplicative of already-issued subject matter. In this Amendment and Response, the Applicant has amended the claims to focus, in this application, specifically on subject matter that was originally recited in claim 37. Each of independent claims 1 and 50 has been amended to incorporate the recitations of claim 37 (relating to impinging the ram and the spacer in a step-wise fashion), and several new claims have been added, also directed to this subject matter.

Response to Restriction Requirement

In the restriction requirement, the Examiner identifies two groups of claims, **Group II** including now-canceled claim 52 only, and **Group I** including claim 1 and all other claims that the Examiner recognized as pending (i.e., claims 2-4, 8-12, 15, 18-19, 22, 24-26, and 50). The Applicant believes that the Examiner overlooked that claims 34, 37, and 44 are also pending and respectfully believes that those three claims also correspond to **Group I**. Claim 37 has been incorporated into both remaining independent claims (1 and 50), and claims 37 and 52 have been canceled. The Applicant respectfully believes that all remaining pending claims correspond to **Group I** and elect **Group I**, including all of pending claims 1-4, 8-12, 15, 18-19, 22, 24-26, 34, 44, 50, and 60-61 for prosecution on the merits. This election is made **without traverse**.

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Summary

The Applicants respectfully believe that each of claims 1-4, 8-12, 15, 18-19, 22, 24-26, 34, 44, 50, and 60-61 is in condition for allowance. Consideration and allowance of the claims are respectfully requested at the earliest possible time.

Respectfully submitted,

Millard F. WALLACE

21 February 2019
(Date)

By: /Gary D. Colby/

GARY D. COLBY, Ph.D., J.D.
Registration No. 40,961
Clearly Clean Products, LLC
Customer No. 160330
603 Industrial Drive
Orwigsburg PA 17961
Telephone: **267-481-2731**
E-Mail: gcolby@clearlyclean.com

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/445,220	02/28/2017	Millard F. WALLACE	CnvMf012CP

CONFIRMATION NO. 9924

160330
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

POA ACCEPTANCE LETTER

OC00000106157401

Date Mailed: 02/26/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/21/2019.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/cnguyen/

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/445,220	02/28/2017	Millard F. WALLACE	CnvMf012CP

CONFIRMATION NO. 9924

POWER OF ATTORNEY NOTICE



207
PRETI FLAHERTY BELIVEAU & PACHIOS LLP
Suite 1100
60 State Street
Suite 1100
BOSTON, MA 02109

Date Mailed: 02/26/2019

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/21/2019.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/cnguyen/

Ningbo Linhua Plastic Ex. 1002, p. 223

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

160330 7590 04/01/2019
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER
LAN, YAN

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 04/01/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	07/01/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

160330 7590 04/01/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	07/01/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAN, YAN	1782	428-035700

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Ningbo Linhua Plastic Ex. 1002, p. 225

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

160330 7590 04/01/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER	
LAN, YAN	

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 04/01/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Ningbo Linhua Plastic Ex. 1002, p. 226

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Notice of Allowability	Application No. 15/445,220	Applicant(s) WALLACE, Millard F.	
	Examiner YAN LAN	Art Unit 1782	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to communication of 2/21/2019.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 8/18/2017.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/YAN LAN/
Primary Examiner, Art Unit 1782

Continuation of 3. The allowed claim(s) is/are: 1-4,8-12,15,18-19,22,24-26,34,44,50 and 60-61

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance:

3. The prior art of record does not teach nor render obvious the subject matter of independent claim 1 and claim 50 comprising a method of shaping a thermoplastic blank to make a shaped article having a body and a smooth periphery that includes a deflectable flange that has a spacer bearing a peripheral edge of the thermoplastic, the spacer is being connected to the body by way of an extension that extends peripherally away from the body and a bend region interconnecting the spacer and the extension, in that, the bend region having a smooth contour and interconnecting the spacer at an approximately right angle with the extension as claimed is formed by impinging a ram against the spacer to deflect the spacer, and heating the bend portion to at least the glass transition temperature, and further impinging the ram against the spacer toward the extension prior to disengaging the ram from the spacer, in order to form the smooth periphery edge configuration as claimed.

4. Wnek (US 2013/0064998) is among the closest art of record. Wnek teaches a method of shaping the edge of a container with a ram; however, Wnek does not teach the specifically claimed smooth periphery edge configuration of the invention.

Conclusion

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to YAN LAN whose telephone number is (571)270-3687. The examiner can normally be reached on Monday - Friday 7AM-4PM.

7. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on 5712721291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/YAN LAN/
Primary Examiner, Art Unit 1782

Notice of References Cited	Application/Control No. 15/445,220	Applicant(s)/Patent Under Reexamination WALLACE, Millard F.	
	Examiner YAN LAN	Art Unit 1782	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20130064998-A1	03-2013	Wnek; Patrick H.	B21D22/26	428/34.1
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

CPC							
Symbol						**Type**	**Version**
B29C	/	51	/	306		F	2013-01-01
B29C	/	51	/	20		I	2013-01-01
B29C	/	51	/	42		I	2013-01-01
B29C	/	51	/	082		I	2013-01-01
B65D	/	1	/	34		I	2013-01-01
B65D	/	1	/	42		I	2013-01-01
B65D	/	43	/	0204		I	2013-01-01
B29K	/	2101	/	12		A	2013-01-01
B29K	/	2105	/	256		A	2013-01-01
B29L	/	2031	/	712		A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	29 March 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190329

Ningbo Linhua Plastic Ex. 1002, p. 234

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B29C	/	51	/	30
B29C	/	51	/	08
B65D	/	43	/	02
B65D	/	1	/	34

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	29 March 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190329

Ningbo Linhua Plastic Ex. 1002, p. 235

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10	12	19	-	28	-	37	-	46	-	55		
2	2	8	11	-	20	-	29	-	38	-	47	-	56		
3	3	9	12	-	21	-	30	-	39	-	48	-	57		
4	4	-	13	13	22	-	31	-	40	-	49	-	58		
-	5	-	14	-	23	-	32	-	41	21	50	-	59		
-	6	10	15	14	24	-	33	-	42	-	51	19	60		
-	7	-	16	15	25	17	34	-	43	-	52	20	61		
5	8	-	17	16	26	-	35	18	44	-	53				
6	9	11	18	-	27	-	36	-	45	-	54				

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 21	
/YAN LAN/ Primary Examiner, Art Unit 1782 (Primary Examiner)	29 March 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190329

Ningbo Linhua Plastic Ex. 1002, p. 236

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

CPC - Searched*		
Symbol	**Date**	**Examiner**
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265	03/29/2019	yl
B29K2101/12 AND B29K2105/256	03/29/2019	yl
B29L2031/712	03/29/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20	03/29/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06	03/29/2019	yl

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Conducted class, subclass search crossed with text search using EAST, inventors, assignee search in EAST	03/29/2019	yl
Google search	03/29/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265		03/29/2019	yl
B29K2101/12 AND B29K2105/256		03/29/2019	yl
B29L2031/712		03/29/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20		03/29/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06		03/29/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Ningbo Linhua Plastic Ex. 1002, p. 238

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Lan YAN
Attorney Docket Number	17-1040 (MW-12CP1)

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3466214		1969-09-09	Polk	
	2	4182462		1980-01-08	Buff	
	3	6983575		2006-01-10	Longo	
	4	8474610		2013-07-02	Knight	
	5	3834606		1974-09-10	Andersson	
	6	4349124		1982-09-14	Faller	
	7	7395923		2008-07-08	Chou	
	8	7921992		2011-04-12	LaRue	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

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Art Unit	1782
Examiner Name	Lan YAN
Attorney Docket Number	17-1040 (MW-12CP1)

	9	3580413		1971-05-21	Quackenbush	
	10	4533585		1985-08-06	Holden	
	11	6482452	B1	2002-11-19	Weller	
	12	6598740	B1	2003-07-29	Wiegers	
	13	5375701		1994-12-27	Hustad	
	14	9302842	B1	2016-04-05	Wallace	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20150001127	A1	2015-01-01	Nelson	
	2	20030041955	A1	2003-03-06	Spengler	
	3	20120085069	A1	2012-04-12	Mader	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

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First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Lan YAN
Attorney Docket Number	17-1040 (MW-12CP1)

	4	20110266168	A1	2011-11-03	Longo	
	5	20020007902	A1	2002-01-24	Nance	
	6	20170001786	A1	2017-01-05	Wallace	
	7	20120291712	A1	2012-11-22	Wallace	
	8	20130142975	A1	2013-06-06	Wallace	
	9	20120119404	A1	2012-05-17	Wallace	
	10	20140054292	A1	2014-02-27	Wallace	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2424805	FR		1979-11-30	Societe des Anciens Etabussements	Machine Translation Provided	☒
	2	2017053937	WO	A1	2017-03-30	Wallace		☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15445220
	Filing Date	2017-02-28
	First Named Inventor	Millard F. WALLACE
	Art Unit	1782
	Examiner Name	Lan YAN
	Attorney Docket Number	17-1040 (MW-12CP1)

	3							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/YAN LAN/	Date Considered	03/28/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]See Kind Codes of USPTO Patent Documents at www.USPTO.GOVor MPEP 901.04. [2]Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5]Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

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Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Lan YAN
Attorney Docket Number	17-1040 (MW-12CP1)

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2017-08-18
Name/Print	Gary D. Colby, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

/YAN LAN/ 03/28/2019

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

/YAN LAN/

03/28/2019

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	36	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/03/29 11:55
L2	6	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/03/29 11:55
L3	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/03/29 11:55
L4	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 11:55
L5	7294	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 11:55
L6	9119	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 11:55
L7	4345	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 11:55
L8	8225	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 11:55
L9	45609	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 11:55
L19	1787	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/03/29 11:57
L20	37	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2019/03/29 11:57

			EPO; JPO; DERWENT; IBM_TDB			
L21	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/03/29 11:58
L22	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/03/29 11:59
L23	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/03/29 12:00
L24	95	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/29 12:04

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L10	15	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/03/29 11:55
L11	6	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/03/29 11:55
L12	0	("20170165896").PN.	USPAT	OR	OFF	2019/03/29 11:56
L13	1365	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/03/29 11:56
L14	2437	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/03/29 11:56
L15	1256	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/03/29 11:56
L16	2458	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR	USPAT	OR	OFF	2019/03/29 11:56

		B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)				
L17	12660	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/03/29 11:56
L18	365	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/03/29 11:57
L25	34	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/03/29 12:04
L26	21	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/03/29 12:04
L27	277	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/03/29 12:13
L28	2372	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/03/29 12:14
L29	6	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/03/29 12:14
L30	1	"4358492".pn.	USPAT	OR	ON	2019/03/29 12:16
L31	0	"20130064998".pn.	USPAT	OR	ON	2019/03/29 12:17
L32	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/03/29 12:17

3/ 29/ 2019 12:18:45 PM
C:\ Users\ ylan\ Documents\ EAST\ Workspaces\ 15445220.wsp

Ningbo Linhua Plastic Ex. 1002, p. 247

Bibliographic Data

Application No: 15/445,220

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /YAN LAN/ Examiner's Signature | Initials

Title: Formed Thermoplastic Article Having Smooth Edges

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/28/2017	428	1782	CnvMf012CP
RULE			

APPLICANTS

Converter Manufacturing, LLC, Orwigsburg, PA, UNITED STATES

INVENTORS

Millard F. WALLACE Orwigsburg, PA, UNITED STATES

CONTINUING DATA

This application is a CIP of PCT/US2016/049692 08/31/2016

PCT/US2016/049692 has PRO of 62212367 08/31/2015

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

03/07/2017

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961
UNITED STATES

FILING FEE RECEIVED

$770

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15445220	Filing Date	2017-02-28	Docket Number (if applicable)	CnvMf012CP	Art Unit	1782
First Named Inventor	Millard F. WALLACE			Examiner Name	Yan LAN		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☐ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Signature of Registered U.S. Patent Practitioner			
Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-07-01
Name	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

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Ningbo Linhua Plastic Ex. 1002, p. 251

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	2891280	B	1959-06-23	Politis	
	2	2960134	B	1960-11-15	Fornas	
	3	3096546	B	1963-07-09	Edwards	
	4	3192565	B	1965-07-06	Rukavina	
	5	3355536	B	1967-11-28	Midgley	
	6	3357053	A	1967-12-12	Lyon	
	7	3423231	A	1969-01-21	Lutzmann	
	8	3568254	A	1971-03-09	Stolki	

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	First Named Inventor	Millard F. WALLACE
	Art Unit	1782
	Examiner Name	Yan LAN
	Attorney Docket Number	CnvMf012CP

	9	3695806	B	1972-10-03	Arfert	
	10	3767507	B	1973-10-23	Stahlecker	
	11	4281979	A	1981-08-04	Doherty	
	12	4358492	A	1982-11-09	Perkins	
	13	5098751	B	1992-03-24	Tamura	
	14	5118277	B	1992-06-02	Padovani	
	15	5758773	B	1998-06-02	Clements	
	16	5919496	B	1999-07-06	Padovani	
	17	5972447	A	1999-10-26	Hata	
	18	5976682	A	1999-11-02	Eichbauer	
	19	6234386	B1	2001-05-22	Drummond	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15445220
	Filing Date	2017-02-28
	First Named Inventor	Millard F. WALLACE
	Art Unit	1782
	Examiner Name	Yan LAN
	Attorney Docket Number	CnvMf012CP

	20	10076865	B2	2018-09-18	Wallace	
	21	10118332	B2	2018-11-06	Wallace	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020119334	A1	2002-08-29	Shepard	
	2	20020127295	A1	2002-09-12	Padovani	
	3	20040043165	A1	2004-03-04	Van Hulle	
	4	20040144482	A1	2004-07-29	Cherpinsky	
	5	20060172095	A1	2006-08-03	Elsaesser	
	6	20130113137	A1	2013-05-09	Bissoli	

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FOREIGN PATENT DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-07-01
Name/Print	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15445220
Filing Date:	28-Feb-2017
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Filer:	Gary David Colby
Attorney Docket Number:	CNVMF012CP

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	2801	1	650	650
		Total in USD ($)		**650**

Electronic Acknowledgement Receipt

EFS ID:	36459052
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	160330
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	CNVMF012CP
Receipt Date:	01-JUL-2019
Filing Date:	28-FEB-2017
Time Stamp:	11:33:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$650
RAM confirmation Number	070119INTEFSW11353902
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	RCE_for_IDS.pdf	74530 497df8bce546642011de6396e729a0ac9ea9d5ac	no	3
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	SIDS.pdf	72343 50f3e7622663d1258182281d0b6ea6b73a421032	no	6
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Fee Worksheet (SB06)	fee-info.pdf	30154 68079f1b9caf17050eb1ba2b77b25a640946a1dc	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	177027		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

160330 7590 07/12/2019
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER
LAN, YAN

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 07/12/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/15/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

Ningbo Linhua Plastic Ex. 1002, p. 262

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

160330 7590 07/12/2019
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	10/15/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAN, YAN	1782	428-035700

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Ningbo Linhua Plastic Ex. 1002, p. 263

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

160330 7590 07/12/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER	
LAN, YAN	

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 07/12/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Ningbo Linhua Plastic Ex. 1002, p. 264

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Updated ***Notice of Allowability***	**Application No.** 15/445,220	**Applicant(s)** WALLACE, Millard F.	
	Examiner YAN LAN	**Art Unit** 1782	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to communication of 7/1/2019.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-4,8-12,15,18-19,22,24-26,34,44,50 and 60-61 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 7/1/2019.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/YAN LAN/
Primary Examiner, Art Unit 1782

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

CPC - Searched*		
Symbol	**Date**	**Examiner**
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265	07/08/2019	yl
B29K2101/12 AND B29K2105/256	07/08/2019	yl
B29L2031/712	07/08/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20	07/08/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06	07/08/2019	yl

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Conducted class, subclass search crossed with text search using EAST, inventors, assignee search in EAST	07/08/2019	yl
Google search	07/08/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265		07/08/2019	yl
B29K2101/12 AND B29K2105/256		07/08/2019	yl
B29L2031/712		07/08/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20		07/08/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06		07/08/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Ningbo Linhua Plastic Ex. 1002, p. 268

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

CPC						
Symbol					**Type**	**Version**
B29C	/	51	/	306	F	2013-01-01
B29C	/	51	/	20	I	2013-01-01
B29C	/	51	/	42	I	2013-01-01
B29C	/	51	/	082	I	2013-01-01
B65D	/	1	/	34	I	2013-01-01
B65D	/	1	/	42	I	2013-01-01
B65D	/	43	/	0204	I	2013-01-01
B26F	/	1	/	40	I	2013-01-01
B29K	/	2101	/	12	A	2013-01-01
B29K	/	2105	/	256	A	2013-01-01
B29L	/	2031	/	712	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	08 July 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190708

Ningbo Linhua Plastic Ex. 1002, p. 269

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B29C	/	51	/	30
B29C	/	51	/	08
B65D	/	43	/	02
B65D	/	1	/	34

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	08 July 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190708

Ningbo Linhua Plastic Ex. 1002, p. 270

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10	12	19	-	28	-	37	-	46	-	55		
2	2	8	11	-	20	-	29	-	38	-	47	-	56		
3	3	9	12	-	21	-	30	-	39	-	48	-	57		
4	4	-	13	13	22	-	31	-	40	-	49	-	58		
-	5	-	14	-	23	-	32	-	41	21	50	-	59		
-	6	10	15	14	24	-	33	-	42	-	51	19	60		
-	7	-	16	15	25	17	34	-	43	-	52	20	61		
5	8	-	17	16	26	-	35	18	44	-	53				
6	9	11	18	-	27	-	36	-	45	-	54				

NONE		**Total Claims Allowed:**
(Assistant Examiner)	(Date)	21
/YAN LAN/ Primary Examiner, Art Unit 1782	08 July 2019	O.G. Print Claim(s) / O.G. Print Figure
(Primary Examiner)	(Date)	1 / Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190708

Ningbo Linhua Plastic Ex. 1002, p. 271

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	2891280	B	1959-06-23	Politis	
	2	2960134	B	1960-11-15	Fornas	
	3	3096546	B	1963-07-09	Edwards	
	4	3192565	B	1965-07-06	Rukavina	
	5	3355536	B	1967-11-28	Midgley	
	6	3357053	A	1967-12-12	Lyon	
	7	3423231	A	1969-01-21	Lutzmann	
	8	3568254	A	1971-03-09	Stolki	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

	9	3695806	B	1972-10-03	Arfert	
	10	3767507	B	1973-10-23	Stahlecker	
	11	4281979	A	1981-08-04	Doherty	
	12	4358492	A	1982-11-09	Perkins	
	13	5098751	B	1992-03-24	Tamura	
	14	5118277	B	1992-06-02	Padovani	
	15	5758773	B	1998-06-02	Clements	
	16	5919496	B	1999-07-06	Padovani	
	17	5972447	A	1999-10-26	Hata	
	18	5976682	A	1999-11-02	Eichbauer	
	19	6234386	B1	2001-05-22	Drummond	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

	20	10076865	B2	2018-09-18	Wallace	
	21	10118332	B2	2018-11-06	Wallace	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020119334	A1	2002-08-29	Shepard	
	2	20020127295	A1	2002-09-12	Padovani	
	3	20040043165	A1	2004-03-04	Van Hulle	
	4	20040144482	A1	2004-07-29	Cherpinsky	
	5	20060172095	A1	2006-08-03	Elsaesser	
	6	20130113137	A1	2013-05-09	Bissoli	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/YAN LAN/	Date Considered	07/08/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-07-01
Name/Print	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

/YAN LAN/ 07/08/2019

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

07/08/2019

/YAN LAN/

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/07/08 09:30
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L4	38	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/07/08 09:30
L5	6	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/07/08 09:30
S1	36	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/03/28 14:40
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S4	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/28 14:42
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S7	4345	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/28 14:42
S8	8225	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/28 14:42
S9	45609	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/03/28 14:42
S10	36	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/03/29 11:55
S11	6	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/03/29 11:55
S12	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/03/29 11:55
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S20	37	((imping$3 same (ram or edge)) same	US-PGPUB;	OR	ON	2019/03/29

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S25	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/03/29 12:26

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	27	"Term Removed"	US-PGPUB; USPAT	OR	OFF	2019/07/08 09:02
S26	15	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/03/29 11:55
S27	6	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/03/29 11:55
S28	0	("20170165896").PN.	USPAT	OR	OFF	2019/03/29 11:56
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		B29C51/14 OR B29C51/265).CPC.)				
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S31	1256	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/03/29 11:56
S32	2458	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/03/29 11:56
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S34	365	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/03/29 11:57
S35	34	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/03/29 12:04
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S37	277	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/03/29 12:13
S38	2372	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/03/29 12:14
S39	6	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/03/29 12:14
S40	1	"4358492".pn.	USPAT	OR	ON	2019/03/29 12:16
S41	0	"20130064998".pn.	USPAT	OR	ON	2019/03/29 12:17
S42	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/03/29 12:17

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Ningbo Linhua Plastic Ex. 1002, p. 281

PTO/SB/30EFS (02-18)
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15445220	Filing Date	2017-02-28	Docket Number (if applicable)	CnvMf012CP	Art Unit	1782
First Named Inventor	Millard F. WALLACE			Examiner Name	Yan LAN		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☐ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

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Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-07-29
Name	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3947205	B	1976-03-25	Edwards	
	2	4621513	B	1986-11-11	Bradford	
	3	8920892	B2	2014-12-30	Hernandez	

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U.S.PATENT APPLICATION PUBLICATIONS

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	1	2012/064203	WO	A2	2012-05-18	Long		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15445220
	Filing Date	2017-02-28
	First Named Inventor	Millard F. WALLACE
	Art Unit	1782
	Examiner Name	Yan LAN
	Attorney Docket Number	CnvMf012CP

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Search Report for European patent application 16 842 900.9 of Wallace. 2019-07-03	☐
	2	Office Action for Canadian Patent Application 2,996,864. 2019-06-19	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-07-29
Name/Print	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

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[Continued on next page]

(54) Title: A CONTAINER

(57) Abstract: An open top container formed by trimming a thermoformed precursor or preform to provide an outwardly extending peripheral profile with the trimming cut locus (II-II) directly under part of the peripheral profile only after reverting to a more relaxed condition than that at which the trimming cut was made. The process involves providing a thermoformed precursor or preform, and trimming a surround from the precursor or preform when stretched to better present the trim locus (II-II) between what will be the edge of the container and the cut edge of the surround.

FIG. 5A

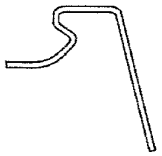


FIG. 5B

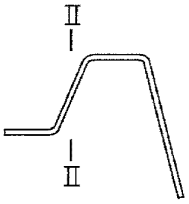
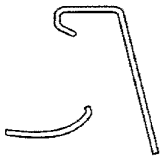


FIG. 5C



WO 2012/064203 A1

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Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

A CONTAINER

FIELD OF THE INVENTION

The present invention relates to an open mouthed container (eg. tray, cup or the like) having a profiled periphery outwardly of the mouth, there being a return of the edge in the under part of the profiled periphery.

