ARTICLE FOR ALLEVIATING BUNION DEFORMITY AND PAIN

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Abstract

An article for overcoming the inward deforming tendency of the big toe of a person suffering from bunions is herein disclosed. The article is constructed of stretch fabric in the form of a tube sock which transitions in the region encompassing the toes, into two distinct pockets. A first elongated pocket encompasses the second through fifth toes, while the other pocket encompasses the big toe. A gap between the pockets works in combination with multiple layers of elastomeric material knit in a long but narrow band on the outside of the big toe and running down the side of the sock. When the sock is donned, the band of elastomeric material creates compressive restoring forces that draw the big toe pocket, and thus the big toe, outwardly from the other toes. Continuous use of the article serves to stretch tight tendons and toes muscles, and deter bunion pain and deformity.
ARTICLE FOR ALLEVIATING BUNION DEFORMITY AND PAIN

FIELD OF THE INVENTION

[0001] The present invention is directed to an improved article for providing treatment and relief of pain due to bunions and the like, and more particularly for the design of adaptive footwear in the form of a contoured sock and an integrally stiffened region.

BACKGROUND OF THE INVENTION

[0002] A bunion is a structural deformity of the foot. It is most often characterized by enlargement of the bone or tissue about the joint of the base of the big toe, which is referred to within the medical community as hallux valgus. Less common than this deformity of the hallux—the big toe—is a deformity at the base of the smallest or fifth toe, which is known as a tailor’s bunion.

[0003] The hallux valgus deformity appears as a bump on the side of the toe, which may be a combination of a swollen bursal sac and a bony growth on the mesophalangeal joint. Once the tissue becomes swollen and tender, the skin around the bunion may become red and irritated. Walking may become increasingly painful, and eventually leads to pain even while not standing on one’s feet. As the deformity progresses, the generally straight alignment of the big toe, as shown in FIG. 1, transforms into an inward leaning rest position, which is illustrated in FIG. 2. The big toe may also suffer from arthritis and a diminished range of motion.

[0004] Bunions are the result of a biomechanical abnormality whereby the tendons and ligaments of the first metatarsal—the bone just behind the big toe—no longer function properly. It is generally agreed that certain inherited foot traits—flat feet, excessive ligamentous flexibility, abnormal bone structure, and some nerve conditions—tend to make a person more susceptible to developing bunions, which is evidenced by appearance of the deformity in younger individuals. Also, while experts may be divided on whether ill-fitting footwear is attributable as the principle cause of bunions, it is agreed that the problem is exacerbated by shoes that crowd the toes, and may also be precipitated or compounded by foot injuries. Studies show that bunions are less prevalent in individuals who tend to go barefoot, while women are 10 time more likely to develop bunions than men, with this disparity seemingly due to the tendency of women to wear high-heeled, narrow-toes shoes. Bunions are also quite common for ballet dancers—individuals who are often plagued by foot injuries, and who also regularly wear tight leather or canvas slippers.

[0005] Treatment for a severe deformity may include surgery. However, before a deformity progresses to the severity which may only be countered with corrective surgery, treatment usually calls for the use of an orthotic device. One of the simplest devices is a toe spacer similar to the one shown by U.S. Pat. No. 4,207,880 to Zinkovich. But the Zinkovich device and other commercially available toe spacers advertised for bunion treatment tend to undesirably apply a separation force at a single point on the big toe, and are also inherently not curative because they rely on the smaller, less sturdy second toe to counter mounting deformation of the great toe. A more therapeutic approach is shown by the bunion splint device of U.S. Pat. No. 6,629,943 to Schroder, which does take advantage of the sturdiness of the entire foot to counter deformation of the great toe. Such a bunion splint would tend to stretch tight tendons and toe muscles and aid in proper alignment of the big toe. However, Schroder uses toe engaging rings and mating connectors on the side of the foot which make the device bulky, and not suitable for use while wearing shoes.

[0006] This invention offers a simple, cost effective device in the form of a contoured stretch sock with an integrally-woven band of elastomeric material to provide a comfortable solution for relief from bunion pain and progressive deformation.

SUMMARY OF THE INVENTION

[0007] The present invention is directed to an article that works to overcome the tendency of the big toe of a person’s foot to deform inwardly as a result of a bunion or other similar condition. Other devices available at this time tend to be too bulky to be worn with shoes, and usually involve multiple pieces for its construction. The present invention provides a more simplified article in the form of a knit sock, which is made primarily of a stretch fabric. The sock terminates, in the region intended to cover the toes, with an elongated pocket to encompass the second through fifth toes, while a smaller adjacent pocket is constructed to encompass only the big toe. There is a gap between the two pockets, which tends to separate the big toe from the other four toes. The sock, beginning on the outside of the big toe, is also provided with multiple layers of elastomeric material which forms a narrow elastic band that stretches along the side of the sock from the tip of the big toe to a region in the sock that is well past the mesophalangeal joint, and is approximately in the middle of the foot.

