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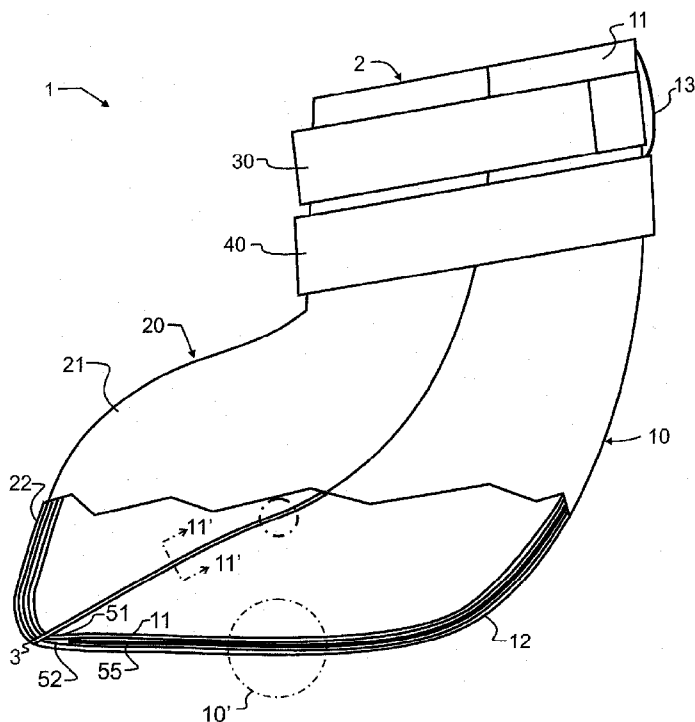


FIG. 9

(57) Abstract: A dog boot is fabricated using a breathable substrate, preferably of durable material such as heavy nylon or polyester. Onto the substrate, various friction and wear pads, puncture and cut resistant layers, tensioning straps, and strategically located cushions are attached. A plurality of layers of Kevlar form a part of the boot bottom lamination. The outer layers of Kevlar are the longest and reach from toe seam to side and upper seams. The inner protective layers of Kevlar are shortened to reduce bunching. Similar Kevlar layers are provided at the top of the boot to protect against cuts and slashes. In addition to the Kevlar, vents may be provided through the top edge of the boot and work with the motion of a dog's foot, allowing air to be sucked in and then pushed out with the action of the dog's foot.

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**Title:** Kevlar Dog Boots

## BACKGROUND OF THE INVENTION

### 1. FIELD OF THE INVENTION

This invention pertains generally to the field of animal husbandry, and more particularly to protective dog boots.

### 2. DESCRIPTION OF THE RELATED ART

Dogs have long been known as “man’s best friend”. Not only do dogs provide companionship, they are also intelligent and readily taught to carry out many tasks that are complementary to those of other public servants. As a result, they can provide great benefit, often times in situations where humans would not be capable. These animals serve very diverse functions, providing companionship, guarding, towing, hunting, rescue, and even sensory conversion, such as a seeing eye-dog or a hearing-assist dog. They may be pets, or may be put in service by individuals or organizations such as search and rescue teams, police, or military organizations.

Regardless of the relationship between person and dog, at various times, and for many diverse reasons, it may be highly desirable for the dog owner to place boots upon the dog’s paws. For example, in inclement weather, a person may not wish to try to clean a dog’s paws after the dog has been outside. Boots that may be placed and then readily removed may be much easier to use than the effort required to thoroughly clean the dog’s feet. In other instances, a dog may have injured one or more paws, and so the paw might need protection. In such case, a suitable

boot may help to protect the affected paw until sufficient healing has occurred to no longer require the boot. In other cases, the dog's pads may be inadequate for traversing the ground when temperatures are particularly severe, such as in colder climates or with dogs that are not adapted to the cold, or conversely in extremely hot climates where the ground surface may be scorching. It is known that during testing on hot surfaces, a drug dog's performance drops due to the hot surface distraction. Racing and sled dogs may be exposed to a particularly harsh course or environment, and so may also need special protection. Boots can be used to prevent snow from getting up between the pads of the foot, freezing, abrading the soft tissue, and thereby producing a lame dog.

A number of artisans have recognized one or more of the foregoing needs, and so have designed various dog boots. One such patent which exemplifies these known boots is U.S. patent 6,526,920 by Griffin, entitled "Dog boot for hunting and other outdoor activities," the teachings which are incorporated herein by reference. This patent describes dog boots having a zipper and dual hook-and-loop leg fasteners with loops for tightening, and a non-skid sole. Additional patents that offer useful teachings and insights are incorporated by reference, including U.S. patents Des. 379,251 by Mezey; Des. 387,511 by Caditz; 2,064,566 by Richman; 2,651,853 by Lewis; 3,762,073 by Cantales; 4,457,261 and 4,543,911 by Marshall; 5,408,812 by Stark; 5,148,657 by Stafford et al; and 5,452,685 by Thomas.

However, these prior art boots tend to suffer from several common limitations. As may be recognized, prior art dog boots are often very difficult to put on the dog's foot. This problem will be intensified by the fact that most dogs will not remain still while a person is trying to put the boot on. Once on, these prior art boots do not stay on well. Many will simply spin about, potentially causing much discomfort or harm to the dog. Others will slide off as the dog walks

or runs. This phenomenon is quite significant, since the boot must be designed to be of non-slip material, or the dog will sprawl on finished wood, ceramic tile, icy or other relatively slippery surfaces. Yet, the boot must also preferentially stay on the dog's paw, rather than slide with respect thereto, even when the booted dog is traversing terrain having good traction. Simply applying more force about the dog's leg to keep the boot on has proven to be totally unsatisfactory, since circulation within the leg may become limited or disrupted causing injury and sometimes amputation or death. Unintended bunching of the boot top can be harder to detect, and can also restrict circulation. Yet, different dogs will have significantly different proportions between pad size and leg diameter, meaning that the boot must be very adjustable to accommodate different dog breeds and sizes. Finally, complex boots are not only more difficult to put on the dog, but they are also much more expensive to produce, which is also undesirable.

While many different types of human boots and those for other diverse animals such as horses have been devised, boots from these anatomically diverse animals have found little practical utility with dogs. In the leg of any human or animal, when a boot or covering is applied, circulation must be preserved. In the case of a human foot, this can easily be achieved by not over-tightening the laces or other bindings, and instead relying upon the approximately ninety-degree bend between the human leg and foot, and the bulging calcaneus bone. The human leg dramatically increases in diameter due to the calcaneus bone. Consequently, a wrap about the lower leg including the tibia and fibula will not pass around or "slide past" the calcaneus or heel bone.

In contrast to the human foot skeletal structure, a dog walks "tip-toe" compared to a human. The dog foot is of much more consistent diameter, and does not have a bulge such as found in the human calcaneus bone. Consequently, the shape of a dog foot causes prior art boots

to be readily slipped off by the dog during ordinary movement, and human boots have no cooperative anatomy similar to the human calcaneus or heel bone in the dog foot with which to engage.

A front dog paw, left-to-right, has almost no dimensional change. The dog leg does not suddenly expand into a much larger paw, but instead remains very close in size and diameter. The exact dimensions of dog legs and paws vary among different dog breeds, but it is important to recognize that many breeds have very little change in diameter along the length of the dog foot, and so the calcaneus human bone is not available on the "tip-toe" dog leg.

In addition to weather and other indirect factors, there are also situations where either man or direct obstacles also will interfere with the dogs. In Europe, it is common for rioters to break glass bottles in front of dogs to stop them. Broken glass is also often encountered by Police K-9 units when they clear buildings. The border patrol uses dogs on the border in the South West part of the U.S. and encounters Cholla Cactus, which is said to be able to penetrate the bottom of a human boot. Search and Rescue dogs are also frequently working in debris that may include sharp objects.

A number of artisans discuss such materials as leather, neoprene, and PVC for applications similar to those for which the present invention is intended. These patents, the contents which are incorporated herein by reference, include 2,424,172 by Huddleston, entitled "Animal boot"; 2,535,394 by Davis, entitled "Shoe for hunting dogs"; 4,967,542 by MacDonald, entitled "Dog boots"; 5,495,828 by Solomon et al, entitled "Animal boots with detachable, vertically adjustable fastening strap"; 6,186,097 by Brockmann et al, entitled "Protection shoe for the paw of a dog"; 6,526,920 by Griffin, entitled "Dog boot for hunting and other outdoor activities"; 6,786,029 by Kuzuu, entitled "Pet nail cover"; and 6,931,767 by Royle, entitled "Foot cover". While these

materials provide improved protection over prior art fabrics, they are inadequate to prevent punctures and cuts from very sharp objects.

