



(19) **United States**
(12) **Patent Application Publication**
Tai

(10) **Pub. No.: US 2008/0098502 A1**
(43) **Pub. Date: May 1, 2008**

(54) **CURVED BILL**

Publication Classification

(76) Inventor: **Tung-Hua Tai**, Taipei (TW)

(51) **Int. Cl.**
A42B 1/00 (2006.01)
(52) **U.S. Cl.** 2/175.1

Correspondence Address:
SALLY CHANG
7F, NO. 3, ALLEY 32, SEC. 6 CHUNG-HSIAO
EAST RD., TAIPEI, TAIWAN, R.O.C. 115
TAIPEI 115

(57) **ABSTRACT**

(21) Appl. No.: **11/715,896**

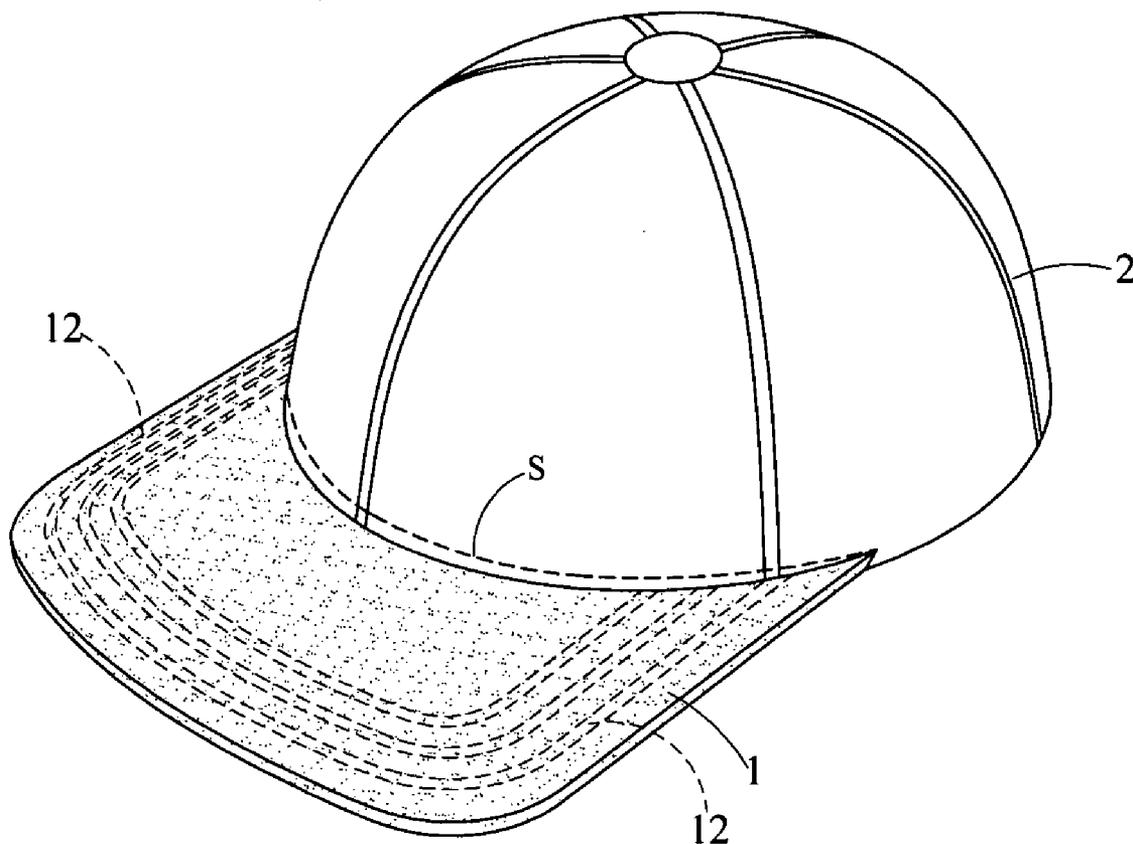
A flexible bill includes a plurality of flexible line segments disposed inside the bill to keep a fashioned curve according to the line segments influenced by an outer force. The bill **1** is combined to a crown **2** to form a cap by stitching a rear fringe of the bill to a front fringe of the crown **2**. Said bill **1** includes a lining **13** made of ethylene vinyl acetate (EVA) clothed by twill **11**. At least, three flexible line segments **12** are disposed between the EVA lining **13** and the twill **11**. Flexible line segments are arrayed side to side in parallel to the bill equidistantly. They can be disposed above or below the bill **1**. The flexible line segments **12** are made of high density polyethylene (HDPE).

