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(54) **PROTECTIVE APPAREL FOR MARTIAL ARTS TRAINING**

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(57) **ABSTRACT**

Protective apparel for use in martial arts or fitness training exercises involving contact between two participants, such as pad work or spar training, comprises a strike surface (**11**) carried on an inflatable bladder (**12**), and securing means (**21-23**) to enable the apparel (**10**, **40**) to be worn by a user (**30**) during spar training. During use, the inflatable bladder (**12**) is inflated to a sufficient pressure to withstand strikes from a sparring partner. The protective apparel may take the form of a torso protector (**10**) or thigh protector (**40**), or other variants. These may be worn by the user (**30**) either alone or in combination to increase the area of the strike surface (**11**), and thus also increase the area of the user's body (**30**) which is protected.

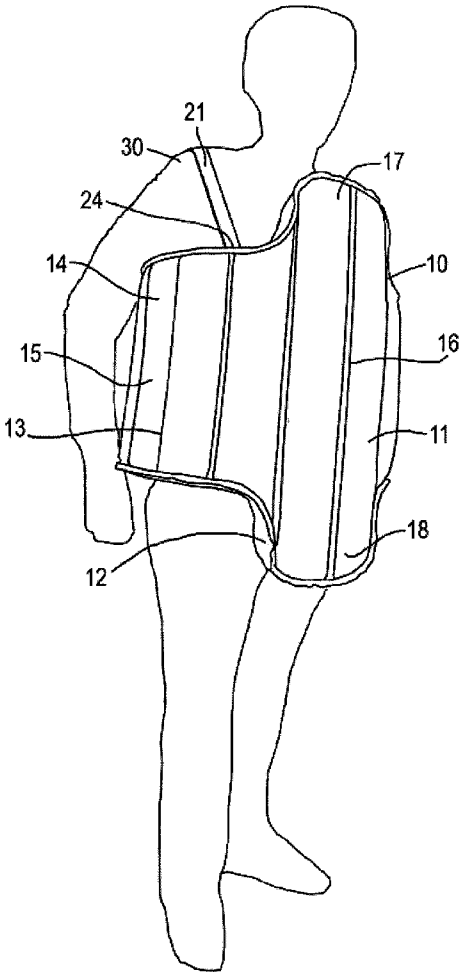

Fig.1

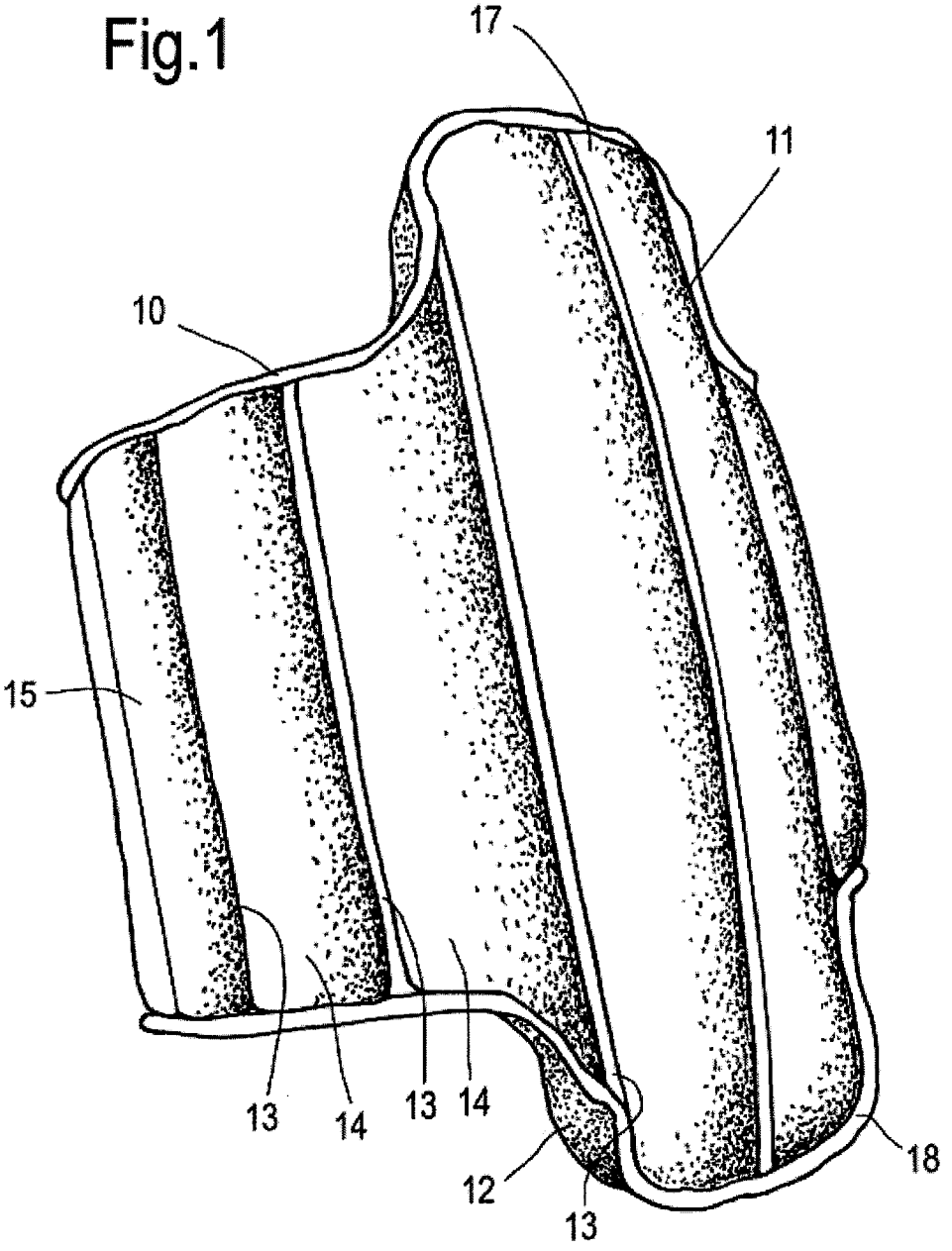

Fig.2

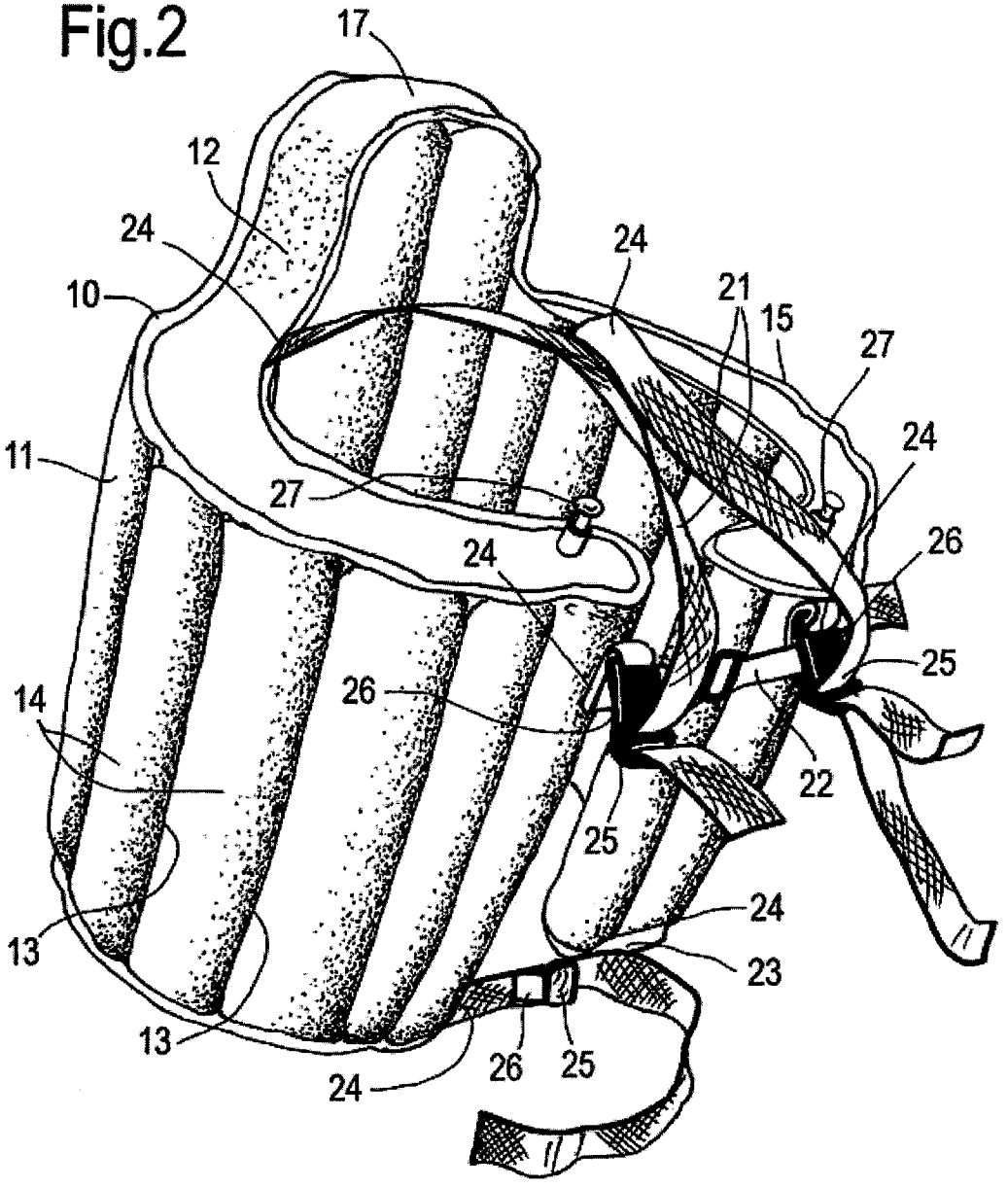
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Fig.3

