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(54) **ENVIRONMENTALLY FRIENDLY AND FUNCTIONAL MARTIAL ARTS GARMENT AND FABRICS**

(57) Disclosures herein relates to martial arts garment of fabric comprising bamboo fibers. Further, martial art fabrics comprising bamboo fibers are provided. Still further, disclosures herein relates to processes for manufacturing martial art fabrics. No chemically processed environmentally harmful substances are added during the manufacturing process. Thereby, fabrics and garments without chemically processed environmentally harmful substances is provided. All embodiments disclosed herein of fabrics and garments, as well as the manufacturing processes for producing them fulfils the requirements set by Ecolabel, Eucolabel and the Nordic Swan Ecolabelling.

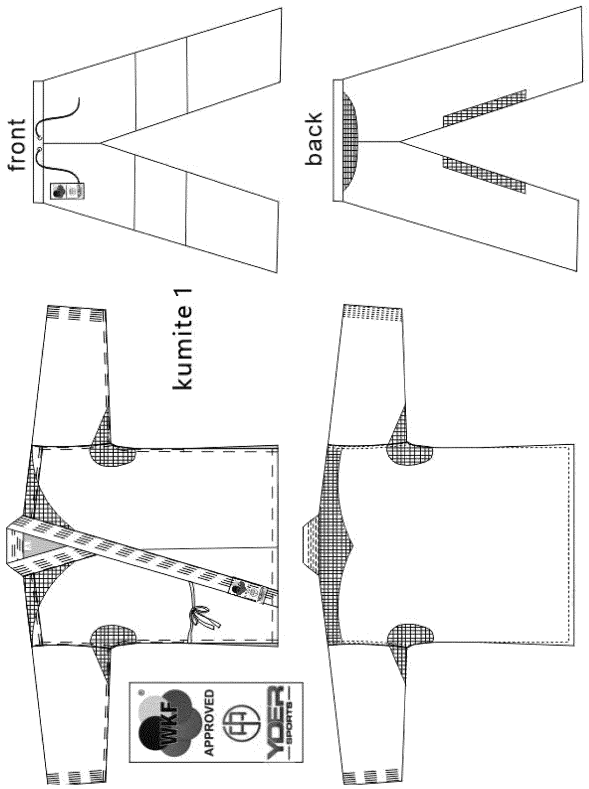

Fig. 2

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Description

TECHNICAL FIELD

[0001] The present disclosure relates generally to fabrics for martial art garments and equipment's.

BACKGROUND

[0002] Within martial art sport clothing and equipment, a lot of the fabrics used are mixed with cotton or polyester, both which is not considered entirely environmentally friendly. Cotton is a thirsty plant that requires a lot of water to grow, and because it is such a popular cash crop, it is using about 2.4% of the worlds arable farm land. Farmers are often forced to plant cotton in areas that don't get enough rain. This has resulted in that approximately 73% of all cotton grown requires irrigation, including the southern USA. The enormous need for water in the cotton production may require up to 20,000 liter water to produce only 1kg cotton, which is equivalent to one pair of jeans, or a single T-shirt.

[0003] As well as being a thirsty crop, cotton cultivation currently uses lots of chemicals - more than 4 per cent of all world pesticides and 10 per cent of insecticides are used in cotton-growing. The chemicals pollute local ecosystems and drinking water supplies. Poorly managed cotton production has had devastating effects on the environment, with the most visible example being the Aral Sea going from the 4th largest lake in the world to a desert because local governments since the 1960s diverted all the rivers and waterways into cotton production, letting the Aral Sea evaporate and give way to the Aralkum Desert, whose sands are so polluted with pesticides and herbicides from decades of cotton industry runoff, dust blown from the Aralkum Desert has infected animals as far away as Antarctica with its toxins.

[0004] Thus, the use of cotton in fabrics causes high environmental load.

[0005] The Swedish environmental objective is a non-toxic environment, and to facilitate the transformation to a circular economy. Development proceeds towards the phasing out of hazardous chemicals and substituting towards chemicals and materials with better environmental and health performance such as green chemistry. The Swedish Chemicals Agency is looking into how public investments in innovation of chemicals and materials enhance substitution of hazardous compounds, thereby contributing to reaching the environmental objective of a non-toxic environment and enabling a long-term development towards a circular economy. A substitution of the use of fabrics with heavy environmental load towards environmentally friendly organic materials like bamboo and cocos, thus fibers from coconuts, is perfectly in line with this objective.

[0006] Fabrics are a group of products that often are used frequently in our daily life and in our homes. They are often used in products being close to the skin and during long term exposure. Thereby, fabrics comprising dangerous chemicals are a threat to our health.

One example is azo based colors. They may cause allergic reactions when exposed to the skin and may also irritate the eyes. Still further, they may be toxic if inhaled or consumed. Also, they are found to be toxic for water living organisms and they may cause harmful long term effects in the aquatic environment.

[0007] When using sports gloves, the skin of the hands will often be damped. Gloves being soggy with moisture may constitute a fertile soil for bacteria, resulting in skin problem like eczema or fungal, or athlete foot. Similar problems as related to sports gloves may occur for socks and hosiery, as well as for training shoes. Martial sports where socks and shoes may be used are for example Taekwando or Wushu, Kung Fu and Tai Chi.

[0008] There have been examples of products for children being found to comprise carcinogenic substances like azo based colors. Other examples of non-environmentally friendly substances used for fabrics are when fabrics or textiles are bleach by chemical substances like chlorine. Especially children and young people are very sensitive to the exposure of chemicals. A product often used by children and young people are dresses for sports, like martial sports. Therefore, there is a need of fabrics being free from harmful chemicals and friendly to the environment, and also suitable for sports wear.

[0009] In Sweden, the consumption of fabrics for clothing and textiles in our homes has increased with more than 30% during a time period of approximately 20 years. This means that the consumption of fabrics are about 14 kg / person and year. The production of fabrics constitutes a heavy load on the environment, the climate and the earth of the people. More than 80% of the environmental load of a clothing occurs in the production phase. This is because the production of fabrics uses large amounts of raw material, water, energy and chemical compounds. The production result in emissions to the air, the water and to the ground and soil.

[0010] Further drawbacks with cotton in martial clothing are that it is not a very strong fabric, it is absorbent and heavy and takes a long time to dry, and also stains easily. Still further, cotton has poor elasticity. It creases badly and it also shrinks badly. Cotton may also be attacked by mildew if left damp.

[0011] Recycled polyester is in some degree environmentally friendly, however; polyester thrown in the nature is still an issue and a threat to the environmental. Although polyester have some desired properties, it is cheap and have good strength, and being at least in some aspect environmentally friendly since it is a re-used material, the use of polyester

is likely to be more and more deprecated by other still more environmentally friendly materials.

[0012] Uniforms or other sports wear or products made of fabric, produced for large events like OS or VM, is one example of products where non-environmentally friendly materials often are used. Using environmentally friendly fabrics in such uniforms will provide a statement made by for example a State being participant in large sports events like OS or the like, showing the world the importance of environmentally related issues. Thereby, the debate regarded environmental related questions may be lifted.

[0013] Today, there is an increased need for environmentally friendly martial sports wear within for example Karate Beginners, Kata, Kumite, Jujutsu, Kung Fu Tai ji, Taolu , or Taekwondo Beginners, Fighting, Poomse . Further examples are Sanda, Judo Jujutsu regular ju-jutsu and brazilian Ju-Jutsu and Aikido Gi, Hakkama. With the growing concern of the heavy environmental pollution of today industry, environmental protection is highly in focus. Therefore, there is a general need for martial sports products with low environmental load.

[0014] The present disclosure aims to be as environmentally friendly as possible, and in addition being a vegan product. In being an environmentally friendly vegan product, it is beneficial to the protection of the environment.

SUMMARY

[0015] The above described problems are addressed by embodiments disclosed herein. The scope of embodiments herein is defined by the attached claims, which are incorporated into this section by reference. A more complete understanding of embodiments of the invention will be afforded to those skilled in the art, as well as a realization of additional advantages thereof, by a consideration of the following detailed description of one or more embodiments. Reference will be made to the appended sheets of drawings that will first be described briefly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Fig. 1-11 shows examples of martial arts garments, in accordance with one or more embodiments described herein.