BACKGROUND

Such an arrangement, if a tray, lends itself to the content of the tray being wrapped by a plastics film and with the wrap path or wrap locus unlikely to encounter die peripheral edge of the profiled periphery because it is placed in out of the way of the direct pathway the wrap will assume from the profiled periphery (eg. as if a tangent) down to the wall to base transition (eg. as if a tangent).

In the past open top containers such as trays, cups or the like have involved either multiple thermoforming steps or a thermoforming step followed by a reforming or crimping step in order to conceal or render harmless the peripheral edge.

An example of a multiple thermoforming step to provide a thermoformed tray is that disclosed in Australian patent 701551 of Drypac Pry Ltd.

The present invention does not thermoform the container to its final form. Rather it relies upon a thermoformed precursor or preform that is then subjected to a tiimming procedure.

We propose a trimming procedure whereby the trimmed product has as its profiled periphery the essentially same form as moulded save for material having been removed to define the peripheral edge.

The trimming procedure we propose as capable of achieving this outcome will cut the material about the container to leave a "concealed-from-above" in-turned edge.

The procedure is considered as providing the prospect of a faster online handling of the output of the mermoforming station with a follow on trim tooling station that can operate at least as fast and preferably in synchrony with the output of the mermoforrning tooling.

Preferably, but not necessarily, the mermoforming is vacuum thermoforming of a sheet material of any of the kinds typified by examples given hereinafter.

The present invention also relates to a procedure that has a wider application than just the open mouthed containers previously mentioned. The wider application is the prospect of providing a preform or precursor of a final product that has a zone which will have the peripheral edge disposed under a flange, bead, rim or like profile (eg. simulating the rolled edge).

The advance is the prospect of that zone being subjected to a cutting procedure (guillotining, laser, water jet, or other) despite that zone (and the resultant cut edge) being underneath in that profiled periphery of the plan silhouette of the item in question when resiliendy stretched, blown or otherwise deformed from its, as moulded, relaxed condition to enable a cut locus is to be provided outwardly of where the cut edge will revert to.

The advance is a recognition that with appropriate forming of a preform or precursor in an appropriate resilient material, it is possible (when still warm and/ or when cold) to deform the profiled periphery resiliently sufficient to enable a cutting locus (by guillotining, punching, etc) to occur outside of what will be the relaxed locus of the resultant cut edge, when viewed in plan silhouette of the resultant product at which cutting would be more difficult.

It is an object of the present invention to provide procedures, methods, tooling and the like capable of performing any such operation or to at least provide the public with a useful choice or a container as a useful choice.

It is a further or alternative object to provide a precursor or preform for such procedures which will at least provide the public with a useful choice.

It is a further or alternative object of the present invention to provide an open mouth container of a thermoformed sheet material with an under turned peripheral region that has reverted after a trimming procedure of a preform or moulded precursor essentially to its "as moulded" (eg. vacuum thermoforming) relaxed disposition.

It is a further or alternative object to provide a trimming procedure coupled to a momentary distortion of a preform or trimmable precursor that makes a cutting locus possible reliant to opposing shear elements.

BRIEF DESCRIPTION OF THE INVENTION

In another aspect the invention is **an open top container** (eg tray, cup or the like) formed by trimming a thermoformed precursor or preform to provide an outwardly extending peripheral profile with the trimming cut locus directly under part of the peripheral profile only after reverting to a more relaxed condition than that at which the trimming cut was made.

In an aspect the invention is **an open mouthed container** (eg. tray, cup or the like) having a profiled periphery about the mouth;

wherein the container has been trimmed from a thermoformed preform or precursor that includes said profiled periphery but not its peripheral edge.

Preferably the trimming removes a surround of what will be the container.

Preferably the trimming (with respect to the tray) provides a trimming cut locus directly under peripheral profile, that locus only being assumed by reverting to a more relaxed (eg. as thermoformed in the preform or precursor) condition than that at which the trimming cut was made.

Preferably said surround has been removed by a single cutting (eg. a guillotine cutting).

Preferably said removal is "on line" (eg. part of a single continuous process at contiguous zones).

Preferably the cutting occurs when that material to provide the edge is resiliently positioned outwardly of its at rest and as moulded position.

Preferably the positioning outwardly is sufficiently outwardly to be outwardly of the eventual periphery of the tray when considered in plan silhouette.

Preferably said positioning outwardly is by pulling or pushing at least outwardly in a trimming apparatus or station.

Alternatively said positioning outwardly is by holding said surround and deforming by a displacement the zone to have said edge.

In another aspect the invention is **a packaging tray** of a plastics material suitable for or for supporting contents wrapped in a plastics film extending in a wrap path or locus about the tray and contents, the tray defining:

a base on which the contents can be, or are to be, supported;

a peripheral wall upstanding from the base; and

a profiled rim including region carried outwardly of the wall from the wall;

wherein the profiled rim including region terminates in a peripheral edge of a peripheral edge region extending inwardly so that the peripheral edge remains or will remain out of a or the wrap path or locus about the tray;

wherein the tray has had said peripheral edge defined by a cutting of a thermoformed tray precursor or preform.

Preferably the cutting of the precursor or preform has occurred when what will be the peripheral edge was a part of a zone pulled outwardly of its post cut position (eg. preferably outside of the plan silhouette of the resultant tray to better enable a cutting interaction of tooling components from either side of said zone.

Preferably the peripheral edge and/ or said zone is substantially as herein described with reference to any one or more of the drawings.

In yet another aspect the invention is a **packaging tray** of a plastics material for supporting contents wrapped in a plastics film extending in a wrap path or locus about the tray

and contents, the tray having a peripheral bead as its rim feature ending in a cut edge under the rim provided by the bead so as to be inwardly of and/ or directed inwardly from the wrap path or locus.

Preferably the cut edge has been provided by punching or otherwise freeing a surround from a thermoformed precursor or preform when, what will become the cut edge, has been held as part of a zone more outwardly.

Preferably the freeing is when the precursor or preform, over at least part of said zone, has been stretched or otherwise deformed from its thermoformed disposition.

In another aspect the invention is **a process for forming a container as previously mentioned,** said process being or involving

providing a thermoformed precursor or preform, and

trimming a surround from the precursor or preform when stretched to better present the trim locus between what will be the cut edge of the container and the cut edge of the surround.

Preferably the better presentation is for cutting on a locus outside of what will become the silhouette plan periphery of the container.

Preferably the process includes any one or more of the steps herein described.

In another aspect the invention is **tooling** able to perform such a process.

Preferably the tooling has the capabilities herein described.

In still a further aspect the invention is, **inline,**

a preform or precursor forming station, and

a preform or precursor trimming station, such inline apparatus being able to trim on a trim line outwardly of where the trimmed product will have the trim cut revert to.

Preferably the inline trimming station has capabilities as herein discussed and/ or is able to provide a container as herein described.

In another aspect the invention consists in **a tray, cup or other container** substantially as herein described with reference to any one or more of the accompanying drawings.

In still a further aspect the invention consists in **a preform or precursor** substantially as herein described with reference to any one or more of the accompanying drawings.

In yet a further aspect the invention consists in **tooling** substantially as herein described with reference to any one or more of the accompanying drawings.

In still a further aspect the invention consists in **a procedure of forming a product** when performed using a preform or precursor and a subsequent trimming procedure, any part of

which is substantially as herein described with or without reference to any one or more of the accompanying drawings.

In still a further aspect the invention consists in, **inline, apparatus** substantially as herein described generally or in particular and/or substantially as shown in any one or more of the accompanying drawings.

In still another aspect the invention is **a method of providing an open topped container (eg. a tray) having a rim beaded on its outer periphery,** said method comprising or including,

in a first tooling assembly able to be parted on a single separation axis (whether progressive or not), moulding a precursor of the container which has the eventual bead at least substantially as its final configuration but which extends beyond the perimeter of the eventual bead below the eventual bead, and

in a second tooling assembly after parting of the first tooling assembly, and irrespectively of whether any part of the first tooling assembly is a part of the second tooling assembly, clamping a region of the precursor's extension that is beyond or distal to the eventual bead and stretching at least that part of die precursor's extension that is proximal to the eventual bead sufficiently to provide for an exposure of a zone to provide a peripheral cut locus outside of what will be the perimeter of the eventual bead thereby to allow cutting on that locus using an axis at least parallel to that axis of the precursor that was aligned to the first tooling assembly single separation axis.

In still another aspect the invention is **a tray, cup or other container** formed by any process or method of the present invention or using any tooling or station of the present invention.

As used herein the term "(s)" following a noun means one or both of the singular or plural forms.

As used herein the term "and/ or" means "and" or "or". In some circumstances it can mean both.

A BRIEF DESCRIPTION OF THE DRAWINGS

A preferred form of the present invention will now be described with reference to the accompany drawings in which

Figure 1 is an isometric view of a typical container/ tray having a profiled periphery in the form of an outwardly extending rim zone and distally therefrom an under turn,

Figure 2 shows a typical cross section of the peripheral wall of the container of Figure 1 (whether on a side or in a corner) laterally through the rim and under turn,

Figure 3 is a sectional view of a preform or precursor thermoformed item able to be trimmed to provide a container substantially as shown in Figures 1 and 2,

Figure 4 shows an enlargement of the preform or precursor feature identified as 'A' in Figure 3, that being able to be trimmed to provide an under turn as shown in Figure 2, and

Figures 5A, 5B and 5C show, as three stages, die features of Figure 4, the distortion, deforming, stretching, blowing or the like of the form of Figure 5A sufficiently to provide a cut line shown by the broken lines II-II in Figure 5B which is outwardly of the final profile periphery and Figure 5C shows how the resilience allows the under turn of the preform or precursor of Figure 5A to be reassumed after the cut has been made on die broken line as shown in Figure 5B.

DETAILED DESCRIPTION OF THE INVENTION

In a preferred form of the present invention a tray will be described.

It should be appreciated however diat the container can be of any form. It can be a cup, a bowl or other.

Whilst reference is made herein to a tray adapted to be encompassed by a wrap of a plastics film, any suitable wrap can be used. Similarly reference hereto to a "wrap" is to a capability of the container. The present invention extends to any such container irrespective of whether or not it is to be used in that way.

Examples of suitable materials from which containers can be formed and which has sufficient resilience to allow the process in accordance with the present invention include typical materials we have hitherto used in our PL1X™ range of containers, trays and the like. Examples of materials include, by way of example, unfoamed PET, PLA, CPET, PP and high impact polystyrene. Foamed materials can be any of the preceding able to be foamed effectively to provide a preform or precursor along the lines envisaged and to have sufficient flexibility to allow a return from a stretch to a to be cut condition.

The process of the present invention in its preferred form is able to provide moulded configuration for the tray defining remnant of the thermoformed preform or precursor.

This means none of the puckering or distortions often encountered with rolling a flanged edge is encountered. Also avoided is the slowness of a double stage thermoforming process such as disclosed in the aforementioned Australian patent.

It is envisaged that the preform or precursors of the present invention can be dealt with serially onkne within less than one minute of exiting the mould eg. from 1 second to 1 minute. Given an appropriate choice of material and profiling of the region to be cut of the preform or precursor, the preform or precursor if wanted can be dealt with much later as a batch.

Figure 1 and 2 shows an optional tray as the container. It has a base 1 and a peripheral wall 2. The peripheral wall at its top has a profiled region 3 made up of an outwardly extending flat or curved rim 4 of the open mouth 5 and having a turn under region 6 leading to its peripheral edge 7.

This peripheral edge 7 is preferably to be sufficiency inwardly of the line 1-1 which runs from a tangent of the curvature of the profiled feature 3 down to the transition at 8 between the wall 2 and base 1 such that there is no tendency for the edge 7 to encounter the film and other material used as a sealing wrap or an enclosement of content in the tray.

Accordingly there is no tendency for tearing.

In a rectangular form or similar form to that depicted in Figure 1 of tray, the stresses of any such film wrap is greatest at the corners. A feature of the present invention is the absence of any film damaging distortions of the edge under 6 even at the corner regions. This is because the edge under 6 right around the wall (including along any straight or outwardly curved wall regions and through the intervening curved or truncated corner regions) is as it was exmould in the preform or precursor as shown in Figures 3 and 4.

The preform or precursor as shown in Figures 3 and 4 has beyond the zone 9, which is to provide the peripheral edge 7, sufficient material over the region 11 to allow the reconformation resiliendy of the region 11 and 9 from the condition shown in Figures 3, 4, and 5A to a condition as shown in Figure 5B which allows cutting (eg. by a peripheral guillotine or punch tooling) on the line Π-Π shown in Figure 5B.

Persons skilled in the art will envisage a variety of ways of dealing with such a preform as envisaged.

Included may be a use of a gaseous pressure or other mechanical or fluid force in suitable tooling to achieve sufficient presentation for trimming.

CLAIMS:

1. **An open top container** formed by damming a thermoformed precursor or preform to provide an outwardly extending peripheral profile with the trimming cut locus direcdy under part of the peripheral profile only after reverting to a more relaxed condition than that at which the trimming cut was made.

2. **An open mouthed container** having a profiled periphery about the mouth;

wherein the container has been trimmed from a thermoformed preform or precursor that includes said profiled periphery but not its peripheral edge.

3. A container of claim 1 or 2 wherein the trimming removes a surround of what will be the container.

4. A container of claim 2 wherein the ttimrning had a trimming cut locus directly under peripheral profile, that locus only being assumed by reverting to a more relaxed condition than that at which the trimming cut was made.

5. A container of claim 3 wherein the surround was removed by a single cutting.

6. A container wherein of claim 5A said removal is "on line".

7. **A packaging tray** of a plastics material suitable for or for supporting contents wrapped in a plastics film extending in a wrap path or locus about the tray and contents, the tray defining:

a base on which the contents can be, or are to be, supported;

a peripheral wall upstanding from the base; and

a profiled rim including region carried outwardly of the wall from the wall;

wherein the profiled rim including region terminates in a peripheral edge of a peripheral edge region extending inwardly so that the peripheral edge remains or will remain out of a or the wrap path or locus about the tray;

wherein the tray has had said peripheral edge defined by a cutting of a thermoformed tray precursor or preform.

8. A tray of claim 7 wherein the cutting of the precursor or preform has occurred when what will be the peripheral edge was a part of a zone pulled outwardly of its post cut position.

9. A tray of claim 8 wherein the peripheral edge when cut was part of a zone outside of the plan silhouette of the resultant tray to better enable a cutting interaction of tooling components from either side of the precursor or perform at said zone.

10. **A packaging tray** of a plastics material for supporting contents wrapped in a plastics film extending in a wrap path or locus about the tray and contents, the tray having a peripheral bead as its rim feature ending in a cut edge under the rim provided by the bead so as to be

inwardly of and/or directed inwardly from the wrap path or locus; wherein the cut edge has been provided by punching or otherwise freeing a surround from a thermoformed precursor or preform when, what will become the cut edge, has been held as part of a zone more outwardly.

11. A tray of claim 10 wherein the freeing was when the precursor or preform, over at least part of said zone, had been stretched or otherwise deformed from its thermoformed disposition.

12. **A process for forming a container as previously mentioned,** said process being or involving

providing a thermoformed precursor or preform, and

trimming a surround from the precursor or preform when stretched to better present the trim locus between what will be the cut edge of the container and the cut edge of the surround.

13. A process of claim 12 wherein the better presentation is for cutting on a locus outside of what will become the silhouette plan periphery of the container.

14. A process of claim 12 or 13 when performed online with the moulding of the preform or precursor.

15. A process of claim 12 wherein the trimming of the whole surround arises from a guillotine like action.

16. **Tooling inline,** comprising

a preform or precursor forming station, and

a preform or precursor trimming station, such inline apparatus being able to trim on a trim line outwardly of where the trimmed product will have the trim cut revert to.

17. **A tray, cup or other container** substantially as herein described with reference to any one or more of the accompanying drawings.

18. **A preform or precursor** substantially as herein described with reference to any one or more of the accompanying drawings.

19. **Tooling** substantially as herein described with reference to any one or more of the accompanying drawings.

20. **A procedure of forming a product** when performed using a preform or precursor and a subsequent trimming procedure, any part of which is substantially as herein described with or without reference to any one or more of the accompanying drawings.

21. **Inline, apparatus** substantially as herein described generally or in particular and/ or substantially as shown in any one or more of the accompanying drawings.

22. **A method of providing an open topped container (eg. a tray) having a rim beaded on its outer periphery,** said method comprising or including,

in a first tooling assembly able to be parted on a single separation axis (whether progressive or not), moulding a precursor of the container which has the eventual bead at least substantially as its final configuration but which extends beyond the perimeter of the eventual bead below the eventual bead, and

in a second tooling assembly after parting of the first tooling assembly, and irrespectively of whether any part of the first tooling assembly is a part of the second tooling assembly, clamping a region of the precursor's extension that is beyond or distal to the eventual bead and stretching at least that part of the precursor's extension that is proximal to the eventual bead sufficiently to provide for an exposure of a zone to provide a peripheral cut locus outside of what will be the perimeter of the eventual bead thereby to allow cutting on that locus using an axis at least parallel to that axis of the precursor that was aligned to the first tooling assembly single separation axis.

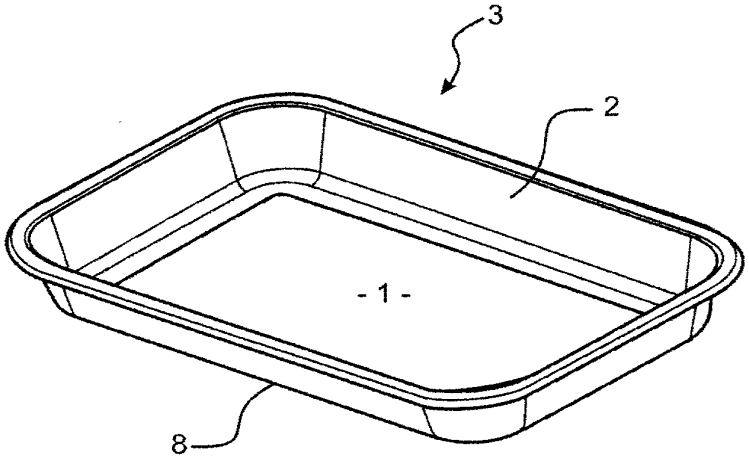


FIG. 1

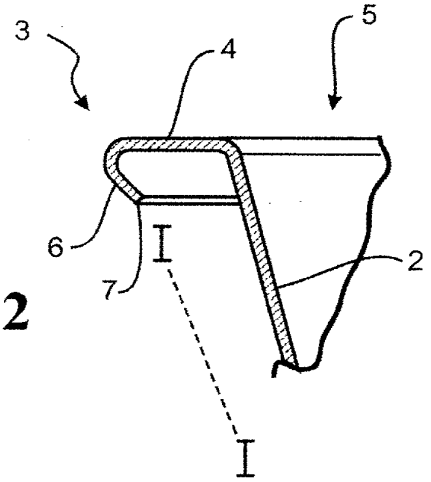


FIG. 2

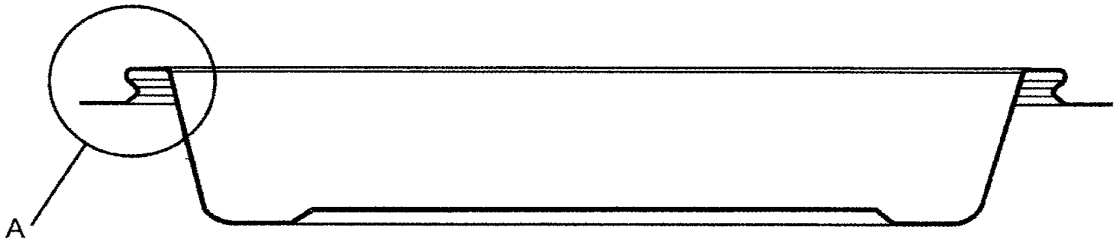


FIG. 3

FIG. 4

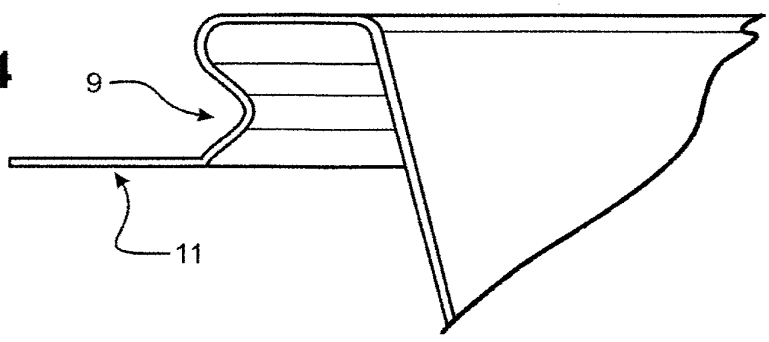


FIG. 5A

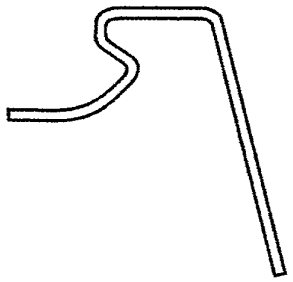


FIG. 5B

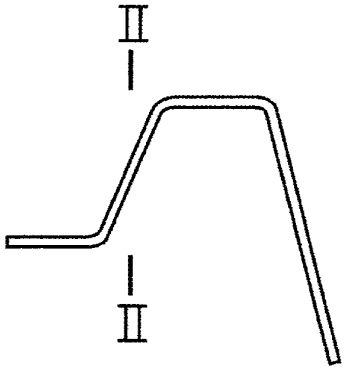
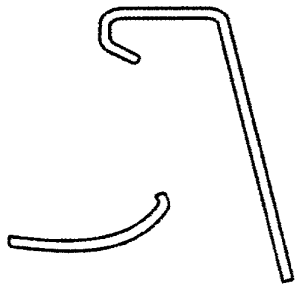


FIG. 5C



INTERNATIONAL SEARCH REPORT

International application No.
PCT7NZ20 11/000234

A. CLASSIFICATION OF SUBJECT MATTER

Int. CI.