U.S. patent 6,470,832 by Peacock, entitled "Animal boots," the teachings and contents which are also incorporated herein by reference, describes forming a foot piece from lightweight metal or other puncture proof material such as hard plastic. Above the foot piece, Peacock proposes a middle section formed from metal mesh or chain mail material, and also proposes that Teflon (PTFE) or Kevlar (Poly-para-phenylene terephthalamide) mesh may also provide enough durability to work. In a first alternative embodiment, Peacock proposes that the body be made from a metal or metalized fabric or similarly puncture resistant material such as Kevlar (Poly-para-phenylene terephthalamide) mesh or nylon mesh. While Peacock acknowledges a similar need, the boot proposed therein is functionally incapable of addressing the diverse needs to which the present invention is directed.

Additional patents for which the teachings are incorporated herein by reference include: 2,222,705 by Conlon, entitled "Dog cover"; 2,446,371 by Jones, entitled "Dog boot"; 3,150,641 by Kesh, entitled "Dust cover for dog"; 3,742,679 by Jordan, entitled "Stretchable pet suit with boots"; 3,747,565 by Kellam, entitled "Article of Animal Apparel"; 4,458,431 by Sinclair, entitled "Boot for pet animal"; 4,633,817 by Taylor, entitled "Protective footwear for animals"; 4,744,333 by Taylor, entitled "Protective footwear for animals"; 5,676,095 by Ralls, entitled "Protective paw coverings for animals"; 6,546,704 by Fisher, entitled "Dog boot"; and 6,851,394 by Young, entitled "Boot and harness swimming system for an animal". A further patent incorporated herein by reference, US 5,996,255 by Ventura, entitled "Puncture resistant insole," discloses a human boot with a hard outsole, having a plurality of floating Kevlar layers therein to protect against puncture. While these layers do offer some puncture and cut resistance, the application to dog

boots complicated not only by the aforementioned factors differentiating anatomy, but also by the use of the hard outsole. When these layers are used with a softer and more compliant exterior such as found on the present invention, the present inventors have discovered that a sharp object will cause the Kevlar to undesirably bunch around the sharp object, pulling the protective pad away from the area where protection is needed, in perhaps the next step, leading to harm simply because of the resulting bunching. Furthermore, the sharp object is not shed, but may remain. In a human boot, the presence of a sharp object will simply cause the person to reach down and pull the object from the shoe. In the case of a dog, the sharp object may effectively injure or disable the dog.

Webster's New Universal Unabridged Dictionary, Second Edition copyright 1983, is additionally incorporated herein by reference in entirety for the definitions of words and terms used herein.

#### SUMMARY OF THE INVENTION

In a first manifestation, the invention is a protective dog boot. A first lamination has a substrate and at least one cut-resistant layer. A second lamination has a substrate, a friction pad, and a plurality of puncture and cut resistant layers. The first lamination and second lamination are coupled at a junction to form a tube having an open end and a closed end. At least one of the plurality of puncture and cut resistant layers extends fully across the first lamination and into the junction between first and second laminations and at least another one of the plurality of puncture and cut resistant layers is distinct and removed entirely from the junction.

In a second manifestation, the invention is a dog boot, suitable for insertion and removal of a dog's leg and paw and operatively providing protective covering about the dog paw. An

operatively protective covering has a closed end and an open end and defines a dog paw region operative to surround the dog's paw, and defines a dog leg region operative to surround the dog's leg. The dog paw region is adjacent to the closed end and the dog leg region is adjacent to said open end. A means adjacent a bottom surface of the dog paw region and dog leg region prevents punctures and cuts. A means adjacent a top surface of the dog paw region and dog leg region prevents cuts. The means for preventing punctures and cuts is joined to the means for preventing cuts at a junction therebetween. A means is provided adjacent the open end for allowing the open end to expand, thereby facilitating insertion of a dog paw therein. A means is provided for contracting the dog leg region. At least one interference-producing cushion is provided on an interior of the dog leg region, protruding interiorly from the operatively protective covering above and immediately adjacent to the dog paw region, and is operative to produce interference with the dog's paw and thereby resist the dog leg region sliding into contact with the dog's paw.

#### OBJECTS OF THE INVENTION

Exemplary embodiments of the present invention solve inadequacies of the prior art by providing a fabric substrate, preferably of durable material, onto which friction pads, wear pads, tensioning straps, and strategically located cushions are attached. Specially configured slits ensure that a wide range of leg sizes relative to paw sizes may be accommodated, while easing application of the boot and eliminating any risk of bunching during such application. The present invention is further designed for use in any situation where broken glass, sharp rocks, or any other sharp objects might penetrate a dog's paw, either from above or below. Layers of Kevlar™ or other puncture- and cut-resistant materials are incorporated between inner and outer layers of the boot.

A first object of the invention is to provide a dog boot which is readily placed about a dog's paw. A second object of the invention is securement of the boot against slippage, spin or separation with respect to the dog's leg, while simultaneously substantially reducing the risk of circulatory disruption or harm to the dog. Another object of the present invention is to ensure that the boot will readily accommodate a wide range of proportions of paw size to leg diameter. A further object of the invention is to provide a boot which is substantially non-slip with respect to a surface the dog is traversing. An additional object of the invention is the provision of protection from sharp objects which might otherwise cut or puncture a dog's paw. Yet another object of the invention is to provide a more readily produced boot which is not unnecessarily complex or expensive to produce, and yet which is durable. An even further object of the invention is that the boot float for water usage. Another object of the invention is that the boot not unduly abrade the dog during use. An additional object of the invention is to provide adequate ventilation to the dog boot, even when preferred materials would otherwise create a physiologically unsafe environment within the boot.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, advantages, and novel features of the present invention can be understood and appreciated by reference to the following detailed description of the invention, taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates a preferred embodiment dog boot designed in accord with the teachings of the present invention from a side plan view, in an operative or worn position, without illustrating the dog's leg.

FIG. 2 illustrates the preferred embodiment dog boot of figure 1 from a top view looking

down into the boot.

FIG. 3 illustrates the preferred embodiment dog boot of figure 1 from a side view, as placed upon the front paws of a dog.

FIG. 4 illustrates the preferred embodiment dog boot of figure 1 from a bottom view with the boot laid flat, and the straps fully released.

FIG. 5 illustrates the preferred embodiment dog boot of figure 4 looking at the bottom of the boot, with the top removed as though inside the boot, from a top view.

FIG. 6 illustrates the preferred embodiment dog boot of figure 1 from a top view with the boot laid flat, and the straps fully released.

FIG. 7 illustrates the preferred embodiment dog boot of figure 6 looking at the top of the boot, with the bottom removed as though inside the boot, from a bottom view.

FIG. 8 illustrates the region of the preferred embodiment dog boot adjacent open end 2 by enlarged sectional view taken along line 8' shown in figure 2.

FIG. 9 illustrates the preferred embodiment dog boot of Figure 1 from a similar view, but with a partial cut-away showing the interior construction of the boot.

FIG. 10 illustrates an enlarged view of the sole of preferred embodiment dog boot of Figure 9 taken along line 10' of Figure 9.

FIG. 11 illustrates an enlarged view of a preferred seam construction taken along line 11' of Figure 9.

FIG. 12 illustrates the preferred embodiment dog boot of Figure 5 looking at the bottom of the boot, with the top removed as though inside the boot, from a top, partial cut-away view to reveal the placement of the interior layers.

FIG. 13 illustrates an enlarged view of an alternative embodiment seam construction taken

along line 11' of Figure 9, and including a vent tube therein.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Manifested in the preferred embodiment boot 1, the present invention fulfills the objectives set forth herein above and others. As shown in figure 1, boot 1 has the appearance of a flexible or somewhat flaccid tube, with a closed end 3 adjacent toe protective patch 22 and an open end 2 distal therefrom. Boot 1 includes a bottom 10 having a non-slip ground-engaging surface 12. In the preferred embodiment boot 1, the rear or bottom of the boot is covered from closed end 3 up to straps 30, 40 with this material, though it will be understood that surface 12 may be of any size, and so may comprise a small pad on bottom 10, or may be omitted completely. This non-slip ground-engaging surface 12 will most preferably be a material sold under the brand name "Toughtek," available from Harrison Technologies, Inc. of Broadalbin, NY, USA, which is a durable material having good traction and pliability even at very low temperatures, and which is non-slip. Ground-engaging surface 12 could be Cordura, other nylon or any material that would have a specific feature such as traction, durability, or waterproofing that the designer elects to incorporate in a boot. However, the non-slip characteristic is most preferable, so as to enable a dog to comfortably stand on relatively slippery surfaces such as finished wood, ice or the like.

A second layer of material 11 may either extend from or be parallel to and continue beyond surface 12, or, when surface 12 is completely omitted, instead of surface 12. Material 11 will most preferably be relatively soft, compliant, durable, strong, and resistant to the elements. Standard nylon, ballistic nylon, or Cordura is most preferred for this substrate, owing to the inherent durability, ready fabrication, and permeability to gasses, while still providing some water resistance. In the preferred embodiment, material 11 extends from toe 17 to flare terminations

16, and is laminated with surface 12 by simple edge stitching.