DETAILED DESCRIPTION

[0017] The present disclosure relates generally to fabrics, or textiles, used in martial art sport clothing and equipment's. More particularly, the present disclosure concern fabrics with specific fiber and/or specific combinations of fibers with environmentally friendly attributes. In accordance with disclosures herein, a fabric is provided having specific combination of natural materials with specific features suitable for use in martial art clothing and equipment. The aim for the present fabric is to be as environmentally friendly as possible, and it shall only contain organic materials, or at least mainly organic materials. Organic fibers will become fertilizers are very environmentally friendly.

[0018] With reference to Fig. 1 - 11, examples of martial arts garments will now be described. A martial arts garment 1 is provided. The martial art garment is in one example made of a fabric comprising bamboo fibers. The martial art garment may be solely of garment of bamboo fibers, or of garments of bamboo combined with other fibers that will be described in the following. It shall however be noted that any other organic fiber may be used as a base fiber. The exemplified martial arts garment 1 may be made of fabric further comprising fibers of at least a second material. Such second material may be any of for example cocos, soya, charcoal, corn or stretch material. However, any other materials suitable for martial arts garments may be used, like recycled polyester or hemp. Examples of garments are a uniform like a set with trousers and a jacket, a
one-piece overall, a single jacket or single trousers, or other attributes like helmets, belts, tops, hoods, headdresses or headbands, or any other sports attributes.

[0019] The martial arts garment 1 may be made of a fabric further comprising fibers of a third material. Such third material may for example be any of cocos, soya, charcoal, corn or stretch material. The martial arts garment 1 may be made of a fabric comprising a fiber combination of four or more materials. Such fiber combination may be any combination of fibers from for example bamboo, cocos, soya, charcoal, corn or stretch material.

[0020] The exemplified martial arts garment 1 may have at least a first garment part 2 and a second garment part 3. The first garment part 2 may comprise fabric of a first fiber combination, and the second garment part 3 may comprise fabric of a second fiber combination. The second garment part 3 may comprise fabric with a combination of bamboo fibers and cocos fibers, whereby increased strength is provided. However, any other fiber combination providing increased strength may be used.

[0021] The second garment part 3 may comprise fabric with a combination of bamboo fibers and soy fibers, whereby increased mobility is provided. Fibers of soy have a natural stretch. However, any other fiber combination providing increased mobility may be used. Still further, classic material providing a stretch function like elastan or the like may be used to increase mobility in the second garment part 3. For example, a combination of bamboo fibers and stretch fibers

may be used, whereby increased mobility is provided for the second garment part 3. Typically, there is a need for mobility in the parts of a martial arts garment 1 being closest to the groin, or to the armpit of the user. Thus, the second garment part 3 shown in the exemplified embodiments is a part of the garment being exposed to large movements and heavy wear due to repeated movements of the user.

[0022] Yet another example of a second garment part 3 being exposed to heavy wear is the knee parts of trousers in a uniform for martial arts, or the elbow area of a jacket, a top or the like. To overcome the problem of parts of the garment being torn apart, the knee part may for example be made of a plurality of layers of separate garments, that may be of the same or of different fabrics with different fiber combinations. Another advantage with multiple layers is that a pad may be provided between the layer, providing protecting of the knees of the user. Further, the design of the garment may provide for more mobility for the user. Still further, the knee parts may be made of fabric providing for increased strength and/or for increased stretch.

[0023] A fabric with stretch provides mobility for the user of a garment. This may be highly important in martial arts wear. Such stretch may be provided by the use of mixing in traditional stretch material in the fabric, like elastan, but also by using fibers with natural stretch, like fibers of soy. Still further, stretch in the fabric may also be provided mechanically by different ways of producing the fabric which may be woven, or non-non-woven. Fabrics herein may be provided with a Diamond, Star and/or Raindrop structure of the fabric surface. Thanks to such a structure of the fabric surface, air will more easy be exposed to the fabric surface whereby the surface may easy dry up when left wet or damped.

[0024] The fabrics disclosed herein are aimed towards martial art sport garments and equipment's. Such equipment may for example be punching bags, pads, carpets or mats, kick pads or mits, gloves, or any other sport accessories made of fabric.

[0025] The fabrics disclosed herein may for example have a wide spectrum of thicknesses; any thickness between 1-2000 gsm (gsm = gram / square meter) may be suitable. Different martial sports typically uses different thicknesses in garments, for example Karate and Taekwondo typically uses about 200 gsm, while garments for judo uses about 800 gsm. Judo and Jiujutsu and BJJ is some examples where more thick fabrics are used upto or more than1000 gsm.

[0026] Offering the present disclosure as an alternative fabric used for martial art clothing will give a huge advantage in the market with the growing concern of the environmental issue. The present disclosure aims to offer an alternative environmentally friendly and vegan product, which the customers can trust in. In the aspect of being environmentally friendly these points have been taken in regards: amount of water required for the plant to grow, processing of the plants to fabric, waste and recyclable possibilities.

[0027] Bamboo fiber is a cellulosic fiber that is regenerated from bamboo plants. Bamboo is a great prospective green fiber with outstanding biodegradable properties for textile materials, with strength comparable to conventional glass fibers. Bamboo used for fiber preparation is usually 3-4 years old. Fiber is produced through alkaline hydrolysis and multi-phase bleaching of bamboo stems and leaves followed by chemical treatment of starchy pulp generated during the process.

[0028] Bamboo fiber has various micro-gaps, which make it softer than cotton and increase its moisture absorption. They are elastic, environment-friendly, and biodegradable. The fiber is bacteriostatic, antifungal, antibacterial, hypoallergenic, hydroscopic, a natural deodorizer, and resistant against ultraviolet light. Furthermore, it is highly durable, stable and tough and has substantial tensile strength. Due to its versatile properties, bamboo fibers are used mainly in textile industry for making attires, towels, and bathrobes. Due to its antibacterial nature, it is further used for making bandages, masks, nurse wears, and sanitary napkins. UV-proof, antibiotic and bacteriostatic curtains, television covers, and wallpapers and many other things are also prepared from bamboo fibers to lessen the effects of bacteria and reduce the harm of ultra violet radiations on human skin.

[0029] Bamboo is one of the planets most versatile grasses. It grows very fast, even up to one foot in a day depending on the right conditions. Having around 1400 species, this plant has multiple uses; it may be eaten, worn as clothes, used for construction purposes etc. In China, a special kind of palatable beer is made from bamboo. Aromatic perfumes and life saving medicines are also made from it. It can be grown and replenished with no impact to the environment. It produces greater biomass and 30% more oxygen than a hardwood forest. It mitigates water pollution due to its high nitrogen consumption. It helps to reduce carbon dioxide gases that are responsible for global warming.

[0030] Fabrics with activated charcoal is yet another example of fabrics with some very useful characteristics; it rapidly pulls moisture away from skin, it spreads the moisture across the surface of the fabric thereby increasing evaporation and dry time, it attracts and traps odors, and then releases trapped odors when washed. Further, fabrics of activated charcoal provides UPF 30+ to 50+ of sun protection. The benefits of activated carbon are refreshed with the heat from washing and drying a fabric. Activated carbon / charcoal may be a manufactured fiber from cocosnut shells, bamboo or any other sources. Activated charcoal are used in apparel like knotwear, fleecewear, T-shirts, outerwear and men's shirts. Further, activated charcoal is used in home fashions and furnishing, mattress ticking, rugs and doormats etc. Still further, activated charcoal is found in automotive upholstery, cleaning brushes and geotextiles like netting. Medical industry is aware of the benefits of charcoal as an odor absorbing material. Charcoal is capable of absorbing harmful elements from gases and fluids. Activated charcoal fabrics are the latest innovation is this process.

[0031] Activated carbon is used as a natural fiber enhancer that adds new performance qualities to blended yarns. During the production of a polyester and an activated carbon blended fiber, a process may be used to create a protective layer that coats the activated carbon. If no protective layer is used, the polyester will fill up the activated carbon pores when the polyester polymer is melted to make the fiber. This can cause the deactivation of the activated carbon. During the yarn processing and fabric production, the method covers and protects the carbon fiber pores. The final step in the fabric production removes this protective layer, exposing the activated carbon pores. Further fabric washing continues to remove this protective layer, exposing more of the activated carbon pores, and increasing the capacity for absorbency. Typically, 40% to 50% of activated carbon in a blended yarn is adequate to create the activated carbon absorption benefits. Thus, blended yarns with activated carbon may have some problems.