B29C 51/32 (2006.0 1) ***B29C 57/12*** (2006.0 1)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI/EPODOC: B29C, B65D and keywords bottle+, container+, jar+, can+, box+, tray+, crate+, carton+, tank+, trim+, cut+, peripher+, edge+, rim+, perimeter+, preform+, presursor+. Google Patent and Espace keyword searchese with keywords container^-, tray+, bottle+, box+, trim+, cut+, peripher+, edge+, rim+, perimeter+, lip+, curl+, return+, roll+, bent.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	US 356 1058 A (KOMENDOWSKI) 09 February 1971	
X	**See Abstract, Figures, columns 4-7**	**2-3, 5-7**
A		**1, 4, 8-16, 22**
	US 6237791 B1 (BECK ET AL.) 29 May 2001	
X	**See Abstract, column 4-5, Figures**	**2-3, 5-7**
A		**1, 4, 8-16, 22**
	WO 2009/0191 72 A1 (ALPLA-WERKE ALWIN LEHNER GMBH & CO.) 12 February 2009	
X	**See Abstract, Figures, page 1, claims**	**2-3, 5-6**
A		**1, 4, 7-16, 22**

[X] **Further documents are listed in the continuation of Box C** [X] **See patent family annex**

* **Special categories of cited documents:**

"A" **document defining the general state of the art which is not considered to be of particular relevance**

"E" **earlier application or patent but published on or after the international filing date**

"L" **document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)**

"O" **document referring to an oral disclosure, use, exhibition or other means**

"P" **document published prior to the international filing date but later than the priority date claimed**

"T" **later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention**

"X" **document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone**

"Y" **document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art**

"&" **document member of the same patent family**

Date of the actual completion of the international search	Date of mailing of the international search report
02 March 20 12	2 March 2012
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **HONG YU** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 7946

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INTERNATIONAL SEARCH REPORT

International application No.
PCT /NZ2011/000234

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3653285 A (YOSHIKAWA ET AL.) 04 April 1972 See Abstract, Figures	2-3, 5-6
A		1, 4, 7-16, 22

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Supplemental Box
(To be used when the space in any of Boxes I to IV is not sufficient)

Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

- Claims 1, 3, 5-6 are directed to an open top container. The feature of a trimming cut locus being directly under part of an outwardly extending peripheral profile of a thermoformed precursor or preform only after reverting to a more relaxed condition than that at which the trimming cut was made is specific to this group of claims.

- Claims 2-6 are directed to an open mouthed container. The feature of a container being trimmed from a thermoformed preform or precursor that includes a profiled periphery about the mouth but not its peripheral edge is specific to this group of claims.

- Claims 7-9 are directed to a packaging tray. The feature of a peripheral edge of a peripheral edge region extending inwardly so that the peripheral edge remains out of a wrap path or locus about the tray is specific to this group of claims.

- Claims 10-1 6, 22 are directed to a packaging tray, a tooling inline and a method of providing an open topped container having a beaded rim about its outer periphery. The feature of forcing a cut/trim edge region of a thermoformed container preform outwardly of where cut/trimmed edge will freely move to without external force to cut/trim the container on the edge specific to this group of claims.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions and which provides a technical relationship among them includes trimming/cutting peripheral profile of a container preform. However this feature does not make a contribution over the prior art because it is disclosed in US 6237791 .

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *aposteriori.*

The International Searching Authority believes that a search and examination for the 2nd to 4th inventions will not involve more than negligible additional search and examination effort over that for the first invention and so no additional search fee is required in order to search and examine that invention.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT7NZ2011/000234

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [ ] Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. [X] Claims Nos.: **17-21**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
The claims do not comply with Rule 6.2(a) because they rely on references to the description and/or drawings.

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See separate page

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. [X] As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/NZ2011/000234

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	3561058	NONE					
US	6237791	AU	67916/98	BR	9809073	CA	2286674
		EP	1007325	NZ	338001	US	6062408
		US	6126886	WO	9845106		
WO	2009019172	NONE					
US	3653285	DE	2050149	FR	2102418		

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX

Ningbo Linhua Plastic Ex. 1002, p. 307

Electronic Patent Application Fee Transmittal

Application Number:	15445220
Filing Date:	28-Feb-2017
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Filer:	Gary David Colby
Attorney Docket Number:	CNVMF012CP

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	2820	1	950	950
		Total in USD ($)		**950**

Electronic Acknowledgement Receipt

EFS ID:	36718451
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	160330
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	CNVMF012CP
Receipt Date:	29-JUL-2019
Filing Date:	28-FEB-2017
Time Stamp:	16:39:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$950
RAM confirmation Number	E20197SG40510907
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	Second_RCE_Filing.pdf	97905 c0b7fb392d68df790ada176ef6e5332a4c4c105b	no	3
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	SIDS2.pdf	155148 4fb09cb99e32eff1b936d90c5b883eeb8b8d6394	no	4
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO_2012_064203A1_Long.pdf	166654 356ee9f922983dc535e3b65150d8be8f77a97408	no	19
Warnings:					
Information:					
4	Non Patent Literature	EPO_SH_RP.pdf	215004 dca7edb6106a5e7574e443b5379a0666c184c530	no	7
Warnings:					
Information:					
5	Non Patent Literature	Canadian_Office_Action.pdf	287256 a46febff1115b0942fed74872a03699888c55d11	no	5
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	30297 644edd2437e598f6689e7c8cda11a778de7ccf8f	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	952264

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

160330 7590 08/22/2019
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER
LAN, YAN

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 08/22/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	11/22/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

160330 7590 08/22/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	11/22/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAN, YAN	1782	428-035700

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Ningbo Linhua Plastic Ex. 1002, p. 314

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

160330 7590 08/22/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER	
LAN, YAN	

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 08/22/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Updated ***Notice of Allowability***	**Application No.** 15/445,220	**Applicant(s)** WALLACE, Millard F.	
	Examiner YAN LAN	**Art Unit** 1782	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to communication of 7/29/2019.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 7/29/2019.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/YAN LAN/
Primary Examiner, Art Unit 1782

Continuation of 3. The allowed claim(s) is/are: 1-4,8-12,15,18-19,22,24-26,34,44,50 and 60-61

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

CPC - Searched*		
Symbol	**Date**	**Examiner**
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265	08/15/2019	yl
B29K2101/12 AND B29K2105/256	08/15/2019	yl
B29L2031/712	08/15/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20	08/15/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06	08/15/2019	yl

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Conducted class, subclass search crossed with text search using EAST, inventors, assignee search in EAST	08/15/2019	yl
Google search	08/15/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265		08/15/2019	yl
B29K2101/12 AND B29K2105/256		08/15/2019	yl
B29L2031/712		08/15/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20		08/15/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06		08/15/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Ningbo Linhua Plastic Ex. 1002, p. 320

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

CPC						
Symbol					**Type**	**Version**
B29C	/	51	/	306	F	2013-01-01
B29C	/	51	/	20	I	2013-01-01
B29C	/	51	/	42	I	2013-01-01
B29C	/	51	/	082	I	2013-01-01
B65D	/	1	/	34	I	2013-01-01
B65D	/	1	/	42	I	2013-01-01
B65D	/	43	/	0204	I	2013-01-01
B26F	/	1	/	40	I	2013-01-01
B29K	/	2101	/	12	A	2013-01-01
B29K	/	2105	/	256	A	2013-01-01
B29L	/	2031	/	712	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	15 August 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190815

Ningbo Linhua Plastic Ex. 1002, p. 321

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B29C	/	51	/	30
B29C	/	51	/	08
B65D	/	43	/	02
B65D	/	1	/	34

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	15 August 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190815

Ningbo Linhua Plastic Ex. 1002, p. 322

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10	12	19	-	28	-	37	-	46	-	55		
2	2	8	11	-	20	-	29	-	38	-	47	-	56		
3	3	9	12	-	21	-	30	-	39	-	48	-	57		
4	4	-	13	13	22	-	31	-	40	-	49	-	58		
-	5	-	14	-	23	-	32	-	41	21	50	-	59		
-	6	10	15	14	24	-	33	-	42	-	51	19	60		
-	7	-	16	15	25	17	34	-	43	-	52	20	61		
5	8	-	17	16	26	-	35	18	44	-	53				
6	9	11	18	-	27	-	36	-	45	-	54				

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	15 August 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190815

Ningbo Linhua Plastic Ex. 1002, p. 323

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	112	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:03
L2	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:07
L3	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:11
L4	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:35
L5	39	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/08/15 13:36
L6	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:36
L7	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:36
L8	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L9	7247	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L10	9713	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36

L11	4579	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
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L13	48933	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L14	39	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/08/15 13:36
L15	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:36
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L19	9713	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L20	4579	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L21	8647	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
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L23	1795	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:36
L24	38	((imping$3 same (ram or edge)) same	US-PGPUB;	OR	ON	2019/08/15

		deflect).clm.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			13:36
L25	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/08/15 13:36
L26	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/08/15 13:36
L27	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:36
L28	99	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L29	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/08/15 13:36
L47	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/08/15 13:36
L48	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:36
L49	39	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT;	OR	OFF	2019/08/15 13:36

			USOCR; EPO; JPO; DERWENT			
L50	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:36
L52	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:44
L53	112	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:44
L54	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:44
L55	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:44
L56	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:44
L57	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L58	7247	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L59	9713	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L60	4579	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L61	8647	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L62	48933	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44

L63	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
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L65	9713	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L66	4579	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L67	8647	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L68	48933	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L69	1795	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:44
L70	99	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/08/15 13:44
L83	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/08/15 13:44
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L85	39	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	OFF	2019/08/15 13:44

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L86	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:44
L87	39	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/08/15 13:44
L88	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:44
L89	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:44
L90	39	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/08/15 13:44
L91	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:44
L92	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:44
L93	38	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/15 13:44
L94	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/08/15 13:44
L95	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/08/15 13:44
L96	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" |	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:44

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L104	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/15 13:44

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L30	16	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/08/15 13:36
L31	7	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/08/15 13:36
L32	0	("20170165896").PN.	USPAT	OR	OFF	2019/08/15 13:36
L33	1385	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/08/15 13:36
L34	2587	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/08/15 13:36
L35	1310	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/08/15 13:36
L36	2542	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/08/15 13:36
L37	13145	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/08/15 13:36
L38	368	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/08/15 13:36
L39	34	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/08/15 13:36
L40	21	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/08/15 13:36
L41	282	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/08/15 13:36
L42	2427	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/08/15 13:36
L43	6	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/08/15 13:36
L44	1	"4358492".pn.	USPAT	OR	ON	2019/08/15 13:36
L45	0	"20130064998".pn.	USPAT	OR	ON	2019/08/15 13:36
L46	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/08/15 13:36
L51	27	"Term Removed"	US-PGPUB;	OR	OFF	2019/08/15 13:36

			USPAT			
L71	16	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/08/15 13:44
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L73	0	("20170165896").PN.	USPAT	OR	OFF	2019/08/15 13:44
L74	1385	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/08/15 13:44
L75	2587	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/08/15 13:44
L76	1310	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/08/15 13:44
L77	2542	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/08/15 13:44
L78	13145	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/08/15 13:44
L79	368	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/08/15 13:44
L80	282	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/08/15 13:44
L81	2427	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/08/15 13:44
L82	0	"20130064998".pn.	USPAT	OR	ON	2019/08/15 13:44
L98	34	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/08/15 13:44
L99	21	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/08/15 13:44
L100	6	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/08/15 13:44
L101	1	"4358492".pn.	USPAT	OR	ON	2019/08/15 13:44
L102	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/08/15 13:44
L103	27	"Term Removed"	US-PGPUB; USPAT	OR	OFF	2019/08/15 13:44

8/15/2019 1:45:48 PM
C:\Users\ylan\Documents\EAST\Workspaces\15445220.wsp

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3947205	B	1976-03-25	Edwards	
	2	4621513	B	1986-11-11	Bradford	
	3	8920892	B2	2014-12-30	Hernandez	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2012/064203	WO	A2	2012-05-18	Long		☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Search Report for European patent application 16 842 900.9 of Wallace. 2019-07-03	☐
	2	Office Action for Canadian Patent Application 2,996,864. 2019-06-19	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/YAN LAN/	Date Considered	08/15/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]See Kind Codes of USPTO Patent Documents at www.USPTO.GOVor MPEP 901.04. [2]Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5]Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-07-29
Name/Print	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

08/15/2019

/YAN LAN/

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

/YAN LAN/ 08/15/2019

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Ningbo Linhua Plastic Ex. 1002, p. 335

PTO/SB/30EFS (02-18)
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15445220	Filing Date	2017-02-28	Docket Number (if applicable)	CnvMf012CP	Art Unit	1782
First Named Inventor	Millard F. WALLACE			Examiner Name	Yan LAN		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☐ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

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Signature of Registered U.S. Patent Practitioner			
Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-09-04
Name	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Appln of:	Millard F. WALLACE	:		
Appln. No.:	15/445,220	:	Group Art Unit:	1782
Examiner:	Yan LAN	:	Conf. No.:	9924
Filing Date:	28 February 2017	:	Attorney Docket No.:	CnvMf012CP

Title: Formed Thermoplastic Article Having Smooth Edges

AMENDMENT AND

REQUEST FOR RECONSIDERATION

This Amendment is submitted with a Request for Continued Examination.

Amendments to the Claims are shown in the listing that begins on page 2.

Remarks begin on page 8.

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Amendments to the Claims

Please amend the claims to read as shown in the following listing of the claims.

1. (Currently Amended) A method of making a shaped article having a body with a smooth periphery, the method comprising

forming a thermoplastic into a shape comprising the body and a deflectable flange at a peripheral portion of the body, the deflectable flange comprising

~~a spacer bearing a peripheral edge of the thermoplastic, the spacer being connected to the body by way of~~ an extension that extends peripherally away from the body and connects thereto

a bend region ~~interconnecting the spacer and the extension, the bend region~~ having a smooth contour and interconnecting the extension, ~~spacer~~ at an approximately right angle ~~with the extension~~, with a spacer that is connected with

a peripheral flange which bears a peripheral edge of the thermoplastic, the spacer and peripheral flange being connected, at an angle other than 180 degrees, at

an elbow;

impinging a ram against the peripheral flange ~~spacer~~ to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic; and

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after impinging the ram against the peripheral flange ~~spacer~~ and heating the bent portion to at least the glass transition temperature, further impinging the ram against the deflectable flange ~~spacer~~ to further deflect the spacer toward the extension prior to

disengaging the ram from the deflectable flange ~~spacer~~, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement to yield the body with a smooth periphery.

2. (Currently Amended) The method of claim 1, wherein the bent portion is cooled below the glass transition temperature prior to disengaging the ram from the ~~spacer~~ deflectable flange.

3. (Original) The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle not less than 75 degrees, but less than 105 degrees.

4. (Original) The method of claim 1, wherein the bend region interconnects the spacer with the extension at an angle of about 87-93 degrees.

5-7. (Canceled)

8. (Original) The method of claim 1, wherein the thermoplastic is formed into a shape comprising the body and having the deflectable flange about its entire periphery.

9. (Previously Presented) The method of claim 1, wherein the thermoplastic is formed into a shape comprising the body having a concave compartment with an opening and the deflectable flange about the entire periphery of the opening.

10. (Original) The method of claim 9, further comprising sealing the compartment using a film that contacts the smooth periphery of the body about the entire periphery of the opening.

11. (Original) The method of claim 10, wherein the compartment is sealed by over-wrapping the body with the film and sealing the film to itself to envelop the body.

12. (Previously Presented) The method of claim 10, wherein the compartment is sealed by applying the film across the opening of the compartment and sealing the film about the periphery of the opening.

13-14. (Canceled)

15. (Original) The method of claim 12, wherein the film is thermoformable and is disposed in a softened state around the smooth periphery of the body and cooled below its softening temperature such that the film that must be stretched outwardly about the smooth periphery of the body in order to displace the film from the opening.

16-17. (Canceled)

18. (Currently Amended) The method of claim 1, wherein the ram is impinged against the ~~spacer~~ deflectable flange to deflect the peripheral edge away from the periphery of the shaped article sufficiently that a flexible film that tautly over-wraps the shaped article after cooling the bent portion does not contact the peripheral edge.

19. (Currently Amended) The method of claim 1, wherein the ram is impinged against the ~~spacer~~ deflectable flange to deflect the peripheral edge sufficiently that the peripheral edge points at the body after cooling the bent portion.

20-21. (Canceled)

22. (Currently Amended) The method of claim 1, wherein the ram is impinged against the ~~spacer~~ deflectable flange to deflect the peripheral edge to a position at which a plane through the

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thermoplastic at the peripheral edge is offset from the plane of the extension by an angle of not less than 180 degrees after cooling the bent portion.

23. (Canceled)

24. (Original) The method of claim 1, wherein the deflectable flange is deflected to differing degrees at selected portions of the ram, whereby the height of the deflected peripheral flange differs at peripheral portions corresponding to the selected portions after cooling the bent portion, yielding at least one portion useable as a stacking extension.

25. (Canceled)

26. (Currently Amended) The method of claim 1, wherein the ram is impinged against the ~~spacer~~ deflectable flange sufficiently to deflect the peripheral edge to a position at which the peripheral edge cannot be perceived by a person running a finger along the periphery of the shaped article after cooling the bent portion.

27-33. (Canceled)

34. (Currently Amended) The method of claim 1, wherein the ram is urged against the ~~spacer~~ peripheral flange by applying force to at least the extension ~~of the deflectable flange~~ in the direction of the ram, wherein the extension extends laterally in a plane about the entire periphery of the opening of a concave compartment in the body and wherein a plug that substantially fills the opening is inserted therein prior to urging the ram against the ~~spacer~~ peripheral flange, whereby the plug inhibits inward displacement of the deflectable flange into the opening.

35-43. (Canceled)

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44. (Currently Amended) The method of claim 1, wherein the ram impinges against the ~~spacer~~ peripheral flange at an upper face of the ram, the upper face having a contour that deflects inwardly toward the body, whereby greater impingement of the spacer against the upper surface of the ram deflects the peripheral edge increasingly toward the body, and wherein the upper face is curved sufficiently that increasing impingement of the ~~spacer~~ deflectable flange against the ram turns the peripheral edge at least about 180 degrees relative to its orientation prior to the impingement.

45-49. (Canceled)

50. (Currently Amended) A method of forming a smooth periphery on a thermoformed article that is made from a thermoplastic and that has a sharp peripheral edge, the method comprising

forming a deflectable flange about the peripheral edge of the article,

the deflectable flange comprising

~~a spacer including peripheral edge of the article, the spacer being connected to the article by way of~~ an extension that extends peripherally away from the article and connects thereto

a bend region ~~interconnecting the spacer and the extension, the bend region~~ having a smooth contour and interconnecting the extension, ~~spacer~~ at an approximately right angle ~~with the extension~~, with a spacer that is connected with

a peripheral flange which bears a peripheral edge of the thermoplastic, the spacer and peripheral flange being connected, at an angle other than 180 degrees, at

an elbow;

impinging a ram against the peripheral flange ~~spacer~~ to deflect the spacer toward the extension, whereby the magnitude of the angle between the spacer and the extension is decreased on

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account of at least one portion of the deflectable flange becoming bent, relative to its pre-impingement position, the bent portion being selected from the group consisting of the extension, the bend region, and the spacer;

heating the bent portion to at least the glass transition temperature of the thermoplastic;

after impinging the ram against the ~~spacer~~ peripheral flange and heating the bent portion to at least the glass transition temperature, further impinging the ram against the ~~spacer~~ deflectable flange to further deflect the spacer toward the extension prior to

cooling the bent portion below the glass transition temperature, whereby the bent portion remains deflected from its pre-impingement position even upon discontinuation of the impingement; and

disengaging the ram from the ~~spacer~~ deflectable flange to yield the article with a smooth periphery.

51-59. (Canceled)

60. (Previously Presented) The method of claim 1, wherein sequential portions of the spacer are softened by impinging the sequential portions against the ram in a plurality of discrete, incremental advances.

61. (Previously Presented) The method of claim 1, wherein sequential portions of the spacer are softened by impinging the sequential portions against the ram in a single smooth motion.

62. (New) The method of claim 1, wherein the elbow connects the peripheral flange to the spacer at an angle of from 60 to 120 degrees.

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Remarks

Claims 1-4, 8-12, 15, 18, 19, 22, 24, 26, 34, 44, 50, and 60-62 are pending in this application following entry of this Amendment. Claim 25 is canceled herein and claims 5-7, 13, 14, 16, 17, 20, 21, 23, 27-33, 35-43, 45-49, and 51-59 were previously canceled. Claims 1, 2, 18, 19, 22, 26, 34, 44, and 50 have been amended. Claim 62 has been added. Claims 1 and 50 are the only independent claims pending after entry of this Amendment.

No additional claim fees are believed to be due, because one claim was canceled and only one dependent claim was added.

Neither the amendments to the claims nor the newly added claim (62) include new matter, for the reasons set forth in the following paragraphs.

Each of claims 1 and 50 has been amended by incorporating therein the recitations of previously-canceled claim 27. Claim 27 originally recited that the deflectable flange includes a peripheral flange (element **120**) and elbow (element **130**) as shown in Figures 1, 4, and 8E-8K. These added elements are recited in the re-worded indented paragraphs of claims 1 and 50. These elements and the arrangements of all elements of the deflectable flange recited in claims 1 and 50 are disclosed at least at paragraphs **[0050-0051]** of the specification as originally filed.

Each of claims 1, 34, 44, and 50 has been amended by incorporating therein the recitations of previously-canceled claim 28. Claim 28 originally recited that the ram impinges against the peripheral flange, as disclosed throughout the specification, such as at paragraphs **[0060-0067]** and **[0070-0072]** and in Figures 1 and 8E-8K. Each of these claims was amended to recite impingement of the ram against the peripheral flange.

Claims 1, 18, 19, 22, 26, 44, and 50 were also amended to clarify that the ram (after initially impinging against the peripheral flange) can also impinge against other portions of the deflectable flange, as disclosed in the specification, for example, at paragraphs **[0071-0072]** and at Figures 8E-8K. This is reflected

- in claims 1 (ninth paragraph) and 50 (eleventh paragraph) by altering "...further impinging the ram against the **spacer**..." to read "...further impinging the ram against the **deflectable flange**...";

- in claim 44 by altering "increasing impingement of the **spacer** against..." to read "increasing impingement of the **deflectable flange** against..."; and
- in claims 18, 19, 22, 26 by altering "**spacer**" to read " **deflectable flange**."

Each of claims 1, 2, and 50 was amended to recite disengagement of the ram from the "deflectable flange," rather than just the "spacer" portion of the deflectable flange. This amendment was necessary in view of the amendment to claims 1 and 50 (adding recitation of impingement of the ram against the peripheral flange and/or other parts of the deflectable flange, as described above) and is supported throughout the specification, such as at paragraphs **[0044]** and **[0069]**.

In claim 34, "of the deflectable flange" is redundant (recited in claim 1) and was deleted solely for that reason.

Claim 44 was also amended to correct an obvious typographical error (omission of the article "a" preceding "contour" on the second line).

New claim 62 includes no new subject matter because it recites the range of angles disclosed, in paragraph **[0051]** of the specification, for the 'elbow' now recited in claim 1.

The Applicant greatly appreciates the Examiner's prior allowance of the claims in this application (three times, in fact). The Examiner's indulgence of the amendments made herein to the claims is respectfully requested.

Since the time this application was filed, several related prioritized and foreign applications have been filed, of which some have already issued as patents, rendering some claims in the present application duplicative of already-issued subject matter. As evidenced by the string of Requests for Continued Examination that have been filed, additional potentially-relevant art has been cited in related applications, and additional newly-cited art is submitted herewith.