A similar material will also be used in the fabrication of boot top 20, as material 21. With somewhat larger exposed surface area, the breathable nature of a woven or non-woven fabric will be very beneficial in many applications, though others may require a waterproof material. A protective patch 22 will preferably be laminated with material 21. As shown in the preferred embodiment boot 1, protective patch 22 serves as a toe patch, which is particularly beneficial when a dog, for whatever reason, has a tendency to drag the toe. Protective patch 22 will help prevent serious damage to boot 1 as well as to the dog's foot. This patch in the preferred embodiment is preferably a stronger, more abrasion resistant material, and so may be Toughtek™, Cordura or ballistic nylon, or other relatively more abrasion resistant material. Waterproofing may also be applied, if desired.

Strap 30, which is relatively close to the open end 2 of boot 1, would potentially slip above open end 2, and so become less effective. To prevent such slippage from occurring, a small closed loop 13 is provided at the top back of boot 1, adjacent open end 2. While in the preferred embodiment, only strap 30 passes through loop 13, it will be recognized by those skilled in the art that both straps 30 and 40 could pass through. Nevertheless, in the preferred embodiment boot 1, the operation of strap 40 is not as well suited to passing through loop 13, and so, in the preferred embodiment and subject to review for each new design incorporating the present invention, it does not do so.

Figure 2 illustrates preferred embodiment boot 1 from a top view, showing the relationship of the various boot components. As illustrated, top and front layer 21 may readily encompass bottom and back layer 11 adjacent the open end 2 of boot 1. Cushioning pads 14, 24 will most preferably extend on an inside of the respective layers 11, 21, within a circumference of

contraction created by straps 30, 40 when these straps are tightened about the leg of a dog. In practice, these pads 14, 24 prevent undesirable constriction of a dog's leg, while at the same time forming a relatively high friction contact with the dog's leg, to help to ensure that boot 1 does not slip off. Noteworthy here is the fact that Cordura and ordinary nylons are generally relatively slippery, though these same materials are very durable and desirable for their intrinsic durability. Consequently, to use a durable and flexible nylon without the present synergy of the higher friction pads will result in the boots sliding from the dog's legs. These pads 14, 24 will also ensure a relatively complete surface contact with an otherwise non-cylindrical leg, which also helps to ensure even force distribution about the entire circumference of contraction formed by straps 30, 40.

Most preferably, boot 1 will be dimensioned to cooperate with the intrinsic geometry of a dog paw. In this regard, it is noted that most dog paws are slightly wider at the pad than they are in the leg region slightly above and immediately adjacent the pad. Consequently, with reasonable sizing and placement, cushion 14 will be placed on the leg adjacent the dog's pad, and strap 40 will secure cushion 14 in that position. Such placement ensures that the bulge at the dog's pad will produce interference with cushion 14, thereby preventing cushion 14 from sliding down into the dog's pad region.

To further advance this effect, it is quite desirable to cut at least cushioning pad 14 and optionally cut cushioning pad 24 at different angles than perpendicular on edges adjacent open end 2, while keeping these edges perpendicular adjacent the dog's pad, as may be best viewed in the enlarged sectional view of figure 8. This permits the dog's paw to pass into boot 1 with less interference, while the sudden perpendicular edge at the base of cushioning pads 14, 24 creates interference.

In the most preferred embodiment, cushioning pads 14, 24 may comprise one or more of a variety of foams and foam rubbers, though closed cell polyurethane and neoprene are preferred, for their combination of low cost, ready availability, water resistance, and high coefficient of friction with many surfaces and materials. This latter coefficient of friction will help to ensure that boot 1 stays in place without requiring excessive forces be applied to straps 30, 40. Additionally, depending upon the relative friction between the dog leg and boot 1, other devices may be used which serve to contract open end 2. Such devices are too numerous to specifically mention herein, but can include elastic materials, and even resilient and elastic fabrics commonly found in the apparel industry.

Figure 4 illustrates boot 1 laid out flat, from a bottom view, as it will typically be after manufacture but before being placed on a dog's leg. Straps 30 and 40 are extending from boot 1, rather than being in the operative, wrapped position shown in figures 1 and 2. Figure 5 illustrates boot 1 showing only bottom 10, looking at the side of bottom 10 opposed to that shown in figure 4. Figure 5 shows the relative size and placement of cushioning pad 14. Figure 5 also illustrates the overall shape and geometry of bottom 10, which is that generally of a rectangle, but with two significant changes. First, adjacent closed end 3, the ninety degree corners that would be found in a standard rectangle have been chamfered, to yield a relatively rounded toe end 17. Those skilled in the art will recognize that the final amount of chamfer or other shaping will depend upon the paw print for which the boot 1 is intended. A good universal shape is the gradual arc formed by extensive chamfer as shown in the present figures.

Opposite to toe end 17 there is a flare which begins at points 15 and narrows with increasing distance from toe end 17 and closed end 3 to the end points 16. In contrast, the top and front 20 has an opposite flare which widens with increasing distance from toe end 17 and

closed end 3 to the end points 26, and also includes the chamfer adjacent closed end 3 which forms rounded toe end 27. Cushion 24 will still most preferably be placed adjacent to straps 30, 40, but will, like pad 14, not extend the full width of the rectangular shape of top and front 20.

Boot 1 consists of both top and front 20 and bottom 10. In the preferred embodiment, these two components are assembled by stitching at a perimeter therebetween, though many other known manufacturing equivalents exist and are contemplated herein, including for exemplary purposes only and not limited thereto, thermal bonding, chemical bonding, and adhesive bonding. Rather than stitching the entire perimeter, which would fully close boot 1, stitching will stop at points 15, and not extend beyond towards points 16. This means that two opposed slits have been formed adjacent points 16, most preferably in the region over which straps 30, 40 travel. The slits thus formed provide overlap without bunching, and the fact that cushions 14, 24 do not form an entire circumference means that straps 30, 40 may be tightened about a wider range of dog legs without any fear of bunching than was possible in the prior art. Yet, and as aforementioned, cushions 14, 24 will ensure good contact with a dog's leg. The shapes illustrated in figures 4 - 7 also allow boot 1 to easily slip onto a dog's foot, as the opening is quite wide at the top of the boot when the slits are opened.

By using closed cell foam for pads 14, 24, boot 1 has the ability to float in water, which is an advantage when a boot comes off the dog in water. Unfortunately, the effects of water, muck and the like may still exert forces that are greater than the boot can otherwise resist. Hook and loop fasteners or a similar product are used to make up the fastening system comprised by straps 30, 40. The top strap 30 is a simple hook and loop fastening system preferably placed near the top of boot 1. The bottom strap 40 uses a plastic loop 43 to increase leverage and holding power. Strap 40 goes around the back of boot 1, through loop 43, and reverses direction to come

back to the front of boot 1. This allows a person to use leverage when tightening strap 40. This strap 40, along with cushions 14, 24 underneath straps 30, 40, ensures boot 1 will stay on the dog under the most severe conditions, including but not limited to mud, water, snow, heavy brush and the like. Figure 6 illustrates the hook portions 31 and 41 of straps 30, 40, and the loop portions 32, 42 which are designed to inter-engage and fasten together, though it will be understood that these arrangements of hooks and loops are not critical to performance.

Underneath and fitted to the shape of base layer 21, but stopping below or adjacent to strap 40 and placed closer to the dog's foot as best visible in Figure 8, are two cut-preventing layers 57, 58 of Kevlar Ice Pick. These cut-preventing layers 57, 58 form a protection layer that is designed to protect the top of the boot from slash-type wounds. Kevlar Ice Pick material was designed for exemplary purpose for prison guards, and is said to protect against penetration from sharp devices such as razor blades or the like. Other Aramid fibers or any sufficiently durable and protective materials may be substituted for Kevlar Ice Pick, known technically as Poly-para-phenylene terephthalamide, depending upon the specific requirements or needs for a specific application of the boots, for both layers 57, 58 and all other references herein to Kevlar. While Kevlar is most preferred, it is known that materials with less tensile strength or cut resistance may be substituted, but with the drawback of added thickness, weight, stiffness, or other undesirable factors.

An additional layer 29 fabricated for exemplary purposes from urethane waterproofed nylon may be provided interior of cut-preventing layers 57, 58 to ensure that the dog's nails do not undesirably snag the Kevlar. In this case, the urethane coating will preferably be on the most exterior surface of the nylon, and the nylon will preferably be a relatively high denier fabric that will allow the nails to slip without significant snagging or damage ensuing.