[0032] The process of manufacturing activated carbon begins with the carbonization of coconut shell carbon to create the charcoal. Any carbon material such as coconut shell, wood, or paddy husk can be used in this process, but the activated carbon manufactured from coconut shell is considered superior to other sources. When producing products with cocos for the food industry, the coconut shell is a waste product. Thus, using coconut shell is both cost effective and environmentally friendly. Still further, coconut shell is also easily available in many places. Among other advantages, the small macrospores structure in coconut shell renders it more effective for the adsorption of gas / vapor.

[0033] The process of making activated carbons consists of crushing the coconut shell in a hammer mill to the required size, and then pulverizing in a ball mill. The shell powder is digested with zinc chloride. The mass is then activated at elevated temperature, quenched and leached by diluted hydrandloric acid, and dried in a tray drier. In the steam treatment activation process, the fully matured, dried, and cleaned coconuts are burned in the presence of a limited supply of air, sufficient enough to produce carbonization, a non-graphite form of carbon, which increases the adsorption properties.

[0034] Corn fiber is a comparatively new innovation in the textile industry. Corn is an agricultural product with large quantities of starch, which manufacturers extract from the plant fibers and break down into sugars that are then fermented and separated into polymers. At this point in the process, the corn fibers are paste-like substances which are then extruded into delicate strands that are cut, carded, combed, and spun into yarn. Aside from the chemical processes, the rest of the process is similar to what is done with wool. A fiber entirely from corn, is fully eco-compatible and has exceptional qualitative features. Corn fiber is available in both spun and filament forms in a wide variety of counts from micro denier for the finest lightest fabrics to high counts for more robust applications. It is derived from naturally occurring plant sugars. When products come to the end of their useful life, they can be returned to the earth, unlike petroleum based products, which can only be disposed of through thermal recycling, physical recycling or landfill.

[0035] Fibers of corn have some advantageous properties like a high melting point, high crystallization degree and good clarity. The corn fiber also has high strength being comparative with a traditional normal poly fiber. Therefore, the use of corn fibers is very broad. The corn fiber has the characteristics of lustrous silk, with excellent hand touch and brightness. Garments in corn fiber reportedly demonstrated good soil release, quick drying and show excellent after-wash appearance. Corn fiber is a manmade fiber derived entirely from annually renewable resources. These fibers have performance advantages often associated with synthetic materials, and complementing properties of natural products such as cotton and wool. Corn fiber is composed of lactic acid, which is produced by converting corn starch into sugar and then fermenting it to get lactic acid. Lactic acid can be considered a commodity chemical sleeping giant, with advantages; it can be made from biomass, it has both a hydroxyl group and a carboxylic acid group and it is optically active.

[0036] Fabrics made from corn fiber is easy to care for, cheap and very comfortable to wear. Moreover, it is stain-resistant and UV resistant. The fabrics may be used for several applications such as readymade apparel, diapers, bedding, carpets and upholstery. Corn fiber balances strength and resilience with comfort, softness and drape in textiles. Corn also uses no chemical additives or surface treatments and is naturally flame retardant. Corn have outstanding moisture management properties and low odor retention, giving a wearer of a corn made garment optimum comfort and confidence. Corn fiber filament is said to have a subtle luster and fluid drape with a natural hand offering a new material to stimulate creativity. Corn fiberfill allows outerwear garment makers to offer a complete story and a more environmentally friendly alternative to polyester and nylon combinations in padded garments. Corn reportedly outperforms synthetics in resistance to UV light, retaining strength color and properties overtime. Further, corn is easy care, independent wash and dry cleaning tests have shown that corn fiber garment tested may be laundered using standard washing and drying machines. Independent testing confirms that corn fibers have superior or equal performance compared to polyester in key active wear applications.

[0037] Moreover, the production of corn fabrics requires low use of fuel, and is therefore environment-friendly as well. The process for manufacturing the polymer used to make corn fiber on an industrial scale centers on the fermentation, distillation and polymerization of a simple plant sugar, maize dextrose. The production and use of corn fiber result in that less greenhouse gases are added to the atmosphere. Greenhouse gases are the chief contributor to global climate change. Highly compostable and chemical recyclability mean that under the right conditions and with the right handling, the complete life cycle of production, consumption, disposal and re-use is neatly closed. However, corn fibers have some disadvantages. The corn fiber textile may be rigid and frail.

[0038] Coconut coir is one of the thickest and most resistant natural fibers available. Cleverly extracted from the outer

shell of a coconut, it comes in two forms; brown coir, which comes from mature coconuts; and white coir, which is made by soaking early stage coconuts for up to 10 months. Brown coir is stronger and used for brushes, mattresses, rugs and rope. The yarn is resistance to salt water which makes it ideal for sea products like fishing nets. 1000 coconuts provide a yield of 10kg of coir. Globally around 650,000 tons are produced annually in 93 countries, with considerable motivation to expand production to further countries.

[0039] Coconut coir has very high concentrations of lignin, which makes it significantly stronger than for example cotton. Coir is highly resistant to microbial action, which renders chemical treatment, including herbicides, unnecessary. It also boasts high wettability, is very absorbent, and yet doesn't require lots of water to grow, only little and often. Coir has impressive durability and absorbency which makes it ideal for geo-textiles, used to prevent soil erosion.

[0040] The sun-resistant capacity of coir makes it even more suited to the task, mimicking soil itself, it is naturally biodegradable and, unlike synthetic alternatives, doesn't require removal after. Coconuts are celebrated for their abundance of benefits; coir comes with an earth-loving byproduct too: peat, which is a high quality mulch and brilliant organic manure. The fiber fineness of a coconut fiber varies between 50 and 300μm.

[0041] The chemical composition of coconut / coir fiber is:

Lignin.....	45.84%
Cellulose.....	43.44%
Hemi-Cellulose.....	00.25%
Pectin's and related Compound.....	03.00%
Water soluble.....	05.25%
Ash.....	02.22%

[0042] Physical properties of coconut / coir fiber:

Length in inches.....	6-8
Density g/cc	1.40
Tenacity g/Tex	10.0
Breaking elongation%.....	30%
Diameter in mm.....	0.1 to 1.5
Rigidity of Modulus.....	1.8924 dyne/cm2
Swelling in water diameter	5%
Moisture at 65% RH.....	10.50%

[0043] A drawback with coconut fiber is that it is highly flammable: Coconut fiber belongs to the class of compounds known as flammable solids. It very easily catches fire upon ignition. A further drawback is that the exceptionally high lignin content implies that the available dyeing and bleaching techniques for textile fibers cannot simply be transferred to coir. Still further, though to that the coir is so strong, this have the effect that it is not very flexible or soft. Therefore, the coconut fiber is great for household items but not very well suited for apparel. Another drawback is that coir cultivation owing to the lengthy soaking and extraction process traditionally has been very time-consuming, however, technology has improved and de-husking machines are available whereby the production time has been reduced.

[0044] Soy textiles and fabric may be processed into fibers using only organic chemicals, like those under the Oeko-Tex Standard 100 certification, that are 100% recyclable. The process uses a 'closed-loop' system where chemicals used are recycled and used again, and again.

[0045] Soy textiles may be certified under one or more of the following certifications:

Global Organic Textile Standard GOTS
Oeko-Tex Standard 100
OCS Blended - Organic Content Standard
OCS 100 - Organic Content Standard

[0046] Soy fabrics have a lot of advantages. The eco friendly soy fabric is derived from food production waste as it is made from the hulls of soy beans. The use of soy textiles are good for our planet, because it is made from fibers that are spun from the 'leftovers' of the soy food industry. Because the plant itself is easily renewable and that the fiber biodegrades far more quickly than oil-based products like polyester, the use of soy has minimal environmental impact. One further advantage with using soy fiber is that is has antibacterial properties. The soy fabric is so biodegradable that

it may be thrown on the compost pile when worn out. Further, soy fiber clothing is light and silky soft, with just a bit of stretch, and has a natural drape. Soy is soft, easy to care for and absorbs dyes quickly, requiring less dye-stuffs. Soy is sometimes called the vegetable "cashmere" because of its luxurious and soft texture. Still, soy is far better than cashmere because it is very easy to care for. Caring for soy textiles and fabrics are easy. The fabric may be machine washed in cold water on a gentle setting. Further, chlorine bleach and fabric softener may be skipped since soy fabrics are naturally soft. Clothing of soy fabrics may be laid down flat to dry. Further, soy has a beautiful drape and need not to be ironed.

