

BIB HAVING AN IMPROVED NECK OPENING

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FIELD OF THE INVENTION

The present invention is related to disposable bibs, and more particularly, to a bib
15 having an improved neck opening.

BACKGROUND OF THE INVENTION

Disposable bibs are well known in the art. Such bibs can be provided for use on
babies during feeding. Disposable bibs can have a laminate construction comprising
20 multiple layers. For instance, disposable bibs can include an absorbent paper topsheet
for receiving spilled food material and a plastic film backsheet for preventing
penetration of spilled liquids through the bib and onto the baby's clothing. Other
multiple layer bib constructions are also known.

The prior art also discloses bibs having different mechanisms for securing a bib to
25 the wearer's person. For instance, a bib can include straps which are tied together
behind the wearer's neck to secure the bib to the wearer. Such straps are inconvenient
to use, and can be awkward to tie on a moving infant. It also known to use snaps, tape
type fasteners, and VELCRO type fasteners to secure a bib to a wearer.

One problem with securing a bib to wearer is that, in fastening the bib to the
30 wearer, the portion of the bib covering the wearer's chest can become distorted,
thereby causing the bib to gap away from the wearer's chest. Such distortion is
undesirable, because it can leave a portion of the wearer unprotected from food spills.
This distortion can be caused by the forces applied to the bib in securing the bib about
the wearer's neck.

35 For instance, bibs which are mass produced with a common neck opening
configuration may not fit all neck sizes and shapes equally well. As the bib neck
opening configuration is made to conform to a wearer's particular neck size and shape,
the portion of the bib over the wearer's chest can be distorted. On the other hand, if a
an oversized bib neck opening configuration is not conformed to the wearer's neck
40 during use, the bib can slip or shift on the wearer during use.

Accordingly, it is an object of the present invention to provide a bib which can be

5 conveniently secured to the wearer's person.

Another object of the present invention is to provide a bib which can accommodate a relatively wide range of neck sizes and shapes.

Yet another object of the present invention is to provide a bib having a neck opening which reduces distortion of the bib when the bib is secured to the wearer.

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SUMMARY OF THE INVENTION

The present invention provides a disposable bib. The bib can have a bib body having a longitudinal length, a longitudinal centerline, and a lateral width, and a pair of shoulder extensions extending from the bib body to provide a
15 generally planar neck opening. The generally planar neck opening has a longitudinal length. The generally planar neck opening comprises a front neck portion, a rear neck portion, and a maximum width portion disposed intermediate the front neck portion and the rear neck portion.

The generally planar neck opening is generally symmetric about a
20 longitudinal axis and is generally asymmetric about a lateral axis extending through the midpoint of the longitudinal length of the neck opening. The lateral asymmetry of the neck opening promotes fit about different neck sizes and shapes, while reducing the tendency of the bib body to gap away from the wearer's chest. The generally planar neck opening can have a lateral asymmetry ratio of at least
25 about 1.15, in another embodiment at least about 1.25, and in yet another embodiment at least about 1.5.

In one embodiment the generally planar neck opening has a lateral asymmetry ratio within a particular angular portion of the neck opening, as defined by an angle B. The neck opening can have an asymmetry ratio of at least
30 about 1.15 within an angular portion of the neck opening defined by: $15 \text{ degrees} < B < 80 \text{ degrees}$. In one particular embodiment the neck opening has an asymmetry ratio of at least about 1.5 within an angular portion of the generally planar neck opening defined by: $30 \text{ degrees} < B < 75 \text{ degrees}$. It desirable that the generally planar neck opening have a lateral asymmetry ratio within a
35 particular angular portion of the neck opening so that the neck opening can

- 5 securely engage a substantial portion of the back half of the wearer's neck without causing excessive gapping of the bib body from the wearer's chest.

 The front neck portion can have a perimeter comprising a shape which is generally concave with respect to the center of the neck opening (i.e. it is concave upward as the bib is worn). The maximum width portion can comprise a
10 line of maximum width, or alternatively, can comprise a generally rectangular shape having a finite area. The rear neck portion can taper as it extends from the maximum width portion. In one embodiment, the rear neck portion can have a longitudinal length greater than that of the front neck portion, and can have an elongated teardrop shape.

- 15 In one preferred embodiment, each shoulder extension has a proximal end and a distal end, and a fastener is associated with at least one of the distal ends of the shoulder extensions. The fastener, which can be a mechanical or adhesive tape type fastener, provides for joining the shoulder extensions together in overlapping fashion adjacent their distal ends, to thereby secure the bib to the
20 wearer.

BRIEF DESCRIPTION OF THE DRAWINGS

 While the specification concludes with claims particularly pointing out and distinctly claiming the present invention, the invention will be better understood from
25 the following description taken in conjunction with the accompanying drawings in which like designations are used to designate substantially identical elements, and in which:

 Figure 1 is an in use perspective view of a disposable bib according to the present invention.

- 30 Figure 2 a front plan view of the disposable bib of the present invention wherein the bib is supported in a flat, generally planar orientation.

 Figure 3 is a rear plan view of a disposable bib of the present invention.