The bottom 10 needs the most protection because it is the area where the dog will be placing its weight while using boot 1. To provide sufficient protection, a total of ten layers of Kevlar have been provided as a Kevlar pad 50, visible in Figures 10 and 12. To sew in ten layers would cause boot 1 to be undesirably bulky, stiff and generally uncomfortable for a dog to wear. Instead, the outer two layers 51, 52 of Kevlar form a pocket. In the preferred embodiment, these outer protective layers 51, 52 of Kevlar are the longest layers, and reach from toe 17 of bottom 10 to the top of surface 12. Before fully enclosing these layers, a Kevlar pad 55 comprising eight layers of Kevlar is placed inside. Even within Kevlar pad 55, the two outermost layers 53, 54 additionally preferably extend higher on boot 1 than the remainder of pad 55. The inner protective layers of Kevlar pad 55 are shortened even further, to additionally help reduce bunching. With such an arrangement, outer protective layers 51, 52 help to transition between the thickness of Kevlar pad 55 to the thickness of only layers 51, 52 and 11, 12.

Kevlar pad 55 may be quilted or sewn together as a unit, such as along seam lines 64, 65 illustrated in Figure 12. Next, to prevent bunching, layers 51, 52 may be sewn thereto at seam line 63. Finally, the assembly of Kevlar 50 and surface 12 are sewn to layer 11 at seam 62, and through seam 61, described in greater detail next.

As is described above, in the preferred embodiment boot 1, bottom 10 and top 20 are sewn together. This construction is best illustrated in Figure 11, wherein seam binding 60 is wrapped about the cut ends of layers 11, 12, 21, 29, 51, 52, 57 and 58, and then sewn at seam 61 to form a unitary structure. For waterproof applications, sealant may additionally be used at the seam. While seam 61 and additional seams 62 - 65 are illustrated herein, alternative means of connection have been contemplated, including, but not limited to, adhesives, sealants, thermal, RF, and ultrasonic bonding, or other means known in the art of material bonding. Nevertheless,

by including Kevlar layers 51, 52, 57 and 58 entirely to the seam, sharp objects are prevented from penetrating boot 1 at or adjacent to the seam.

Since for many applications requiring the extreme protection provided by preferred embodiment boot 1 waterproofing is also desirable, boot 1 is provided with suitable waterproofing layers. Back and front layers 11 and 21 might, for exemplary purposes, be provided with a urethane coating or other suitable means to prevent moisture penetration therethrough. Similarly, layer 29 may also be urethane coated. Where Toughtek is used as outer layer 12 and toe guard 22, additional waterproofing is inherently provided thereby.

An undesirable side effect of waterproofed layers is the loss of ventilation within the boot. Since a dog sweats through foot pads, moisture will undesirably accumulate in the base of the dog boot. This may result in a damp and uncomfortable environment that may lead to chaffing, sores, icing, abrasions, and other discomfort. To prevent these undesirable side effects, in the present invention foam pads 14, 24 may, as a considered alternative embodiment, also incorporate tubes or air vents 23. These vents will most preferably allow air to flow out from and back into boot 1, most preferably forced to flow as a result of the dog's paws during its natural movement.

A variety of different arrangements for tubes 23 are considered herein, one which is illustrated in figure 2 showing tubes 23 passing through or integral with pad 24, but which could also pass through and integral with pad 14 as well or instead of through pad 24. A second alternative is the passage of tubes 23 adjacent the edge of pads 14, 24. Either placement will preserve the ability to tighten straps 30, 40 without the tubes undesirably forming pressure points. Particularly where tubes 23 are formed from softer and more resilient material such as thin-walled vinyl or rubber, the tube may exhibit compressive characteristics very similar to that of the foam pads.

An alternative placement is illustrated in Figure 13, which shows tube 23 passing inside of seam binder 60. Since the outer seams are relatively stiff compared to much of the rest of the boot, and since these seams pass from toe 17, 27 to the v-split adjacent to strap 40, the seams can serve a second function by carrying tube 23 therein without otherwise consequentially altering the feel or function of boot 1.

The ordinary movement of a dog paw within boot 1 will lead to a certain amount of forward and backward position change, leading to a change in air volume between the front and back. This volume change can be directly harnessed by providing tubes 23 that couple air exterior to boot 1 to the front and separately to the back of boot 1. By so doing, the natural movements will move air first into the front and out of the back of boot 1, and then will move air into the back and out the front. Tubes 23 may, if so desired, pass throughout the seam region and may be provided with perforations at suitable locations to permit air to flow in and out therefrom. Alternatively, one-way valves of any suitable construction, but for exemplary purposes flapper valves, may be provided if so desired to control the flow of air to force movement in a single direction. This has the benefit that air passing into tube 23 is not simply drawn back into boot 1 on a reversing flow cycle, and will instead be pushed always out of boot 1.

In some cases, the natural volume changes within boot 1 will not be sufficient to satisfy a particular application. To address the needs of that application, it is further contemplated herein that the various boot layers themselves or additional layers may be provided that will serve as bellows. Again for exemplary purposes, if urethane coated layer 29 is provided with a one-way air valve to permit air to pass from the interior of boot 1 to a space between layer 29 and layer 21, the movement of layer 29 will act as a bellows. In a further alternative, the bottom of boot 1 such as illustrated in Figure 9 may be provided with a separate bellows such that the weight of

the dog pressing down onto outer layer 12 will also compress the bellows and force air from within boot 1 to the exterior, and then the lifting of the paw will permit such bellows to expand by drawing air from within boot 1 into the bellows. As may be apparent, there will many different suitable designs for ventilation that will become apparent to those skilled in the art after a review of the present specification.

As may be understood, these preferred embodiment boots have many uses, including keeping a dog's feet clean when outside, to protect hunting, police and search and rescue dog's feet from cuts, thorns, and burrs, and, when walking them, to protect dog's feet from chemicals and severe cold in the winter, and severe heat in the summer.

Additionally, while the preferred embodiment describes application to dogs in accord with the requirement for enablement, those skilled in animal husbandry will recognize that the present invention will have application to other animals having similar paw and leg anatomy. Consequently, while the foregoing details what is felt to be the preferred embodiment of the invention, no material limitations to the scope of the claimed invention are intended. Further, features and design alternatives that would be obvious to one of ordinary skill in the art are considered to be incorporated herein. The scope of the invention is set forth and particularly described in the claims herein below.

## CLAIMS

We claim:

1. A protective dog boot, comprising:
  - a first lamination of a substrate and at least one cut-resistant layer;
  - a second lamination of a substrate, a friction pad, and a plurality of puncture and cut resistant layers;
  - said first lamination and said second lamination coupled at a junction to form a tube having an open end and a closed end;
  - at least one of said plurality of puncture and cut resistant layers extending fully across said first lamination and into said junction between said first and second laminations and at least another one of said plurality of puncture and cut resistant layers distinct from said junction.
2. The protective dog boot of claim 1, wherein said at least another one of said plurality of puncture and cut resistant layers comprises a second plurality of layers, at least one of said second plurality of layers larger than at least another one of said second plurality of layers.
3. The protective dog boot of claim 1, wherein said plurality of puncture and cut resistant layers further comprise poly-para-phenylene terephthalamide.
4. The protective dog boot of claim 1, wherein said at least one cut-resistant layer further comprises poly-para-phenylene terephthalamide.

5. The protective dog boot of claim 3, wherein said at least one cut-resistant layer further comprises poly-para-phenylene terephthalamide.
6. The protective dog boot of claim 1, further comprising a means for drawing air into and out of said boot responsive to movement of a dog's paw within said secure dog boot.
7. The protective dog boot of claim 6, wherein said means for drawing air into and out of said boot further comprises a bellows.
8. The protective dog boot of claim 1, wherein said second lamination further comprises a cushion on a surface of said second substrate and a ventilation passage extending from an exterior of said boot adjacent to a top of said cushion and into an interior of said boot.
9. The protective dog boot of claim 1, further comprising a ventilation passage through said junction.
10. A dog boot, suitable for insertion and removal of a dog's leg and paw and operatively providing protective covering about said dog paw, comprising:
  - an operatively protective covering having a closed end and an open end and
  - defining a dog paw region operative to surround said dog's paw, and
  - defining a dog leg region operative to surround said dog's leg, said dog paw region adjacent to said closed end and said dog leg region adjacent to said open end;

a means adjacent a bottom surface of said dog paw region and said dog leg region for preventing punctures and cuts;

a means adjacent a top surface of said dog paw region and said dog leg region for preventing cuts, said means for preventing punctures and cuts joined to said means for preventing cuts at a junction therebetween;

a means adjacent said open end for allowing said open end to expand, thereby facilitating insertion of a dog paw therein;

a means for contracting said dog leg region; and

at least one interference-producing cushion on an interior of said dog leg region protruding interiorly from said operatively protective covering above and immediately adjacent to said dog paw region operative to produce interference with said dog's paw and thereby resist said dog leg region sliding into contact with said dog's paw.