In this Amendment and Response, the Applicant has amended the claims to focus on subject matter pertaining significantly to the Applicant's present commercial operations (see, for example, paragraphs **[0070-0071]** – that is, embodiments in which a peripheral flange **120** and elbow **130** are present prior to smoothing). This embodiment is disclosed throughout the

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specification, such as at paragraphs **[0050-0051]**, **[0070-0072]**, and **[0089-0096]**, and in Figures 1, 4, and 8E-8K. Paragraph **[0095]**, for example, discloses impinging the ram against the peripheral flange to cause deflection of the spacer (as recited in amended claim 1, seventh paragraph). Paragraph **[0072]** and Figures 8F and 8G, for example, disclose further impingement of the ram against the deflectable flange (i.e., not necessarily against only the peripheral flange or the spacer) to induce further deflection of the spacer (as recited in amended claim 1, ninth paragraph). That the bent portion of the deflectable flange is cooled by disengaging it (and not necessarily only the peripheral flange or the spacer) from the ram is disclosed in paragraphs **[0044]** and **[0071]** and recited in amended claim 1 and in conforming amendments in claims 2, 18, 19, 22, 26, 34 and 44. Changes substantially identical to the amendments to independent claim 1 were also made to independent claim 50.

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Summary

The claims, as amended herein, are believed to be distinct from, and non-obvious in view of, all prior art known to the Applicant and are also believed to be non-duplicative of other claims which have been so far awarded to the Applicant. Reconsideration and allowance of the claims (i.e., claims 1-4, 8-12, 15, 18, 19, 22, 24, 26, 34, 44, 50, and 60-62), as amended herein, are respectfully requested at the earliest possible time.

Respectfully submitted,

Millard F. WALLACE

4 September 2019
(Date)

By: /Gary D. Colby/

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Enclosures:
- Request for Continued Examination
- Third Supplemental Information Disclosure Statement

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3291361	A	1966-12-13	Commeyras	
	2	3497917	A	1970-03-03	Negoro	
	3	3522877	A	1970-08-04	Phillips	
	4	4349146	A	1982-09-14	Holden	
	5	4419320	A	1983-12-06	Perkins	
	6	4889231	A	1989-12-26	Foote	
	7	6737003	B1	2004-05-18	Golden	
	8	9908281	B1	2018-03-06	Wallace	

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	Attorney Docket Number	CnvMf012CP

	9	10189624	B2	2019-01-29	Wallace	
	10					
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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090291174	A1	2009-11-26	Lewis	

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FOREIGN PATENT DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Attorney Docket Number	CnvMf012CP

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	1388710	GB		1975-03-26	Hurcomb		☐
	2	96/01179	WO	A1	1996-01-18	Drypac		☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]See Kind Codes of USPTO Patent Documents at www.USPTO.GOVor MPEP 901.04. [2]Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5]Applicant is to place a check mark here if English language translation is attached.

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Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-09-04
Name/Print	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

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(19)



(54) A PROCESS OF REDUCING THE UNDULATIONS OF AN END PORTION OF A CORRUGATED PLASTICS SHEET, OF BENDING THE END PORTION AND A MACHINE THEREFOR

(71) We, BLACKNELL BUILDINGS LIMITED, of Westmead (formerly named "Pinehurst Avenue"), Farnborough, Hampshire, GU14 71B, a British Company, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of and a thermo-folding machine for reducing the undulations in an end portion of a corrugated sheet of plastics material and for bending it at an included angle above 45° relatively to the remainder of the sheet.

It is known to transform the end portions of flat plastics sheets into corrugated end portions and to bend these over an included angle of approximately 45° relatively to the flat area of the remainder of the sheet. The invention is concerned with a reversal of the known process and with bending the end portion relatively to the remainder of the sheet over an included angle greater than 45°, particularly for the purpose of substantially flattening the end portion of a corrugated plastics sheet to be used as a cover or roof in building extensions where it is essential, or at least desirable, to seal the end portion fixed to and/or abutting against a vertical wall of the building to be extended. The corrugated sheets are generally fixed to, or into, the building wall so that the longitudinal extent of their undulations transverses the plane containing the outer surface of the wall. Unless, therefore, the corrugated roofing sheet thus fixed is sealed, rain will obviously penetrate through the gap between the building wall and the undulation ridges standing proud of the wall. Such sealing has hitherto been effected by fixing a sealing sheet of bendable material by its one end portion to the building wall and laying its other end portion—which is bent substantially perpendicularly relatively its wall end portion—above the end portion of the corrugated sheet that abuts against the wall. A profiled filler is frequently inserted between the end portion of the corrugated sheet and the end portion of the sealing sheet above it in order to improve the seal. However, even if the gap between the corrugated sheet and the building wall is thus covered by the sealing sheet, rain, as a result of capillary action, still tends to penetrate between the corrugated sheet, the sealing sheet and the filler even if the corrugated sheet is fastened to the building in such a disposition that its mean plane forms with the building wall above it an included angle of more than 90°, in which it slopes slightly downwardly. Fixing the corrugated sheet in this known fashion to the building wall is time-consuming and expensive.

The invention aims at providing a method of and apparatus for bending an end portion of a corrugated sheet and at least reducing the undulations in the bent end portion of such corrugated sheets so that they can be fixed more easily and the gap between the end portion of the sheet and the building wall substantially reduced so that it can be sealed more effectively.

Accordingly, the invention provides a method of reducing the undulations in an end portion of a corrugated sheet of plastics material and of bending it relatively to the remainder of the sheet at a predetermined included angle exceeding 45°, comprising the steps of loading the sheet on to a corrugated surface of a base plate of a thermo-folding machine so that the end portion to be treated projects beyond the base plate, heating the projecting end portion by means of a folding-machine heater to an extent sufficient to permit its deformation and of bending the projecting end portion and simultaneously reducing the undulations thereof by pressing it by

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means of a forming surface of a pressure plate of the machine against a forming end face of the base plate contained in a plane intersecting the main plane of the corrugated surface at an included angle corresponding to the predetermined one.

The invention also provides a thermo-folding machine for reducing the undulations in an end portion of a corrugated sheet of plastics material and of bending it relatively to the remainder of the sheet, at an included angle exceeding 45°, the machine comprising a reciprocable base plate having a corrugated top surface for carrying a mid-portion of the sheet so that the end portion to be treated projects beyond and towards a folding-machine heater reciprocable in the same plane as the base plate, the heater being provided with a slot of cross-section dimensions sufficient to accommodate the projecting end portion of the sheet and having a heating capacity sufficient for heating and deforming it; and a pressure plate reciprocable in a plane normal to the plane of motion of the base plate and the heater, having a corrugated surface corresponding to and parallel with that of the base plate and a forming surface extending from the mean plane of its corrugated surface at an included angle of less than 135° but exceeding 45° towards the heater and the base plate; the arrangement being such that, when in operation the sheet has been loaded onto the base plate, the base plate and the heater are moved towards each other for the projecting end portion of the sheet to be heated, the heater, after heating the end portion, to be moved away from the base plate and thereafter the pressure plate to be moved so that it bends the projecting end portion by pressing it against a base plate forming surface, which is parallel with the flat forming surface of the pressure plate, and simultaneously reducing its undulations.

The expression "reducing the undulations" as used in this Specification is to be understood to mean a reduction of the amplitude and height of the undulations of the corrugated sheet as manufactured.

In order to make the invention more thoroughly understood, one embodiment of a thermo-folding machine according to the invention will now be described in more detail with reference to the accompanying schematic drawing:—

The machine comprises a lower tool assembly, or base plate 2, movable, in the embodiment illustrated, horizontally between two end positions and having a corrugated top surface, the longitudinal extent of the corrugations being parallel with the directions of movement. The corrugated top surface may be integral with the base plate but, preferably, is an exchangeable tool removably attached to the main body of the base plate so that it may serve for corrugated platics sheets 4 of different undulations to be loaded thereon. As will be seen from the drawing the sheet 4 is removably secured to the base plate 2 in such a way that its mid-portion is carried on the corrugated surface of the base plate while an end portion thereof to be treated projects beyond the base plate towards a heater 6 comprising upper and lower heating elements, for example electric heating elements, between which there is provided a slot 8 of cross-sectional dimensions sufficiently large to accommodate the projecting end portion of the sheet. The heat output of the elements is such as to heat the sheets to an extent sufficient for their deformation, and is substantially the same as that of heating elements used for vacuum forming a material of the same composition and thickness. Thus, the heat output of the elements may be, for example, within the range of between 100°C and 200°C.

The heater is movable between two extreme end positions in the same plane as the base plate. It will be evident from the foregoing description that a machine according to the invention is primarily intended for treating, *i.e.*, bending and reducing the undulations in, an end portion of the corrugated sheet transverse to the longitudinal extent of the sheet undulations. However, it is also feasible to treat the sheet end portions parallel with the undulation. The heater may be divided—and this is particularly advisable in the aforementioned instance—into two superposed parts which are hinged together at their ends remote from the base plate 2 so that at least one of them can be pivoted relatively to the other and which, in their closed condition, leave a gap, or slot, between them to accommodate the end portion to be treated, but which are opened for receiving the end portion.

An externally accessible adjustable stop 10 is provided in the slot 8, in order to accommodate and heat end portions of different lengths. The machine also comprises an upper tool assembly, or pressure plate, generally denoted by the reference numeral 12 and including a tool-holder 14 onto which is clamped an exchangeable forming tool 16 having a corrugated lower surface 18 complementary to and parallel with the corrugated surface of the base plate and corresponding to the undulations in the sheet to be treated. The forming tool 16 also includes a forming surface 20 which in the embodiment illustrated is normal to the mean plane of the corrugated surface 18 and parallel with a forming surface 22 of the base plate, the surface 22 being normal to the corrugated top surface of the base plate.

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However, in practice it will generally not be necessary to bend the end portion relative to the main sheet portion at an included angle of 90°. It has to be borne in mind that a method and machine according to the invention were originally developed for treating plastics sheets serving as roofs, or covers, of building extensions. Such roofs require a slight drop in the direction away from the building wall to which the sheet end portions are attached. In order to achieve this, the forming surface 20 will generally extend from the mean plane of the surface 18 at an included angle of more than 45° but less than 135°. The included angle between the top surface of the base plate and its surface 22 will correspond to that between the associated surfaces of the tool 16.

The pressure plate is movable in a plane normal to the plane of motion of the heater and the base plate, that is to say in the embodiment illustrated it can be raised and lowered so that its forming surface 20 can be lowered to be located opposite the forming surface 22 of the base plate. When in operation the pressure plate is thus lowered, it will move the projecting end portion of the sheet 4 from its substantially horizontal position and bend it downwards against the forming surface 22 of the base plate.

The forming surface 20 constitutes one lateral end face of a projecting portion 21 of the forming tool 16; Although not essential, it has been found to be advantageous under some conditions to provide the projecting portion 21 at its base with a recess 24 extending from said base towards the corrugated surface 18 and across the full width of the portion 21. Thus, when the pressure plate is lowered the two legs of the projection on both sides of the recess will slide over a piston rod 26 of a fluid-flow, for example pneumatic, piston and cylinder unit 28 provided for co-operation with the recess—and only in conjunction with the latter—and attached to the base plate in such a fashion that in operation the piston and piston rod are moved in directions parallel with the movement of the base plate. The free end of the piston rod is provided with a boss 30 which, when the pressure plate has been lowered, will engage the projecting portion 21 at its end face opposite to the forming surface 20. In order to bend the sheet and reduce the undulations of the corrugated end portion, the piston rod and piston will be withdrawn into the cylinder of the unit 28, as a result of which the boss 30 will press the forming tool 16 against the action of a biasing spring 32 towards the tool-holder 14 and the complete pressure plate 12 against the end portion of the sheet to be treated and against the forming surface 22 of the base plate.

It will be seen from the drawing that the junction between the corrugated surface of the base plate and its forming surface 22 is rounded in order to prevent the sheet to be treated from cracking which might occur if the junction were a sharp corner. The junction between the surfaces 18 and 20 of the forming tool 16 is correspondingly rounded. However, the radius of rounding-off of these junctions may be considerably smaller than that illustrated in the drawing. The pressure plate 12 is provided with means for cooling the heated sheet, for example with means for circulating through its interior a stream of cold water. The base plate may be cooled in a similar fashion.

WHAT WE CLAIM IS:—

1. A method of reducing the undulations in an end portion of a corrugated sheet of plastics material and of bending it relatively to the remainder of the sheet at a predetermined included angle exceeding 45°, comprising the steps of loading the sheet on to a corrugated surface of a base plate of a thermo-folding machine so that the end portion to be treated projects beyond the base plate, heating the projecting end portion by means of a folding-machine heater to an extent sufficient to permit its deformation and of bending the projecting end portion and simultaneously reducing the undulations thereof by pressing it by means of a forming surface of a pressure plate of the machine against a forming end face of the base plate contained in a plane intersecting the mean plane of the corrugated surface at an included angle corresponding to the predetermined one.

2. A thermo-folding machine for reducing the undulations in an end portion of a corrugated sheet of plastics material and of bending it relatively to the remainder of the sheet, at an included angle exceeding 45°, the machine comprising a reciprocable base plate having a corrugated top surface for carrying a mid-portion of the sheet so that the end portion to be treated projects beyond and towards a folding-machine heater reciprocable in the same plane as the base plate, the heater being provided with a slot of cross-sectional dimensions sufficient to accommodate the projecting end portion of the sheet and having a heating capacity sufficient for heating and deforming it; and a pressure plate reciprocable in a plane normal to the plane of motion of the base plate and the heater, having a corrugated surface corresponding to and parallel with that of the base plate and a forming surface extending from the mean plane of its corrugated surface at an included angle of less than 135° but exceeding 45° towards the heater and the base plate; the arrangement being such that, when in operation the sheet has been loaded on to the base plate, the base plate and the heater are moved towards

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each other for the projecting end portion of the sheet to be heated, the heater, after heating the end portion, to be moved away from the base plate and thereafter the pressure plate to be moved so that it bends the projecting end portion by pressing it against a base plate forming surface, which is parallel with the flat forming surface of the pressure plate, and simultaneously reducing its undulations.

3. A machine according to claim 2, wherein the corrugated top surface of the base plate is an exchangeable tool removably securable to the main body of the base plate.

4. A machine according to claim 2 or claim 3, wherein the longitudinal extent of the corrugations of the top surface of the base plate is parallel with the directions of the reciprocal movement thereof.

5. A machine according to any of the claims 2 to 4, wherein the heater is electrically operable and includes two superposed heating elements, and wherein the slot is formed between the superposed elements.

6. A machine according to any of the claims 2 to 5, wherein the slot is provided with an adjustable stop.

7. A machine according to any of the claims 2 to 6, wherein the pressure plate comprises a tool-holder and a forming tool removably attached thereto and wherein a forming-tool surface remote from the tool-holder is corrugated and complementary to and parallel with the corrugated top surface of the base plate.

8. A machine according to claim 7, wherein the forming tool includes the forming surface, and wherein the forming tool is provided with a projection having a lateral end face serving as the forming surface.

9. A machine according to claim 8, wherein the projection is provided at its free end face contained in a plane substantially normal to the forming surface with a recess extending inwardly therefrom for accommodating the piston rod of a fluid-flow piston and cylinder unit.

10. A machine according to claim 9, wherein the cylinder of the unit is attached to the base plate and its piston and piston rod are movable in a plane parallel with the direction of movement of the base plate, and wherein the free end of the piston rod is provided with a boss arranged to engage the projection—when moved so that its forming surface is positioned opposite that of the base plate—for pressing the forming tool and the end portion of the sheet to be treated against the forming surface of the base plate.

11. A machine according to any of the preceding claims, wherein the pressure plate is provided with means for cooling the treated sheet.

12. A machine according to any of the preceding claims, wherein the base plate is provided with means for cooling the treated sheet.

13. A thermo-folding machine for reducing the undulations in an end portion of a corrugated sheet of plastics material and bending it relatively to the remainder of the sheet at an included angle exceeding 45°, constructed, arranged and adapted to operate substantially as herein described with reference to the accompanying drawings.

14. A method of reducing the undulation in an end portion of a corrugated sheet of plastics material and of bending it relatively to the remainder of the sheet at an included angle exceeding 45°, substantially as herein described.

15. A corrugated sheet of plastics material having an end portion bent relatively to the remainder of the sheet at an included angle exceeding 45° and having the reduced undulations at the bent end portion, prepared by a method according to claim 1 or claim 14.

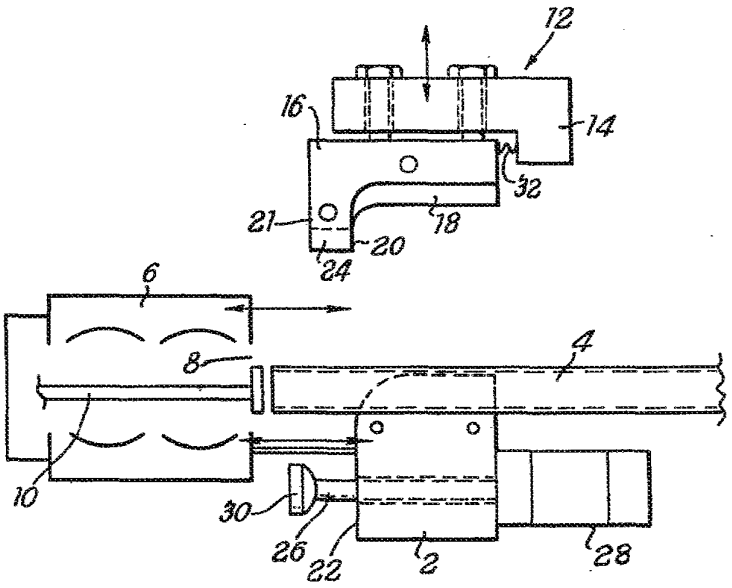
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1388710 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*



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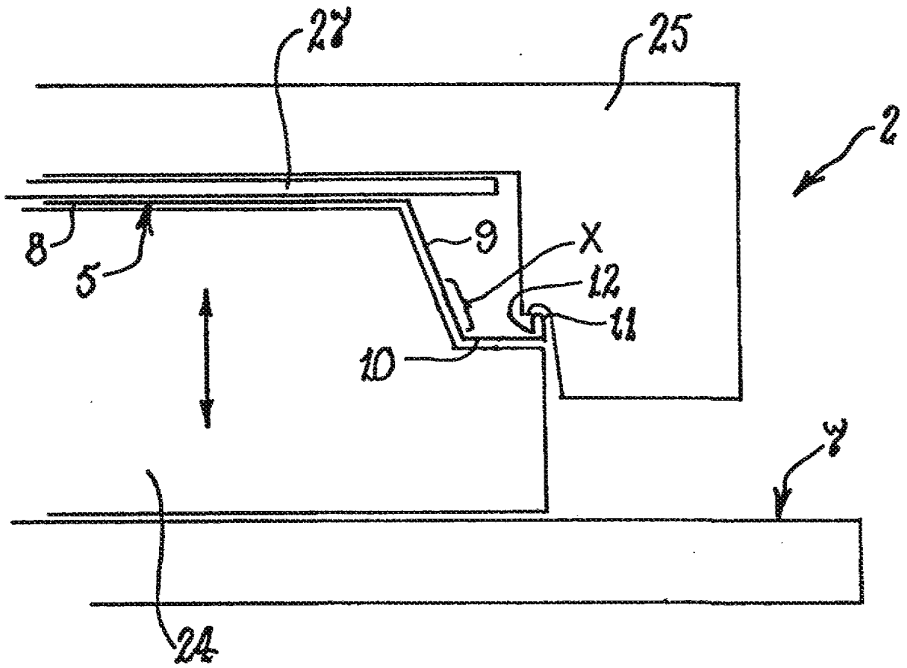
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(54) Title: PACKAGING

(57) Abstract

A method of producing a plastic tray (5) having a peripheral edge region (11) terminating in a terminal edge (12) which is deformed inwardly out of a wrap path around the tray (5) is disclosed. The peripheral edge region (11) of the tray (5) is heated to render it malleable. The region (11) is deformed by bringing an appropriately configured die into engagement with the malleable region (11) and rolling the region (11). The region (11) is then cooled such that it sets and hardens in the deformed condition. In a preferred form, the tray (5) is heated by heating the die (25) which is used to roll the edge region (11). This invention also extends to a method of attaching the two elements of a two-piece tray to each other and to apparatus for carrying out the method of the invention.



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PACKAGING

This invention relates broadly to packaging. More specifically this invention relates to trays for packaging which are wrapped in plastic film or plastic wrap, methods of producing such trays, and apparatus for producing such trays.

It will be convenient to hereinafter describe the invention with particular reference to plastic trays used for the packaging of foodstuffs such as red meat, fish, poultry, garden produce and the like although it is to be understood that the invention is capable of broader application. Typically food to be packaged would be placed on such a tray and then wrapped in polythene wrap or film to seal it off from the atmosphere and preserve its freshness until sale.

In this specification, the term "tray" shall not be limited to flat or shallow containers. Further the term shall not be limited to containers having four straight edged sides. For example, it is specifically envisaged that the trays defined in this specification might contain chickens and that the tray might be configured to conform with the outline of the shape of the chicken.

In this specification, the term "plastic" shall be construed to include any group of materials, synthetic or natural, which may be shaped when soft and then hardened, including resins, resinoids, polymers, cellulose derivatives, casein materials and proteins.

In the past, foam trays, for example of expanded polystyrene foam, have been widely used for the packaging of foodstuffs. As foam is a relatively soft material and the edges of the tray are rounded, the terminal edges thereof do not have a tendency to cut plastic film within which the trays are wrapped. However the disposal of these trays after use is not environment friendly. Foam cannot be recycled and if it is burnt, environmentally damaging gaseous compounds can be released into the atmosphere. Consequently there is a trend away from the use of foam trays to the use of plastic trays which can be recycled. Generally all plastic trays used in packaging are formed by a thermoforming operation. However, such trays have a sharp terminal edge

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forming the periphery thereof with an unfortunate tendency to tear or cut through plastic film within which the trays are wrapped. As far as the Applicant is aware it has thus far not been possible to negatively form an article in a thermoforming operation. That is it has not been possible to provide a tray which has a terminal edge which does not form the peripheral edge of the tray. Put another way it has not been possible to provide a tray in which the terminal edge faces away from the path transversed by plastic film which is wrapped around the tray (hereinafter referred to as the wrap path.

This problem of the sharp terminal edge tending to cut or tear the wrap within which the tray is wrapped leads to substantial productivity losses. For example, up to 25% of trays may need to be wrapped twice. Further trays which appear to be suitably wrapped may have wrap weaknesses which have not yet manifested themselves as tears but with the potential to tear and break en route to the point of sale of the packaged trays. This can lead to spoiling food within the packaged trays.

It would therefore be advantageous if a method and an apparatus could be found for providing these trays with a peripheral edge region which reduced the tendency of the wrap to tear.