[0047] The eco friendly soy fabric has excellent absorption qualities which allow perspiration to evaporate. Thereby, clothing of soy fabrics are cool and comfortable to wear during hot weather. Further, due to the moisture management of soy textiles and fabrics, they are also anti bacterial. Still further, the soy fabric will also provide protection from the sun due to the UV resistant qualities. Yet another advantage is that soy has some natural stretch, providing for a flexible fabric.

[0048] However, soy fabrics do have the disadvantage that is it not as strong as for example cotton or hemp.

[0049] To overcome the disadvantages for each and every fiber mentioned above, fabrics made of combined fibers are provided. For fabrics disclosed herein, any of the following fibers may be used in any combination; bamboo, charcoal, cocos, soy, corn or stretch material. For example, any of the following fibers or fiber combinations may be used:
100% bamboo, bamboo combined with charcoal or bamboo combined with cocos, or bamboo combined with both charcoal and cocos. Fabrics herein may further comprise any of the following fiber combinations; bamboo combined with soy or bamboo combines with corn, or bamboo combines with both soy and corn. Still further, bamboo may be combined with both soy and cocos, or bamboo may be combines with cocos and stretch material. It may however be noted that any other suitable combination of environmentally friendly fibers may be used.

[0050] The ratio of the different fibers combined in fabrics herein may be very wide, like 0,01% - 99.99 %, or even less. Nanotechnology may be used when combining fibers.

[0051] Other fiber combinations that may be used are for example cocos combined with charcoal and soya. Both charcoal and soya have anti-bacterial effects that may be greatly beneficial. Any other fiber combination based on natural organic fibers may still be used.

[0052] Combining fibers of bamboo with fibers of charcoal will result in fabrics with many benefits. Such fabric will have very strong adsorption capacity: the adsorption capacity of bamboo combines with charcoal is more than five times that of charcoal alone. The combined material of bamboo / charcoal may absorb, decompose odor and deodorize substances. For a martial suit or dress the material is advantageous since the material will absorb sweat and other liquids that the user may be exposed to. Further, the combined material may be used to absorb harmful substances such as for example formaldehyde, benzene, toluene, ammonia and dust. Other advantageous properties of combined bamboo / charcoal fabrics is the far-infrared emission, heat storage and warmth; the far-infrared emissivity is up to 0.87, which enables the material to store heat and keep warm, and the temperature rise rate is much faster than an ordinary cotton fabric. Therefore, a martial suit of such fabric will keep the wearer comfortable, warm when it is cold and cool when it is hot. A combined bamboo / charcoal fiber will have a natural cross-section covered with both large and small oval pores, which enables the fabric to instantly absorb and evaporate a large amount of water, or other liquids. Due to the hollowness, the combined bamboo / charcoal fiber have good properties of hygroscopicity, moisture release, and air permeability. Further, the combined bamboo / charcoal fiber has antibacterial properties. While bacteria may multiply on cotton fabrics, bacteria on a combined bamboo / charcoal fiber fabric will instead reduce by more than 90% after 24 hours.

[0053] There are examples of fabrics of bamboo / charcoal with nano particles of bamboo in its fiber.
The latest advancement in nanotechnology has given a new and constructive dimension to bamboo charcoal fabrics.

[0054] Certifications for environmentally friendly products are available. Ecolabel, and the Nordic Swan Ecolabelling of textiles, are examples of such certifications. All embodiments disclosed herein of fabrics and garments, as well as the manufacturing processes for producing them fulfils the requirements set by Ecolabel the Nordic Swan Ecolabelling.

[0055] The fabrics disclosed herein may comprise organic fibers with natural antibacterial properties. Thereby a fabric with antibacterial properties is provided without adding chemically processed environmentally harmful substances with antibacterial properties. Yet another example disclosed herein is fabrics that may comprise organic fibers with flame proof properties. Thereby a flameproof fabric may be provided without adding chemically processed environmentally harmful substances with flameproof properties.

[0056] Still further, if the fabrics disclosed herein is colored, they may be colored by natural color substances. Thereby a colored fabric is provided without adding any chemically processed environmentally harmful color substances like for example azo based colors that may cause allergic reactions may also irritate the eyes and are found to be toxic for water living organisms, and may cause harmful long term effects in the aquatic environment.

[0057] Fabrics disclosed herein is color fast when washed. Thereby no environmentally color substances will emission to the wastewater from the washing procedure. Further, products like garments produced of the fabric may be worn for longer time if the garments is colorfast, thereby providing a more durable garment.

[0058] To still further provide an environmentally friendly product, fabrics disclosed herein is recyclable. Thereby. a worn-out fabric may be used to produce new fabrics, and the life-cycle of the fabric is extended. Fabrics disclosed herein may be compostable. Thereby a worn-out fabric may be composted and turned to soil. The fabric is thus thanks to the naturals fibers used so biodegradable that it may be thrown on the compost pile when worn out, without leaving any harmful traces. Fabrics disclosed herein may further comprise organic fibers with natural high or low density. Thereby a fabric with desired density may be provided without adding chemically processed environmentally harmful substances like cerium in order to increase, or decrease the weight of the fabric. The fabrics disclosed herein may for example have a wide spectrum of thicknesses; any thickness between 1-2000 gsm (gsm = gram / square meter) may be suitable. Thanks to a mixture of fibers with different density, any desired thickness and weight may be provided.

[0059] Fabrics disclosed herein may comprise organic fibers with natural anti-mold properties. Thereby a fabric with anti-mold properties may be provided without adding chemically processed environmentally harmful substances like chlorophenol based compounds in order to increase the resistance to mold of the fabric. Traditional materials like cotton may easy be attacked by mildew if left damp. Especially when it comes to sports wear, garments may often be damp. Yet another situation when fabrics or garments are exposed to damp is during transportation. During long transportations the ambient temperature may vary considerably, causing moisture to deposit on the fabric whereby the risk of developing mold on the fabric surface is high. By using fibers being naturally resistant to mold and mildew, a more sustainable fabric is provided.

[0060] Processes for manufacturing fabrics are also disclosed herein. In the manufacturing process, no chemically processed environmentally harmful substances are added during the manufacturing process. Thereby a fabric without chemically processed environmentally harmful substances may be provided. Thereby both the environment and the user of the textile are protected. Nordic Swan Ecolabel presents a long list of prohibited chemicals regulate the textile production. These are chemicals which are harmful to the environment and human health. None of those chemicals are used in processes for manufacturing fabrics disclosed herein. Textiles with the Nordic Swan Ecolabel give the opportunity for a long lifetime and the quality is therefore tested and documented.

[0061] In processes for manufacturing a fabric disclosed herein less than 250 liters of water per kilogram of manufactured fabric is used. Water, as well as any other solvents that may be used, may be re-used in a closed-loop system. Thereby the manufacturing process uses a minimum of water and/or other solvents. By using ecologic fibers less water consuming, the use of blue water for producing fabrics herein is substantially reduced. Still further, the water that still may be needed may be reused in the production process, or may be provided by green water. The water foot-print of from producing fabrics disclosed herein is thus very small compared to traditional production of fabrics of for example classic fibers like cotton.

[0062] The total emission of organic compounds from textile printing and finishing production sites are <100,0 mg C/Nm3. Emissions are below the limit of 150,0 mg C/ NM3 for coating and drying processes due to the recovery and reuse of solvents, if used. For weaving, dyeing, printing and finishing sites wastewater discharges to the environment are < 20g COD/kg textiles processed. This is measured downstream of on-site wastewater treatment plant and/or off-site wastewater treatment plant receiving wastewater from the processing sites. The Nordic Swan Ecolabelling of textiles and fabrics have focus areas for the textile industry that are sustainable fibers, substitution of hazardous chemicals (e.g. Greenpeace's Detox List), reduction in energy and water consumption, recycling and a circular economy, responsible production in terms of workers' rights, and focus on quality and slow fashion rather than fast fashion.