(22) Filed: **Mar. 9, 2007**

(30) **Foreign Application Priority Data**

Oct. 23, 2006 (TW) 095218698

10



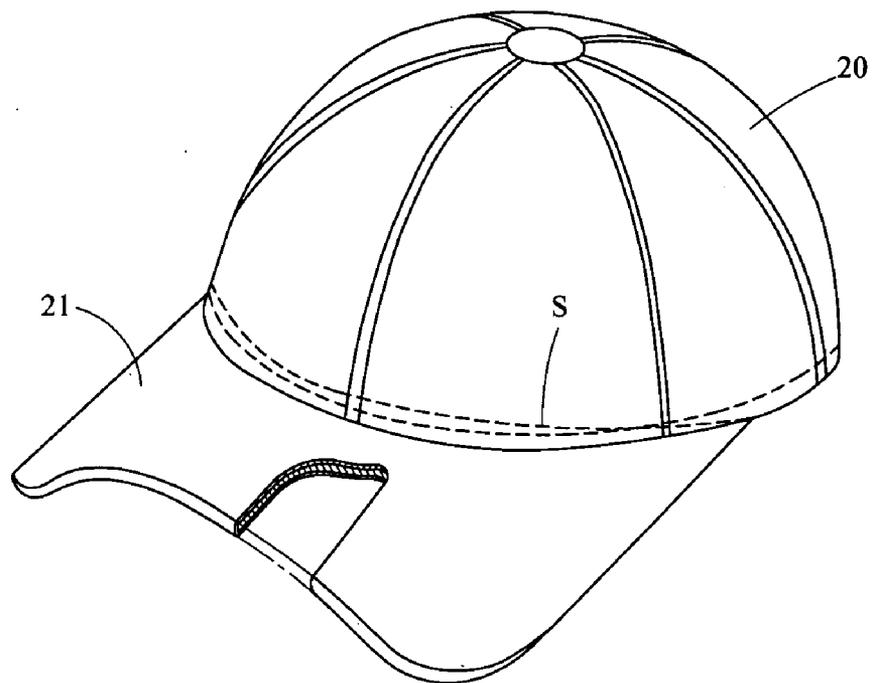


FIG. 1
Prior art

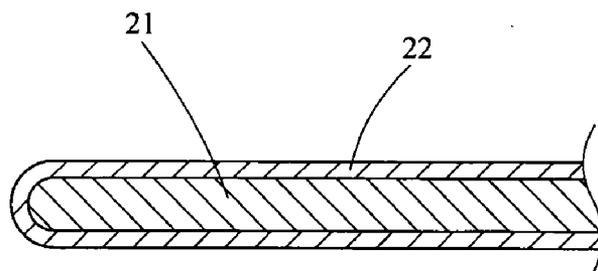


FIG. 2
Prior art

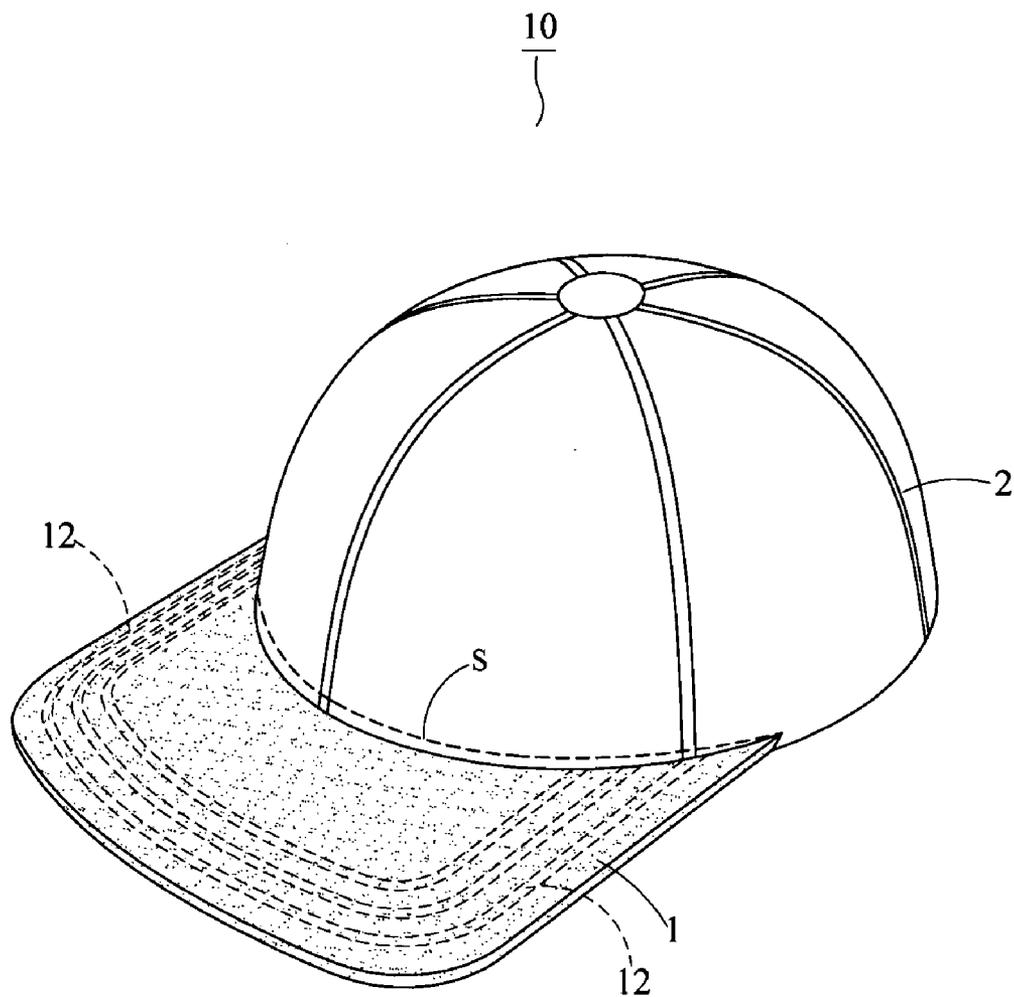


FIG. 3

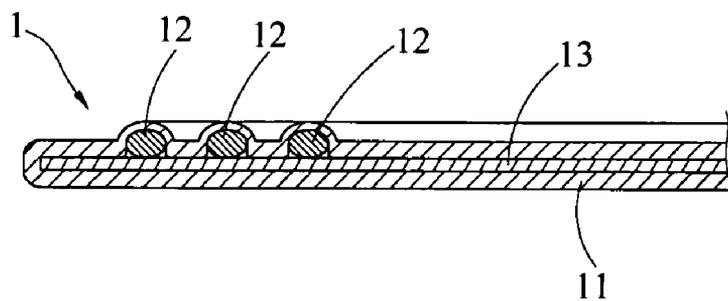


FIG. 4

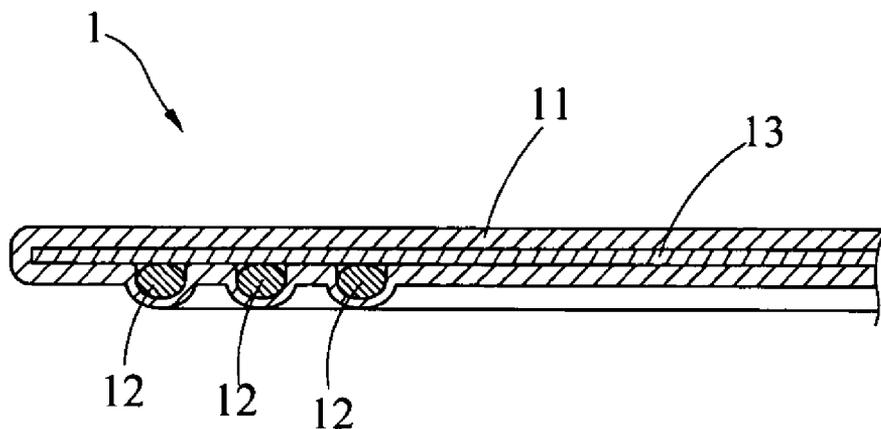


FIG. 5

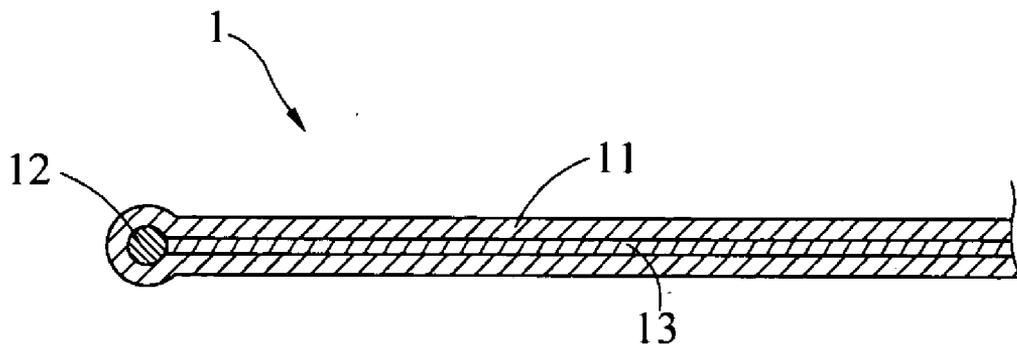


FIG. 6

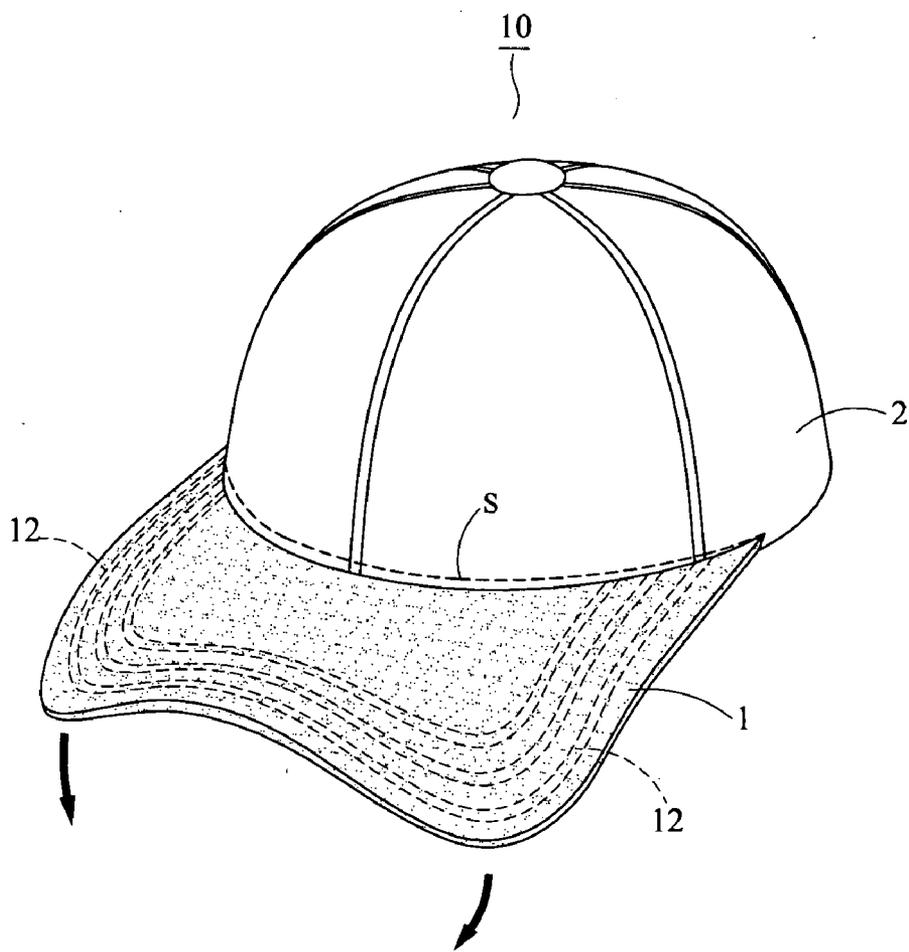


FIG. 7