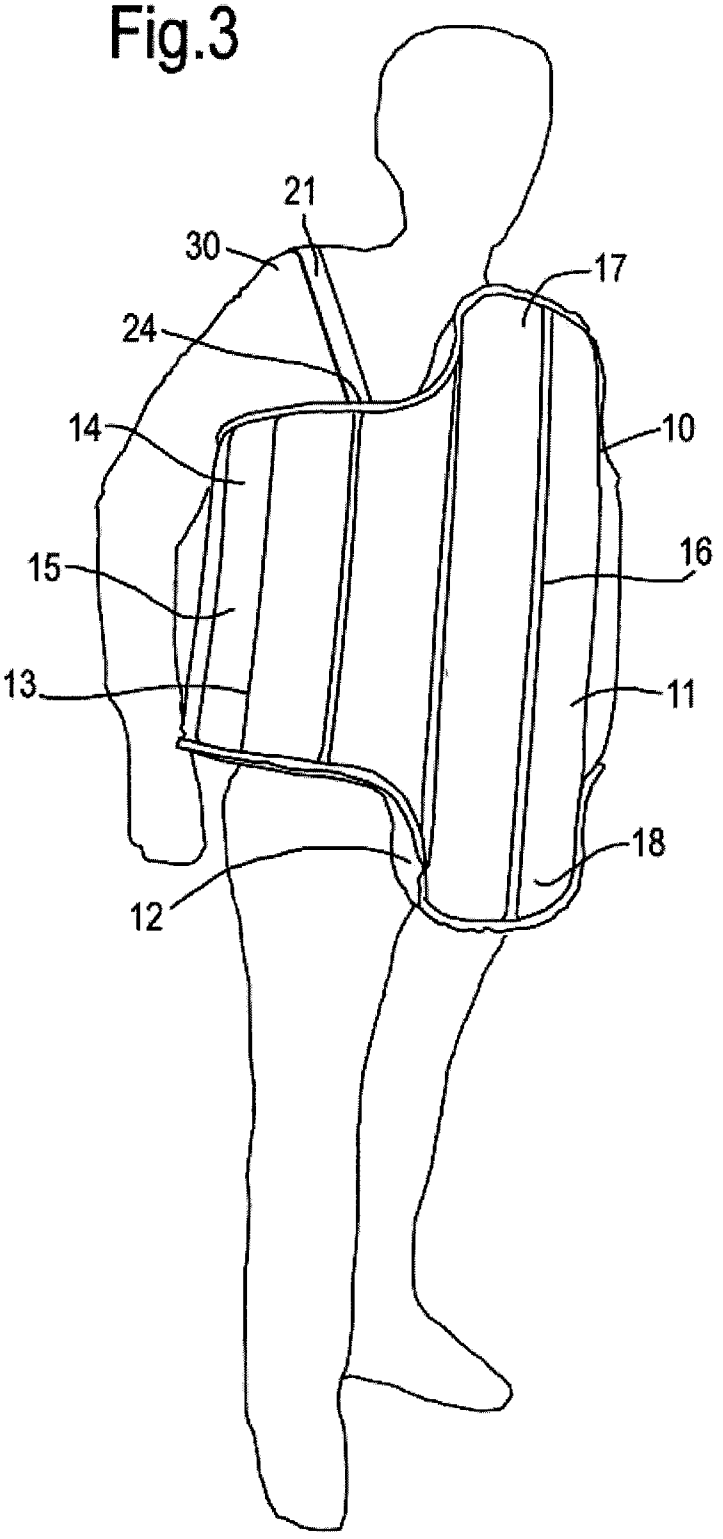


Fig.4

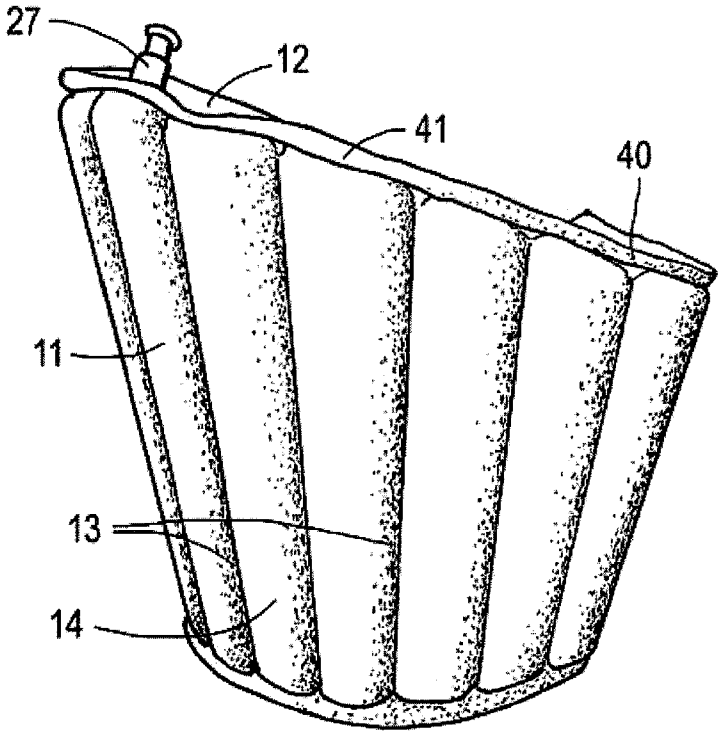


Fig.5