 Figure 4 is a cross-sectional view taken along lines 4-4 in Figure 2

- 35 Figure 5 is an enlarged, partial schematic illustration of a neck opening having a closed shape, the figure illustrating measurement of the lateral asymmetry ratio and angle B when the bib is supported in a flat, generally planar orientation.

 Figure 6 is an enlarged, partial schematic illustration of a neck opening having an open shape.

5 Figure 7 is a front plan view of a partially assembled bib showing the outer perimeter of the bib and the neck opening, and prior to folding of the bib body to form a pocket panel and an apron panel.

 Figure 8 is a front plan view of a partially assembled bib, wherein a portion of the bib body has been folded to position a pocket panel to overlie a portion of
10 the bib body panel.

 Figure 9 is a front plan view of a bib wherein a portion of the bib body has been folded to position an apron panel to overlie the pocket panel.

 Figure 10 is a cross-sectional view through the body panel, pocket panel, and apron panel taken along lines A-A in Figure 9, and showing an apron panel
15 having a convex outward crease, a pocket panel having a concave outward crease, and the body panel having a concave outward crease.

 Figure 11 is a perspective view of a bib having portions of the pocket and body panels deformed along longitudinally extending creases to provide a pocket gusset.

20 Figure 12 is a cross-sectional view through the body panel, pocket panel, and apron panel similar to that in Figure 11, and showing an apron panel having a convex outward crease, a pocket panel having a convex outward crease, and the body panel having a concave outward crease.

 Figure 13 is a perspective view showing a bib with an apron panel having a
25 laterally extending crease spaced from the open edge of the bib pocket.

 Figure 14A is a plan view of a sheet of material on which partially assembled bibs are arranged in a first nested configuration.

 Figure 14B is a plan view of a sheet of material on which partially assembled bibs are arranged in a second nested configuration.

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DETAILED DESCRIPTION OF THE INVENTION

 Figures 1-3 illustrate a disposable bib 20 according to one embodiment of the present invention. The bib 20 comprises a bib body 22 having longitudinally extending sides 32 and 34, a longitudinal length L, a longitudinal centerline 21, a
35 laterally extending bottom edge 36, and a lateral width W. The term "longitudinal" refers to an axis or direction measured along the length of the bib body 22, which direction or axis is generally parallel to a line extending from the wearer's head to the wearer's waist, as the bib is worn. The terms "lateral" and "transverse" refer to an axis or direction which is perpendicular to the longitudinal
40 centerline 21, and which is generally parallel to a line extending across the wearer's chest as the bib is worn.

5 The bib 20 also comprises a pair of shoulder extensions 24, 26 having proximal ends 24A, 26A and distal ends 24B, 26B. The shoulder extensions 24, 26 extend from the bib body 22 from their proximal ends to their distal ends to provide a generally planar neck opening 200 when the bib is supported on a flat, horizontal surface.

10 The generally planar neck opening 200 has a front neck portion 210, a rear neck portion 230, and a maximum width portion 220 disposed intermediate the front neck portion 210 and the rear neck portion 230. The neck opening 200 also has a longitudinal length 240 measured along the longitudinal centerline 21. (Figure 2)

15 The generally planar neck opening 200 is generally symmetric about a longitudinal axis, such as the longitudinal centerline 21, and is generally asymmetric about a lateral axis passing through the midpoint 242 of the longitudinal length 240 when the bib is supported on a flat, horizontal surface. The lateral asymmetry of the neck opening 200 promotes fit about different neck
20 sizes and shapes without slipping, while reducing the tendency of the bib body 22 to gap away from the wearer's chest when the shoulder extensions 24, 26 are overlapped behind the wearer's neck to fasten the bib to the wearer.

 The bib 20 can also include a pocket 100 extending substantially the full lateral width of the bib 20 for catching and receiving food particles. In one
25 embodiment, the bib body 22 can comprise a body panel 70, a pocket panel 105, and an apron panel 150. The body panel 70 can be separated from the pocket panel 105 by a laterally extending fold in the bib body, and the pocket panel 105 can be separated from the apron panel 150 by another parallel laterally extending fold in the bib body.

30 The body panel 70 is disposed adjacent the wearer's body when the bib is secured to the wearer. The pocket panel 105 can have a generally rectangular shape, and is disposed adjacent the body panel 70 to form a pocket space intermediate the body panel and the pocket panel. The pocket panel 105 extends longitudinally from a pocket bottom edge 120 to a pocket open edge 110, and the
35 pocket panel 105 extends laterally intermediate the bib side edges 32 and 34. The bottom edge 120 and the open edge 110 can both be substantially perpendicular to the longitudinal centerline 21 and substantially parallel to an imaginary lateral axis.

 The apron panel 150 can extend from the pocket open edge 110 to the bib
40 bottom edge 36. The apron panel 150 can depend in a pendulous fashion from the pocket open edge 110 to provide gravitational opening of the pocket 100. The

5 body panel 70, pocket panel 105, and apron panel 150 can be formed from a continuous sheet of material, the sheet of material comprising one or more laminae. U.S. Patent 4,445,231 "Bib Having Gravitationally Openable Pocket" issued May 1, 1984 to Noel is incorporated herein by reference for the purpose of showing a bib construction for forming a bib having a pocket and an apron panel.