Accordingly it is an object of this invention to devise a method and an apparatus for producing a tray which overcomes at least some of these disadvantages.

According to a first aspect of this invention there is provided a method of producing a plastic tray having a peripheral edge region terminating in a terminal edge which is deformed such that the terminal edge is displaced out of a wrap path around the tray, the method including:

providing a plastic tray having a peripheral edge region terminating in a terminal edge;

heating the peripheral edge region of the tray such that said peripheral edge region becomes malleable and the remainder of the tray remains non-malleable; and

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deforming the peripheral edge region of the tray by bringing an appropriately configured deforming means into engagement with said peripheral edge region of the tray to displace the terminal edge out of the wrap path, the deforming being effected by relative movement between the tray and the deforming means.

Typically the method includes cooling the peripheral edge region of the tray such that it sets and hardens with the terminal edge displaced out of the wrap path.

Preferably the step of heating the peripheral edge region of the tray includes producing a sharp transition from malleable to non-malleable plastic which forms a fold line about which said peripheral edge region is deformed. This assists in crisply defining the fold line along which the peripheral edge region of the tray is folded.

In one embodiment said deforming means is a die and said heating the peripheral edge region of the tray includes heating the die which in turn heats the peripheral edge region of the tray when brought into heat conductive contact therewith. In this embodiment, deforming the peripheral edge region includes rolling the peripheral edge region. Preferably the edge region around the full periphery of the tray is rolled substantially simultaneously.

Advantageously the die is configured such that upon engagement with the tray, it heats the peripheral edge region of the tray, and when the peripheral edge region is malleable, it rolls the peripheral edge region of the tray.

Preferably heating the peripheral edge region of the tray includes creating a temperature gradient across the peripheral edge region, the temperature being hotter adjacent the terminal edge and decreasing inwardly therefrom.

Advantageously the temperature gradient across the peripheral edge region is obtained by configuring the die such that it is in heat conductive contact with part of the peripheral edge region of the tray longer than other parts thereof.

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In a most preferred form rolling the peripheral edge region of the tray includes moving the tray into engagement with the die.

In an alternative embodiment the heating comprises blowing hot air over the peripheral edge region of the tray. In this alternative embodiment the portion of the tray laterally inwardly of the peripheral edge region is shielded from the hot air blast.

Further in accordance with this alternative embodiment the deforming means includes a former and a complementary engagement formation, the former being moved into engagement with the complementary engagement formation to deform the peripheral edge region. In this alternative embodiment, the cooling includes actively cooling the peripheral edge region of the tray using cooling water.

This invention also extends to a plastic tray produced by the methods described above.

According to a second aspect of this invention there is provided a method of joining two tray members to each other to form a unitary two-piece tray the method including:

providing base and cover members each having a peripheral edge region terminating in a terminal edge;

mounting the cover member in a superimposed relationship on the base member such that the peripheral edge regions of the two trays are substantially in alignment with each other;

heating the peripheral edge regions of the base and cover members such that said peripheral edge regions become malleable and the remainder of the base and cover members remain non-malleable; and

deforming the peripheral edge regions of the base and cover members laterally inwardly, by bringing an appropriately configured deforming means into engagement with said peripheral edge regions, so as to crimp the two peripheral edge regions to each other to form a unitary two-piece tray.

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Advantageously the terminal edges of respectively the cover and base members are also displaced out of the wrap path.

This invention also extends to a two-piece plastic tray including:

a base member, and

a cover member mounted in superimposed relationship on the base member, each said member including a peripheral edge region terminating in a terminal edge,

wherein the peripheral edge regions of the base and cover members are crimped together so as to form a unitary two-piece tray.

Preferably the peripheral edge regions of the base and cover members are deformed downwardly and laterally inwardly by said crimping such that the terminal edges thereof are displaced laterally inwardly out of the wrap path.

Preferably the peripheral edge region which is deformed laterally inwardly has a width of at least 2 mm.

Advantageously the cover member is water permeable and the base member is water impermeable. This may be accomplished by having a plurality of apertures defined in the cover member. Moisture absorbent means may be sandwiched between the base and cover members for absorbing moisture on the tray. In a most preferred form the moisture absorbent means comprises a particulate moisture absorbing material contained within a water permeable bag.

Further said base member typically defines a first plurality of spaced reinforcing rib formations and the cover member typically defines a second plurality of spaced reinforcing rib formations extending transversely to said first plurality of rib formations.

This invention also extends to a plastic tray including a peripheral edge region terminating in a terminal edge, wherein the peripheral edge region is deformed laterally inwardly such that the terminal edge is displaced out of a wrap path around the tray.

According to a third aspect of this invention there is provided apparatus for producing a plastic tray including a peripheral edge region terminating in a

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terminal edge, wherein the peripheral edge region is deformed laterally inwardly such that the terminal edge is displaced out of a wrap path around the tray, including:

heating means for heating the peripheral edge region of the tray to a temperature at which it is malleable; and

an appropriately configured deforming means for deforming the peripheral edge region of the tray and displacing the terminal edge of the tray out of the wrap path, the deforming means being moved relative to the tray to engage said tray and effect said deforming.

In one embodiment, the deforming means includes a die for deforming by rolling the peripheral edge region of the tray. Preferably in this embodiment, the heating means acts to heat the die which heats the peripheral edge region of the tray by being brought into heat conductive engagement therewith.

Advantageously the die is configured so as to engage the edge region of the tray around the full periphery thereof and to roll said peripheral edge region substantially simultaneously in a single step.

Preferably the die is configured so as to heat the peripheral edge region of the tray when it initially engages the tray to a temperature at which the edge region is malleable, and thereafter to roll the peripheral edge region of the tray.

Preferably this embodiment also includes an ejector for detaching the tray from the heated die once the deforming has been carried out.

In an alternative embodiment, the heating means includes a hot air blast which is directed onto the peripheral edge region of the tray. In this embodiment the deforming means includes a former and a complementary deforming formation, the former being movable relative to the complementary deforming formation. In this embodiment the former is typically a rigid body comprising a plurality of linear or straight edge portions and a plurality of corner portions. Alternatively in a closely related embodiment, the former comprises an inflatable tube or hydraulic cylinder.

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Further in this embodiment it is preferable that the apparatus includes shield means for shield that portion of the tray laterally inwardly of the peripheral edge region, from the hot air blast.

Advantageously the apparatus of this embodiment also includes cooling means for actively cooling the peripheral edge region of the tray. Such cooling means typically includes cooling water which is passed over the former.

Apparatus for producing a plastic tray in accordance with this invention can manifest itself in many different forms. Several example embodiments are described in detail below. These examples are provided merely for the purposes of providing an enabling disclosure and the particularity of the drawings is not to be understood as superseding the generality of the preceding description. In the drawings:

Fig 1 is a schematic sectional front elevation of an apparatus for performing the invention in accordance with a first embodiment of the invention, prior to the deforming operation taking place;

Fig 2 is a schematic sectional front elevation of the apparatus of Fig 1 after the deforming operation has taken place;

Fig 3 is a schematic sectional front elevation of an apparatus for performing the invention in accordance with a second embodiment of the invention, prior to the deforming operation taking place;

Fig 4 is a schematic sectional front elevation of the apparatus of Fig 3 after the deforming operation has taken place;

Fig 5 is a schematic sectional front elevation of an apparatus for performing the invention in accordance with a third embodiment of the invention, prior to the deforming operation taking place;

Fig 6 is a schematic sectional front elevation of the apparatus of Fig 5 after the deforming operation has taken place;

Fig 7 is a schematic sectional front elevation of an apparatus for performing the invention in accordance with a fourth embodiment of the invention, prior to the deforming operation taking place;

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Fig 8 is a schematic sectional front elevation of the apparatus of Fig 7, after the deforming operation has taken place;

Fig 9 is a perspective view of apparatus in accordance with the first embodiment;

Fig 10 is a perspective view of the leading edge of the apparatus of Fig 9 showing the manner in which the straight or linear edge and corner former portions are brought into sequential engagement with the tray edge;

Fig 11 is an exploded perspective view of the apparatus of Figs 9 and 10;

Fig 12 is a schematic sectional view of an edge of a thermoformed tray which is particularly suitable for use in implementing this invention;

Fig 13 is a schematic sectional view of the edge of the tray of Fig. 12 after it has been deformed out of the wrap path in accordance with the invention.

Fig. 14 is a top perspective view of a two-piece tray in accordance with an embodiment of this invention;

Fig. 15 is a bottom perspective view of the tray of Fig. 14; and

Fig. 16 is a cross-sectional view of the tray of Figs. 14 and 15, the section through XVI-XVI.

In Fig 1 of the drawings, reference numeral 1 refers generally to apparatus according to the invention for carrying out the method of the invention.

The apparatus 1 comprises broadly heating means in the form of a hot air duct 2 through which hot air is blasted, deforming means in the form of a former 3 and an anvil 4. The anvil 4 is a deforming formation which is complementary in shape to said former 3. Cooling means (not shown) in the form of water cooling are also provided.

A plastic tray 5 to be deformed by the apparatus 1 is mounted on a substantially planar support surface 7. The tray 5 has a base 8, a sloping side wall 9 extending up from the base 8, a peripheral rim 10 extending around the top of the side wall 9, a peripheral edge region indicated by the numeral 11 and

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a sharp razor-like terminal edge 12. The peripheral edge region 11 is heated and deformed in carrying out the method of this invention. This is discussed in more detail below.

The former 3 is a solid block slidable along the support surface 7 towards and away from the anvil 4. The former 3 may be driven by any suitable mechanical drive means. Such drive means are well known to persons skilled in the art and as such will not be described in any further detail here.

The hot air duct 2 is positioned above the peripheral edge region 11 of the tray 5 and directs hot air blown through the duct 2 onto the edge region 11. The hot air may be provided by any suitable hot air supply means. Such air supply systems are well known to persons skilled in the art and as such will not be described in any further detail here.

The anvil 4 is formed by a clamping foot 13 pivotally mounted on a clacker box 14. This pivotal mounting enables the anvil to be removed from underneath the peripheral edge region 11 when the peripheral edge region 11 has been deformed.

In use, a thermoformed plastic tray 5, typically having a sharp terminal edge 12, is inverted and mounted on the support surface 7 with the clamping foot 13 placed over the underside of the rim 10 of the tray 5. Hot air is then blown through the hot air duct 2 heating up the peripheral edge region 11 of the tray 5. The configuration of components at this stage of the operation is shown in Fig 1. When the plastic material of the tray reaches the temperature at which it becomes malleable, 150 to 250°C, the former 3 is brought into operative engagement with the peripheral edge region 11 deforming it. In the fully deformed position the operative surface of the former 3 is adjacent the complementary operative surface of the anvil 4. The structural features of the former are described in more detail below. The hot air blast is then interrupted and the peripheral edge region 11 of the tray 5 is cooled so that it sets in the deformed configuration. The configuration of components at this stage of the operation is shown in Fig 2.

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The former 3 is then moved outwardly away from the peripheral edge region 11 and the clamping foot 9 is pivoted inwardly and upwardly relative to the clacker box 14 to free it from the deformed peripheral edge region 11. The tray 5 is then removed from the support surface 7 and the cycle is repeated with another tray 5.

The cycle time for the entire operation would be of the order of three to five seconds. Of this the cooling time would be a half to three quarters of a second. The cycle time is obviously dependent upon the aggressiveness of the heating of the edge region 11 of the tray 5, the rate at which the edge region 11 is cooled, and the gauge of the tray 5 being subjected to the post-forming treatment. Obviously the greater the rate of heat transfer for both heating and cooling operations, the shorter will be the cycle time. A short cycle time is obviously desirable as this will enable more containers to be treated per unit time.

Figs 9 to 11 illustrate the apparatus of the first embodiment in some detail using the same reference numerals as in Figs 1 and 2.

The apparatus 1 has a rectangular box-like appearance. There are four hot air ducts 2 directing air along the four edges 12 of the rectangular tray 5. Each of the ducts 2 fans outwardly from a round pipe cross-section at its upper end to an elongate slot cross-section at its lower end which extends along the length of the tray edge 12. As discussed above cooling water is used to cool and harden the deformed peripheral edge region 11. The cooling water is circulated through pipes 30 mounted on the former 3 thereby acting to cool the former 3 which in turns cools the region 11.

The former 3 which extends circumferentially around the tray edge 12 is divided up into a plurality of portions. Four straight edge or linear portions 34, 35, 36, 37 extend along the straight edges of the tray 5 and four corner portions 38, 39, 40, and 41 are positioned at the corners of the tray 5. The linear portions 34-37 of the former 3 are sized to overlap the corner radius of the tray 5. Thus there is some overlap of tray edge region covered by respectively the linear

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portions 34-37 and the corner portions 38-41. This overlap is very useful in rounding off the tray edge in the corner region satisfactorily as otherwise it has a tendency to form sharp points. Once the peripheral edge region 11 of the tray 5 has been heated to a malleable state, the linear portions 34-37 are actuated by being brought into deforming engagement therewith. As discussed above, the linear portions 34-37 overlap the corner radius of the tray 5 causing the peripheral edge region 11 in the corner radius to taper upwardly in the configuration shown by numerals 42 in Fig 10. The straight edge or linear portions 34-37 are then retracted back from the tray edge and the corner portions 38-41 actuated and brought into engagement therewith. The linear and corner portions cannot be actuated to engage the tray edge simultaneously as there is overlap between the two. When the corner portion engages the tray edge, it engages the tapered corner and deforms it into a neat tray edge corner having a smooth blended form with a rounded profile.

Another particularly desirable feature is the maintaining of the support surface 7 at ambient temperature or even colder to maintain some rigidity in the rim 10 of the tray 5 when hot air is blown through the duct 2. This is important to get the region 11 to bend at the correct point, that is without bending the rim 10. The contact of the rim 10 with the cold surface 7 counteracts the heating by the hot air. Further the upper side of the rim 10 is shielded by the clackerbox 14 and clamping foot 13 which is interposed between the hot air blast and the rim 10. It is desirable that some rigidity be maintained in the laterally outer portion of the rim 10 as this is the point around which the peripheral edge region 11 is folded. Further the rigidity of the rim 10 also acts as a brake to the former portions 34-41 defining the end of the stroke thereof. If the rim 10 is too hot and malleable it will simply be deformed by the advancing former portions 34-41.

Fig 11 in addition to the features shown in the earlier drawings, shows conduits 45 conduiting compressed air to the clacker box 14 for moving the feet 13 of the clackerbox 14 inwardly and out from under the rim 10 of the tray 5.

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The embodiment illustrated in Figs 3 and 4 is very similar to that shown in Figs 1 and 2. Unless otherwise specified, the same reference numerals have been used to refer to the same components as in Fig 1. The only difference between these two embodiments lies in the configuration and action of the former 3. As it is brought into engagement with the peripheral edge region 11 of the tray 5, which in this embodiment is horizontally extending, the edge region 11 is curled or rolled upwardly and around so as to form the curved or rounded edge for the tray. The end result is substantially the same as with the first embodiment.

The third embodiment illustrated in Figs 5 and 6 is also very similar to that shown in Figs 1 and 2. Unless otherwise specified, the same reference numerals have been used to refer to the same components as in Figs 1 and 2. The only difference between these two embodiments lies in the substitution of the inflatable tube 20 for the former 3. The tube 20 is inflated with air and as it is inflated expands thereby deforming the edge region 11 of the tray as shown in Fig 6. Such tubes or bladders are well known to persons skilled in the art and as such they will not be described any further here. This embodiment is the most desirable from a maintenance point of view because it does not have any mechanically moving parts.

The fourth embodiment illustrated in Figs 7 and 8 is similar to the embodiment illustrated in Figs 1 and 2. Accordingly where appropriate, the same reference numerals have been referred to the same components as in Figs 1 and 2.

In Fig 7 the tray 5 is positioned upside down on a support 24. The support 24 is spaced beneath a deforming means which is a downwardly facing die 25 substantially in alignment therewith. The die 25 is configured so as to heat and deform the peripheral edge region 11 of the tray 5 by rolling, when it is brought into contact therewith. The die 25 may be heated by any suitable heating means. Such heating means will be well known to persons skilled in the

art and are not discussed further in the specification. One particularly suitable heating means for heating the die is electrical heating.

The support 24 is configured to complement the basic shape of the tray 5 to support the tray 5 when it makes contact with the die 25. It is particularly preferable that the support 24 supports the sidewall 9 of the tray 5 towards the rim end 10 thereof. This region is shown by numeral X in Fig. 7. The providing of the appropriate support is important to prevent inward deformation of the tray 5. If such support is not provided, the edge of the tray 5 may end up being uneven and/or distorted. The support 24 is moved towards the die 25 to the position shown in Fig. 8 to deform the peripheral edge region 11. Any suitable drive means may be used to achieve this. As the various drive means that are available will be well known to persons skilled in the art, they are not discussed further in the specification. One particularly suitable drive means is provided by a piston and cylinder assembly (not shown).

An ejector 27 for detaching the trays 5 with deformed edges from the die 25 is located within the interior of the die 25. The operation of the ejector 27 is discussed in more detail below.

In use, carrying out the method of the invention, an inverted tray is provided or mounted on the support 24. At this point the terminal edge 12 forms the peripheral edge of the tray 5. The support 24 is then moved upwardly towards the die 25 by actuating the piston and cylinder assembly. As a result, the peripheral edge region 11 of the tray 5 is brought into contact with the die 25. This heats the peripheral edge region 11 of the tray making it malleable and then deforms or rolls the peripheral edge region 11 of the tray 5 such that the edge 12 is displaced out of the wrap path. This position is illustrated in Fig. 8.

The support 24 is then retracted downwardly away from the die 25. Generally the tray 5 would remain in contact with the die 25 after the support 24 was lowered or retracted. This is because the malleable plastic of the peripheral edge region 11 tends to adhere to the hot die 25. The ejector 27 which is sandwiched between the base 8 of the tray 5 and the die 25 is then urged

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downwardly away from the die 25 to detach the tray 5 from the die 25 causing it to drop onto the support 24. Any suitable means can be used for urging the ejector 27 downwardly. As such mechanisms are well known in the art they are not discussed further in the specification. Separation of the tray 5 from the die 25 facilitates cooling of the peripheral edge region 11 of the tray 5 allowing it to harden in a deformed condition.

Typically the die 25 is in the form of a full rectangle when viewed in plan view and is designed to roll or deform the entire peripheral edge region 11 of the tray 5 in a single step.

Fig. 12 illustrates the profile of the edge of a thermoformed tray which is somewhat different to that illustrated in the preceding drawings. As with the other trays, the tray in Fig. 12 has a rim 10, a peripheral edge region 11 and a terminal edge 12. However, the profile of the rim 10 leading into the edge region 11 is more curved than the corresponding region of the tray in Fig. 1.

As can be seen in Fig. 13 this gives the finished tray product a more rounded peripheral edge region which is preferable to the edge region shown in Fig. 2.

Optionally the implementation of this invention may involve pre-heating the peripheral edge region 11 of the tray 5 before the tray 5 is fed into the apparatus of Figs. 7 and 8. The pre-heating is effected by a heater comprising an electric heating element formed into the shape of the periphery of the tray 5 around the full perimeter thereof. The heating element is arranged to be closely spaced, for example about 3mm, away from the edge 12 of the tray 5 during said pre-heating. By pre-heating the tray 5 immediately before it is brought into contact with the die 25, the cycle time for the deforming of the tray edges can be reduced. The electric heating elements described above are well known to persons skilled in the art and as such will not be described in any further detail here.

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Naturally if the deforming or rolling of the edge of the tray is carried out at the site of the thermoforming of the tray, such pre-heating step is generally unnecessary.

One particularly suitable plastic from which the trays can be made softens at between 100°C and 150°C and becomes molten near 200°C. Obviously however other plastics can also be used in carrying out this invention and such other plastics may soften and become molten at temperatures different to those specified above.

Figs. 14 to 16 illustrate a two-piece tray indicated generally by reference 50 which can be treated, like a one-piece tray according to the method and by the apparatus described above.

The tray 50 comprises broadly a water impermeable base member 51 and a complementary water permeable cover member 52. The members 51 and 52 are thermoformed from plastic and as such the individual members prior to attachment generally have a sharp terminal edge forming the outer periphery thereof such as that indicated by numeral 12 in Fig.1 The cover member 52 is superimposed over the base member 51. The peripheral edge regions of the two members 51 and 52 are tightly crimped together by the deforming operation described above with reference to Figs. 1, 2, 9, 10 and 11 to attach the two members to each other to form a unitary article. As a result, the terminal edges 12 of the two members 51 and 52 are folded downwardly inwardly well out of the wrap path and the tray 50 presents a less aggressive edge 54 to the wrap path 55. The crimping or deforming of the edges 12 of the two elements 51 and 52 out of the wrap path 55 performs the dual function of attaching the two members 51 and 52 to each other and providing a tray with a peripheral edge 54 which does not damage plastic wrap.

The tray 50 would generally be of rectangular configuration having a rectangular base 56 surrounded by a low peripheral sidewall 57. A circumferential peripheral rim 58 projects outwardly away from the upper end of the side wall 57.

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The tray generally also includes the further features of a first plurality of longitudinally extending rib formations 59 on the base member 51 and a second plurality of rib formations 60 extending perpendicularly to said first plurality of rib formations 59 on the cover member 52. Further, apertures 61 are defined in the cover member 52 to facilitate the passage of moisture therethrough. Water absorbent material 62, which is typically a granular material contained within a permeable bag, is sandwiched between the members 51 and 52 for absorbing exudate which issues from food carried on the tray 50 and drains through the apertures 61 in the cover member 52. The absorption of the moisture enables the tray and food packed thereon to retain a fresh aesthetically pleasing appearance for several days.

It is important to appreciate that all of the four apparatus embodiments illustrated in Figs 1 to 8 can be used to crimp the base and cover members 51 and 52 to each other to form the two piece trays.

An advantage of a method in accordance with the present invention is that it enables thermoformed plastic trays to be provided which are particularly suitable for wrapping in plastic film or wrap. This will lead to improved productivity in the wrapping of plastic trays. Further this invention enables the alteration to the trays to be carried out on a high volume assembly line scale at reasonable cost.

A yet further advantage of the method of this invention is that it facilitates the attachment of the two elements of a two-piece tray to each other to form a unitary tray assembly. It thus obviates the requirement of using adhesive to adhere the two-tray elements to each other. A two-piece tray according to this invention is aesthetically pleasing, has a peripheral edge which does not damage plastic wrap within which it is wrapped, and has a good mechanical strength. All these factors render it extremely suitable for use in food packaging.

A further advantage of a tray having a deformed peripheral edge region is that the region is far less prone to cracking than trays having untreated

peripheral edge regions. Without wishing to be bound by theory, Applicant believes that this is due to the heat treatment step in which the edge region is heated to a deformation temperature, and which has the effect of stress relieving the thermoformed plastic. This is analogous to the stress relieving of glass by a re-annealing process. Alternatively, the heat treatment step may also effect some beading of the plastic by melting.