[0063] Nordic Swan Ecolabelled textiles have reduced environmental impact throughout the lifecycle of the textile. The textile production complies with UN human rights and relevant International Labour Conventions. The different fibers in the fabric - depending on the type of fibers - must be either organic, recycled or bio-based. If the fibers are bio-based, they have to be produced with reduced environmental impact. In order to protect the environment and the user of the textile, a long list of prohibited chemicals regulate the textile production. These are chemicals which are harmful to the environment and human health. Textiles with the Nordic Swan Ecolabel give the opportunity for a long lifetime and the quality is therefore tested and documented.

[0064] The requirements help to stimulate a circular economy, save resources and reduce the amount of waste. This is due to the requirements for either recycled or bio-based raw materials, strict control of the chemicals included in the textile, quality testing of the finished textile and requirements that prohibit the use of plastic and metal applications for decorating. The requirements include strict requirements for the cultivation and / or production of fibers in order reduce the environmental impact. For selected types of professional textiles, it is also possible to use fibers certified according to BCI or FairTrade.

[0065] The strict environmental and health requirements for chemicals need to be met. Substances that can cause cancer, damage inheritance or reproductive capacity, and prohibition of endocrine disruptors, flame retardants and fluorine substances are all prohibited. All chemicals in the textile production are controlled for their environmental and health properties. This leads to cleaner wastewater. Textile production need to be water and energy efficient, which saves water and reduces CO2 emissions. The quality of the fabrics and textiles need to be tested for color fastness and shrinking. The textile manufacturer must comply with UN human rights and relevant International Labour Conventions.

In order to protect the environment and the user of the textile, a long list of prohibited chemicals regulate the textile production.

Claims

1. Martial arts garment (1) of fabric comprising bamboo fibers.

2. Martial arts garment (1) according to claim 1, wherein the fabric further comprises fibers of at least a second material, wherein the second material is any of cocos, soya, charcoal, corn or stretch material.

3. Martial arts garment (1) according to claim 2, wherein the fabric further comprises fibers of at least a third material, wherein the third material is of any of cocos, soya, charcoal, corn or stretch material.

4. Martial arts garment (1) according to claim 2, wherein the fabric comprises a fiber combination of four or more materials, wherein the fiber combination is any combination of fibers from bamboo, cocos, soya, charcoal, corn or stretch material.

5. Martial arts garment (1) according to any of claims 1 - 4 having at least a first garment part (2) and a second garment part (3), wherein the first garment part (2) comprises fabric of a first fiber combination, and the second garment part (3) comprises fabric of a second fiber combination.

6. Martial arts garment (1) according to claim 5, wherein the second garment part (3) comprises fabric comprising a combination of at least bamboo fibers and cocos fibers, whereby increased strength is provided.

7. Martial arts garment (1) according to claim 5, wherein the second garment part (3) comprises fabric comprising a combination of at least bamboo fibers and soy fibers, whereby increased mobility is provided.

8. Martial arts garment (1) according to claim 5, wherein the second garment part (3) comprises fabric comprising a combination of at least bamboo fibers and stretch fibers, whereby increased mobility is provided.

9. Martial arts garment (1) according to any of claims 5-8, wherein the second garment part (3) is a part of the garment being closest to any of the groin area or the armpit of the user.

10. Martial art fabric comprising bamboo fibers.

11. Martial arts fabric according to claim 10, wherein the fabric further comprises fibers of at least a second material, wherein the second material is any of cocos, soya, charcoal, corn or stretch material.

12. Martial arts fabric according to claim 11, wherein the fabric further comprises fibers of at least a third material, wherein the third material is of any of cocos, soya, charcoal, corn or stretch material.

13. Martial arts fabric according to claim 12, wherein the fabric comprises a fiber combination of four or more materials, wherein the fiber combination is any combination of fibers from bamboo, cocos, soya, charcoal, corn or stretch material.

14. Martial art fabric according to any of claims 10-13, comprising organic fibers with natural antibacterial properties, whereby a fabric with antibacterial properties is provided without adding chemically processed environmentally harmful substances with antibacterial properties.

15. Martial art fabric according to any of claims 10-14, wherein said fabric comprises organic fibers with flame proof properties, whereby a flameproof fabric is provided without adding chemically processed environmentally harmful substances with flameproof properties.

16. Martial art fabric according to any of claims 10-15, wherein said fabric is colored by natural color substances, whereby a colored fabric is provided without adding chemically processed environmentally harmful color substances.

17. Martial art fabric according to any of claims 10-16, wherein said fabric is color fast when washed, whereby no color

substances will emission to the wastewater from the washing procedure.

18. Martial art fabric according to any of claims 10-17, wherein said fabric is recyclable, whereby a worn-out fabric may be used to produce new fabrics.

19. Martial art fabric according to any of claims 10-18, wherein said fabric is compostable, whereby a worn-out fabric may be composted and turned to soil.

20. Martial art fabric according to any of claims 10-19, wherein said fabric comprises organic fibers with natural high or low density, whereby a fabric with desired density is provided without adding chemically processed environmentally harmful substances like cerium in order to increase, or decrease the weight of the fabric.

21. Martial art fabric according to any of claims 10-20, wherein said fabric comprises organic fibers with natural anti-mold properties, whereby a fabric with anti-mold properties is provided without adding chemically processed environmentally harmful substances like chlorophenol based compounds in order to increase the resistance to mold of the fabric.

22. Martial art fabric according to any of claims 10-21, wherein said fabric comprises a mixture of fibers with different density, whereby a fabric with any density between 1-2000 gram / square meter is provided.

23. Martial art fabric according to any of claims 10-22, wherein said fabric comprises a combination of two or more different fibers, wherein said fibers are combined in any ratio between 0, 01% and 99,99%.

24. Process for manufacturing a martial art fabric according to any of claims 10-23, wherein no chemically processed environmentally harmful substances are added during the manufacturing process, whereby a fabric without chemically processed environmentally harmful substances is provided.

25. Process for manufacturing a martial art fabric according to claim 24, wherein said manufacturing process uses less than 250 liters of water per kilogram of manufactured fabric.

26. Process for manufacturing a martial art fabric according to any of claims 24 or 25, wherein said manufacturing process re-uses water and other solvents in a closed-loop system, whereby said manufacturing process uses a minimum of water and/or other solvents.