10 At least one of the body panel 70, the pocket panel 105, and the apron panel 150 comprise a longitudinally extending crease. In one embodiment, the panels 70, 105, and 150 comprises longitudinally extending creases 570, 505, and 550, respectively (Figure 10). Each of the creases 570, 505, and 550 can be substantially parallel to and substantially aligned with the longitudinal centerline
15 21 of the bib body 22. The pocket panel 105 and the body panel 70 are deformable in a predetermined line defined by the longitudinally extending creases, to thereby form a pocket gusset 600 (Figure 11). The pocket gusset maintains the pocket 100 in an open configuration for receiving spilled liquid and solid material.

20 The bib 20 also preferably comprises a fastening assembly for joining together the shoulder extensions 24 and 26 in an overlapping fashion, to thereby secure the bib 20 to the wearer. The fastening assembly can comprise a mechanical fastener having elements disposed on at least one of the shoulder extensions, which elements penetrate and physically engage a landing surface on
25 the other shoulder extension. In one embodiment, the fastener can comprise an array 305 of projections 310 extending from a substrate 312 joined to the shoulder extension 26. The projections 310 are engagable with a landing surface, the landing surface being disposed on at least a portion of the shoulder extension 24.

In one embodiment, the projections 310 can comprise prongs, and the
30 landing surface can comprise a target surface 350 of a nonwoven web 352 disposed on at least a portion of the shoulder extension 24 (Figures 2-4). In the embodiments shown, the web 352 is disposed on both the shoulder extensions 24, 26 to provide a soft, nonabrasive surface about the wearer's neck.

Referring to the components of the bib 20 in more detail, the bib 20
35 according to the present invention can comprise a composite construction having multiple laminae. For instance, the bib 20 can comprise a laminate of an absorbent outer topsheet layer 40 and a garment facing backsheet layer 80 which is liquid impermeable relative to the topsheet 40. The topsheet 40 has a first outer surface 42 for receiving spilled food material, and a second inner surface 44. The backsheet 80
40 has a first garment facing surface 82 and a second surface 84. The surface 84 of the backsheet 80 and the surface 44 of the topsheet 40 are oppositely facing surfaces,

5 and can be joined together, such as with an adhesive, to form a laminate. In one embodiment, the shoulder extensions 24, 26, the bib body panel 70, the pocket panel 105, and the apron panel 150 are formed from a single, continuous sheet of the laminate of the topsheet 40 and the backsheet 80.

10 The topsheet 40 can comprise a paper web having a basis weight of from about 10 to about 50 pounds per three thousand square feet. The following U.S. Patents are incorporated by reference for the purpose of disclosing how to make tissue paper suitable for use in making a topsheet 40: U.S. Patents 4,191,609; 4,440,597; 4,529,480; 4,637,859; 5,223,096; and 5,240,562. A suitable
15 topsheet 40 can be formed from a single ply or multiple ply paper towel, such as a Bounty Paper Towel manufactured by The Procter and Gamble Company of Cincinnati, Ohio.

The backsheet 80 can comprise a liquid impervious polymeric film, such as a polyolefinic film. In one embodiment the backsheet 80 can comprise a polyethylene film having a thickness of between about 0.0076 millimeter and
20 about 0.0508 millimeter. In one embodiment the backsheet can comprise a FS-II embossed Polyethylene film having a thickness of about 1 mil and manufactured under the designation CPC-2 (P-9703) by Tredegar Film Products of Cincinnati, Ohio.

The topsheet 40 can be joined to the backsheet 80 in any suitable manner,
25 including but limited to methods such as adhesive bonding, mechanical bonding, and ultrasonic bonding. A suitable adhesive for joining the topsheet 40 and the backsheet 80 is a hot melt adhesive such as a hot melt pressure sensitive adhesive. One particular adhesive which is suitable for joining the topsheet 40 to the backsheet 80 is an HL-1258 adhesive manufactured by H. B. Fuller Co. of St.
30 Paul, MN. Other suitable adhesives include Findley Adhesives H2031 and H2120 available from Findley Adhesives of Elmgrove, Wisconsin.

The mechanical fastener can comprise an array 305 of polyolefinic prongs 310 extending from a polyolefinic substrate 312. In one embodiment, the prongs 310 comprise a prong shank 320 extending from a prong base proximal the
35 substrate 312 to a prong end 330 having a width greater than the width of the prong shank. The array 305 can comprise between about 600 and about 3600 prongs 310 per square inch, each having a prong end 330 having an edge which extends radially outward from the prong shank around the entire circumference of the prong shank, the prong end 330 having a generally rounded edge. Such an
40 array of prongs 310 provides a relatively soft, non-abrasive surface to reduce irritation of the wearer's skin.

5 In one embodiment, the array 305 can include about 900 prongs 310 per square inch. The array of prongs 310 can be non-directionally oriented, as compared to some arrays of hook shaped elements, which arrays can have a particular directionality which depends on the orientation of the hook shaped elements. A suitable fastener comprising a substrate 312 having pressure sensitive
10 adhesive disposed on a first surface of the substrate and a non directional array 305 of prongs 310 extending from a second, opposite surface of the substrate is manufactured by the 3M Company of St. Paul, MN under the designation XPH-4152.