A yet further advantage of the bending over the edge of the tray is that it mechanically strengthens the rim of the tray. Trays for food packaging are exposed to various forces during the handling and transport thereof. Trays in accordance with preferred embodiments of this invention have rims of increased mechanical strength and thus are far less prone to this bending and deformation.

A further advantage of the deforming of the edge of the tray is that it substantially eliminates the presence of microscopic "hairs" on the tray. Hairs are minute strands of plastic which are generated when the trays are cut immediately after the thermoforming operation. Customers of the trays, especially in the food industry regard these hairs as a potential hazard to consumers and are increasingly seeking trays that are free of these microscopic hairs.

It is to be understood that various alterations, modifications, and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the ambit of the invention disclosed herein.

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CLAIMS:

1. A method of producing a plastic tray having a peripheral edge region terminating in a terminal edge which is deformed such that the terminal edge is displaced out of a wrap path around the tray, the method including:

providing a plastic tray having a peripheral edge region terminating in a terminal edge;

heating the peripheral edge region of the tray such that said peripheral edge region becomes malleable and the remainder of the tray remains non-malleable; and

deforming the peripheral edge region of the tray by bringing an appropriately configured deforming means into engagement with said peripheral edge region of the tray to displace the terminal edge out of the wrap path, the deforming being effected by relative movement between the tray and the deforming means.

2. A method according to Claim 1, including cooling the peripheral edge region of the tray such that it sets and hardens with the terminal edge displaced out of the wrap path.

3. A method according to Claim 2, wherein the step of heating the peripheral edge region of the tray includes producing a sharp transition from malleable to non-malleable plastic which forms a fold line about which said peripheral edge region is deformed.

4. A method according to Claim 3, wherein said deforming means is a die and wherein said heating the peripheral edge region of the tray includes heating the die which in turn heats the peripheral edge region of the tray when brought into heat conductive contact therewith.

5. A method according to Claim 4, wherein said deforming the peripheral edge region includes rolling the peripheral edge region.

6. A method according to Claim 5, wherein said rolling comprises rolling the edge region around the full periphery of the tray substantially simultaneously.

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7. A method according to Claim 5 or Claim 6, wherein the die is configured such that upon engagement with the tray, it heats up the peripheral edge region of the tray, and when the peripheral edge region is malleable, it rolls the peripheral edge region of the tray.

8. A method according to any one of Claims 4 to 7, wherein said heating the peripheral edge region of the tray includes creating a temperature gradient across the peripheral edge region, the temperature being hotter adjacent the terminal edge and decreasing inwardly therefrom.

9. A method according to Claim 8, wherein said temperature gradient across said peripheral edge region is obtained by configuring the die such that it is in heat conductive contact with part of the peripheral edge region of the tray longer than other parts thereof.

10. A method according to Claim 9, wherein rolling the peripheral edge region of the tray includes moving the tray into engagement with the die.

11. A method according to any one of Claims 4 to 10, wherein said peripheral edge region is passively cooled by detaching it from the die, spacing it away from the die, and exposing it to convection cooling by surrounding air.

12. A method according to Claim 3, wherein said heating comprises blowing hot air over the peripheral edge region of the tray.

13. A method according to Claim 12, wherein that portion of the tray laterally inwardly of the peripheral edge region is shielded from the hot air blast.

14. A method according to Claim 13, wherein said deforming means includes a former and a complementary engagement formation, the former being moved into engagement with the peripheral edge region and the complementary engagement formation to deform said peripheral edge region.

15. A method according to any one of Claims 12 to 14, which includes actively cooling the peripheral edge region of the tray using cooling water.

16. A plastic tray produced by the method claimed in any one of Claims 1 to 15.

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17. A method of joining two tray members to each other to form a unitary two-piece tray, the method including:

providing base and cover members each having a peripheral edge region terminating in a terminal edge;

mounting the cover member in a superimposed relationship on the base member such that the peripheral edge regions of the two trays are substantially in alignment with each other;

heating the peripheral edge regions of the base and cover members such that said peripheral edge regions become malleable and the remainder of the base and cover members remain non-malleable; and

deforming the peripheral edge regions of the base and cover members laterally inwardly, by bringing an appropriately configured deforming means into engagement with said peripheral edge regions, so as to crimp the two peripheral edge regions to each other to form a unitary two-piece tray.

18. A method according to Claim 17, wherein the terminal edges of respectively the cover and base members are displaced out of the wrap path.

19. A two-piece plastic tray, including:

a base member, and

a cover member mounted in superimposed relationship on the base member, each said member including a peripheral edge region terminating in a terminal edge,

wherein the peripheral edge regions of the base and cover members are crimped together so as to form a unitary two-piece tray.

20. A two-piece plastic tray according to Claim 19, wherein the peripheral edge regions of the base and cover members are deformed downwardly and laterally inwardly by said crimping such that the terminal edges thereof are displaced laterally inwardly out of the wrap path.

21. A two-piece plastic tray according to Claim 20, wherein the peripheral edge region of the base and cover members which is deformed laterally inwardly crimping the two members to each other, has width of at least 2mm.

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22. A two-piece plastic tray according to any one of Claims 19 to 21, wherein the cover member is water permeable and the base member is water impermeable.

23. A two-piece plastic tray according to Claim 22, wherein the cover member has a plurality of apertures defined therein for permitting water to permeate therethrough.

24. A two-piece plastic tray according to Claim 22 or Claim 23, wherein moisture absorbent means are sandwiched between the base and cover members for absorbing moisture on the tray.

25. A two-piece plastic tray according to Claim 24, wherein the moisture absorbent means comprises a particulate moisture absorbing material contained within a water permeable bag.

26. A two-piece plastic tray according to any one of Claims 19 to 25, wherein said base member defines a first plurality of spaced reinforcing rib formations and the cover member defines a second plurality of spaced reinforcing rib formations extending transversely to said first plurality of rib formations.

27. A plastic tray including a peripheral edge region terminating in a terminal edge, wherein the peripheral edge region is deformed laterally inwardly such that the terminal edge is displaced out of a wrap path around the tray.

28. Apparatus for producing a plastic tray including a peripheral edge region terminating in a terminal edge, wherein the peripheral edge region is deformed laterally inwardly such that the terminal edge is displaced out of a wrap path around the tray, including:

heating means for heating the peripheral edge region of the tray to a temperature at which it is malleable; and

an appropriately configured deforming means for deforming the peripheral edge region of the tray and displacing the terminal edge of the tray out of the wrap path, the deforming means being moved relative to the tray to engage said tray and effect said deforming.

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29. Apparatus according to Claim 28, wherein the deforming means includes a die for deforming by rolling the peripheral edge region of the tray.

30. Apparatus according to Claim 29, wherein the heating means acts to heat the die which heats the peripheral edge region of the tray by being brought into heat conductive engagement therewith.

31. Apparatus according to Claim 30, wherein the die is configured so as to engage the edge region of the tray around the full periphery thereof and to roll said peripheral edge region substantially simultaneously in a single step.

32. Apparatus according to Claim 30 or Claim 31, wherein the die is configured so as to heat the peripheral edge region of the tray when it initially engages the tray to a temperature at which the edge region is malleable, and thereafter to roll the peripheral edge region of the tray.

33. Apparatus according to any one of Claims 29 to 32, including an ejector for detaching the tray from the heated die once the deforming has been carried out.

34. Apparatus according to Claim 28, wherein the heating means includes a hot air blast which is directed onto the peripheral edge region of the tray.

35. Apparatus according to Claim 28 or Claim 34, wherein the deforming means comprises a former and a complementary deforming formation, the former being movable relative to the complementary deforming formation.

36. Apparatus according to Claim 35, wherein said former is a rigid body.

37. Apparatus according to Claim 36, wherein the former comprises a plurality of linear or straight edge portions and a plurality of corner portions.

38. Apparatus according to Claim 35, wherein said former is an inflatable tube or hydraulic cylinder.

39. Apparatus according to any one of Claims 34 to 38, including shield means for shielding that portion of the tray laterally inwardly of the peripheral edge region from the hot air blast.

40. Apparatus according to any one of Claims 34 to 39, including cooling means for actively cooling said peripheral edge region of the tray.

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41. Apparatus according to Claim 40, wherein said cooling means includes cooling water which is passed over said former.

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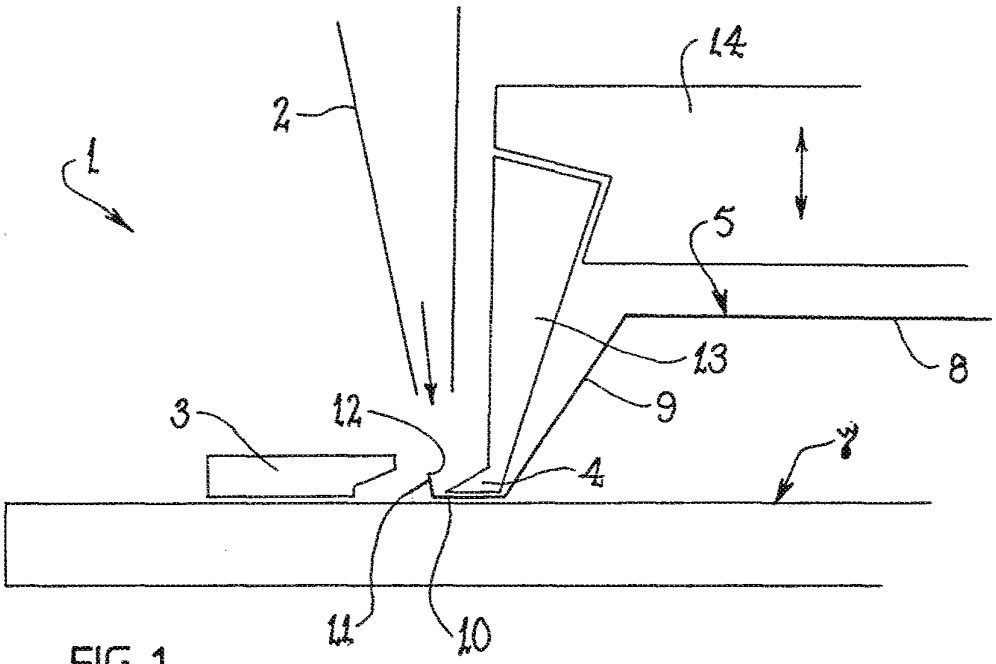