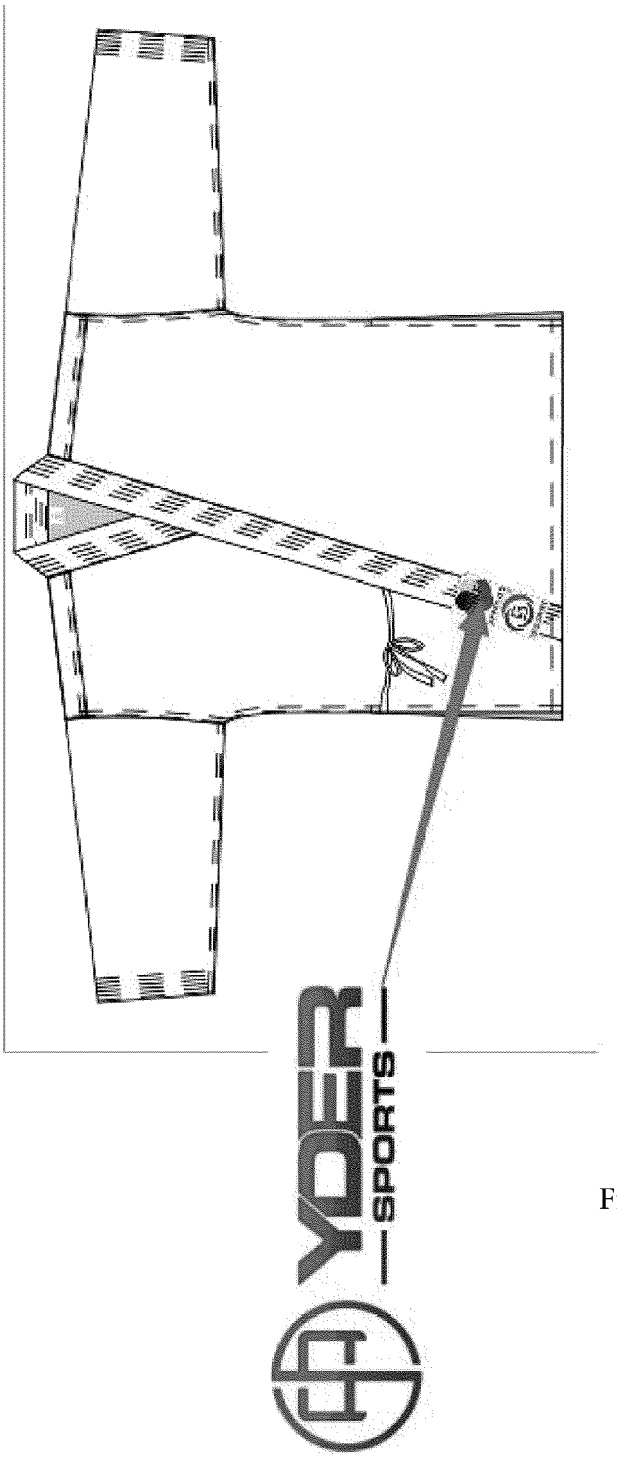

Fig. 1

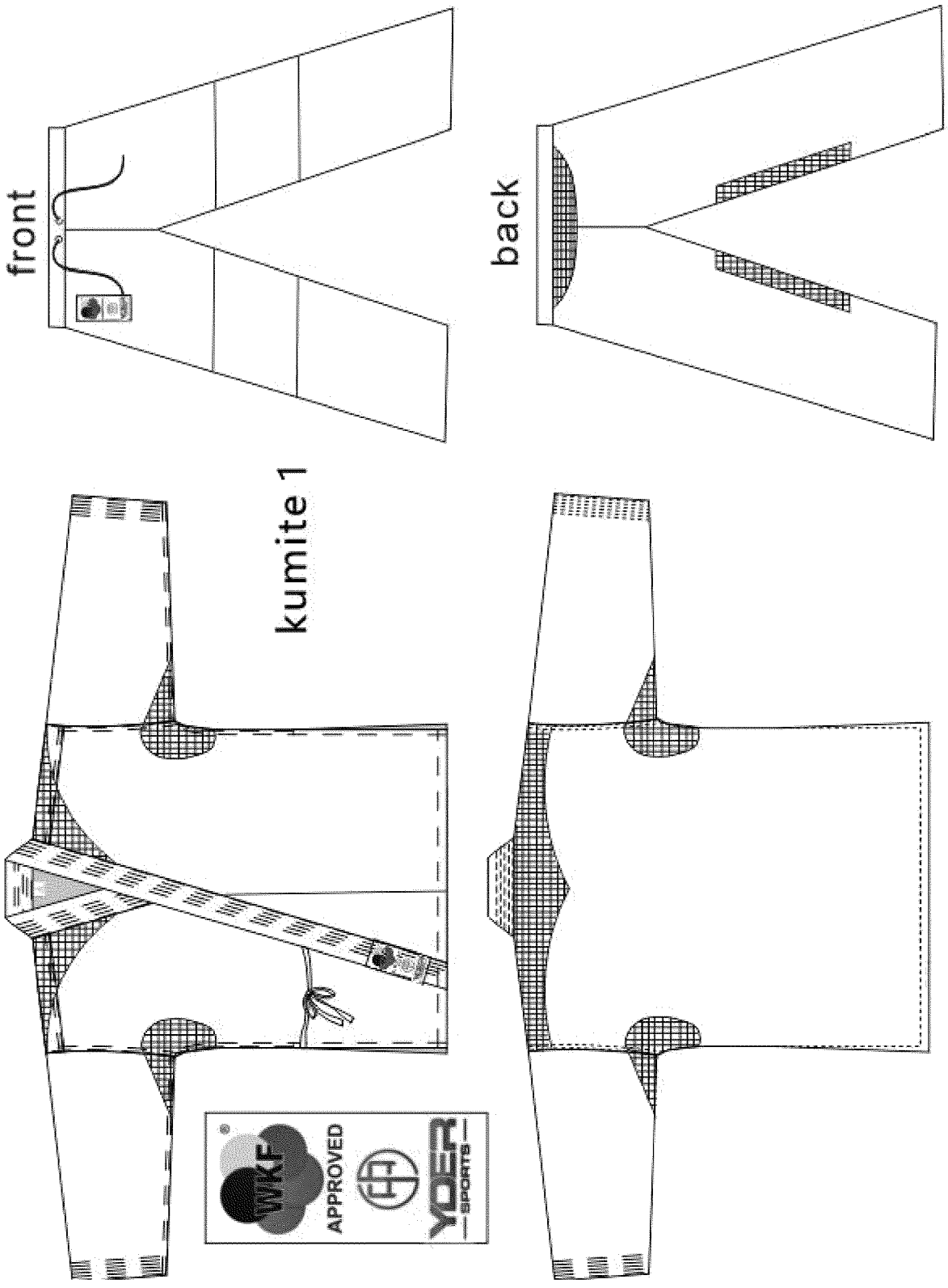

Fig. 2