In another embodiment, the array 305 of prongs 310 can comprise about
15 2500 prongs per square inch, and can comprise a fastener manufactured by the 3M Co. under the designation XPH-4182.

In an alternative embodiment, the fastener can comprise an array 305 of hook shaped elements. A suitable fastener comprising hook shaped elements is manufactured by the 3M Company under the designation KN0513.

20 The following documents are incorporated by reference for the purpose of disclosing suitable arrays of target surface engaging elements, including directional and non-directional arrays, and including hook shaped and non-hook shaped target engaging elements: U.S. Patent 4,216,257 issued Aug. 5, 1980; U.S. Patent 4,846,815 issued July 11, 1989; U.S. Patent 4,894,060 issued Jan.
25 16, 1990; U.S. Patent 5,392,498 issued Feb. 28, 1995; U.S. Patent 5,326,612 issued July 5, 1994; and U.S. Patent 5,407,439 issued April 18, 1995; and PCT Publication WO 94/23610 published October 27, 1994.

The target surface 350 can comprise the surface of a nonwoven web of fibers 352 disposed on at least a portion of the shoulder extensions 24 and 26 to
30 cover an upper portion of the surface 42 of topsheet 40. In the embodiment shown in Figure 2, the target surface 350 extends over the majority of the outer surface of the shoulder extensions 24 and 26, and terminates at a lower edge 354. The edge 354 is located adjacent to the juncture of the rear neck opening portion 230 with the maximum width neck portion 220.

35 Accordingly, the nonwoven web extends over portions of the shoulder extensions which can come in contact with the wearer's skin, such as portions of the shoulder extensions 24 and 26 which are bounded by the rear neck opening portion 230, and presents a soft, non-irritating surface to the wearer's skin. In
40 alternative embodiment, the nonwoven web can extend below the perimeter 201 of the front neck opening portion 210, and can cover all or a portion of the body panel 70. The nonwoven web 352 can have the characteristic that it permits

5 liquids to pass through to the absorbent topsheet layer 40, while the surface 350 remains relatively dry to the wearer's touch. In addition, the nonwoven web 352 can contribute to the absorbency of the bib by creating void space intermediate the nonwoven web 352 and the topsheet 40.

10 The nonwoven web 352 is selected so that the prongs 310 can securely engage the fibers of the web 352. In one embodiment, the target surface 350 can comprise the surface of a web 352 of spunlaid, thermally point bonded polypropylene fibers, the web having a basis weight of about 22 grams per square meter and the fibers having an average denier less than about 3.0 grams per 9000 meter of fiber length. A suitable nonwoven web 352 is manufactured by the
15 Fiberweb Corp. of Simpsonville, S.C. under the designation Celestra Unicorn. Such a web of fibers provides a target surface which can be securely engaged by the above listed prongs 310, and which is soft and nonabrasive to the wearer's skin.

The generally planar neck opening 200 can have a closed shape, as shown in
20 Figure 5, or an open, rearwardly converging shape, as shown in Figure 6. In either case, the maximum lateral width of the opening 200 is located in the maximum width portion 220 disposed intermediate the front and rear neck portions. The maximum lateral width located in the maximum width portion 220 is greater than lateral widths measured in the front and rear neck opening
25 portions. In contrast, U shaped and V-shaped neck openings are not rearwardly converging, and do not include a maximum width portion disposed intermediate a front neck opening portion and a rear neck opening portion.

The maximum width portion 220 of the opening 200 can have a finite longitudinal length 225, as shown in Figure 5 (e.g. the portion 220 has a
30 generally rectangular shape), or alternatively, the maximum width portion 220 can be a line of maximum width, as shown in Figure 6. The longitudinal length 225 of the maximum width portion 220 can be less than the longitudinal length 215 of the front neck opening portion 210, as measured along the longitudinal centerline 21.

35 If the neck opening has a closed shape, the length 240 is measured along the longitudinal centerline 21 between opposite points on the perimeter 201 of the opening 200. If the neck opening 200 has an open, rearwardly converging shape, as shown in Figure 6, the minimum lateral width 246 separating the edges of the shoulder extensions 24 and 26 in the rear neck opening portion is first identified.
40 The longitudinal length 240 is then measured along the longitudinal centerline 21 from the front neck opening portion 210 to the midpoint of the lateral width 246.

5 If there are multiple locations in the rear neck portion 230 having the minimum lateral width 246, the length 240 is measured from the front neck opening to the midpoint of the minimum lateral width 246 positioned closest to the front neck opening portion 210.

The front neck opening portion 210 can have a perimeter 201 comprising a
10 shape which is generally concave with respect to the center of the neck opening (i.e. concave upward as the bib is worn) as shown in Figure 5. The perimeter 201 of the front neck portion 210 can comprise any number of commonly recognized geometric shapes, including but not limited to oval, circular, parabolic, or elliptical shapes. Alternatively, the perimeter of the front neck
15 portion 210 could comprise one or more straight line segments, one or more curved segments, or a combination of straight line segments and curved segments.