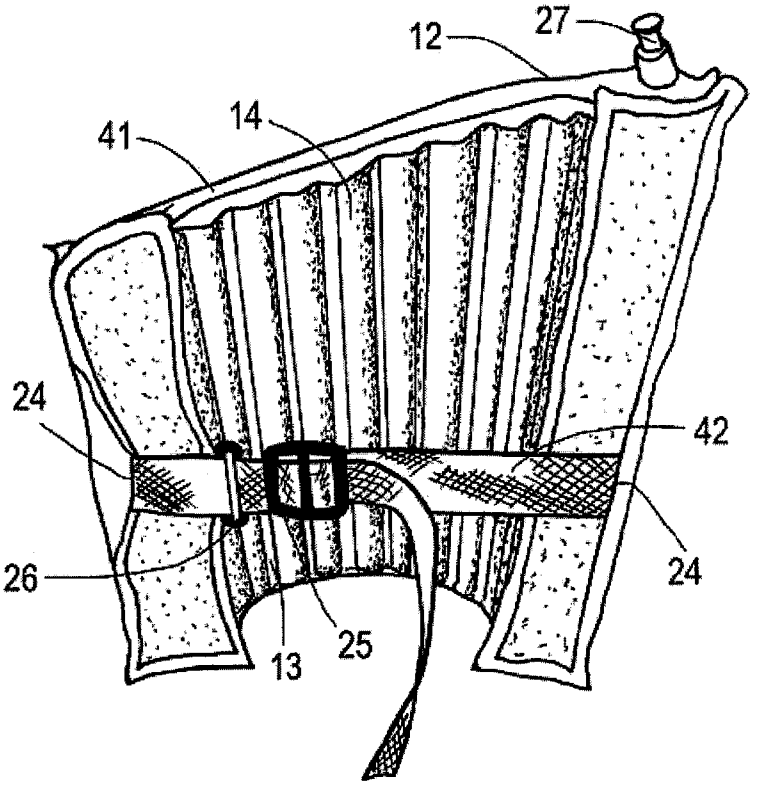


Fig.6

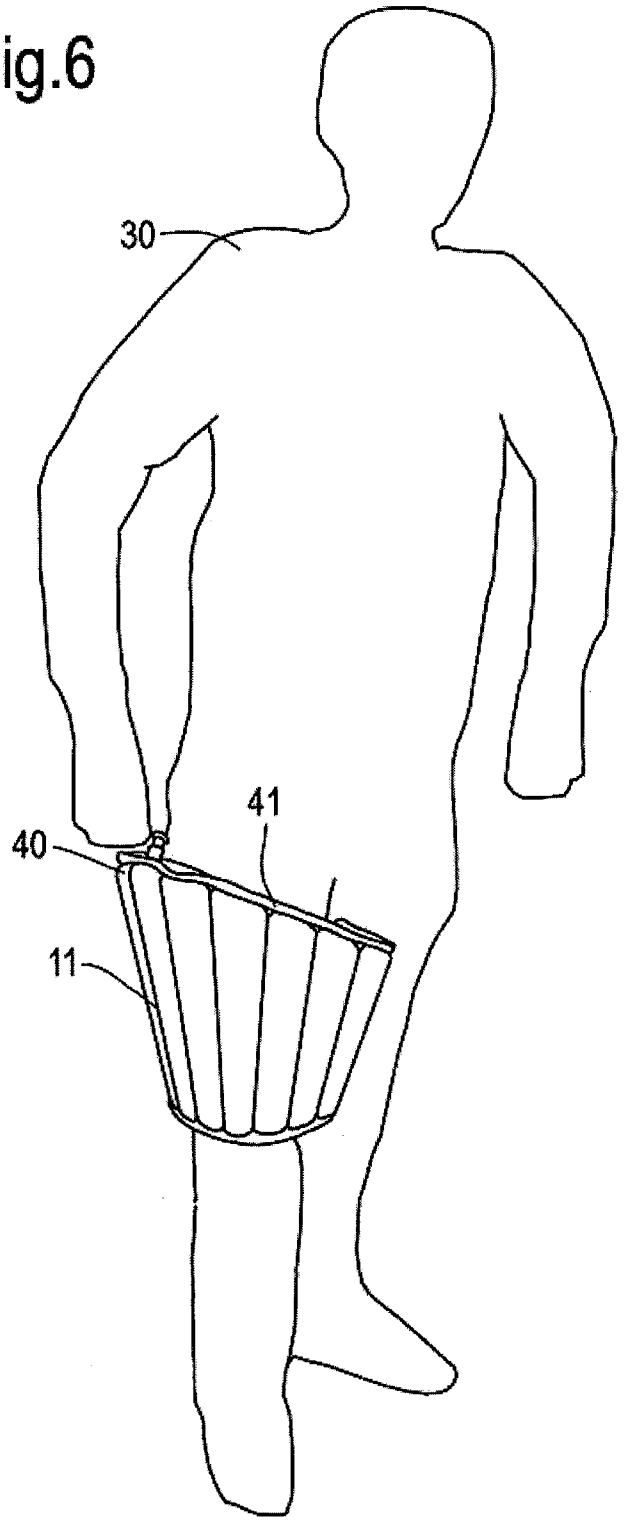
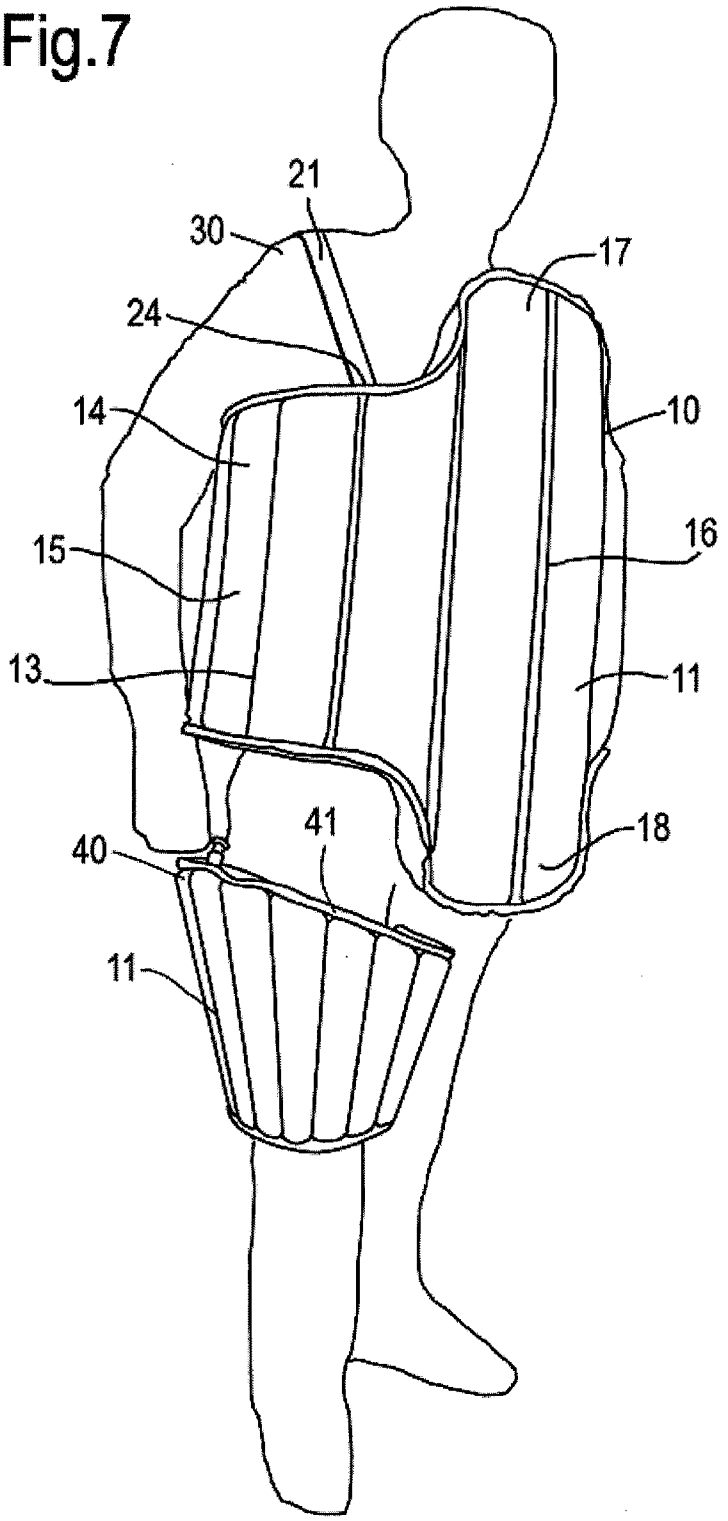