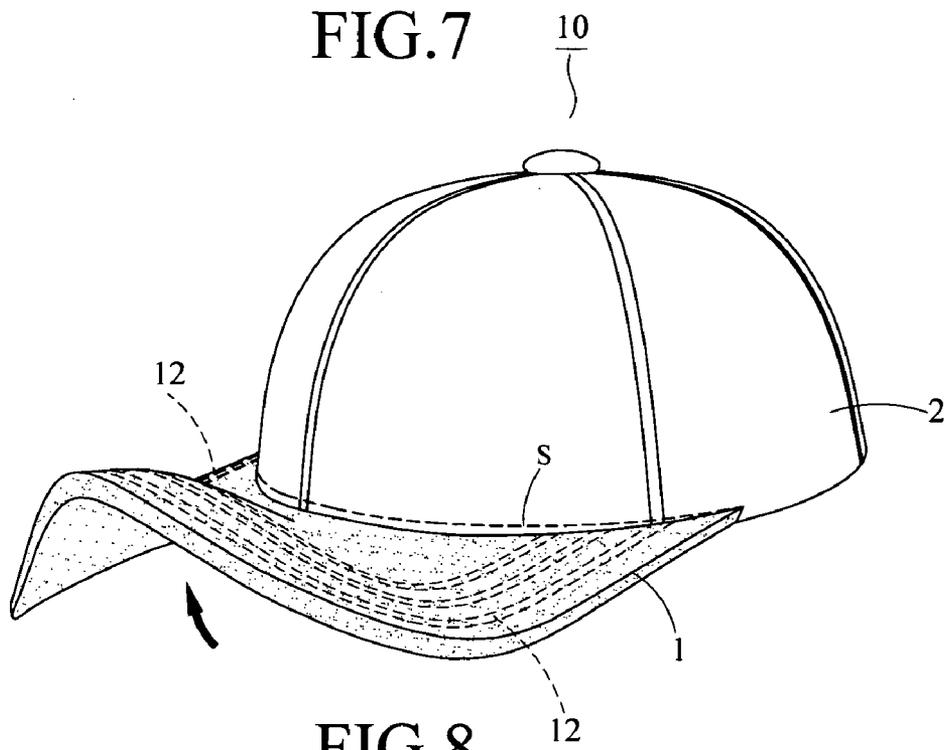


FIG. 8

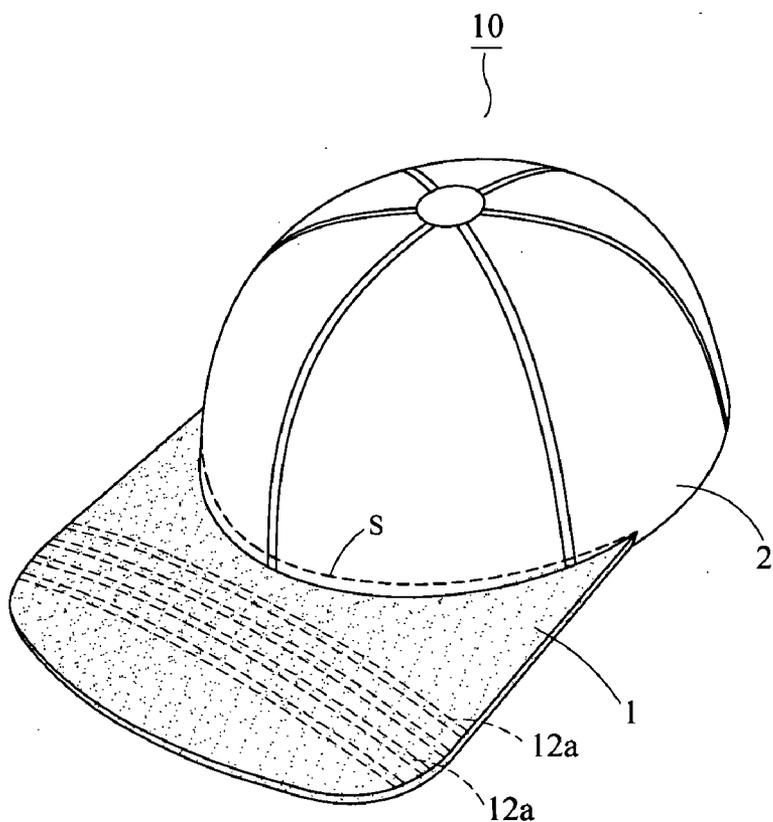


FIG. 9

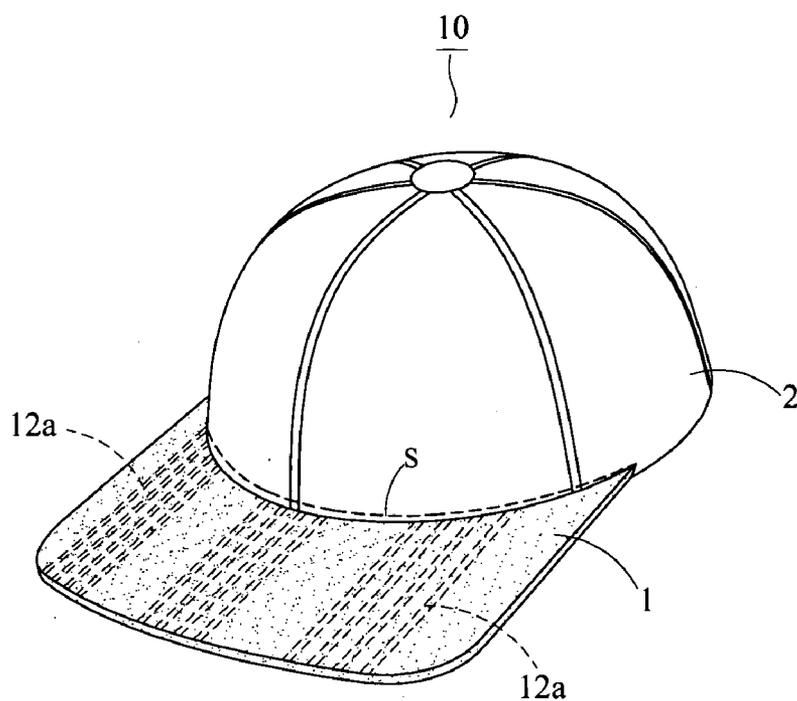


FIG. 10

CURVED BILL

FIELD OF THE INVENTION

[0001] The present invention is related to a bill of a cap; particularly a bill bent to form different shapes by hand as users desired.

BACKGROUND OF THE INVENTION

[0002] On the market, a bill of a cap usually is composed of a fixed shape of plastic lining covering with layers of fabrics. Such a bill, after bending, could not keep a deformed shape, but soon restore to the original shape. Therefore, the shape of the bill has no chance to show any tasteful, elegant transformation subject to alterations. For a longer while, the bill will be a dull, stiff decoration to the cap without any freshness. Accordingly, those skilled in the art have provided a freely transformable bill, such as U.S. Pat. No. 6,735,782 entitled "Cap with a freely transformable visor" to Boo Yi Park on May 18, 2004. Park taught a piped fabric portion adjacent an outer periphery of upper and lower fabrics, into which a deformable plastic sheath defining a channel, and a metal material lying within the channel enclosed thereby allows the visor (i.e. bill) to be readily bent or folded as well as easily restored to its original configuration. Though the piped fabric portion overextended or overarched too much may cause "metal fatigue" to the metal material. When laundering, the metal material may be rusty by washing soda or laundry detergent.