[0008] The narrow band of elastomeric fabric serves to create what is principally a unidirectional elastic force that draws the big toe away from the other toes, and serves to stretch tight tendons and toe muscles, and deter bunion pain and deformity. The article may be constructed similar to a tube sock so that it may be worn on either foot. The article may also be constructed as a series of articles having incrementally larger gaps between the big toe pocket and the other pocket, and also having additional elastomeric layers, whereby each in the series of articles could be successively worn by the user as the person’s toe is induced to a less inwardly prone posture.

OBJECTS OF THE INVENTION

[0009] It is an object of this invention to provide an article which may provide relief from the deformation and pain accompanying bunions.

[0010] It is another object of this invention to provide a bunion corrective device that may utilize the sturdiness of the entire to accomplish realignment of the big toe.

[0011] It is further object of this invention to provide an article which is lightweight and simple to manufacture.

[0012] It is another object of this invention to provide a bunion corrective device that may be both worn at night, and also during the daytime while wearing shoes.

[0013] It is another object of this invention to provide a bunion corrective device in the form of a series of articles
where each may be worn in succession accomplish a progressive realignment of the big toe.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of the bones of a normal foot. FIG. 2 is a top view of the bones of a foot which is affected by a bunion, resulting in an inward facing deformation of the big toe. FIG. 3 is a side view of the bones of a foot which is affected by a bunion. FIG. 4 is a side view of an alternate embodiment of the current invention being worn by a user with a bunion. FIG. 5 is a side view of a preferred embodiment of the current invention being worn by a user with a bunion. FIG. 6 is a top view of a preferred embodiment of the current invention being worn on the foot of a person with a bunion. FIG. 7 is a top view of the article of the current invention. FIG. 8 is a section view showing the inside stitching of the lateral elastic region of the article of the current invention.

DETAILED DESCRIPTION OF THE INVENTION

The article 10 for correcting toe deformities due to a bunion, and to alleviate the associated foot pain, is shown in FIG. 7. The article 10 may be constructed as shown to be worn like a sock, and may be worn at home while not wearing shoes, or alternatively worn while wearing shoes that have a wide enough toe box to accommodate the article. The article encourages outward support of the big toe, which is also termed the great toe, or in medical terminology, the hallux. The article, in one embodiment (see FIG. 5), may be constructed to contour closely to the shape of the foot as it appears in FIG. 3, and thus accommodate the bottom arch, the turn at the heel of the foot, and the ankle. This embodiment would necessitate that the article be tailored, as with a pair of shoes, to fit either the left foot or the right foot.

In a preferred embodiment, the article 10 shown in FIG. 7 is constructed without contouring for the heel, and as such, being configured similar to a tube sock, it may be worn on either the left foot or the right foot, as will be described herein. A person experiencing deformation and pain due to a bunion on both of their feet may simply purchase and utilize multiple copies of the article 10 to be worn concurrently on both of his or her feet.

A preferred embodiment of the article 10 may have a first end 12, a center region 16, and a second end 11. Second end 11 may be constructed to have a generally circular cross-section and thus form a tube shape which begins at the top free end 14, and extends to bottom transition end 15. Second end 11 may have a second knit construction 13 which is loosely knit so as to provide ease in initially opening the article for applying it onto one’s foot, as well as ease in pulling the second end away from ones calf, while it is being worn, to remove the article from one’s foot. Rib stitching 27 may be used for second end 11. To aid in maintaining the integrity of the top free end 14 of the second end 11, a narrow, generally circular elastic band 26 may be interwoven into the article. The elastic band 26 may be a rubber band or other elastic type of band. The narrow elastic band 26 may also assist in keeping the top free end 14 from sliding down the leg of the person using the article. Any typical fabric material may be used in second end 11, including, but not limited to, cotton, linen, wool, cashmere, silk, a synthetic fabric, or a blend. The fabric for second end 11 may also be a two-way stretch fabric, and it may also be loosely knit.