Fig.7



PROTECTIVE APPAREL FOR MARTIAL ARTS TRAINING

[0001] This invention relates to protective apparel for use in martial arts or fitness training. In particular, it relates to protective apparel adapted to be worn by a user during martial arts training exercises involving contact between two participants, such as pad work or spar training. The term "spar training" is used broadly herein to refer to any martial arts training exercise involving contact between two participants, and thus includes pad work within its scope.

[0002] Spar training, often referred to simply as sparring, is an essential part of martial arts training utilised in practically all forms of martial art. It allows a trainee to practice and develop their skills against an actual opponent, though in a strictly regulated environment, rather than against a static, artificial opponent such as a dummy or punch-bag. In addition to its use in martial arts, spar training has also gained popularity in general fitness training.

[0003] Clearly, the protection of participants against injury is of great importance in any spar training encounter. A wide range of protective apparel has been developed, which varies in construction according to the part of the body to be protected, and the form of martial art for which it is intended. The aim of such protective apparel is to attenuate the impact of strikes (punches, kicks etc.) received from one's spar training partner, and this is generally achieved by the use of some form of compressible foam.

[0004] Compressible foam protective apparel does however suffer from a number of drawbacks. In particular, the presence of a solid medium—whatever its shock-absorbing properties—in contact with the user's body, means that some force from the impact will still be transferred to the user. The risk of injury can thus only be reduced rather than eliminated. For the same reason, the risk of injury to the hand or foot of the spar training partner performing a strike also remains. Additionally, the wear and tear caused by repeated striking will eventually take its toll on the apparel, resulting either in the compressible foam becoming fatigued (i.e. failing to expand back to its initial state following impact) or the apparel becoming damaged. Either of these occurrences will expose the user to the risk of potentially serious injury. This problem can be compounded by the fact that the apparel may show no visible signs of having failed.

[0005] In addition to the risk of injury associated with such unsatisfactory protection, the quality and efficacy of spar training can also be adversely affected. That is to say, because of the known shortcomings of compressible foam protective apparel as outlined above, users tend to limit the power which they impart to strikes, so as to avoid injuring themselves or their partner.