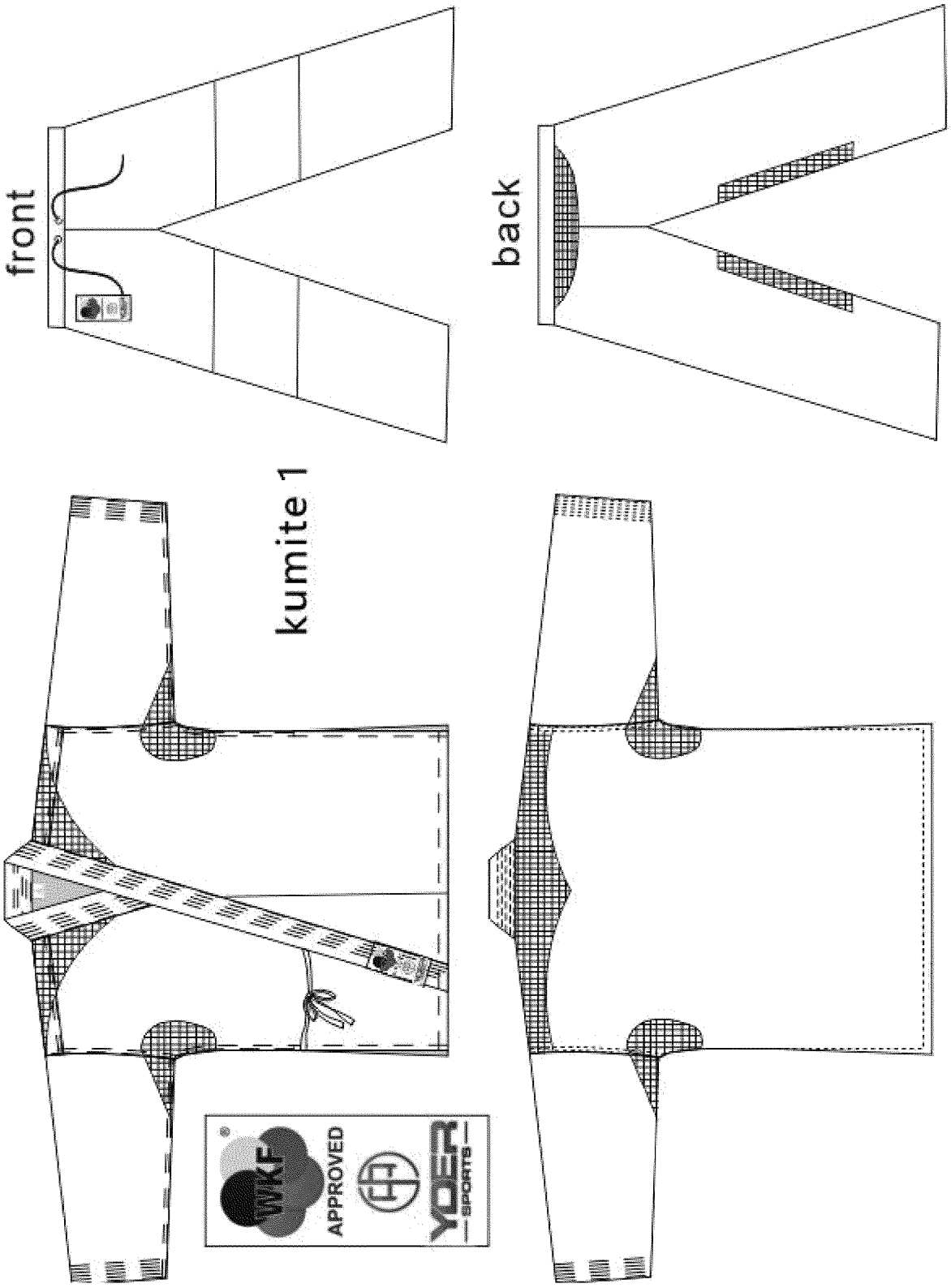

Fig. 3

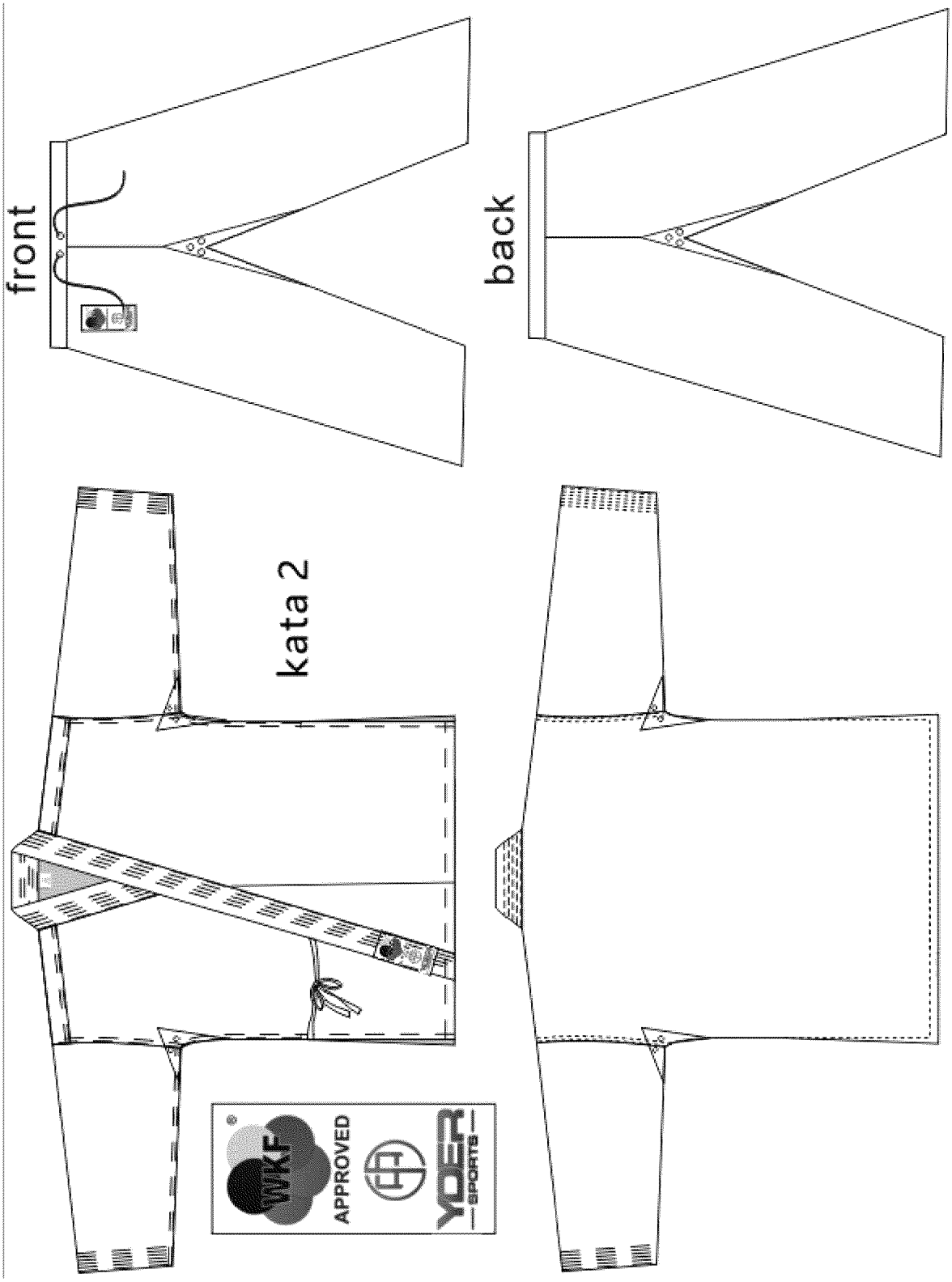

Fig. 4

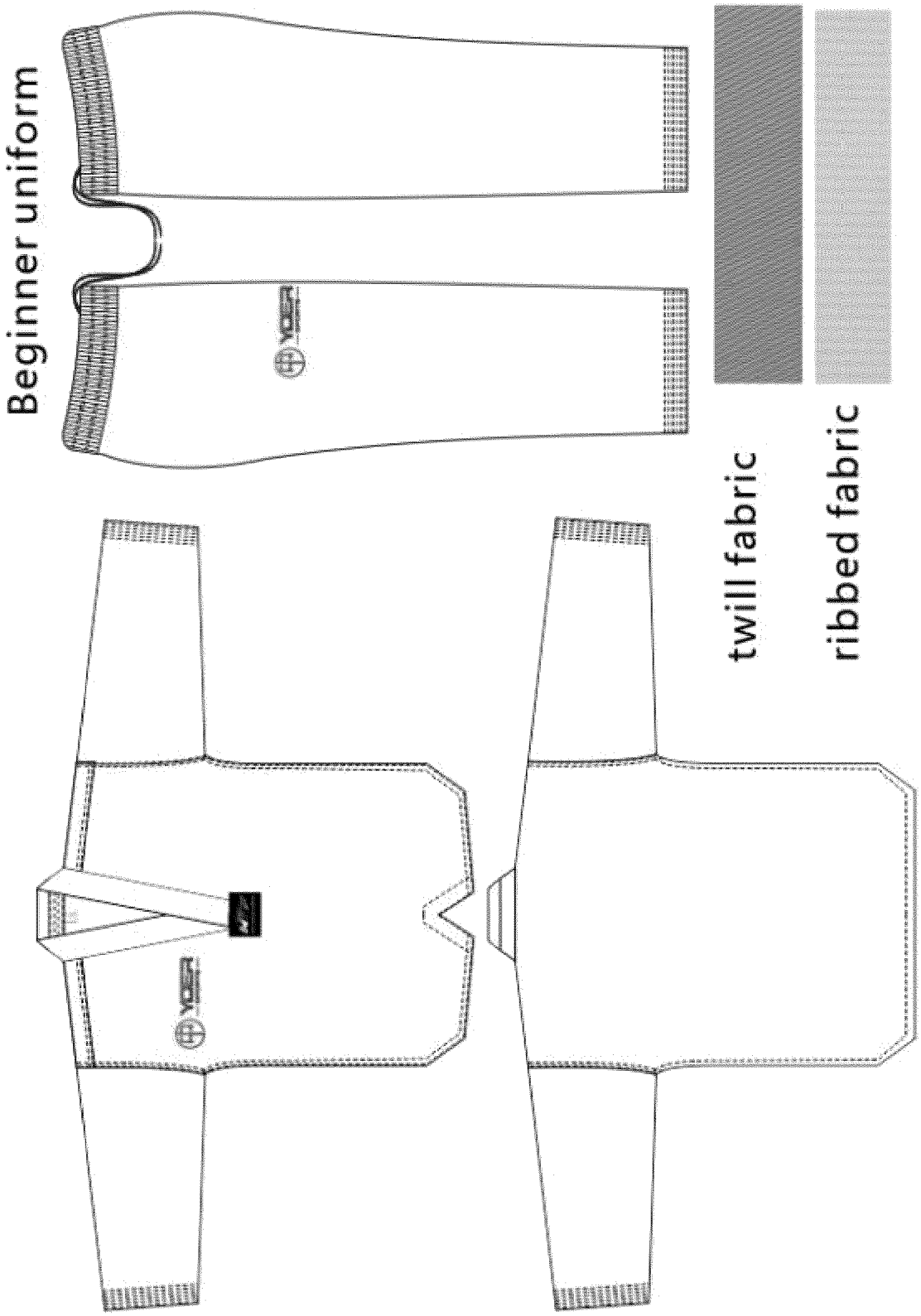