Second end 11 need not be incorporated into the article 10, but in a preferred embodiment which does so incorporate second end 11, it will change into the center region 16 at bottom transition end 15, whereby the center region 16 may also be constructed to have a generally circular cross-section to form a tube-shape. Center region 16 may be constructed using a second knit construction, being a more tightly knitted stretch fabric. The fabric may be a two-way knit fabric formed in a fashion similar to that shown by U.S. Pat. No. 3,069,885 to Cooper. The tube-shaped section formed by center region 16 may be of any length, but in a preferred embodiment it will be sufficiently long to accommodate various sized feet, thereby eliminating the need of a different sized article for different individuals. It may be seen that a person having smaller feet may simply have an extra length of sock that would reach higher up on the user’s leg.

In the preferred embodiment, center region 16 may transition into first end 12, whereby the tube-shape of center region 16 is knitted to divide into a first pocket 17 and a big toe pocket 18. First pocket 17 is knitted to form a slightly elongated pocket, so as to accommodate the second through fifth toes of the user’s foot. The big toe pocket 18 may be formed so as to contour generally to the shape of the big toe, and may be proportionately undersized to ensure a snug fit over the big toe. As is common for forming a tube shaped product, the second end 11 and center region 16 may be created using circular knitting, otherwise known as “knitting in the round,” while the first pocket 17 and big toe pocket 18 of first end 12 may alternatively be flat knitted and have a sewn seam 28.

The elongated first pocket 17 may have an inside surface 21. Big toe pocket 18 may have a tip 35, an outside surface 34, and an inside surface 20 which transitions into inside surface 21 of first pocket 17 to create gap 19. Gap 19 serves to form the two distinct and independent pocket areas—first pocket 17 and big toe pocket 18. It may be seen by looking at article 10 in FIGS. 6 and 7 that the inside face 21 of first pocket 17 would rest against the second toe of the user’s foot, while the inside face 20 of big toe pocket 18 would rest against that portion of the big toe that is adjacent to the second toe.

The preferred embodiment of this invention may also include a lateral elastic region 22, which may be constructed of multiple layers of elastomeric fabric that is knitted into a portion of center region 16 and a portion of first end 12, and which may have one or more layers of cross-stitching 27 (FIG. 8). The lateral elastic region 22 may preferably have a narrow but generally elongated rectangular shape, where the narrow width is located on the outside lateral portion of the foot, on outer surface 34 of big toe pocket 18, and thus faces away from the toes of a foot. When the user wears the article 10 as seen in FIGS. 5 and 6, its effect is optimized by having the user align the lateral elastic region 22 against the outside of the big toe.

The toe end 23 of lateral elastic region 22 preferably begins near the tip 35 of big toe pocket 18, and continues on to at least some portion of the center region 16, ending preferably near the middle of the foot, as shown by arch end 24. In an alternate embodiment, shown in FIG. 4, a lateral elastic region 32 may be knitted so as to be much shorter in length, and may simply extend some distance in both directions
beyond the mesophalangeal joint 45, which is shown in FIG. 6. The lateral elastic regions 22 and 32, as designed, provides a built-in elastic force so that when the article is worn on the foot of the user, it develops a compressive restoring force 29 which is not balanced by an equal force on the opposite side of the great toe, and thus creates a rotational force 30 that has the tendency to draw the big toe pocket 18 away from the first pocket 17. The rotational force 30 of big toe pocket 18 therefore provides a force to resist deformation of the big toe towards the second toe, and serves to stretch tight tendons and toes muscles, and deter bunion pain and deformity. As seen in FIG. 6, the lateral elastic region, as with the rest of the article, will contour to the shape of the foot and provide for a compact and streamlined solution for support for the big toe, which may still comfortably be used by a person while wearing shoes. 

The first end 12 may be constructed using the same two-way knit fabric as center region 16. Although not shown in FIG. 4, it should be noted that it may also be advantageous to utilize, in certain areas like the region around gap 19, a knit fabric which is elastic in one direction and non-elastic in the orthogonal direction, such as the surgical bandages shown by U.S. Pat. No. 3,570,482. The mono-directional elastic would serve to direct elastic forces where needed, but not allow such forces in a region that would tend to draw the big toe toward the second toe, which may occur in the region near gap 19. 