[0006] The applicant's co-pending UK patent application no. 10 16826.8 discloses inflatable martial arts training apparatus intended to be removably mounted on a structural element within a building, for the performance of martial arts or fitness training exercises involving a user punching and/or kicking the apparatus.

[0007] It has now been realised that sufficient pressure within such an inflatable bladder can withstand even the extreme forces associated with being punched or kicked by a martial arts master. Moreover, the shock-attenuating properties provided by an inflated bladder have been found to be superior to those associated with compressible foam. The present invention thus seeks to provide inflatable personal protection for use in spar training which overcomes the shortcomings of compressible foam protective apparel, and provides increased protection against injury, whilst enabling users to impart full power to their strikes during spar training. The present invention further seeks to provide a lightweight, easily portable and collapsible alternative to conventional protective apparel.

[0008] The present invention has been developed for use in martial arts spar training, and will therefore be described herein with particular emphasis on this intended use. Nevertheless, it is envisaged that the present invention may also be adapted for use in relation to other contact sports, or indeed for use in any environment where protective apparel is desirable.

[0009] According to the present invention there is provided protective apparel for use in martial arts or fitness training, comprising:

[0010] a strike surface carried on an inflatable bladder; and

[0011] securing means to enable the apparel to be worn by a user during said training;

[0012] wherein, during use, the inflatable bladder is inflated to a sufficient pressure to withstand strikes (punches and kicks) from a training partner, without causing injury to said user.

[0013] The inflatable bladder may be inflated either prior to the user donning the protective apparel, or once the apparel is in situ on the user's body. It is however essential that inflation of the bladder to the required pressure be carried out prior to the commencement of spar training. Inflation of the bladder may be carried out either orally, using conventional air pumps, or by the provision of canisters of pressurised air or other gas.

[0014] The strike surface is preferably three-dimensional, and most preferably has a generally cylindrical profile. This is preferably achieved by forming the inflatable bladder such that it adopts a generally cylindrical profile on inflation.

[0015] The inflatable bladder preferably comprises one or more strengthening ribs, located internally thereof. The strengthening ribs serve to impart greater resistance against damage and so prolong the useful life of the protective apparel. Most preferably, said strengthening ribs divide the inflatable bladder into a plurality of chambers, thereby imparting a segmented structure to the apparel. This segmented structure also assists in providing the generally cylindrical profile.

[0016] The protective apparel may be formed with each said chamber being individually sealed, which would necessitate each individual chamber being provided with its own inflation valve. However, it is generally preferred that each said chamber will in fact be in fluid communication with its adjacent chamber(s), such that air may flow from one chamber to another, with the inflatable bladder being provided with a single inflation valve. This enables the bladder to be inflated to a higher pressure than would otherwise be attainable, thus giving enhanced protection. Moreover, allowing air to flow from one chamber to another has been found to enhance the shock-attenuating properties of the inflated bladder, by means of a process known as pneumatic energy dissipation (PED).

[0017] Two or more inflatable bladders, each having an inflation valve associated therewith, maybe provided. Each inflatable bladder may comprise a plurality of interconnected segmented chambers.

[0018] The protective apparel, and the inflatable bladder which forms an integral component thereof, are preferably

formed from thermoplastic polyurethane (TPU) and/or polyvinyl chloride (PVC). This may desirably take the form of TPU or PVC coated fabric material. The seams and joints of the apparel are preferably joined by ultrasonic welding, in order to provide maximum strength without the need for additional components or materials to achieve the joining.

[0019] In order to protect the or each inflation valve, each said valve is preferably located on a surface other than the strike surface. The or each inflation valve is preferably a quick release valve to facilitate speedy deflation of the device following a training session.

[0020] The securing means to enable the protective apparel to be worn by a user preferably comprises one or more straps. Most preferably, said one or more straps are provided with complementary quick release buckle fasteners.

[0021] In a first major embodiment of protective apparel according to the present invention, the apparel is adapted to be worn on a user's torso, and comprises: a generally cylindrical central portion adapted to wrap around said user's torso such that the strike surface extends over the front thereof; an upper portion adapted to protect said user's chest region; and a lower portion adapted to protect said user's groin region; each of said upper and lower portions extending from the generally cylindrical central portion.

[0022] The strike surface preferably extends over said generally cylindrical central portion and said upper and lower portions. The inflatable bladder preferably extends throughout said generally cylindrical central portion and said upper and lower portions.

[0023] In said first major embodiment, the securing means preferably comprises a pair of parallel straps adapted to be secured across a user's back region. Alternatively, or additionally, the securing means may comprise a pair of parallel straps adapted to be secured over a user's shoulder region.

[0024] In a second major embodiment of protective apparel according to the present invention, the protective apparel is adapted to be worn on a user's leg or arm, and is adapted to wrap around said user's leg or arm such that the strike surface extends outwardly thereof.

[0025] In said second major embodiment, the securing means preferably comprises one or more straps adapted to be secured over an inner face of said leg or arm.

[0026] It is envisaged that said first and second major embodiments may be utilised together, so as to increase the area of the strike surface and thus provide protection to the user over a greater area of the body. Accordingly, the present invention also provides a protective apparel kit comprising an article of protective apparel for a user's torso as hereinbefore described, and one or more articles of protective apparel for a user's leg(s) and/or arm(s), as hereinbefore described.