11. The dog boot of claim 10, wherein said at least one interference-producing cushion further comprises a termination distal to said open end, said at least one interference-producing cushion located entirely within said dog leg region.
12. The dog boot of claim 10, further comprising a bellows for ventilating an interior of said dog boot with exterior air.
13. The dog boot of claim 10, further comprising a ventilation tube passing within and through said interference-producing cushion.

14. The dog boot of claim 12, further comprising a ventilation tube adjacent with said interference-producing cushion and coupled with said bellows.
15. The dog boot of claim 12, wherein said ventilation tube passes through said junction.

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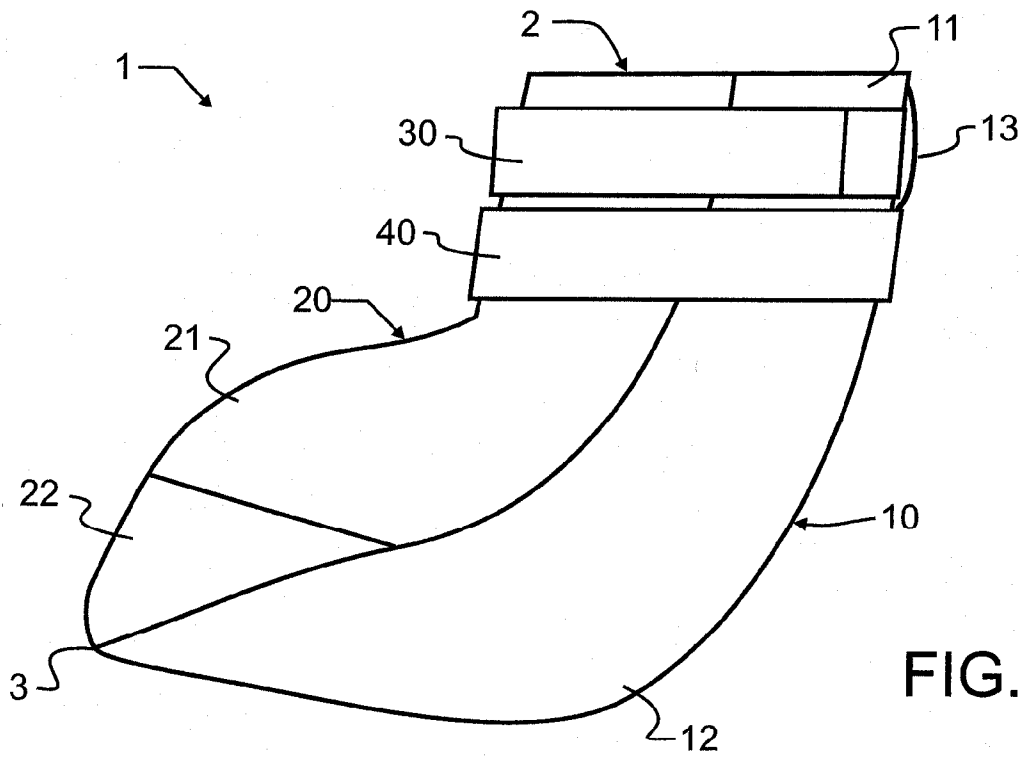