[0003] Further, as shown in FIGS. 1 and 2, a perspective view and a sectional view of US application serial no. 2006/014793 entitled "Visor cap or hat having foldable bill" assigned to Sung Yie Liao and earlier published on Jul. 6, 2006. Liao taught a visor made of high density polyethylene (HDPE) support (i.e. lining) is hidden inside two layers of fabrics. HDPE may keep a deformed shape, when bent. Therefore, HDPE hidden inside the fabrics as a visor may impart a certain fixed pattern when bending.

[0004] HDPE is a tough thermoplastic resin, can be acquired when manufacturing under lower pressure or liquefying the phase change (gaseous) ethylene. HDPE is a wax-like feeling, opaque material, with a melt point higher than 134° C., it is harder and more rigid than polyethylene (PE) with a hardness about industrial standard of Japan (JIS) hardness (HS JISA shore D) 65~68 but its density is in the range of 0.941~0.965 g/cm³ even lighter than water (about 1 g/cm³). HDPE also resists erosion against acid/alkaline liquid. On the market, more than half of plastic bags or bottles either transparent or translucent are made of PE, for example, the market share of the bottle made of polyethylene terephthalate (PET) in China is almost 70%, in Taiwan, about 50%.

[0005] Large molecular chain of HDPE has ultimate strength larger than other polymers, such as nylon, Kevlar, polyester, polypropylene, polyoxymethylene (POM), polyvinyl alcohol (PVA), and HDPE has a high modulus.

[0006] HDPE, in use, usually requires an overall installed cost, such as the cross section of HDPE roll is distorted into an oval to lower the capacity than a circular cross section. And the last several wraps of HDPE are usually scrapped. Further, HDPE is available in thicknesses ranging from 40 to 120 mil. And HDPE is noted for less toxic, but cost more than such as PVC.

[0007] Thereby, whenever we adopted a cap bill mainly made of a whole piece of HDPE, which is cost-inefficient

further because of its lack of flexibility, such HDPE bill with cap is occupied a bulky space for storing it within a container or a closet. Even laundering a cap with bill made of HDPE, such a piece of cap and bill should not be laundered through washer machine, because the whirlpool may cause damage to the integral shape of the bill with cap.

[0008] Further, bill made of HDPE is formed without any capillary tubes therethrough, in other words, bill made of HDPE is not expected to be air permeable.

[Problems to be Solved by the Invention]

[0009] Accordingly, the present invention is to provide a bill of cap with flexibility and air permeability, after bending, a fixed shape can be retained. And manufacturing of the cap bill is cost-efficient.

SUMMARY OF THE INVENTION

[Means of Solving Problems]

[0010] The present invention is to provide a curved bill comprising: a rear fringe coupled to a front edge of a crown portion by stitching, said bill includes a layer of ethylene vinyl acetate (EVA) covered by a twill layer with a plurality of high density polyethylene flexible line segments stitched along an inner side of said bill said plurality of line segments are parallel and equally spaced from each other, whereby the bill can be retained in a fixed shape upon bending of the bill; wherein a first respective end of said plurality of line segments is attached at a first rear end of the bill and extends in a U-shape such that second respective ends of said plurality of line segments is attached at a second rear end of the bill spaced from said first end.

[0011] The curved bill as mentioned above wherein said plurality of line segments extend across said bill in a transverse configuration.

[0012] The curved bill as mentioned above wherein said plurality of line segments extend in a longitudinal direction from said rear end to a front end of the bill.

[0013] The curved bill as mentioned above wherein a diameter of the flexible line segment is in the range of 0.6~1.5 mm.

[0014] The curved bill as mentioned above wherein the number of said flexible line segment is in the range of 3~20 segments.

[0015] The curved bill as mentioned above wherein both ends of stitches S, which extend between the crown and the bill, meet both ends of the line segments by stitching, where both ends of curved line segments are converged to a middle portion of the stitches S.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1: shows a perspective view of a cap with foldable bill of prior arts;

[0017] FIG. 2: shows a sectional view of a cap with foldable bill of prior arts;

[0018] FIG. 3: shows a perspective view of a cap with ethylene vinyl acetate (EVA) lining of the first embodiment of the present invention;

[0019] FIG. 4: shows a cross sectional view of FIG. 1;

[0020] FIG. 5: shows another cross sectional view of FIG. 1;

[0021] FIG. 6: shows another cross sectional view of FIG. 1;

[0022] FIG. 7: shows a schematic view of a cap with EVA lining of FIG. 1 in use;

[0023] FIG. 8: shows another schematic view of FIG. 1 in use;

[0024] FIG. 9: shows a perspective view of a cap with EVA lining of the second embodiment of the present invention; and

[0025] FIG. 10: shows a perspective view of a cap with EVA lining of the third embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] The present invention is described in detail according to the appended drawings hereinafter.