FIG 1

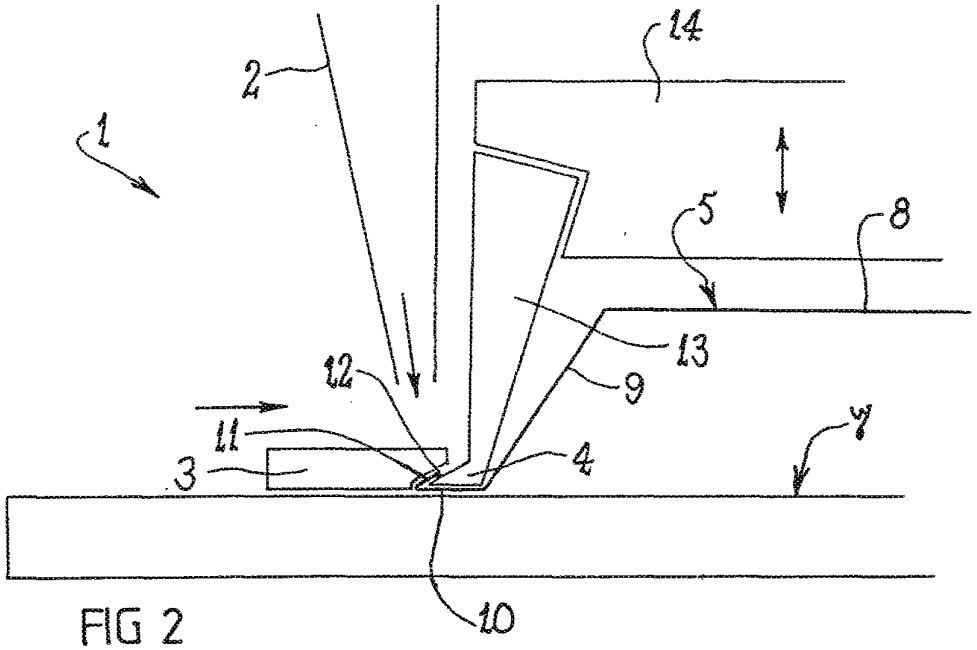


FIG 2

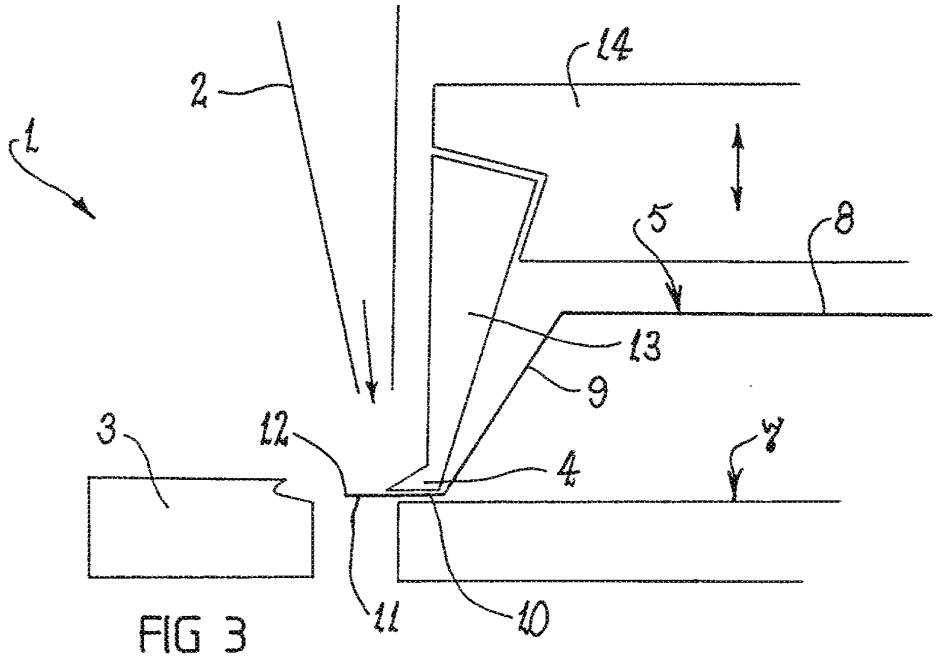


FIG 3

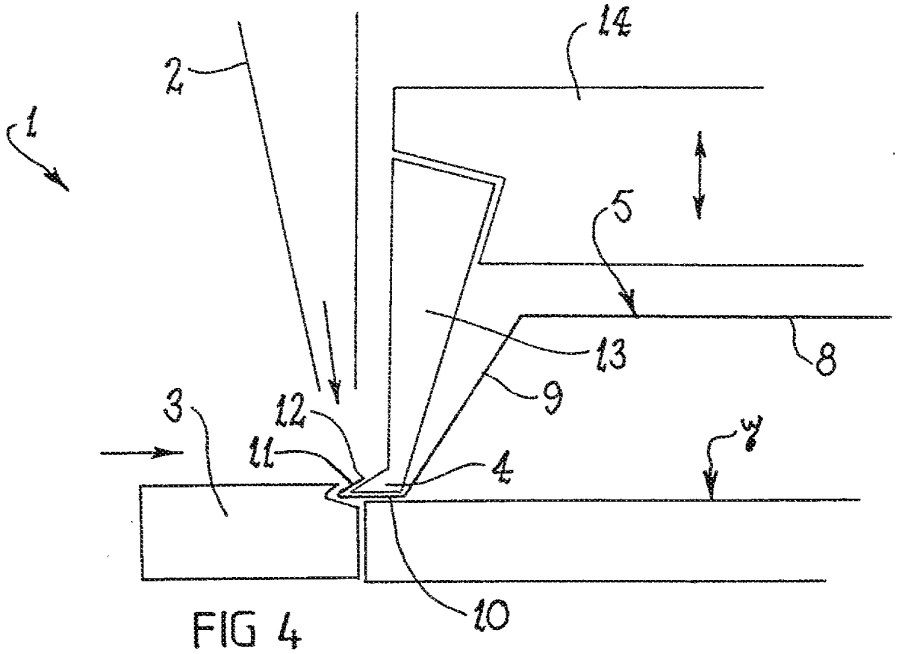


FIG 4

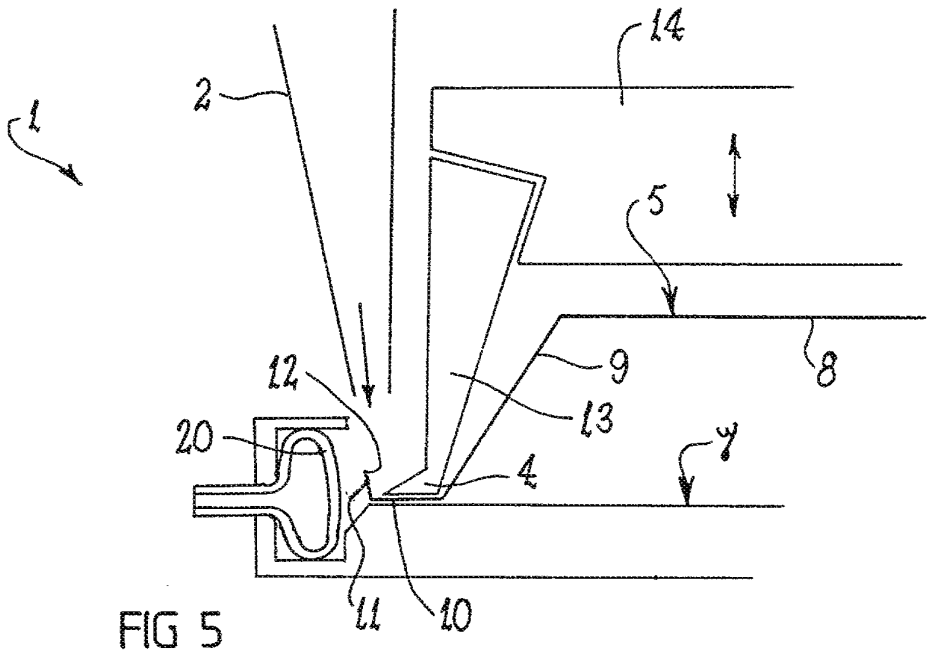


FIG 5

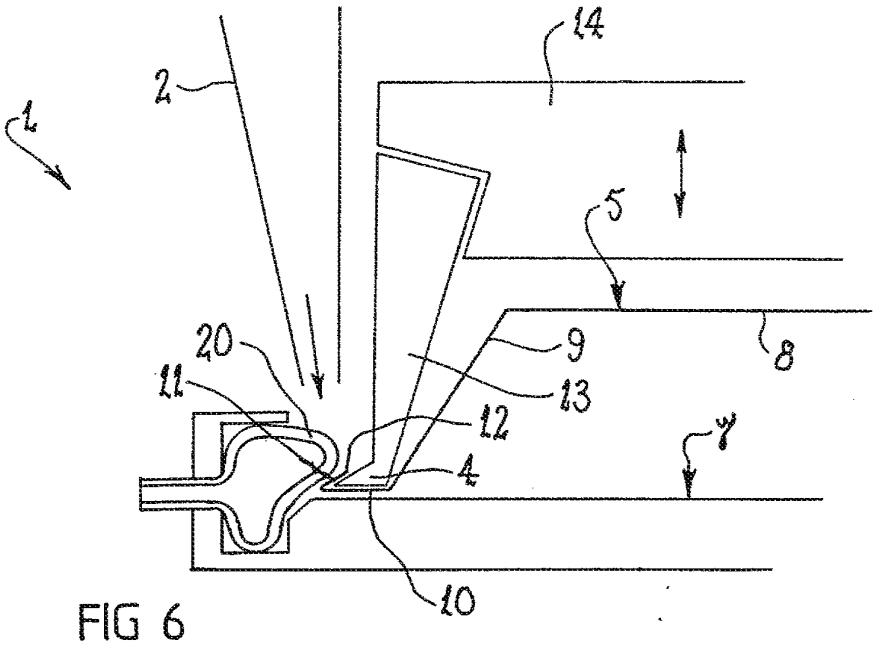


FIG 6

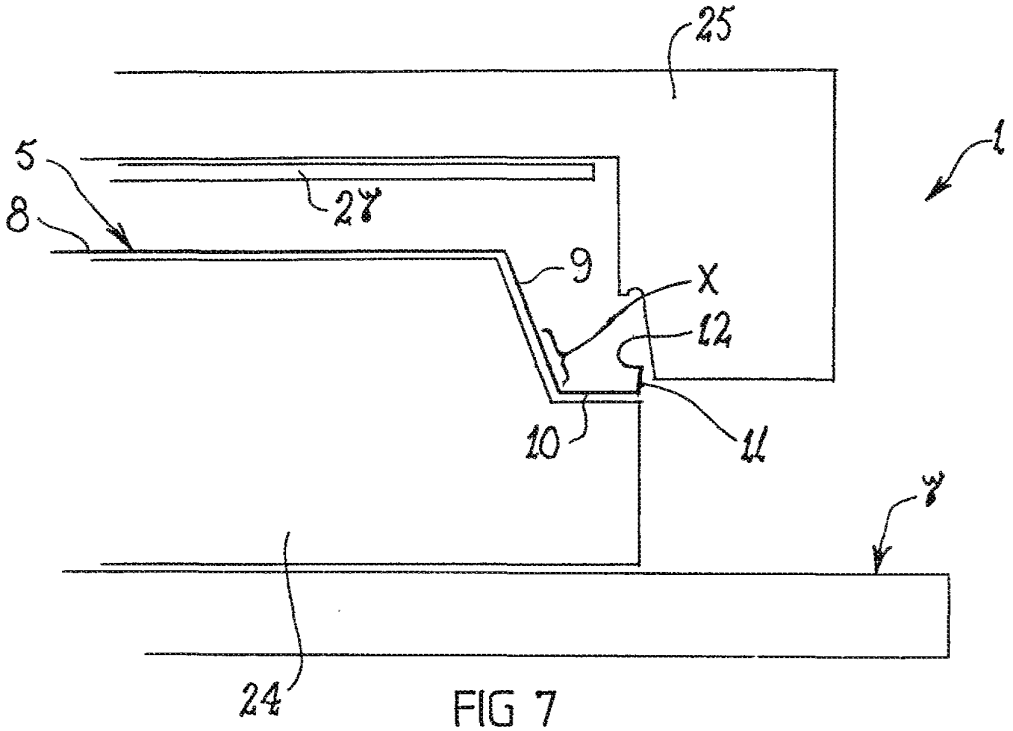


FIG 7

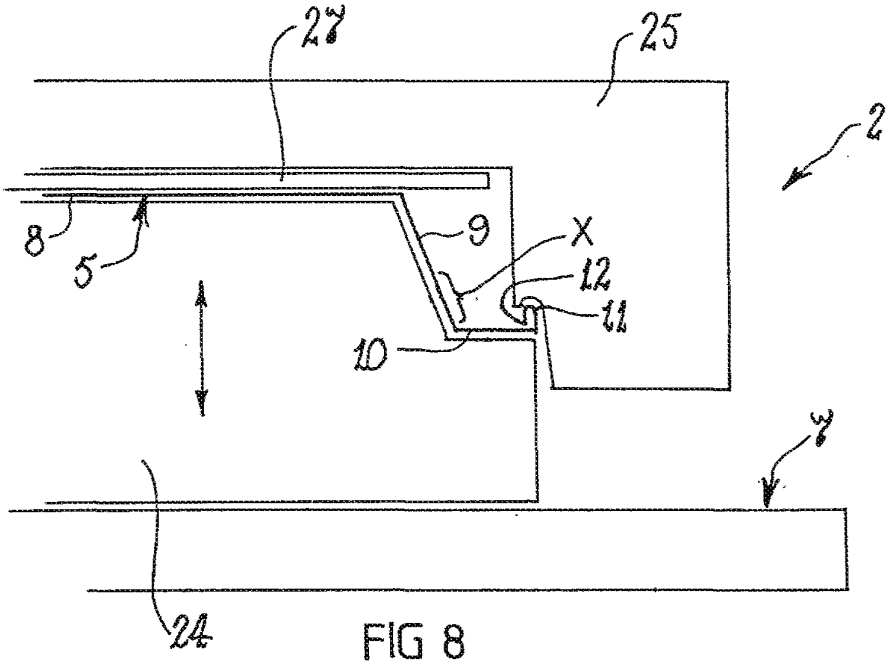


FIG 8

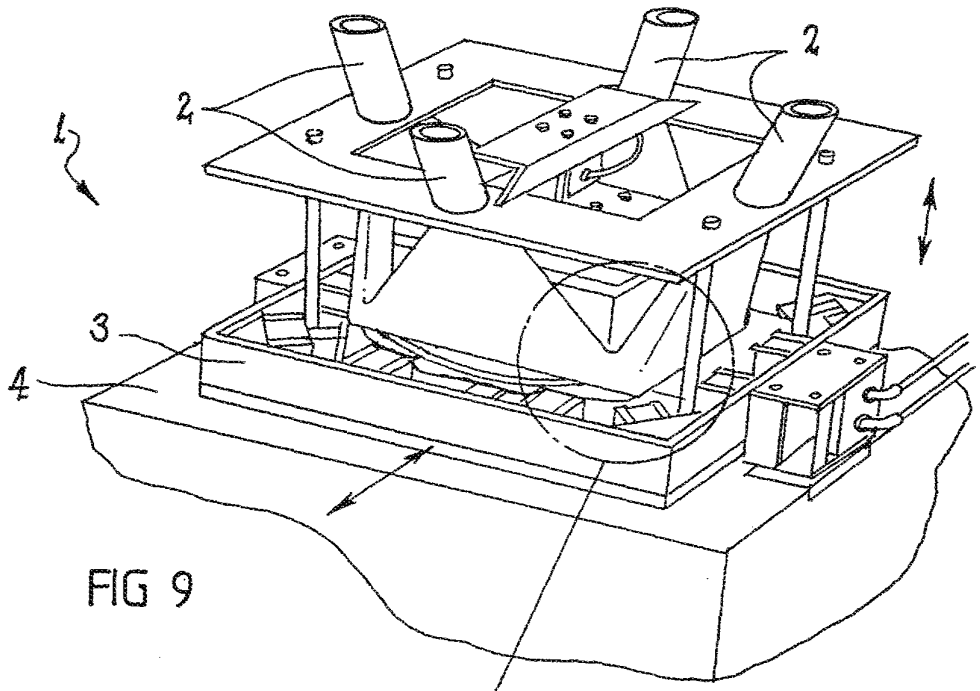


FIG 9

SEE FIG 10

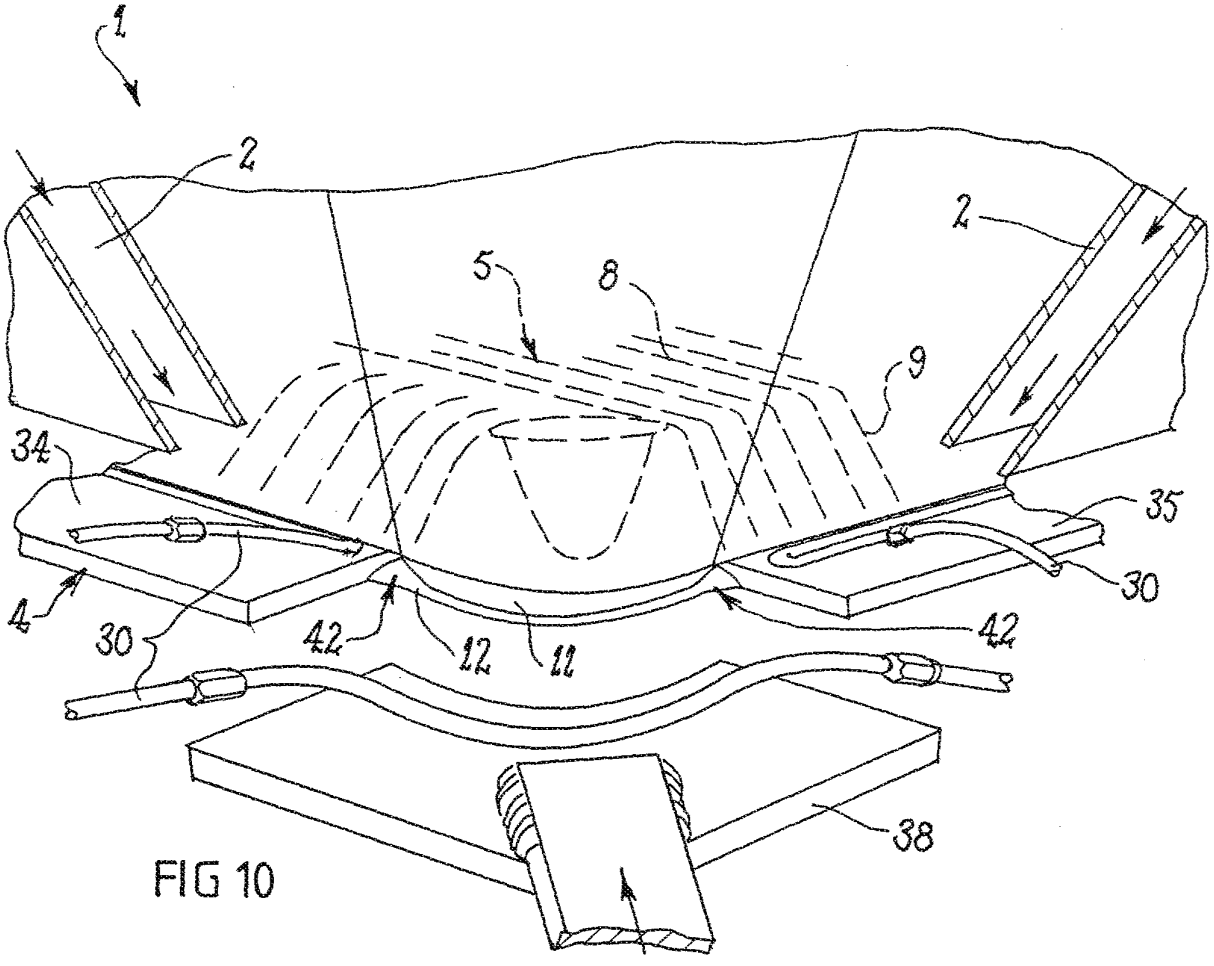


FIG 10

Ningbo Linhua Plastic Ex. 1002, p. 389

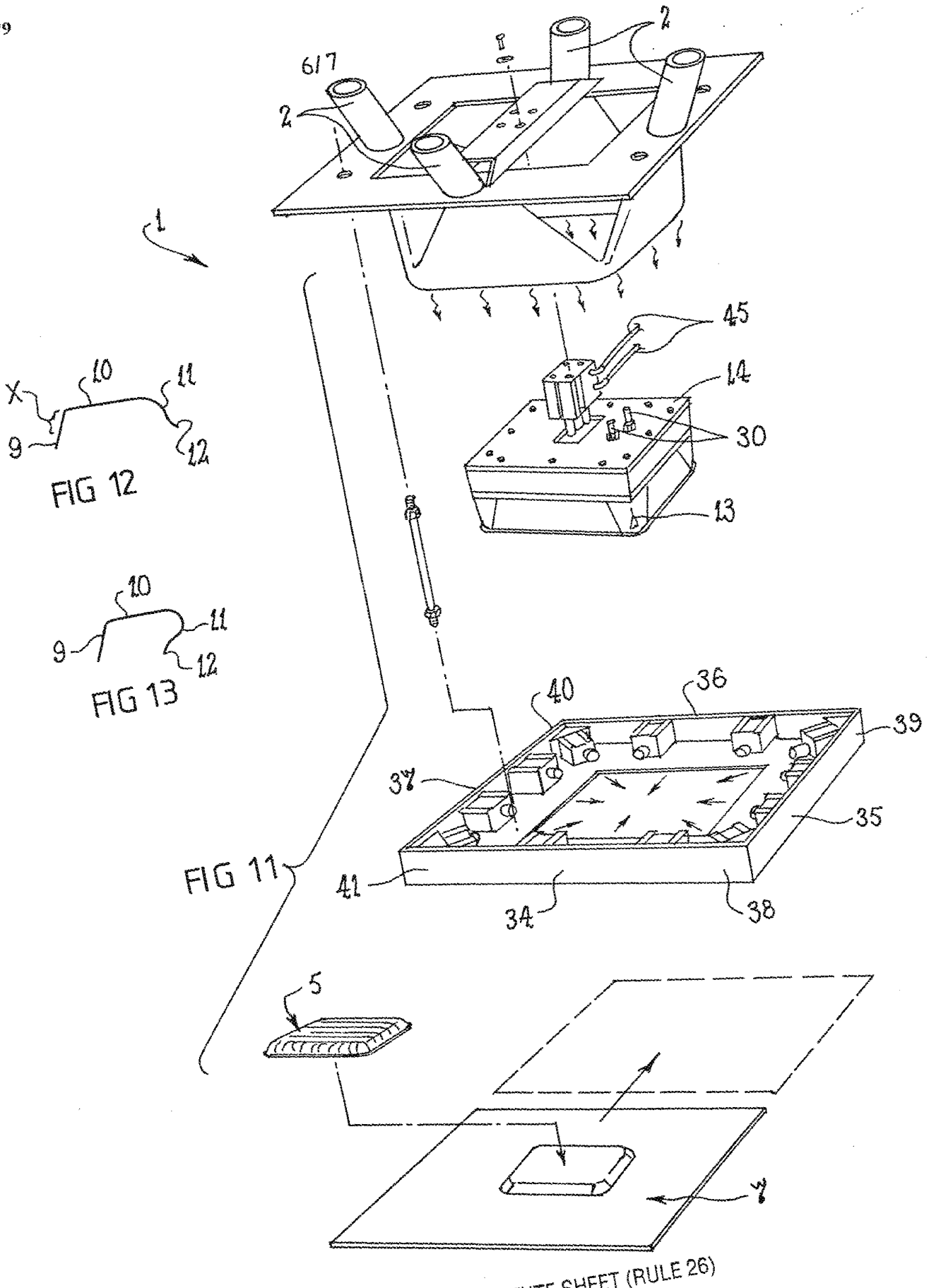


FIG 12

FIG 13

FIG 11

Ningbo Linhua Plastic Ex. 1002, p. 390

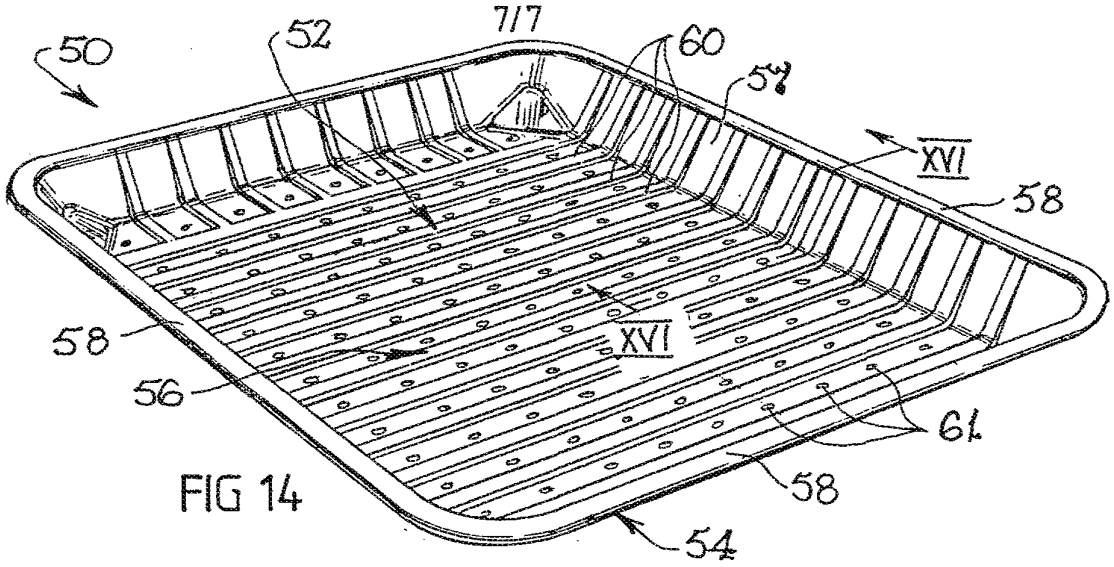


FIG 14

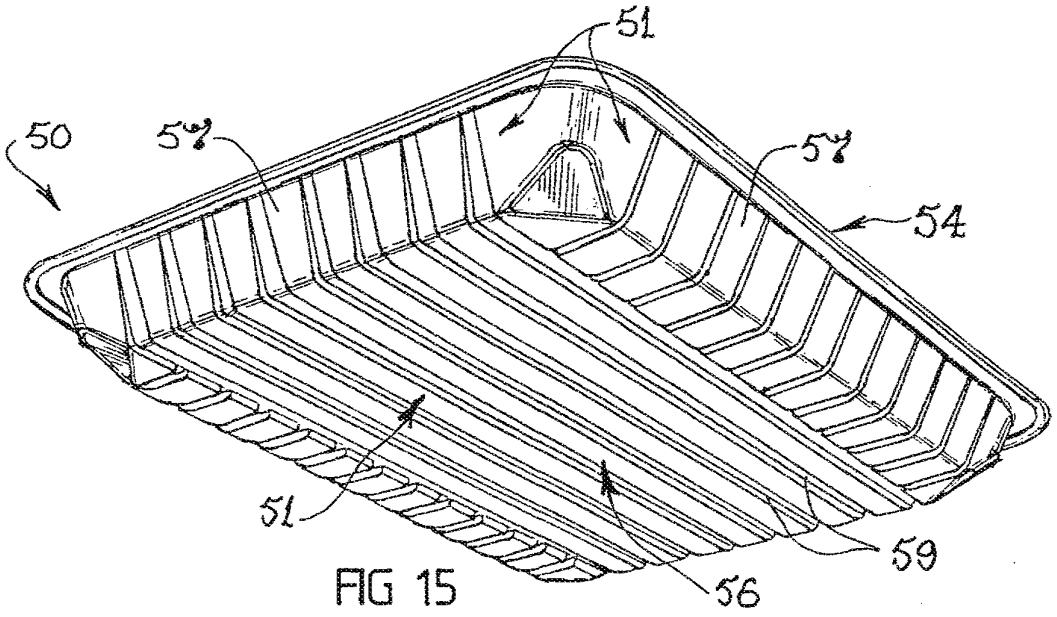


FIG 15

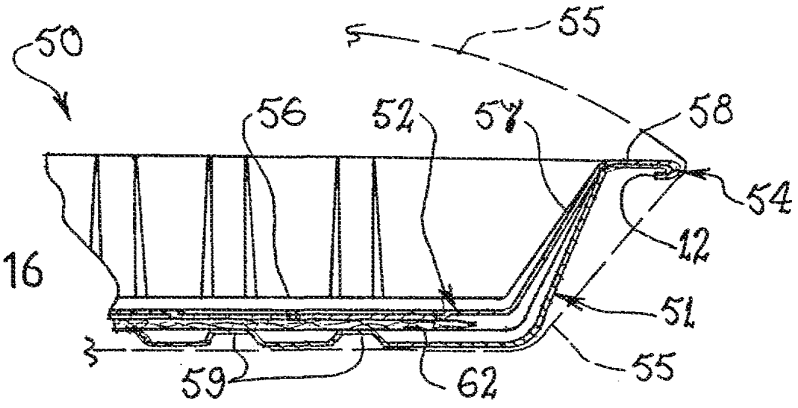


FIG 16

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INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 95/00404

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: B29C 51/00, 51/20 B65D 1/34, 81/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC B29C 51/00, 51/20, 51/22, 17/00, 17/02, 17/04, 17/06, B65D 1/34, 81/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
DERWENT: IPC as above and (tray# or plate#) and (edge# or peripheri or lip#)
JAPIO: as for DERWENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB-B-1388710 (BLACKNELL BUILDINGS LIMITED) 26 March 1975 page 2, lines 51 - 90	1-18, 28-41
A	US,A,4889231 (FOOTS et al) 26 December 1989 figures 3,7 and 8	16
A	US,A,4349146 (HOLDEN) 14 September 1982 column 2, lines 40 - 56	16

[X] Further documents are listed in the continuation of Box C

[ ] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 October 1995	23 OCTOBER 1995
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929	Authorized officer L. Menz Telephone No.: (06) 283 2431

Form PCT/ISA/210 (second sheet) (July 1992) copbro

INTERNATIONAL SEARCH REPORT

ternational Application No.
PCT/AU 95/00404

C (Continuation) **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AU,B,21308/92 (631520) (DRYPAC PTY LTD) 26 November 1992 figures 1 - 7	17-27
A	Derwent Abstract Accession No. 55335X/29 Class A32, JP,A,60-019476(IGARASHI Y) 17 June 1976 abstract	1-18, 28-41
A	Derwent Abstract Accession No.73521A/41 ClassA32 (A13), JP,A,53-101065 (SEKISUI PLASTICS KK) 4 September 1978 abstract	1-18 28-41
A	Derwent Abstract Accession No.91295Y/51 Class A32 (A92), JP,A,52-135375 (OMORI KIKAI KOGYO) 12 November 1977 abstract	1-18, 28-41

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INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 95/00404

Box 1 Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

(i) Claims 1 - 18 and 28 - 41 claim a method and apparatus having a peripheral edge region terminating in a terminal edge which is deformed.

(ii) Claims 19 to 27 claim a tray having a peripheral edge region.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.
PCT/AU 95/00404

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
GB	1388710		
US	4889231	CA	2018291
US	4349146		
AU	21308/92		

END OF ANNEX

Form PCT/ISA/210 (patent family annex) (July 1992) copbro

Electronic Patent Application Fee Transmittal

Application Number:	15445220
Filing Date:	28-Feb-2017
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Filer:	Gary David Colby
Attorney Docket Number:	CNVMF012CP

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	1	50	50
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	2820	1	950	950
		Total in USD ($)		**1000**

Electronic Acknowledgement Receipt

EFS ID:	37062562
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	160330
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	CNVMF012CP
Receipt Date:	04-SEP-2019
Filing Date:	28-FEB-2017
Time Stamp:	14:22:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	E201994E24210098
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	Third_RCE_Filing.pdf	74573 08b102bba6575b404840d8760876896ad5e8f420	no	3
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2		AM_for_FG_with_3rd_RCE.pdf	59436 9aeb2b2f06f959391d95f67d44fe94a722be1774	yes	11

Multipart Description/PDF files in .zip description

Document Description	Start	End
Preliminary Amendment	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	11

Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	SIDS3.pdf	128152 1af3c02cbe51307861e98cf46c128169ee70603e	no	5
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	GB1388710_Hurcomb.pdf	1119127 f4b7d7035645536fd8e034a37eaf09c94584a3db	no	5
Warnings:					
Information:					

5	Foreign Reference	WO1996001179_Drypac.pdf	4437110 fedec51d512a032cfb9f8b53fb2ca55dd32977ec	no	36
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	31875 0760ab816e8de27c79a7af105bc2fd0e22b6901d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5850273		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/445,220	Filing Date 02/28/2017	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/04/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 21	Minus	** 20	= 1		x $50 =	50
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	50

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/EUGENIA V HARDY/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

160330 7590 10/02/2019
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER	
LAN, YAN	
ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 10/02/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	01/02/2020

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

160330 7590 10/02/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	01/02/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAN, YAN	1782	428-035700

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Ningbo Linhua Plastic Ex. 1002, p. 403

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

160330 7590 10/02/2019

Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

EXAMINER	
LAN, YAN	

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 10/02/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/445,220	Applicant(s) WALLACE, Millard F.	
	Examiner YAN LAN	Art Unit 1782	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to communication of 9/4/2019.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date see attached.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/YAN LAN/
Primary Examiner, Art Unit 1782

Continuation of 3. The allowed claim(s) is/are: 1-4,8-12,15,18-19,22,24,26,34,44,50 and 60-62

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 9/4/2019 has been entered.

3. Claims 1-4, 8-12, 15, 18-19, 22, 24, 26, 34, 44, 50, and 60-62 are all the claims pending. New claim 62 is added.

Reasons for Allowance

4. Claims 1-4, 8-12, 15, 18-19, 22, 24, 26, 34, 44, 50, and 60-62 are allowed over the prior art of record.

5. The following is an examiner's statement of reasons for allowance:

6. The prior art of record, either alone or in combination, fails to disclose or suggest the claimed steps of a specific method of shaping a thermoplastic blank to make a shaped article having a body and a particular smooth periphery in the manner as so defined in claims 1 and 50, wherein the method calls for steps of forming thermoplastic blank into a shape comprising a body and a specific deflectable flange as defined that is

at a peripheral portion of the body; in particular, the deflectable flange comprising an extension that extends peripherally away from the body and connects thereto a bend region having a smooth contour and interconnecting the extension, at an approximately right angle, with a spacer that is connected with a peripheral flange which bears a peripheral edge of the thermoplastic, the spacer and peripheral flange being connected, at an angle other than 180 degrees, at an elbow. The claimed method further calls for steps of impinging the ram against the peripheral flange to cause deflection of the spacer, and further impinging the ram against the deflectable flange to induce further deflection of the spacer.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to YAN LAN whose telephone number is (571)270-3687. The examiner can normally be reached on Monday - Friday 7AM-4PM.

9. Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on 5712721291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/YAN LAN/
Primary Examiner, Art Unit 1782

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

CPC - Searched*		
Symbol	**Date**	**Examiner**
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265	09/28/2019	yl
B29K2101/12 AND B29K2105/256	09/28/2019	yl
B29L2031/712	09/28/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20	09/28/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06	09/28/2019	yl

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Conducted class, subclass search crossed with text search using EAST, inventors, assignee search in EAST	09/28/2019	yl
Google search	09/28/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	Art Unit
	YAN LAN	1782

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
B29C51/306 AND B29C51/082 AND B29C51/20 AND B29C51/42 AND B29C47/0026 AND B29C47/0054 AND B29C47/068 AND B29C47/8835 AND B29C47/8885 AND B29C51/14 AND B29C51/265		09/28/2019	yl
B29K2101/12 AND B29K2105/256		09/28/2019	yl
B29L2031/712		09/28/2019	yl
B65D1/34 AND B65D1/42 AND B65D43/0204 AND B65D1/265 AND B65D1/40 AND B65D21/0212 AND B65D21/0233 AND B65D53/06 AND B65D77/2024 AND B65D81/20		09/28/2019	yl
B32B27/08 AND B32B3/266 AND B32B7/06		09/28/2019	yl

/YAN LAN/ Primary Examiner, Art Unit 1782	

Ningbo Linhua Plastic Ex. 1002, p. 412

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

CPC								
Symbol							**Type**	**Version**
B29C	/	51	/	306			F	2013-01-01
B29C	/	51	/	20			I	2013-01-01
B29C	/	51	/	42			I	2013-01-01
B29C	/	51	/	082			I	2013-01-01
B65D	/	1	/	34			I	2013-01-01
B65D	/	1	/	42			I	2013-01-01
B65D	/	43	/	0204			I	2013-01-01
B29K	/	2101	/	12			A	2013-01-01
B29K	/	2105	/	256			A	2013-01-01
B29L	/	2031	/	712			A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	22	
/YAN LAN/ Primary Examiner, Art Unit 1782	28 September 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20190927

Ningbo Linhua Plastic Ex. 1002, p. 413

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B29C	/	51	/	30
B29C	/	51	/	08
B65D	/	43	/	02
B65D	/	1	/	34

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 22	
/YAN LAN/ Primary Examiner, Art Unit 1782 (Primary Examiner) 28 September 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure Fig. 1B

U.S. Patent and Trademark Office Part of Paper No.: 20190927

Ningbo Linhua Plastic Ex. 1002, p. 414

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10	12	19	-	28	-	37	-	46	-	55		
2	2	8	11	-	20	-	29	-	38	-	47	-	56		
3	3	9	12	-	21	-	30	-	39	-	48	-	57		
4	4	-	13	13	22	-	31	-	40	-	49	-	58		
-	5	-	14	-	23	-	32	-	41	21	50	-	59		
-	6	10	15	14	24	-	33	-	42	-	51	19	60		
-	7	-	16	15	25	17	34	-	43	-	52	20	61		
5	8	-	17	16	26	-	35	18	44	-	53	22	62		
6	9	11	18	-	27	-	36	-	45	-	54				

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 22	
/YAN LAN/ Primary Examiner, Art Unit 1782 (Primary Examiner) (Date) 28 September 2019	O.G. Print Claim(s) 1	O.G. Print Figure Fig. 1B

U.S. Patent and Trademark Office Part of Paper No.: 20190927

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S248	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S247	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
S246	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S245	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S244	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 17:15
S243	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S242	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S241	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S240	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/09/28 17:15

			EPO; JPO; DERWENT			
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S238	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S237	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S236	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S235	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S234	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S233	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
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S231	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S230	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S229	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S228	4638	((B29L2031/712).CPC.)	US-PGPUB;	OR	OFF	2019/09/28

			USPAT; USOCR; DERWENT			17:15
S227	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S226	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S225	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S224	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S223	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S222	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S221	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S220	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S219	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S218	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S217	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S216	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2019/09/28 17:15

			IBM_TDB			
S215	113	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S214	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S213	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S212	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S211	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S210	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
S209	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
S208	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S207	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" |	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15

		"6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.				
S206	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S205	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 17:15
S204	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S203	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S202	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S201	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S200	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S199	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S198	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S197	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S196	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S195	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S194	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB;	OR	OFF	2019/09/28

			USPAT; USOCR; EPO; JPO; DERWENT			17:15
S193	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S192	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S191	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S190	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S189	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S188	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S187	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S186	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S185	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S184	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S183	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S182	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15

S181	113	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S180	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S179	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S178	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S177	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
S176	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
S175	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S174	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15

S173	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
S172	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 17:15
S171	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S170	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 17:15
S169	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S168	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S167	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S166	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S165	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S164	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S163	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S162	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S161	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15

S160	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S159	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S158	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S157	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S156	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S155	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 17:15
S154	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 17:15
S153	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S152	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 17:15
L25	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:24
L24	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L23	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" |	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:24

		"5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.				
L22	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:24
L21	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 22:24
L20	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:24
L19	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:24
L18	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L17	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L16	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L15	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L14	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L13	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L12	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:24
L11	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:24

L10	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:24
L9	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L8	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L7	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L6	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L5	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L4	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:24
L3	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:24
L2	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:24
L1	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:24
L115	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L114	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:25
L113	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" |	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25

		"4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.				
L112	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L111	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 22:25
L110	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L109	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L108	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L107	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L106	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L105	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L104	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L103	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L102	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L101	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25

L100	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:25
L99	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L98	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L97	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L96	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L95	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L94	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L93	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L92	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L91	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L90	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25

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		B65D77/2024 OR B65D81/20).CPC.)				
L89	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L88	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L87	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L86	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L85	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L84	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L83	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L82	113	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L81	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L80	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L79	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L78	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L77	27	(US-10076865-$ | US-10118332-$ | US-	US-PGPUB;	OR	OFF	2019/09/28

		15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	USPAT			22:25
L76	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:25
L75	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L74	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L73	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L72	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 22:25
L71	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L70	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25

L69	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L68	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L67	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L66	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L65	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L64	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L63	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L62	9	((("CONVERTER") near3 ("MANUFACTURI NG") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L61	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L60	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L59	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L58	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L57	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L56	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25

		B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)				
L55	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L54	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L53	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L52	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L51	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:25
L50	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L49	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L48	113	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:25
L46	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L45	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:25
L44	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:25
L43	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:25

		3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.				
L233	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:26
L232	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L231	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L230	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L229	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L228	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L227	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L226	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L225	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L224	50005	((B32B27/08 OR B32B3/266 OR	US-PGPUB;	OR	OFF	2019/09/28

		B32B7/06).CPC.)	USPAT; USOCR; DERWENT			22:26
L223	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L222	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L221	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L220	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L219	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L218	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L217	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L216	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L215	113	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L214	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L213	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:26
L212	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	OFF	2019/09/28 22:26

			DERWENT			
L211	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L210	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:26
L209	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:26
L208	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L207	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L206	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L205	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 22:26
L204	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26

L203	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L202	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L201	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L200	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L199	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L198	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L197	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L196	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L195	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:26
L194	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L193	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L192	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L191	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L190	9895	((B29K2101/12 OR B29K2105/256).CPC.	US-PGPUB;	OR	OFF	2019/09/28

		)	USPAT; USOCR; DERWENT			22:26
L189	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L188	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L187	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L186	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:26
L185	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L184	6	("4062311" | "4309888" | "4489584").PN. OR ("4621513").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L183	4	"4621513".PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L182	3	("20130064998").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L181	113	(impinging same (ram or edge)) same deflect same (heat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L180	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:26
L179	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L178	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26

L177	27	(US-10076865-$ | US-10118332-$ | US-15445220-$ | US-20020119334-$ | US-20020127295-$ | US-20040043165-$ | US-20040144482-$ | US-20060172095-$ | US-20130113137-$ | US-2891280-$ | US-2960134-$ | US-3096546-$ | US-3192565-$ | US-3355536-$ | US-3357053-$ | US-3423231-$ | US-3568254-$ | US-3695806-$ | US-3767507-$ | US-4281979-$ | US-4358492-$ | US-5098751-$ | US-5118277-$ | US-5758773-$ | US-5919496-$ | US-5972447-$ | US-5976682-$ | US-6234386-$).DID.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:26
L176	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:26
L175	104	((B29C51/306).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L174	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L173	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L172	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 22:26
L171	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:26
L170	1798	(imping$3 same (ram or edge)) same deflect	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/09/28 22:26

			DERWENT; IBM_TDB			
L169	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L168	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L167	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L166	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L165	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L164	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L163	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L162	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:26
L161	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L160	50005	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L159	8764	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L158	4638	((B29L2031/712).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L157	9895	((B29K2101/12 OR B29K2105/256).CPC.)	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L156	7224	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR	US-PGPUB; USPAT;	OR	OFF	2019/09/28 22:26

		B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USOCR; DERWENT			
L155	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:26
L154	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:26
L153	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:26
L152	42	((("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:26
L248	5	(US-15445220-$ | US-2996864-$ | US-3947205-$ | US-4621513-$ | US-8920892-$).DID.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:27
L247	1	("20170165896").PN.	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:27
L246	68	("20010013518" | "20020193031" | "20030064181" | "20030074760" | "20040112902" | "20040126524" | "20040134917" | "20040145196" | "20040168954" | "20060037960" | "20060059747" | "20070199942" | "2542413" | "2838781" | "2922176" | "3148799" | "3348243" | "3380100" | "3514012" | "3579669" | "3698594" | "3757990" | "4010866" | "4182462" | "4525880" | "4765123" | "4798130" | "4828134" | "4944427" | "5061532" | "5178293" | "5411167" | "5445110" | "5460289" | "5501360" | "5503293" | "5632130" | "5653089" | "5681625" | "5727708" | "5782057" | "5816501" | "5966772" | "5975299" | "6041450" | "6058518" | "6196410" | "6276554" | "6434782" | "6471086" | "6679398" | "6761011" | "6851570" | "7004348" | "D319518" | "D448130" | "D569567").PN. OR ("7721910").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:27
L245	2	"7721910".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:27
L244	1	("2017/0165896").URPN.	USPAT	OR	OFF	2019/09/28 22:27
L243	39	((imping$3 same (ram or edge)) same deflect).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/09/28 22:27

L242	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:27
L241	9	(("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:27
L240	42	(("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:27
L239	2	("20100200596" | "4411849").PN. OR ("9987835").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/09/28 22:27
L238	9	(("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:27
L237	42	(("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:27
L236	9	(("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:27
L235	42	(("WALLACE") near3 ("Millard"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/09/28 22:27
L234	2	("20170165896").PN.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2019/09/28 22:27

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S273	2563	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S272	1327	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S271	2629	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S270	1390	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S269	0	("20170165896").PN.	USPAT	OR	OFF	2019/09/28 17:15
S268	9	(("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15

S267	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 17:15
S266	27	"Term Removed"	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:15
S265	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/09/28 17:15
S264	0	"20130064998".pn.	USPAT	OR	ON	2019/09/28 17:15
S263	1	"4358492".pn.	USPAT	OR	ON	2019/09/28 17:15
S262	7	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/09/28 17:15
S261	2444	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/09/28 17:15
S260	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 17:15
S259	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 17:15
S258	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S257	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 17:15
S256	13289	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S255	2563	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S254	1327	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S253	2629	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S252	1390	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/09/28 17:15
S251	0	("20170165896").PN.	USPAT	OR	OFF	2019/09/28 17:15
S250	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:15
S249	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 17:15
S302	27	"Term Removed"	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:16
S301	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/09/28 17:16
S300	1	"4358492".pn.	USPAT	OR	ON	2019/09/28 17:16
S299	7	((imping$3 or impingement) and (ram or	USPAT	OR	ON	2019/09/28

		edge) and (curl or bend) and deflect).clm.				17:16
S298	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 17:16
S297	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
S296	0	"20130064998".pn.	USPAT	OR	ON	2019/09/28 17:16
S295	2444	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/09/28 17:16
S294	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 17:16
S293	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 17:16
S292	13289	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
S291	2563	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
S290	1327	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
S289	2629	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
S288	1390	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
S287	0	("20170165896").PN.	USPAT	OR	OFF	2019/09/28 17:16
S286	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 17:16
S285	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 17:16
S284	27	"Term Removed"	US-PGPUB; USPAT	OR	OFF	2019/09/28 17:16
S283	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/09/28 17:16
S282	0	"20130064998".pn.	USPAT	OR	ON	2019/09/28 17:16
S281	1	"4358492".pn.	USPAT	OR	ON	2019/09/28 17:16
S280	7	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/09/28 17:16
S279	2444	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/09/28 17:16
S278	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 17:16
S277	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 17:16
S276	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28

						17:16
S275	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 17:16
S274	13289	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/09/28 17:16
L139	1327	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L138	2629	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L137	1390	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L136	0	("20170165896").PN.	USPAT	OR	OFF	2019/09/28 22:25
L135	9	((("CONVERTER") near3 ("MANUFACTURING") near3 ("LLC"))).AS,AANM.	USPAT	OR	OFF	2019/09/28 22:25
L134	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 22:25
L133	27	"Term Removed"	US-PGPUB; USPAT	OR	OFF	2019/09/28 22:25
L132	1	"20130064998".pn.	US-PGPUB; USPAT	OR	ON	2019/09/28 22:25
L131	0	"20130064998".pn.	USPAT	OR	ON	2019/09/28 22:25
L130	1	"4358492".pn.	USPAT	OR	ON	2019/09/28 22:25
L129	7	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/09/28 22:25
L128	2444	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/09/28 22:25
L127	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 22:25
L126	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 22:25
L125	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L124	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 22:25
L123	13289	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L122	2563	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L121	1327	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L120	2629	((B29K2101/12 OR B29K2105/256).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L119	1390	((B29C51/306 OR B29C51/082 OR	USPAT	OR	OFF	2019/09/28

		B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)				22:25
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L116	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 22:25
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L40	1	"4358492".pn.	USPAT	OR	ON	2019/09/28 22:25
L39	7	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/09/28 22:25
L38	2444	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/09/28 22:25
L37	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 22:25
L36	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 22:25
L35	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L34	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 22:25
L33	13289	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L32	2563	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
L31	1327	((B29L2031/712).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
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L29	1390	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/09/28 22:25
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L26	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 22:25

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L148	7	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/09/28 22:26
L147	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 22:26
L146	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28 22:26
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L143	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 22:26
L142	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 22:26
L141	13289	((B32B27/08 OR B32B3/266 OR B32B7/06).CPC.)	USPAT	OR	OFF	2019/09/28 22:26
L140	2563	((B65D1/34 OR B65D1/42 OR B65D43/0204 OR B65D1/265 OR B65D1/40 OR B65D21/0212 OR B65D21/0233 OR B65D53/06 OR B65D77/2024 OR B65D81/20).CPC.)	USPAT	OR	OFF	2019/09/28 22:26
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L300	1	"4358492".pn.	USPAT	OR	ON	2019/09/28 22:27
L299	7	((imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect).clm.	USPAT	OR	ON	2019/09/28 22:27
L298	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 22:27
L297	36	((B29C51/306).CPC.)	USPAT	OR	OFF	2019/09/28 22:27
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L295	2444	(imping$3 or impingement) and (ram or edge) and (curl or bend) and deflect	USPAT	OR	ON	2019/09/28 22:27
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L293	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 22:27
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L288	1390	((B29C51/306 OR B29C51/082 OR B29C51/20 OR B29C51/42 OR B29C47/0026 OR B29C47/0054 OR B29C47/068 OR B29C47/8835 OR B29C47/8885 OR B29C51/14 OR B29C51/265).CPC.)	USPAT	OR	OFF	2019/09/28 22:27
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L285	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 22:27
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L278	285	(imping$3 or impingement) and (ram or edge) and curl and deflect	USPAT	OR	ON	2019/09/28 22:27
L277	22	((B29C51/306).CPC.) and (rim or spacer)	USPAT	OR	OFF	2019/09/28 22:27
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L275	371	(imping$3 same (ram or edge)) same deflect	USPAT	OR	ON	2019/09/28 22:27
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L267	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 22:27
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L249	18	((("WALLACE") near3 ("Millard"))).INV.	USPAT	OR	OFF	2019/09/28 22:27

9/28/2019 10:32:53 PM
C:\Users\ylan\Documents\EAST\Workspaces\15445220.wsp

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3291361	A	1966-12-13	Commeyras	
	2	3497917	A	1970-03-03	Negoro	
	3	3522877	A	1970-08-04	Phillips	
	4	4349146	A	1982-09-14	Holden	
	5	4419320	A	1983-12-06	Perkins	
	6	4889231	A	1989-12-26	Foote	
	7	6737003	B1	2004-05-18	Golden	
	8	9908281	B1	2018-03-06	Wallace	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15445220
	Filing Date	2017-02-28
	First Named Inventor	Millard F. WALLACE
	Art Unit	1782
	Examiner Name	Yan LAN
	Attorney Docket Number	CnvMf012CP

	9	10189624	B2	2019-01-29	Wallace	
	10					
	11					
	12					
	13					
	14					
	15					

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090291174	A1	2009-11-26	Lewis	

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FOREIGN PATENT DOCUMENTS

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	1388710	GB		1975-03-26	Hurcomb		☐
	2	96/01179	WO	A1	1996-01-18	Drypac		☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/YAN LAN/	Date Considered	09/27/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]See Kind Codes of USPTO Patent Documents at www.USPTO.GOVor MPEP 901.04. [2]Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5]Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15445220
Filing Date	2017-02-28
First Named Inventor	Millard F. WALLACE
Art Unit	1782
Examiner Name	Yan LAN
Attorney Docket Number	CnvMf012CP

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Gary D. Colby/	Date (YYYY-MM-DD)	2019-09-04
Name/Print	Gary D. COLBY, Ph.D., J.D.	Registration Number	40961

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

/YAN LAN/ 09/27/2019

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The information provided by you in this form will be subject to the following routine uses:

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

/YAN LAN/

09/27/2019

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /Y.L/

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

160330 7590 10/02/2019
Clearly Clean Products, LLC
603 Industrial Drive
Orwigsburg, PA 17961

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/28/2017	Millard F. WALLACE	CNVMF012CP	9924

TITLE OF INVENTION: FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	01/02/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LAN, YAN	1782	428-035700

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Converter Manufacturing, LLC
2 Gary D. Colby, Ph.D, J.D.
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
Converter Manufacturing, LLC	Orwigsburg, PA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☒ Publication Fee (if required) ☐ Advance Order - # of Copies

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No.

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Gary D. Colby/ Date 27 December 2019

Typed or printed name Gary D. Colby, Ph.D., J.D. Registration No. 40961

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Ningbo Linhua Plastic Ex. 1002, p. 455

Electronic Patent Application Fee Transmittal

Application Number:	15445220
Filing Date:	28-Feb-2017
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Filer:	Gary David Colby
Attorney Docket Number:	CNVMF012CP

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**500**

Electronic Acknowledgement Receipt

EFS ID:	38151772
Application Number:	15445220
International Application Number:	
Confirmation Number:	9924
Title of Invention:	FORMED THERMOPLASTIC ARTICLE HAVING SMOOTH EDGES
First Named Inventor/Applicant Name:	Millard F. WALLACE
Customer Number:	160330
Filer:	Gary David Colby
Filer Authorized By:	
Attorney Docket Number:	CNVMF012CP
Receipt Date:	27-DEC-2019
Filing Date:	28-FEB-2017
Time Stamp:	15:20:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$500
RAM confirmation Number	E2019BQF21595539
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Issue_Fee_Payment.pdf	782774 ff9996754baf60dd34e73352f3419a0bd5261519	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29902 76b157a9d3df203e15ce7201081b4493e90c9aad	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	812676		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

CPC						
Symbol					**Type**	**Version**
B29C	/	51	/	306	F	2013-01-01
B29C	/	51	/	20	I	2013-01-01
B29C	/	51	/	42	I	2013-01-01
B29C	/	51	/	082	I	2013-01-01
B65D	/	1	/	34	I	2013-01-01
B65D	/	1	/	42	I	2013-01-01
B65D	/	43	/	0204	I	2013-01-01
B29K	/	2101	/	12	A	2013-01-01
B29K	/	2105	/	256	A	2013-01-01
B29L	/	2031	/	712	A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	15 January 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20200115

Ningbo Linhua Plastic Ex. 1002, p. 460

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B29C	/	51	/	30
B29C	/	51	/	08
B65D	/	43	/	02
B65D	/	1	/	34

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	15 January 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office — Part of Paper No.: 20200115

Ningbo Linhua Plastic Ex. 1002, p. 461

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/445,220	WALLACE, Millard F.
	Examiner	**Art Unit**
	YAN LAN	1782

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	7	10	12	19	-	28	-	37	-	46	-	55		
2	2	8	11	-	20	-	29	-	38	-	47	-	56		
3	3	9	12	-	21	-	30	-	39	-	48	-	57		
4	4	-	13	13	22	-	31	-	40	-	49	-	58		
-	5	-	14	-	23	-	32	-	41	21	50	-	59		
-	6	10	15	14	24	-	33	-	42	-	51	18	60		
-	7	-	16	-	25	16	34	-	43	-	52	19	61		
5	8	-	17	15	26	-	35	17	44	-	53	20	62		
6	9	11	18	-	27	-	36	-	45	-	54				

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	21	
/YAN LAN/ Primary Examiner, Art Unit 1782	15 January 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	Fig. 1B

U.S. Patent and Trademark Office Part of Paper No.: 20200115

Ningbo Linhua Plastic Ex. 1002, p. 462

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/445,220	02/18/2020	10562222	CNVMF012CP	9924

160330 7590 01/29/2020

Converter Manufacturing, LLC
603 Industrial Drive
Orwigsburg, PA 17961

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 133 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Millard F. WALLACE, Orwigsburg, PA;
Converter Manufacturing, LLC, Orwigsburg, PA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

FEE ADDRESS CHANGE

APPLICATION #	FILING OR 371(C) DATE	REQUEST ID
15/445,220	02/28/2017	134309

The following fields have been changed to Customer Number 160330 on 12/06/2023 via Patent Center in view of the certification copied below that authorized the change.

- Maintenance Fee Address

The address for Customer Number 160330 is:

160330 - Converter Manufacturing, LLC
603 Industrial Drive
Orwigsburg, PA 17961

I certify, in accordance with 37 CFR 1.4(d)(4), that I am :

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature	Name	Registration #
/Gary D. Colby/	Gary Colby	40961

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

CORRESPONDENCE ADDRESS CHANGE

APPLICATION #	FILING OR 371(C) DATE	REQUEST ID
15/445,220	02/28/2017	134309

The following fields have been changed to Customer Number 160330 on 12/06/2023 via Patent Center in view of the certification copied below that authorized the change.

- Correspondence Address

The address for Customer Number 160330 is:

160330 - Converter Manufacturing, LLC
603 Industrial Drive
Orwigsburg , PA 17961

I certify, in accordance with 37 CFR 1.4(d)(4), that I am :

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature	Name	Registration #
/Gary D. Colby/	Gary Colby	40961