FIG. 1

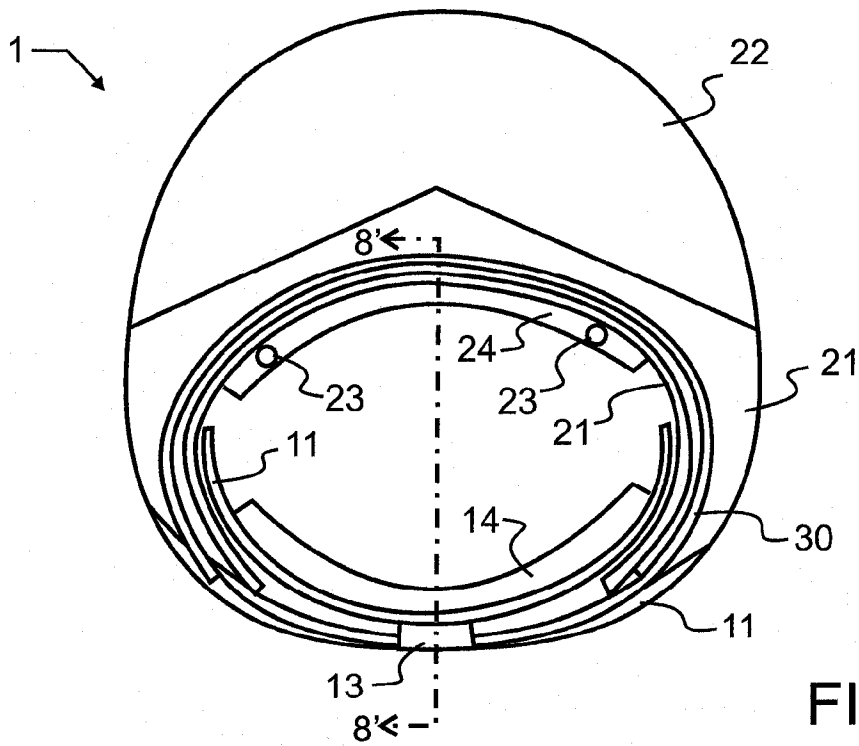


FIG. 2

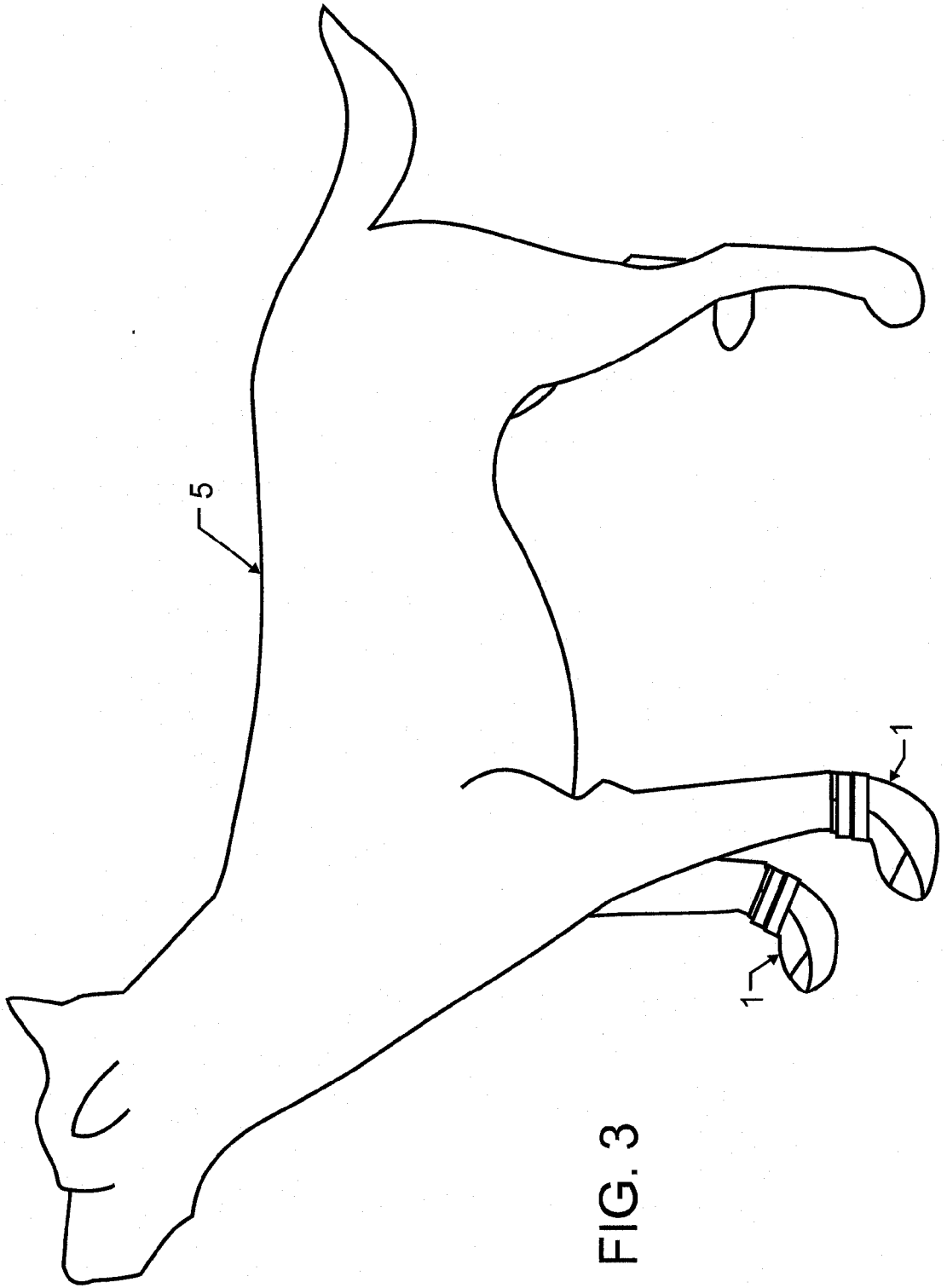


FIG. 3

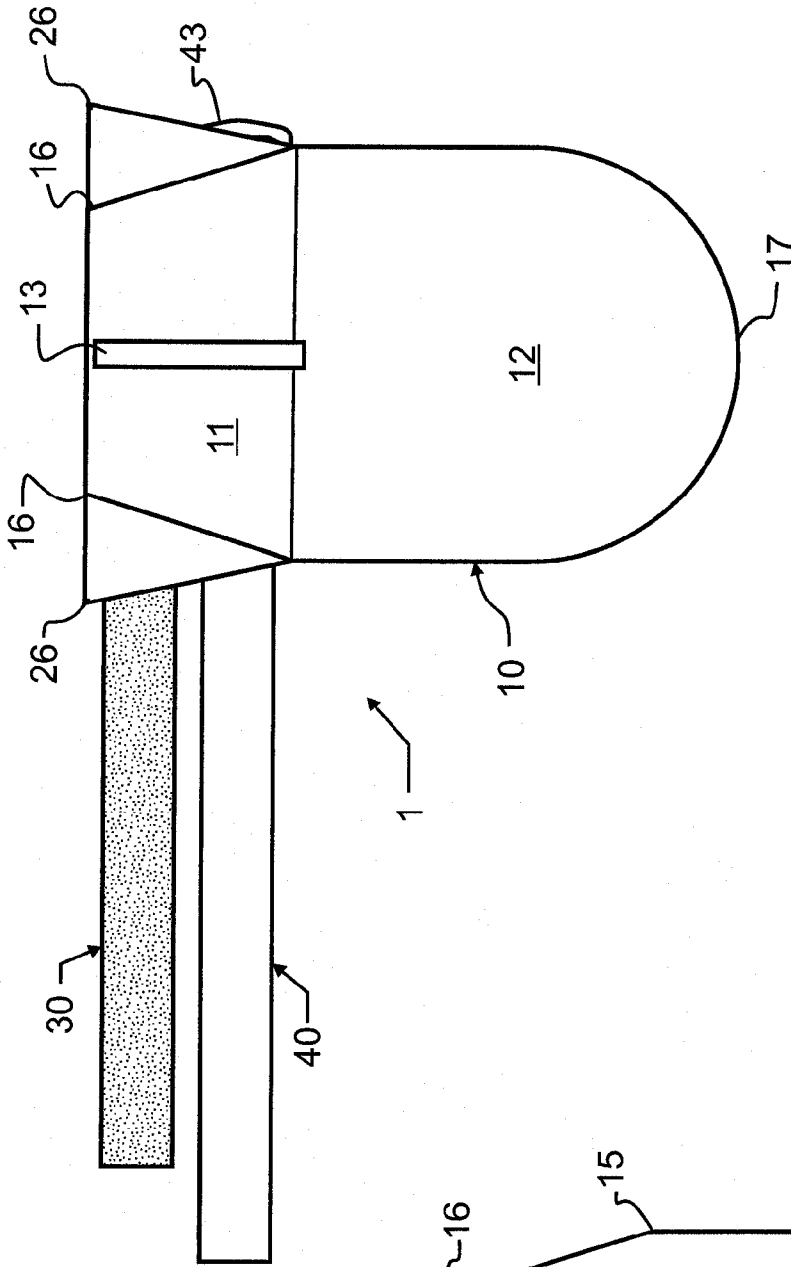


FIG. 4

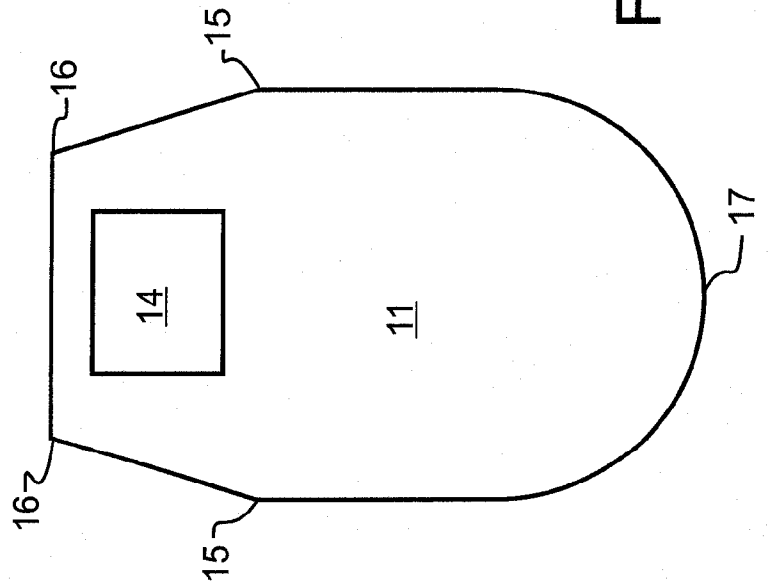


FIG. 5