[0027] As shown in FIG. 3, a perspective view of a cap with a lining made of ethylene vinyl acetate (EVA) is illustrated. A rear fringe of a bill 1 is stitched with a front fringe of a crown 2 by a plurality of stitches S to form a cap 10 by stitching; the bill 1 includes an ethylene vinyl acetate (EVA) lining 13 as an inner layer clothed by a twill 11 as an outer layer. At least three flexible line segments 12 are disposed between the twill 11 and the lining 13. The flexible line segments 12 are selectively disposed only on one surface on the EVA 13; hence both ends of the flexible line segments 12 are more or less convergent to a middle portion of the plurality of stitches S where EVA lining 13 meets the crown 2. Leftover end of the twill 11 stitched together by the stitches S as the rear fringe of the bill 1, leftover end of the crown 2 stitched together by the stitches S formed as the front fringe of the crown 2. Thereby, the stitches S is broader than the rear fringe of the bill 1 and the front fringe of the crown 2 stitched together, but the stitches S should be limited by both leftover ends of them. After stitching, the stitches S combined leftover ends and both fringes integrally as a whole. The flexible line segments 12 are stitched to an upper surface of the EVA lining 13, or a lower surface of the EVA lining 13 and the flexible line segments 12 are curved rearward to the stitches S and the crown 2. Thereby, the stitches S is further to combine the curved flexible line segments 12 with both ends converged rearward to enhance the EVA lining 13 under a strain. Thereby, when the bill hangs over a forehead of wearer, the bill 1 is to be bent upward or downward with a curved fashion.

[0028] Said flexible line segments 12 baste coherently from a first rear end of the EVA lining 13, and extends along a contour of the lining 13 to a second rear end of the EVA lining 13; the flexible line segments 12 are curved with both ends to converge toward the middle portion of stitches S along the rear fringe of the bill 1. The flexible-line segments 12 curved in U shape, while an open end of the U shape faces rearward to the crown 2. The number of flexible line segments 12 distributed about the EVA lining 13 are limited in the range from 3 to 20. These line segments are arrayed together side by side equidistantly by stitching, adhering or hot melt adhesive laminating to the lining 13 either above or below the same.

[0029] As mentioned above, the flexible line segments 12 are made of high density ethylene (HDPE) a material can be repeatedly heated approach to the melt point to retain a deformability to the modified material. HDPE shows high resistance to chemical erosion, for example, in mixed cresol at 150° C., even HDPE melted, it did not dissolve in solvent mixture. Said HDPE piece once being slit into fiber like line segments, when bending, it will not restore the original shape, but being fashioned to a curved shape effected by an outer force.

[0030] The diameter of flexible line segment 12 is restricted to the range from 0.6 mm to 1.5 mm based on the assumption that if a flexible line segment 12 is slender than 0.6 mm diameter, the line segment may not retain a curved shape as required, while a flexible line segment 12 is gross than a 1.5 mm diameter, the line segments 12 are too stiff to bend. And these gross flexible line segments 12 may stretch out from the surfaces of the EVA lining 13 induces the bill 1 out of shape.

[0031] Said EVA lining 13 is kind of foam, where when vinyl acetate (VA) content is incrementally increased thereto, it can improve viscosity, softness, rubber elasticity, or solubility to EVA. Therefore, this kind of EVA is suitable for coating fiber, or upgrade from EVA to modified polyvinyl chloride (mPVC)—such as ethylene vinyl acetate-vinyl chloride copolymer (EVA-VC) modified polyvinyl chloride (mPVC). Where when ethylene content is incrementally increased thereto, it can improve modulus in rigid, endurance characteristic of abrasion and insulation capacity of EVA. Though thermal plastic rubber (TPR), polyurethane (PU) may be similar to EVA, both of them might be used in the present invention instead of EVA, but molded TPR is heavier than EVA; PU is more expensive than EVA. As well-known, chemosynthesis produces EVA foam with an elasticity, a softness, a shock absorptive capacity, and a higher resistance to chemical erosion. It can be formed in one step to reduce the residue waste and speed up production. A bill made of EVA foam is therefore incorporated in the present invention.

[0032] The flexible line segments 12 can be located at places as following:

[0033] As shown in FIG. [[2]]4, a cross sectional view of the bill is illustrated. Where a plurality of flexible line segments 12 are disposed above EVA lining 13, and clothed within the twill 11.

[0034] As shown in FIG. [[3]]5, a cross sectional view of the bill is illustrated. Where a plurality of flexible line segments 12 are disposed below EVA lining 13, and clothed within the twill 11.