A plurality of slits 211 can extend in a generally radial fashion from the perimeter 201 of the front neck opening portion 210. The slits 211 provide a
20 close yet comfortable fit of the perimeter 210 of front neck opening portion 210 against the wearer's neck. The slits 211 allow the resulting petal like portions of bib intermediate the slits 211 to slide over each other as the shoulder extensions 24, 26 are overlapped. The slits 211 thereby help reduce distortion and gapping of the bib body as the neck opening 200 is made to conform to the wearer's neck. Accordingly, the slits 211 cooperate with the shape of the neck opening 200 to
25 improve fit of the bib about the wearer's neck, and reduce distortion and gapping of the bib body as the shoulder extensions 24, 26 are overlapped to accommodate a particular neck size. Such slits, or bifurcations, are disclosed generally in U.S. Patent 4,416,025 to Moret, which Patent is incorporated herein by reference.

The rear neck opening portion 230 can have a perimeter 201 comprising
30 straight line segments, curved segments, or a combination of straight line segments and curved segments. In Figures 5 and 6, the perimeter of the rear neck portion 230 comprises generally straight line segments defined by the inside edges of the shoulder extensions 24 and 26. These straight line segments are convergent, but do not necessarily intersect, as the rear neck opening portion 230
35 extends from the maximum width portion 220, such that the rear neck opening portion 230 is tapered as it extends from the maximum width portion 220. The concave perimeter of the front neck opening portion 210 and the tapered rear neck opening portion 230 provide a teardrop shaped neck opening 200, as shown in Figure 5. Figure 6 shows a teardrop shaped neck opening 200 which is truncated.

40 The rear neck opening portion 230 can have a longitudinal length 235 which is greater than the longitudinal length 215 of the front neck opening portion 210,

5 as shown in Figures 3. In one embodiment, the longitudinal length 235 is at least about 1.2 times, in another embodiment, at least about 1.5 times, and in still another embodiment, at least about 2.0 times the longitudinal length 215. For instance, in one nonlimiting embodiment, the length 215 can be about 1.2 inches, the length 225 can be about .64 inch, the length 235 can be about 2.7 inch, and
10 the lateral width of the maximum width portion 220 can be about 3.4 inch.

Varying neck sizes and shapes having a lateral width less than that of the maximum width portion 220 can be accommodated by overlapping the shoulder extensions 24 and 26 to different degrees. Overlapping the shoulder extensions 24 and 26 to releasably fasten the shoulder extensions behind the wearer's neck will
15 generally cause at least some distortion of the bib body 22, which can cause the bib body 22 to gap away from the wearer's chest. This distortion will generally increase as the shoulder extensions are overlapped to a greater degree.

The bib of the present invention provides a neck opening 200 which, for a given maximum lateral width and perimeter of the opening 200, securely fits a
20 wide range of neck sizes and shapes while minimizing the above mentioned distortion and gapping. Bibs with shoulder extensions defining a circular neck opening when the bib is in a generally planar orientation will generally exhibit high distortion when the shoulder extensions are overlapped to fit necks significantly smaller than the diameter of the circular opening. Bibs having a
25 neck opening with a laterally elongated oval shape (major axis oriented laterally) will also exhibit significant distortion as the shoulder extensions are overlapped to accommodate smaller neck sizes.

Bibs with shoulder extensions defining a longitudinally elongated oval shaped neck opening (major axis oriented longitudinally) when the bib is in a
30 generally planar orientation can exhibit less distortion than bibs having laterally elongated openings. However, such a neck opening shape may act as a slot, allowing the bib to shift longitudinally relative to the wearer. Bibs having shoulder extensions defining a U or V-shaped neck opening when the bib is in a generally planar orientation can also exhibit excessive distortion when the
35 shoulder extensions are overlapped, and can shift longitudinally.

The bib of the present invention provides the advantage that the shoulder extensions 24 and 26 engage the rear portion of the wearer's neck at varying degrees of overlap to accommodate a wide arrange of neck sizes, while reducing the amount of distortion of the bib body 22 which would otherwise occur as the
40 overlap is increased to accommodate relatively smaller neck sizes.

The generally planar neck opening 200 according to the present invention

5 has a lateral asymmetry ratio greater than 1.0. In some embodiments, the ratio can be at least about 1.15, in other embodiments at least about 1.25, in yet other embodiments at least about 1.5. A bib opening 200 having longitudinal symmetry and a lateral asymmetry ratio greater than 1.0 provides the advantage that the perimeter 201 of the rear neck opening portion can engage the back portion of
10 necks of various size with minimal distortion and gapping of the bib body 22. Referring to Figures 5 and 6, the lateral asymmetry ratio is measured using the following procedure.

The bib 20 is supported on a flat, horizontal surface to provide a generally planar neck opening 200. A "generally planar neck opening 200" is provided
15 when the shoulder extensions 24, 26 and the body panel 70 are in substantially the same plane and the shoulder extensions 24, 26 are in a non-overlapping configuration. The midpoint 242 of the length 240 is then located, such as with a ruler having its edge placed over the bib and along the centerline 21. The location of the midpoint can be marked on the flat, horizontal surface. An imaginary line
20 is then constructed which extends through the midpoint 242 of the longitudinal length 240 of the neck opening and which intersects the perimeter 201 of the neck opening 200 at two points: a first intersection point 261 located on the perimeter of the rear neck portion 230 and a second intersection point 262 in an opposite portion of the perimeter of the neck opening (points 261, 262, and 242 are
25 collinear). The location of point 261 is chosen so that the ratio of the distance 264 (measured from the midpoint 242 to the second point 262) to the distance 263 (measured from the midpoint 242 to the first point 261) is maximum. This ratio, obtained by dividing distance 264 by distance 263, is the asymmetry ratio of the neck opening 200.