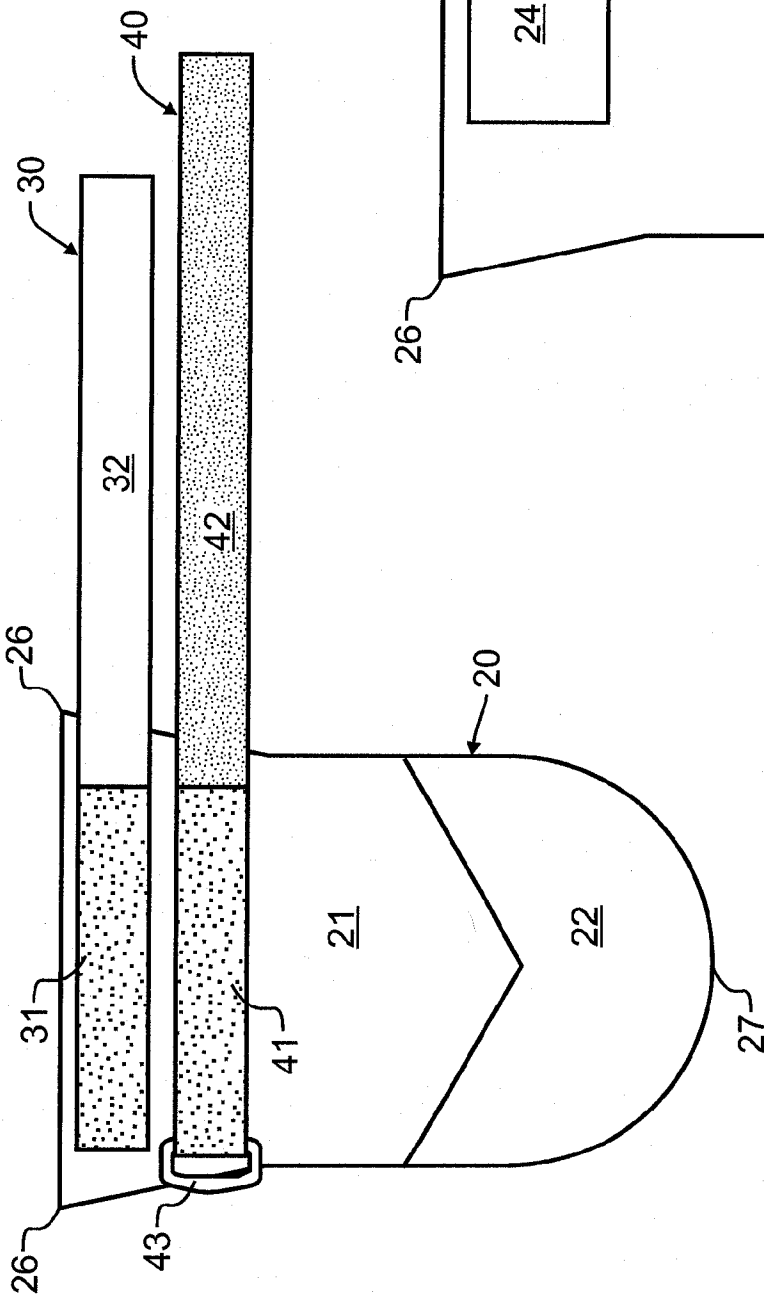


FIG. 6

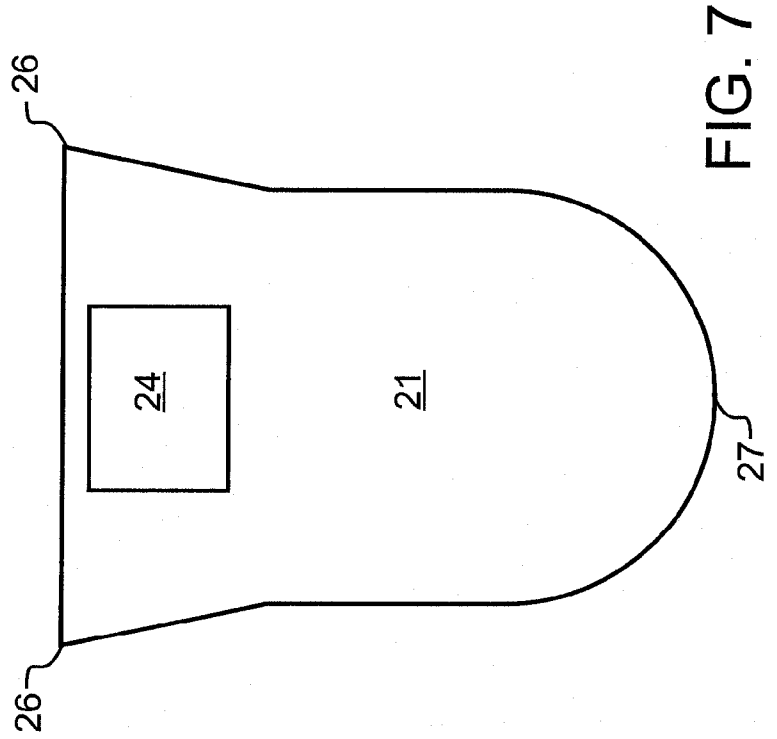


FIG. 7

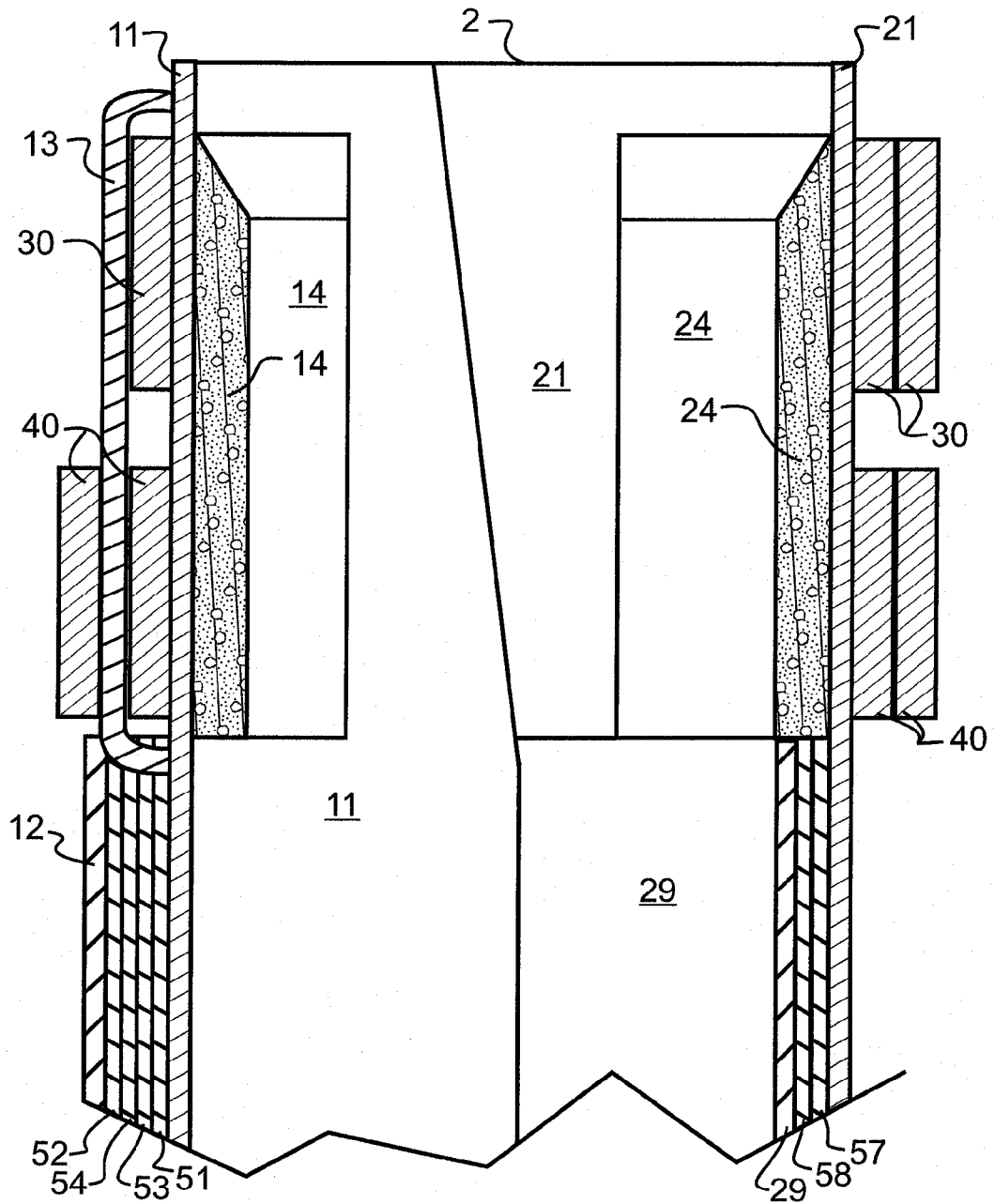
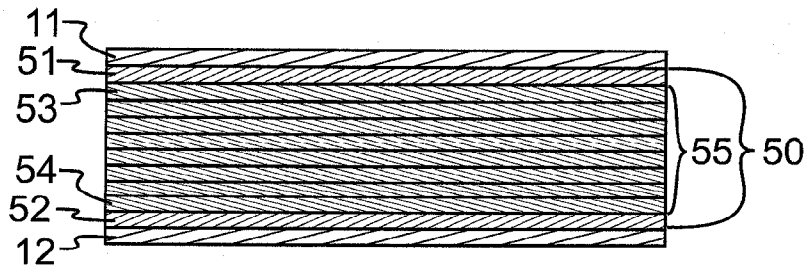
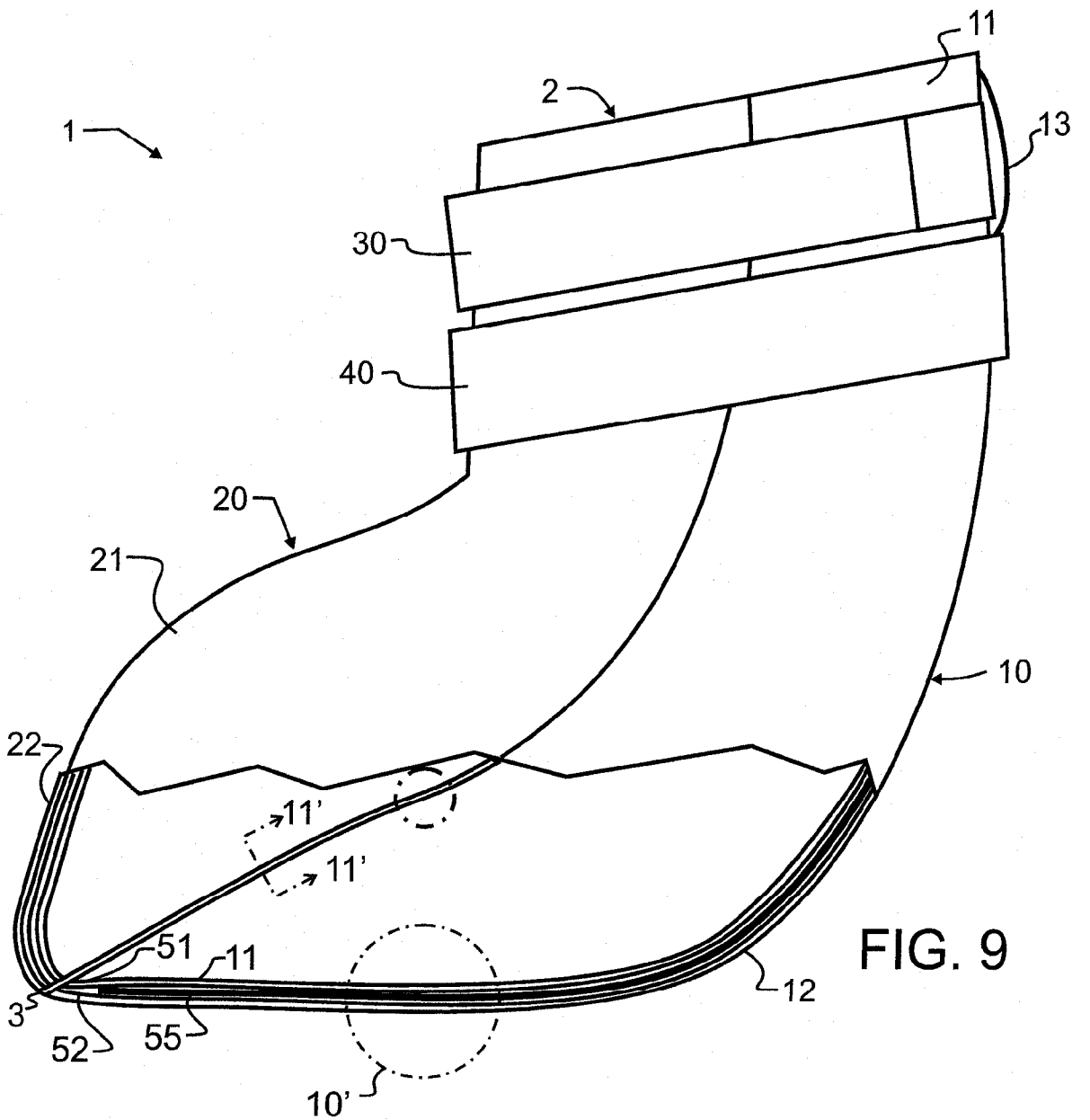