[0027] In order that the present invention may be more clearly understood, a preferred embodiment thereof will now be described in detail, though only by way of example, with reference to the accompanying drawings, in which:

[0028] FIG. **1** shows a front perspective view of protective apparel according to a first major embodiment of the present invention;

[0029] FIG. **2** shows a rear perspective view of the protective apparel of FIG. **1**;

[0030] FIG. **3** shows a front perspective view of a user wearing the protective apparel of FIGS. **1** and **2**;

[0031] FIG. **4** shows a front perspective view of protective apparel according to a second major embodiment of the present invention;

[0032] FIG. **5** shows a rear perspective view of the protective apparel of FIG. **4**;

[0033] FIG. **6** shows a front perspective view of a user wearing the protective apparel of FIGS. **4** and **5**; and

[0034] FIG. **7** shows a front perspective view of a user wearing both the protective apparel of FIGS. **1** and **2**, and the protective apparel of FIGS. **4** and **5**, in combination.

[0035] Referring first to FIG. **1**, there is shown a first major embodiment of protective apparel for use in martial arts or fitness training according to the present invention, in the form of a torso protector **10**. The torso protector **10** comprises a three dimensional strike surface **11**, carried on an inflatable bladder **12**. A plurality of strengthening ribs **13** are provided internally within the bladder **12**. In addition to providing enhanced strength to the torso protector **10**, the strengthening ribs **13** also divide the bladder **12** into a plurality of chambers **14**. As can be seen in FIG. **1**, this imparts a segmented structure to the torso protector **10**, which assists in the formation of the protector **10** with a generally cylindrical profile, thus enabling the protector **10** to wrap around the torso of a user. The individual chambers **14** of the inflatable bladder **12** may either be individually sealed, or more preferably may be in fluid communication with one another, such that air may pass from one chamber to another. This improves the shock-attenuating properties of the inflatable bladder **12** by employing pneumatic energy dissipation (PED).

[0036] The torso protector **10** is formed with a generally cylindrical central portion **15**, intended to wrap around and protect the torso of a user. At the front **16** of the protector **10**, are formed upper and lower portions **17**, **18** extending from the central portion **15**. The upper portion **17** is intended to cover and protect a user's chest region, whilst the lower portion **18** is intended to cover and protect a user's groin region. The strike surface **11** extends over the central portion **15**, the upper portion **17** and the lower portion **18**. The inflatable bladder **12** extends internally of the protector **10** throughout the central portion **15**, the upper portion **17** and the lower portion **18**.

[0037] Referring now to FIG. **2**, it can be seen that the rear side of the torso protector **10** is provided with securing means to enable the protector **10** to be worn by a user during said spar training. The securing means takes the form of a pair of shoulder straps **21**, an upper back strap **22**, and a lower back strap **23**, each securely affixed to the protector at an anchor point **24**. The shoulder straps **21** are designed to pass over a user's shoulders thereby to retain the protector **10** in place on the user's torso. The upper and lower back straps **22**, **23** are designed to pass around a user's back and serve to retain the protector **10** in place on the user's torso, and prevent movement of the protector **10** on the torso.

[0038] Each strap **21**, **22**, **23** is provided with a male buckle member **25** constituting one half of a plastic quick release buckle mechanism of familiar construction, each said male buckle member **25** being adapted to engage with a complementary female buckle member **26** affixed to the protector at an anchor point **24**. As can be seen, the female buckle members **26** associated with the shoulder straps **21** may share an anchor point **24** with the upper back strap **22**, and the female buckle member **26** associated therewith. The quick release buckle mechanisms **25**, **26** also enable adjustment of the length of each strap **21**, **22**, **23** to fit users of differing sizes and to tighten or loosen the straps **21**, **22**, **23** during use, as required.

[0039] As can also be seen in FIG. **2**, the protector **10** is provided with inflation valves **27** in communication with the internal inflatable bladder **12** and adapted to enable inflation and deflation thereof. In the example shown, two inflation valves **27** are provided, each adapted to inflate one side of the protector **10**, with an internal partition (not shown) being provided in the inflatable bladder **12**. The inflation valves **27** are provided on an upwardly facing surface of the protector **10** rather than on the strike surface **11**, so as to prevent damage to the inflation valves **27** during use.

[0040] Referring now to FIG. **3**, this shows the torso protector **10** being worn by a user **30**, ready to participate in martial arts spar training. The protector **10** is wrapped around the torso of the user **30**, facilitated by the segmented construction of the protector **10**, as defined by the strengthening ribs **13** and chambers **14** of the inflatable bladder **12**. The generally cylindrical central portion **15** thus wraps around the user's abdomen and sides, with the upper portion **17** extending to cover the user's chest region, and the lower portion **18** extending to cover the user's groin region. The protector is held in place by use of the back straps **22**, **23** (not visible in FIG. **3**) and the shoulder straps **21**.