30 In one embodiment the generally planar neck opening 200 has a lateral asymmetry ratio within a particular angular portion of the neck opening 200, as defined by an angle B. It is desirable that the generally planar neck opening 200 have a lateral asymmetry ratio exceeding 1.0 within a particular angular portion of the neck opening so that the neck opening can securely engage the back portion of
35 the wearer's neck with a component of force which prevents slipping or shifting of the bib relative to the wearer.

Referring to Figures 5 and 6, angle B is measured from a lateral axis passing through midpoint 242. In one embodiment, the neck opening 200 has an asymmetry ratio of at least about 1.15, in another embodiment at least about 1.25,
40 and in yet another embodiment at least about 1.5, wherein the asymmetry ratio is positioned within an angular portion of the neck opening defined by: 15 degrees

- 5 $\angle B < 80$ degrees, and more particularly, within an angular portion defined by 30 degrees $\angle B < 75$ degrees.

Prior to the time the bib is to be used, the shoulder extensions 24 and 26 can be joined together, such as at their distal ends 24B, 26B, along a selective line of weakening 270. When the bib is to be used, the shoulder extensions are separable
10 along the selective line of weakening 270, such that the shoulder extensions can be separated without tearing or otherwise damaging other portions of the bib, and releasably joined together in an overlapping fashion by the fastening assembly.

In one embodiment, the selective line of weakening 270 is aligned with the longitudinal centerline 21, and comprises a plurality of spaced apart perforations 271.
15 The perforations 271 extend partially or fully through the thickness of the bib 200. The perforations can be formed with a perforating knife, and can extend through each of the backsheet 80, topsheet 40, and nonwoven web 352.

The selective line of weakening 270 provides the advantage that the distal ends of the shoulder extensions are interconnected, rather than loose, prior to use. The
20 bib is therefore easier to handle prior to use. In addition, the use of a selective line of weakening provides for ease of manufacturing. For instance, the bibs 20 can be manufactured by joining together continuous webs of the backsheet 80 material, the topsheet 40 material, and the nonwoven 352 material to form a continuous, multiple laminae sheet. The multiple laminae sheet can then be perforated at predetermined
25 positions corresponding to the desired location of each bib to be cut from the sheet.

The bibs can then be cut from the sheet according to a predetermined pattern. Accordingly, there is no need to attempt to position or support loose distal ends of the shoulder extensions during manufacturing. Figure 14A shows a sheet having partially completed bibs in a first nested configuration relative to a machine direction
30 of movement of the sheet of material, with the outer perimeters and neck openings of the bibs shown. The multiple laminae sheet can be moved continuously between a first die cutting station, where the neck openings of the bibs are cut out, to a second die cutting station where the outer perimeters of the bibs are cut to release the individual partially completed bibs from the sheet. Folding of the partially completed
35 bib to form the panels 105 and 150 can occur before cutting begins, between cutting operations, or after all cutting operations are completed.

In Figure 14A, the partially completed bibs are arranged with their lengthwise dimension parallel to a cross-machine direction, so that the bottom edges 36 of the partially completed bibs form the edges of the moving sheet. The arrangement
40 shown in Figure 14A can reduce the scrap material generated, and eliminate the need for a scrap trimming operation along the shoulder extensions' outer perimeter.

5 Figure 14B shows a sheet having partially completed bibs in a second nested configuration relative to the machine direction of movement of the sheet of material. In Figure 14B, the lengthwise dimension of the partially completed bibs is oriented parallel to the machine direction of the moving sheet.

The bib 20 of the present invention can comprise one or more creases
10 positioned in predetermined locations. The creases can be formed by folding the bib 20 for packaging. The creases can be positioned to facilitate opening of the pocket 100, and maintaining the pocket 100 in an open configuration.

Figure 7 shows a partially constructed bib structure. In Figure 7, the neck opening 200 and the outer perimeter of the bib have been cut from a sheet of
15 material comprising a topsheet 40 layer adhesively joined to a backsheet 80 layer. In addition, a nonwoven web 352 has been secured to cover the shoulder extensions 24 and 26. In Figure 7, the pocket 100 has not yet been formed.

In Figure 7, adhesive 99 has been applied along the edges of the partially constructed bib. The partially constructed bib can then be folded along a fold line
20 410, as shown in Figure 8 to create pocket bottom edge 120, and to position the pocket panel 105 adjacent the body panel 70, such that the pocket panel 105 overlies a bottom portion of the body panel 70. The adhesive 99 joins the longitudinally extending edges of the pocket panel 105 to the bottom portions of the longitudinally extending edges of the body panel 105, such that the pocket 100
25 is closed along the pocket bottom edge 120 and along its longitudinally extending side edges.

The pocket panel 105 is preferably seamless intermediate its longitudinally extending edges, such that pocket panel 105 extends as a single unitary panel intermediate its longitudinally extending edges. Seams, such as those formed by
30 joining together two edges of pieces of material with adhesive, are undesirable in the pocket panel 105 because they require added construction steps, and because seams can affect the operation of the creases formed in the panel by folding.