As it is the goal of this invention to create elastic forces which work to draw the great toe outward and away from the other toes, and consistent use of the article provides such relief, it may be beneficial to have the article 10 designed and constructed to provide a successively greater resistance force to oppose inward deformation of the big toe, which may be achieved in other embodiments by providing a progressively increasing gap 19 between the first pocket 17 and the big toe pocket 18. Furthermore, additional layers of elastomeric fabric in the lateral elastic region 22 could similarly serve to provide a greater force to overcome deformation of the hallux. The article could thus be manufactured and sold as a set or series of articles, which may be used in progressive treatment by first utilizing the article with the smaller gap, and then successively using the next article in the series, having an incrementally larger gap, and then another larger gapped article, and so on. Creating a series of such articles with increasing gaps and/or enhanced lateral elastic region would also permit the user to personally select an article which initially provides a level of support which is noticeable, but does not cause an undesirable level of discomfort. 

It should be recognized that the article disclosed herein could be adapted for use treating the “tailor’s bunion” deformity which occurs at the base of the smallest or fifth toe, by relocating the enhanced elastic region to be proximate to the little toe. Moreover, the padding may be located on the top of the sock, or at any bony prominences that manifest themselves on the foot. Furthermore, the sock may be further adapted to supply a compartment for each toe, or some combination of toes. For example, the big toe pocket 18 may be sized and shaped to include the second toe, and thereby treat deformity of the second toe in addition to deformity of the big toe. Also, where individual compartments are utilized for each toe—a first toe pocket, a second-toe pocket, a third-toe pocket, a fourth-toe pocket, and a fifth-toe pocket—the elasticity could be differentially located on opposite sides of the individual toe pocket to create a non-loaded side of the toe and a tensed side of the toe. The toe-to-toe tensioning may serve to counter deformity of intermediate toes.

The examples and descriptions provided merely illustrate a preferred embodiment of the present invention. Those skilled in the art and having the benefit of the present disclosure will appreciate that further embodiments may be implemented with various changes within the scope of the present invention.

What is claimed is:

1. An article, for use by a person suffering from bunions to counter deformity, said article comprising a generally tubular sock constructed of knitted stretch fabric, said generally tubular sock transitioning into at least a first pocket and a second pocket, said first pocket being formed to encompass one or more toes, and said second pocket being formed to encompass the remaining of said one or more toes, said first pocket and said second pocket being separated by a gap; at least one of said pockets further comprising a highly elastic region formed into a narrow elongated band on a portion of said pocket, said highly elastic region comprised of one or more layers of knitted elastomeric fabric, said knitted elastomeric fabric of said highly elastic region being capable of creating an elastic compressive restoring force, said elastic compressive restoring force working to counter deformation.

2. The article according to claim 1 wherein said narrow elongated band is located on a side of said at least one pocket.

3. The article according to claim 2 wherein said at least one pocket with said highly elastic region on a side of said pocket further comprises a region of non-elastic fabric on a side of said pockets.

4. The article according to claim 1 wherein said first pocket comprises a generally cylindrically-shaped pocket encompassing a big toe, and wherein said second pocket is an elongated pocket sized to encompass a second through fifth toes, and wherein said highly elastic region is located on said big toe pocket on a portion being generally opposite to said gap.

5. The article according to claim 1 wherein said at least a first pocket and a second pocket further comprises a first-toe pocket, a second-toe pocket, a third-toe pocket, a fourth-toe pocket, and a fifth-toe pocket, each of said pockets being shaped to correspond to the encompassed toe, one or more of said toes further comprising said highly elastic region.

6. An article, for use by a person suffering from bunions to stretch tight tendons and toe muscles, and deter bunion pain and deformity, said article comprising a sock having:

(a) a first end and a center region, said first end and said center region being comprised of a first knit construction, said first knit construction comprising a knitted stretch fabric, said knitted stretch fabric of said center region forming generally a cylindrical shape, said knitted stretch fabric of said center region transitioning at said first end from said generally cylindrical shape to form a first pocket and a big toe pocket, said first pocket being elongated, said big toe pocket being generally cylindrically-shaped, said cylindrically shaped big toe pocket located adjacent to said elongated first pocket, said first pocket and said big toe pocket being formed to create a gap between said first pocket and said big toe pocket;

(b) a lateral elastic region, said lateral elastic region extending from at least a portion of said big toe pocket of said first end to at least a portion of said center region, said lateral elastic region being formed on a side of said big
toe pocket opposite to said gap, said lateral elastic region comprised of one or more layers of knitted elastomeric fabric, said knitted elastomeric fabric of said lateral elastic region creating an elastic compressive restoring force, said elastic compressive restoring force causing outward rotation of said big toe pocket away from said first pocket.

7. The article according to claim 6 wherein said lateral elastic region runs along an entire side of said big toe pocket.

8. The article according to claim 7 wherein said lateral elastic region extends along at least half of said center region.