[0041] Referring now to FIGS. **4** and **5**, there is shown a second major embodiment of protective apparel for use in martial arts or fitness training according to the present invention, in the form of a thigh protector **40**. The thigh protector **40** is constructed, and intended for operation in, essentially the same manner as that discussed above with reference to the torso protector **10**, and like reference numerals are thus utilised to denote like components. The thigh protector **40** differs from the torso protector **10** in that it does not comprise a central portion **15**, upper portion **17** and lower portion **18**. Instead, the thigh protector **40** is formed with a generally cylindrical profile, but with a slanting upper face **41** to provide a comfortable fit for the user. As will be appreciated, the thigh protector **40** may be constructed with the upper face **41** slanted in either a left or right orientation, so as to be worn on either the user's left or right thigh. The example shown in FIGS. **4** and **5** is intended to be worn on a user's right thigh. As can be seen in FIG. **5**, the thigh protector is provided with a single thigh strap **42** adapted to be secured around the user's inner thigh.

[0042] Referring now to FIG. **6**, this shows the thigh protector **40** being worn by a user **30**, ready for participation in martial arts spar training. The thigh protector **40** wraps around the user's thigh in the same manner as described above with reference to the torso protector **10**, facilitated by the segmented construction of the protector **40**. The thigh protector **40** is held in place on the user's thigh by the thigh strap **42** (not visible in FIG. **6**) passing around the user's inner thigh, so that the strike surface **11** remains oriented outwards. As can be seen, the right-oriented slant of the upper face **41** complements the shape of the user's body, leaving the hip region unencumbered.

[0043] Referring now to FIG. **7**, this shows the user **30** wearing both the torso protector **10** according to the first major embodiment of the present invention, and the thigh protector **40** according to the second major embodiment of the present invention, ready for participation in martial arts spar training. The strike surface **11** thus extends over a larger area of the user's body, and thus the area of the user's body which is protected is also increased. As can be seen, the slanting upper face **41** now also complements the shape of the torso protector **10**, having regard to the lower portion **18** thereof. It will be appreciated that a left-oriented thigh protector **40** may also be provided in order to provide a still larger strike surface **11**, and thus a still larger protected area.

[0044] It will also be appreciated that the thigh protector **40** according to the second major embodiment of the present invention may easily be further adapted to form a (left or right oriented) shin protector, upper arm protector or forearm protector. In this way, each area of the body can be protected by protective apparel according to the present invention, either individually or in combination.

1. Protective apparel for use in martial arts training, comprising:

a strike surface carried on an inflatable bladder; and

securing means to enable the apparel to be worn by a user during said training;

wherein, during use, the inflatable bladder is inflated to a sufficient pressure to withstand strikes from a training partner.

2. The protective apparel as claimed in claim **1**, wherein the strike surface is three-dimensional.

3. The protective apparel as claimed in claim **2**, wherein the strike surface has a generally cylindrical profile.

4. The protective apparel as claimed in claim **1**, wherein said inflatable bladder is shaped so as on inflation to adopt a generally cylindrical profile.

5. The protective apparel as claimed in claim **1**, wherein said inflatable bladder comprises at least one strengthening rib, located internally of the bladder.

6. The protective apparel as claimed in claim **5**, wherein said at least one strengthening rib divides the inflatable bladder into a plurality of chambers, thereby imparting a segmented structure to the apparel.

7. The protective apparel as claimed in claim **6**, wherein each said chamber is in fluid communication with its adjacent chamber.

8. The protective apparel as claimed in claim **1**, wherein the inflatable bladder is provided with an inflation valve.

9. The protective apparel as claimed in claim **8**, wherein the inflation valve is located on a surface other than the strike surface.

10. The protective apparel as claimed in claim **8 9**, wherein the inflation valve is a quick release valve.

11. The protective apparel as claimed in claim **1**, wherein the securing means to enable said protective apparel to be worn by a user comprises at least one strap.

12. The protective apparel as claimed in claim **11**, wherein said at least one strap is provided with complementary quick release buckle fasteners.

13. The protective apparel as claimed in claim **11**, wherein the apparel is adapted to be worn on a user's torso, and comprises: a generally cylindrical central portion adapted to wrap around said user's torso such that the strike surface extends over the front thereof; an upper portion adapted to protect said user's chest region; and a lower portion adapted to protect said user's groin region; and wherein each of said upper and lower portions extends from the generally cylindrical central portion.

14. The protective apparel as claimed in claim **13**, wherein the strike surface extends over said generally cylindrical central portion and said upper and lower portions.

15. The protective apparel as claimed in claim **14**, wherein the inflatable bladder extends throughout said generally cylindrical central portion and said upper and lower portions.

16. The protective apparel as claimed in claims **13**, wherein the securing means comprises a pair of parallel straps adapted to be secured across a user's back region.

17. The protective apparel as claimed in claims **13**, wherein the securing means comprises a pair of parallel straps adapted to be secured over a user's shoulder region.

18. The protective apparel as claimed in claim **11**, wherein the apparel is adapted to be worn on a user's limb, and is adapted to wrap around said user's limb such that the strike surface extends outwardly thereof.

19. The protective apparel as claimed in claim **18**, wherein the securing means comprises at least one strap adapted to be secured over an inner face of said limb.

20. A protective apparel kit comprising the protective apparel as claimed in claim **13**, and at least one article of protective apparel adapted to be worn on a user's limb, and adapted to wrap around said user's limb such that the strike surface extends outwardly thereof.

* * * * *