The partially constructed bib can then be folded along a fold line 420 which is parallel to a lateral axis, as shown in Figure 9, to create a crease forming the
35 pocket open edge 110, and such that the apron panel 150 overlies the pocket panel 105. In one embodiment, the body panel 70 can also be folded along a laterally extending fold line 430. The fold line 430 is generally parallel to, and underlies, the pocket open edge 110. Folding the body panel 70 along the fold line 430 creates a crease 530 (Figure 11) in the body panel 70 which is generally parallel
40 to, and underlies, the pocket open edge 110 when the bib 20 is in a generally planar configuration.

5 The bib body panel 70 can next be folded along fold line 440 so that the shoulder extensions 24, 26 overlie a portion of the bib body panel and the pocket panel 105. In embodiment, the bib body panel can be folded along fold line 440 with the bib in the configuration shown in Figure 8, so that portions of both the panels 105 and 150 are directly subjacent the shoulder extensions 24, 26.
10 Alternatively, the bib can be folded along fold line 440 with the bib in the configuration shown in Figure 9, so that panel 150 is subjacent the shoulder extensions 24, 26, and panel 105 is subjacent panel 150.

 According to the present invention, the bib can be folded along a longitudinally extending fold line 460 to form at least one longitudinally extending
15 crease in each of the body panel 70, the pocket panel 105, and the apron panel 150. Without being limited by theory, it is believed that such creases aid in maintaining the pocket 100 in an open configuration.

 Depending on the configuration of the bib when the fold along line 460 is made, the resulting creases in the body panel 70, the pocket panel 105, and the
20 apron panel 150 can be convex outward or concave outward.

 For instance, if the bib is in the configuration shown in Figure 8 when it is folded along fold line 460, the bib can be folded so that edges of the bib are rotated upward out of the plane of Figure 8. Then, when the bib is unfolded to the configuration shown in Figure 9, longitudinal creases will be as shown in
25 Figure 10, which is a cross-sectional view through the panels of the bib taken along line A-A in Figure 9.

 Referring to Figure 10, such folding provides a longitudinally extending crease 550 on the apron panel 150, a longitudinally extending crease 505 on the pocket panel 105, and a longitudinally extending crease 570 on the portion of the
30 body panel 570 subjacent the pocket panel. The crease 550 is convex outward, and the creases 505 and 570 are concave outward (outward is the direction away from the wearer's body as the bib is worn, so that the convexity of the crease 550 in the apron panel 150 is opposite to that of the crease 505 in the pocket panel 105).

35 The creases 550, 505, and 570 aid in holding the pocket 100 open. Referring to Figure 11, with the bib 20 secured to the wearer, the outwardly convex crease 550 facilitates grasping of the panel 150, such as been the thumb and forefinger. The apron panel can be pulled outward and downward to open the pocket 100. Without being limited by theory, the convex outward crease 550 can
40 also space a portion of the apron panel 150 along the centerline 21 outward of the

5 edge 110, so that the weight of the portion of apron panel along the centerline 21 is more effective in opening the pocket 100.

As the apron panel 150 is pulled outward and downward, the pocket bottom edge 120 can deform upwardly at its center point along the longitudinal centerline, such that the panel 105 is deformed along crease 505 and body panel 70 is deformed along crease 570. Such deformation of the pocket panel 105 and the body panel 70 along predetermined directions defined by the creases 505 and 570 can form a pocket gusset 600 for maintaining the pocket 100 in an open configuration, as shown in Figure 11. Formation of the gusset 600 can be aided by exerting an upward force (such as by a forefinger) at the center of the edge 120 while simultaneously pulling outward and downward on the apron panel 150 along the crease 550.

The pocket gusset extends intermediate the body panel 70 and the pocket panel 105. The gusset 600 can extend from at least part of the crease 505 to at least part of the crease 570. The gusset 600 can thereby separate a portion of the pocket panel 105 from a portion of the body panel 70, and act as stiffener for preventing the panels from coming together and closing the pocket 100. Formation of the gusset 600 can create a crease 610 at the apex of the gusset. The crease 610 extends intermediate the body panel 70 and the pocket panel 105. The crease 610 can comprise a portion of at least one of the creases 570 and 505.

25 In some embodiments, it may be desirable to prevent the gusset 600 from extending above the level of the pocket open edge 110. When the bib body is folded to create the laterally extending crease 530, as described above, the crease 530 can serve to prevent the gusset 600 from extending upward along the longitudinal centerline 21 above the level of the pocket open edge 110. Alternatively, the body panel 70 can comprise a laterally extending stiffener for preventing the gusset 600 from extending above the level of the pocket opening 110.

The pocket panel 105 and the body panel 70 preferably each comprise a single longitudinally crease. The pocket panel 105 is substantially free of longitudinally extending creases intermediate the longitudinally extending crease 505 and each of the bib side edges 32, 34 of the bib. Similarly, the body panel 70 is preferably substantially free of longitudinally extending creases intermediate the longitudinally extending crease 570 and the side edges 32, 34 of the bib. Such additional creases can result in excessive stiffening of the panels 70 and 105, thereby reducing the ability of the panels to deform to create the gusset 600.