FIG. 8



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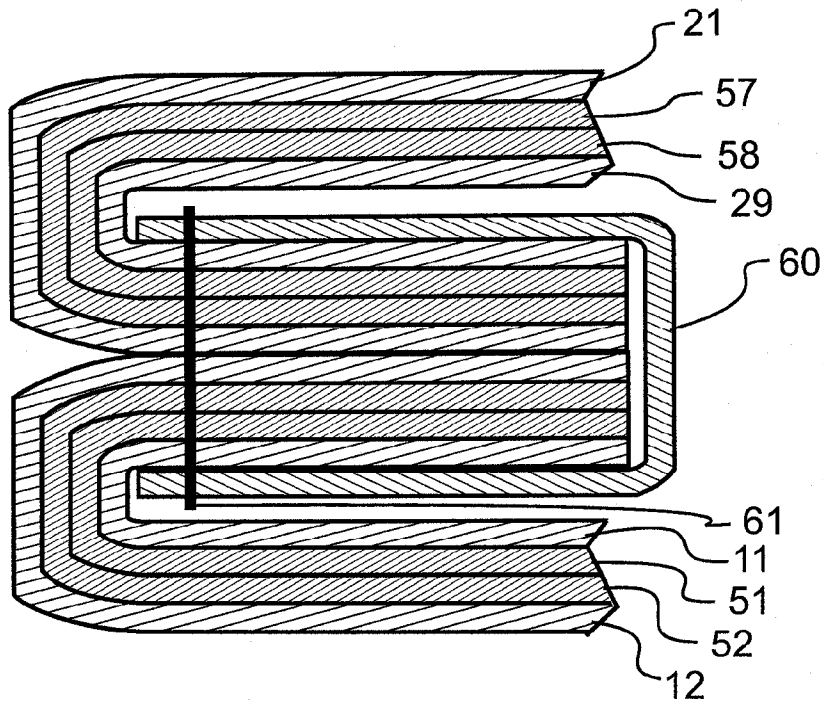
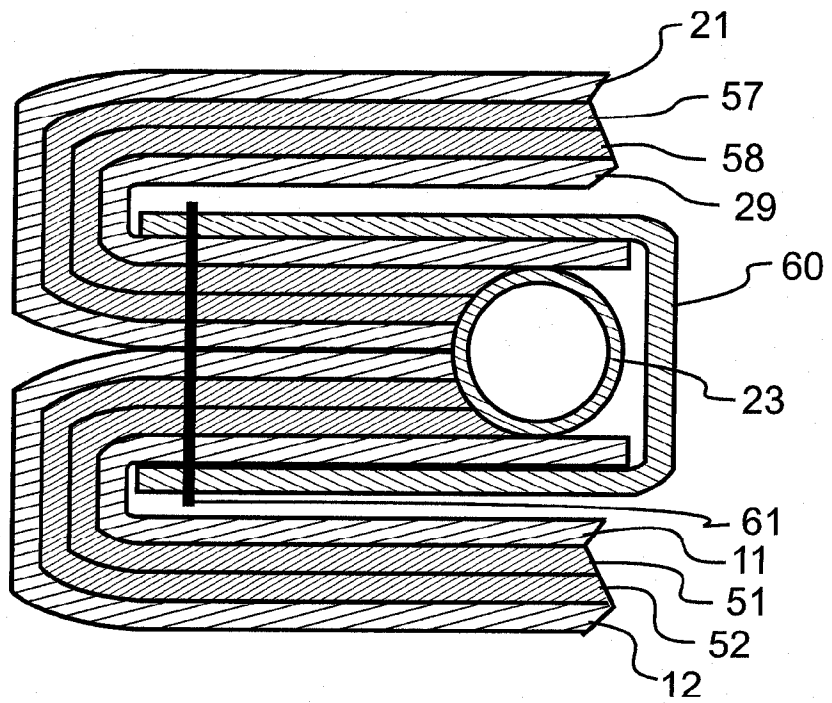


FIG. 11

FIG. 13



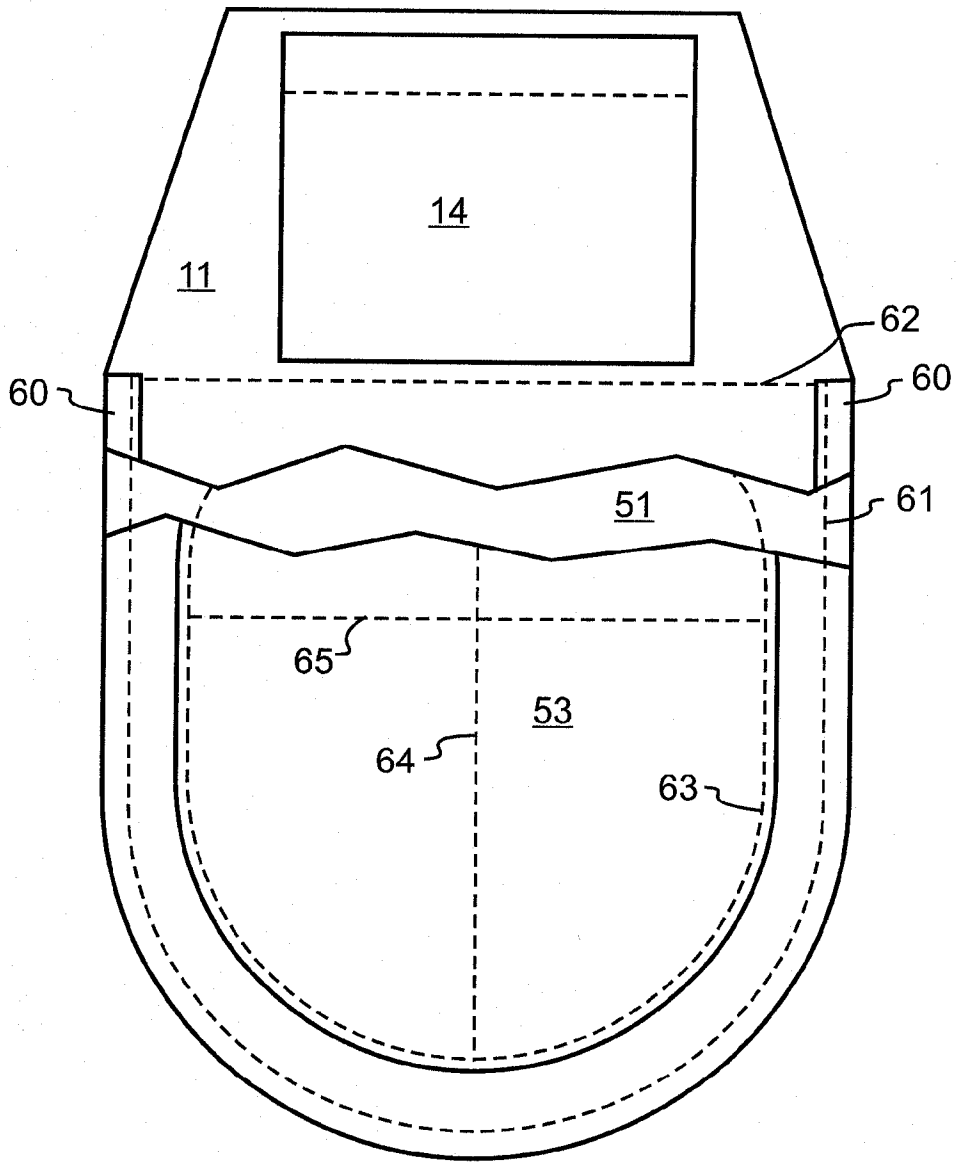


FIG. 12