[0035] As shown in FIG. [[4]]6, a cross sectional view of the bill is illustrated. Where a plurality of flexible line segments 12 are disposed contour of the bill 1, thereby the flexible line segments 12 are thoroughly curved in U shape, thereby, both ends of the flexible line segments 12 meet both ends of the stitches S by stitching, a circumference around the bill in front of the crown is surrounded by the curved flexible line segments 12 with an open end of the U shape faces the crown 2. Because these U shaped line segments are stitched together in link with stitches S intersected between the bill 1 and the crown 2, thereby, the bill is enclosed by the stitches S and the U-shaped flexible line segments 12, which are preferable gross than slender. In other words, the diameter of the flexible line segments 12 approaches to 1.5 mm but not larger than 1.5 mm.

[0036] As shown in FIG. 7, a schematic view of the bill in use is illustrated. Where three flexible line segments 12 curved in U shape disposed along inside the visor 1. As a result, both left and right sides of the bill 1 can be upward or downward bent by an outer force, such as user's hand force, and a fixed shape can be retained when bending the bill 1 as desired. Even the outer force removed, the fixed shape of the bill 1 still can be kept for a longer while, during which the bill 1 will not restore the original shape.

[0037] As shown in FIG. 8, another schematic view of the bill in use is illustrated. Where the bill 1 can be upward or downward bent, a fixed shape of the bill 1 is thereby retained

whenever bending. For example, once the user bends the bill 1 to alternate the upward or downward bending force, a fixed shape to the bill 1 is consecutively shaped to such an extent that the outer force is exerted there more or less equal in strength.

[0038] As shown in FIG. 9, a perspective view of the bill of the second embodiment of the present invention is illustrated. Flexible line segments 12a are transversally extended from left side to right side. Such a transversal disposition is suitable for bending downward or upward to the left or right sides of the bill 1, but not for bending upward or downward the visor 1 from a front side or a rear side. Where stitches S mainly is arranged in parallel to the disposed line segments 12 to facilitate the deformation of the bill.

[0039] As shown in FIG. 10, a perspective view of the bill of the third embodiment of the present invention is illustrated. Wherein the flexible line segments 12b are longitudinally disposed inside the bill from the front side to the rear side. Such a longitudinal disposition is suitable for bending upward or downward the visor 1 from the front or rear sides, but not for bending upward or downward from the left or right sides of the bill 1. Where stitches S mainly is arranged in perpendicular to the disposed line segments 12 to facilitate the deformation of the bill.

[0040] The detailed description of the present invention has been described above. It will be recognized and understood that various modifications may made therein and the appended claims are intended to cover all such modification that may fall within the spirit and scope of the invention.

[Advantage Obtained by Application of the Invention]

[0041] Preferrable three flexible HDPE line segments parallel to each other kept an equal distance therebetween can be disposed along a contour of the bill in a U shape with an open end face the crown. Or three flexible HDPE line segments are disposed inside the EVA lining in longitudinal or transversal direction. In addition to the EVA lining, the three flexible HDPE line segments are increased to the bill with a bendable flexibility, which keeps a fixed shape to the bill when bending.

While flexible HDPE line segments fit within EVA lining by stitching is easy, simple, and cheap than a whole piece of HDPE. After bending, fixed shapes retained by the EVA lining combined with, at least, three HDPE line segments is further superior than a whole piece HDPE.

[0042] EVA lining combined with HDPE line segments to support a bill, which is lighter and more flexible than a whole piece of HDPE bill. Therefore, to collect and keep cap with HDPE bill, or to launder the same through washer machine, it must be more acceptable than the prior art.

What is claimed is:

1. A curved bill comprising: a rear fringe coupled to a front edge of a crown portion by stitching, said bill includes a layer of ethylene vinyl acetate (EVA) covered by a twill layer with a plurality of high density polyethylene flexible line segments stitched along an inner side of said bill said plurality of line segments are parallel and equally spaced from each other, whereby the bill can be retained in a fixed shape upon bending of the bill; wherein a first respective end of said plurality of line segments is attached at a first rear end of the bill and extends in a U-shape such that second respective ends of said plurality of line segments is attached at a second rear end of the bill spaced from said first end.

2. (canceled)

3. The curved bill of claim 1 wherein said plurality of line segments extend across said bill in a transverse configuration.

4. The curved bill of claim 1 wherein the said plurality of line segments extend in a longitudinal direction from said rear end to a front end of the bill.

5. The curved bill of claim 1 wherein a diameter of the flexible line segment is in the range of 0.6~1.5 mm.

6. The curved bill of claim 1 wherein the number of said flexible line segment is in the range of 3~20 segments.

7. The curved bill of claim 1 wherein both ends of stitches S, which extend between the crown and the bill, meet both ends of the line segments by stitching, where both ends of curved line segments are converged to a middle portion of the stitches S.

* * * * *