5 In the embodiment shown in Figure 13, the apron panel comprises a laterally extending crease 595. The crease 595 is disposed intermediate the edge 110 of the pocket panel and the bottom edge 36, and the edge 110 and the crease 595 can both be substantially parallel to a lateral axis. The crease 595 is spaced from the edge 110 of the pocket panel 105 to provide a lever arm effect. The
10 crease 595 spaces a portion of the apron panel 150 outwardly from the edge 110, so that the weight of the apron panel 150 is more effective in opening the pocket 100. The crease 595 can be spaced about 0.5 inch to about 1.5 inch from the edge 110 to form a ledge 596 in the apron panel 150.

In an alternative embodiment, the partially constructed bib in Figure 7 can
15 first be folded along the fold line 430 so that the surface 42 below the line 430 overlies and faces the surface 42 above the line 430. The partially constructed bib can then be folded along a longitudinally extending line to form a convex outward crease 550, a convex outward crease 505, and a concave outward crease 570. Next, the partially constructed bib can be unfolded along the longitudinally
20 extending line to the configuration shown in Figure 7. The bib construction can then be completed by folding and gluing pocket panel 105, and folding apron panel 150. The resulting panel creases are shown in Figure 12.

The crease configuration of Figure 12 provides advantages in channeling spilled material into the pocket 100. A concave outward crease 570 provides the
25 bib body with a shape which directs spills toward the longitudinal centerline 21. A concave outward crease 570 coupled with a convex outward crease 505 promotes separation of the pocket panel 105 from the body panel 70, especially along the longitudinal centerline 21.

Other crease arrangements can also be constructed, such that the creases
30 550, 505, and 570 are: all convex outward; all concave outward; 550 and 570 convex outward, 505 concave outward; 550 concave outward, 505 and 570 convex outward; 550 and 505 concave outward, 570 convex outward; and 550 and 570 concave outward, 505 convex outward.

35 While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is intended to cover in the appended claims all such changes and modifications that are within the scope of the invention.

1. A disposable bib comprising:
a bib body having a longitudinal length and a lateral width; and
a pair of shoulder extensions extending from the bib body to provide a generally planar neck opening having a longitudinal length, each shoulder extension having a proximal end and a distal end;
wherein the generally planar neck opening has a front neck portion, a rear neck portion, and a maximum width portion disposed intermediate the front neck portion and the rear neck portion, and wherein the generally planar neck opening is generally symmetric about a longitudinal axis and generally asymmetric about a lateral axis passing through the midpoint of the longitudinal length of the neck opening.
2. The disposable bib of Claim 1 wherein the generally planar neck opening has a lateral asymmetry ratio of at least about 1.15; preferably at least about 1.25; and more preferably at least about 1.5.
3. The disposable bib of Claim 2 wherein the generally planar neck opening has a lateral asymmetry ratio of at least about 1.15 within an angular portion of the neck opening defined by: $15 \text{ degrees} < B < 80 \text{ degrees}$; wherein the generally planar neck opening preferably has a lateral asymmetry ratio of at least about 1.25 within an angular portion of the neck opening defined by: $15 \text{ degrees} < B < 80 \text{ degrees}$; wherein the generally planar neck opening more preferably has a lateral asymmetry ratio of at least about 1.25 within an angular portion of the neck opening defined by: $30 \text{ degrees} < B < 75 \text{ degrees}$; and wherein the generally planar neck opening most preferably has a lateral asymmetry ratio of at least about 1.5 within an angular portion of the neck opening defined by: $30 \text{ degrees} < B < 75 \text{ degrees}$.
4. The bib of Claims 1, 2, or 3 wherein the front neck portion of the generally planar neck opening comprises a perimeter having a generally concave shape.
5. The bib of Claims 1, 2, 3, or 4 wherein the rear neck portion has a longitudinal length which is at least about 1.2 times, more preferably at least about 1.5 times, and most preferably at least about 2.0 times greater than the longitudinal length of the front neck portion.
6. The bib of Claims 1, 2, 3, 4, or 5 comprising a generally teardrop shaped planar neck opening.

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7. The bib of Claims 1, 2, 3, 4, 5, or 6 wherein the bib body comprises a plurality of slits extending from the front neck portion of the generally planar neck opening.
8. The disposable bib of Claims 1, 2, 3, 4, 5, 6, or 7 wherein the pair of shoulder extensions extend from the bib body to provide a generally planar neck opening having a longitudinal length, each shoulder extension having a proximal end and a distal end; and
wherein the bib further comprises a fastener associated with at least one of the distal ends of the shoulder extensions for releasably joining the shoulder extensions together in overlapping fashion adjacent their distal ends;
wherein the fastener preferably comprises a plurality of projections extending from one of the shoulder extensions and a target surface engagable by the projections, the target surface disposed on the other of the shoulder extensions.
9. The bib of Claims 1, 2, 3, 4, 5, 6, 7, or 8 wherein the distal ends of the shoulder extensions are joined together along a selective line of weakening to form a generally planar neck opening having a closed shape, and wherein the shoulder extensions are separable along the selective line of weakening.



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