9. The article according to claim 8 wherein said knitted elastomeric fabric is formed from orthopedic support fabric.

10. The article according to claim 9 wherein said knitted elastomeric fabric is comprised of elastic yarn running in one direction and non-elastic yarn running in another direction.

11. The article according to claim 9 wherein said knitted elastomeric fabric is formed from the group consisting of: cotton; spandex rubber; lycra; and nylon.

12. The article according to claim 8 wherein said elastomeric fabric of said lateral elastic region is of a weight where it may be worn within shoes.

13. The article according to claim 12 wherein said center region and said second end are formed by knitting in the round.

14. The article according to claim 13 wherein at least a portion of said first end is formed by knitting in the round, and a portion is formed by flat knitting, said flat knit portion having sewn seams.

15. The article according to claim 14 wherein said gap between said first pocket and said big toe pocket is increased by contouring said big toe pocket away from said first pocket.

16. An article, for use by a person suffering from bunions to stretch tight tendons and toe muscles, and deter bunion pain and deformity, said article comprising a sock having:

(a) a first end and a center region; said first end and said center region comprised of a first knit construction, said first knit construction comprised of a knitted stretch fabric, said knitted stretch fabric of said center region forming generally a cylindrical shape; said knitted stretch fabric of said center region transitioning at said first end from said generally cylindrical shape to form a first pocket and a big toe pocket; said first pocket being elongated; said big toe pocket being generally cylindrically-shaped, said cylindrically-shaped big toe pocket being located adjacent to said elongated first pocket; said first pocket having and inside surface; said big toe pocket having an inside surface, an outside surface and a tip; said inside surface of said first pocket and said inside surface of said big toe pocket forming a gap between said first pocket and said big toe pocket, and creating a length of said big toe pocket;

(b) a lateral elastic region; said lateral elastic region extending from said tip of said big toe pocket and into said center region by a distance at least twice said length of said big toe pocket; said lateral elastic region being formed on said outside surface of said big toe pocket opposite to said gap, said lateral elastic region comprised of one or more layers of knitted elastomeric fabric, said knitted elastomeric fabric of said lateral elastic region creating an elastic compressive restoring force, said elastic compressive restoring force causing outward rotation of said big toe pocket away from said first pocket;

(c) a second end, said second end comprising a cuff having a bottom transition end beginning at said center region and a top free end, said second end being comprised of a second knit construction, said second knit construction being comprised of a loosely knit stretch fabric, said loosely knit stretch fabric of said second end forming generally a cylindrical shape; said second end further comprising a circular rubber band at said top free end, said circular rubber band being woven into said loosely knit stretch fabric at said top free end, said cuff further comprising ribbing.

17. A method of stretching tight tendons and toe muscles, and deterring bunion pain and deformity, said method comprising the steps of:

(a) providing a series of article, said series of article capable of providing lateral support for an inwardly-deforming great toe, each successive article of said series of article providing progressively greater lateral support, a first article of said series of article comprising;

(i) a first end and a center region; said first end and said center region comprised of a first knit construction, said first knit construction comprised of a knitted stretch fabric, said knitted stretch fabric of said center region forming generally a cylindrical shape; said knitted stretch fabric of said center region transitioning at said first end from said generally cylindrical shape to form a first pocket and a big toe pocket; said first pocket being elongated; said big toe pocket being generally cylindrically-shaped, said cylindrically-shaped big toe pocket being located adjacent to said elongated first pocket; said first pocket having and inside surface; said big toe pocket having an inside surface, an outside surface and a tip; said inside surface of said first pocket and said inside surface of said big toe pocket forming a gap between said first pocket and said big toe pocket, and creating a length of said big toe pocket;

(ii) a lateral elastic region; said lateral elastic region extending from said tip of said big toe pocket and into said center region by a distance at least twice said length of said big toe pocket; said lateral elastic region being formed on said outside surface of said big toe pocket opposite to said gap, said lateral elastic region comprised of one or more layers of knitted elastomeric fabric, said knitted elastomeric fabric of said lateral elastic region creating an elastic compressive restoring force, said elastic compressive restoring force causing outward rotation of said big toe pocket away from said first pocket;

(b) a second article of said series of article, said second article comprising an article formed with every feature of said first of said article, said gap between said first pocket and said big toe pocket for said second article being incrementally greater than said gap of said first article, and wherein said greater gap is provided by said big toe pocket of said second article angling away from said first pocket.

(c) each succeeding article beyond said second article of said series of article comprising an article having an incrementally greater gap.

(d) wearing each of said series of article for a period of time beginning with said first article.