Fig. 5

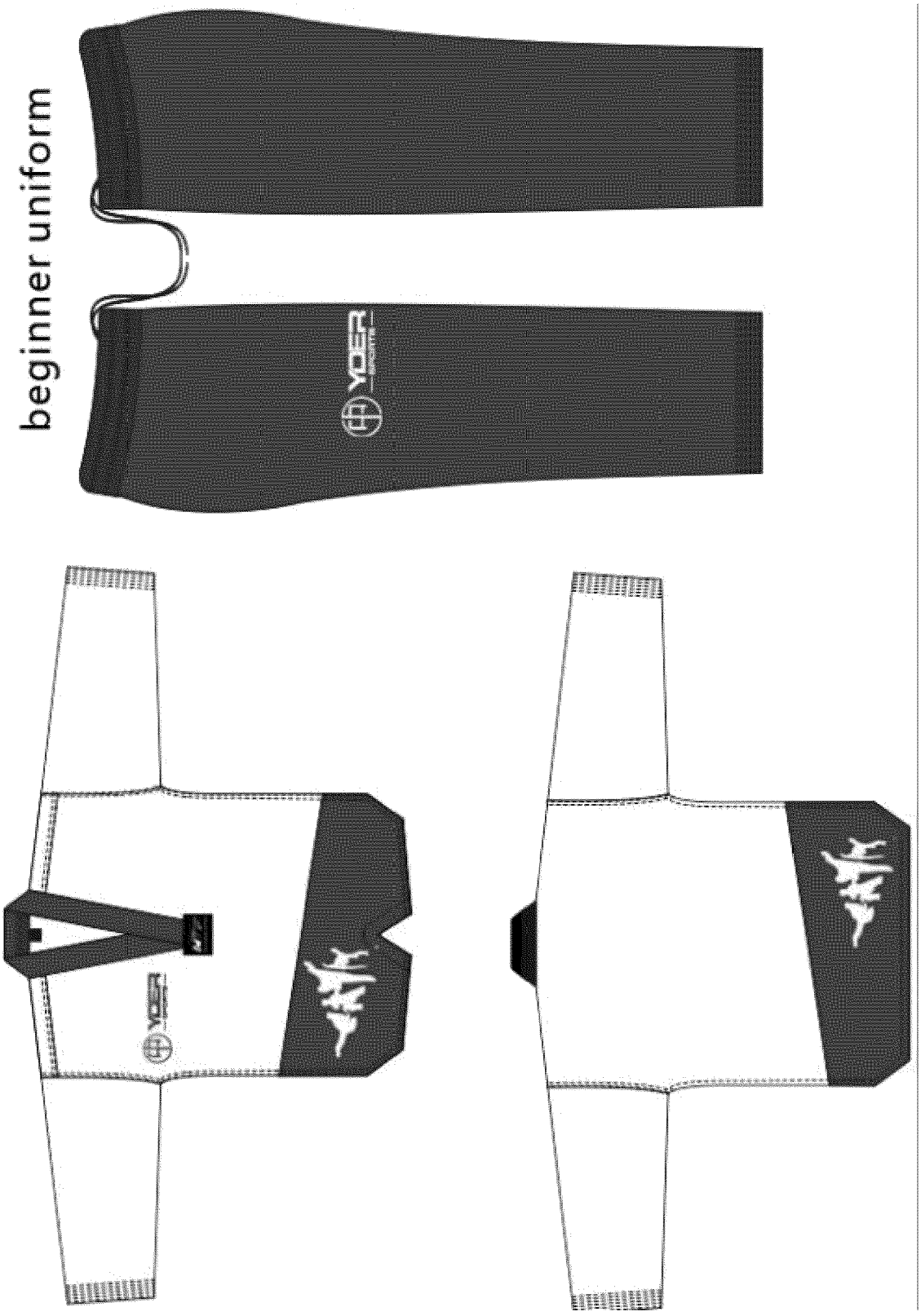

Fig. 6

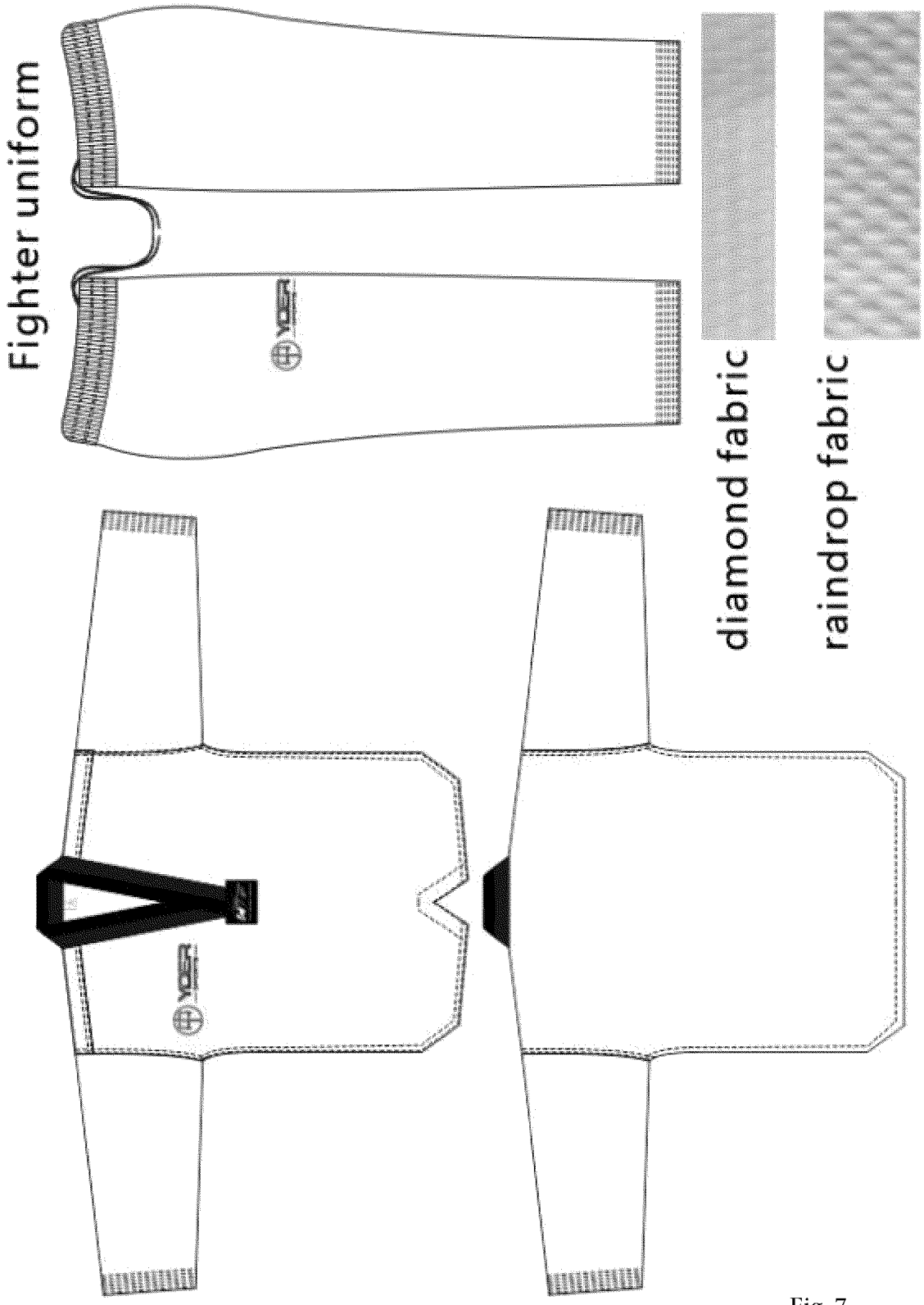

Fig. 7

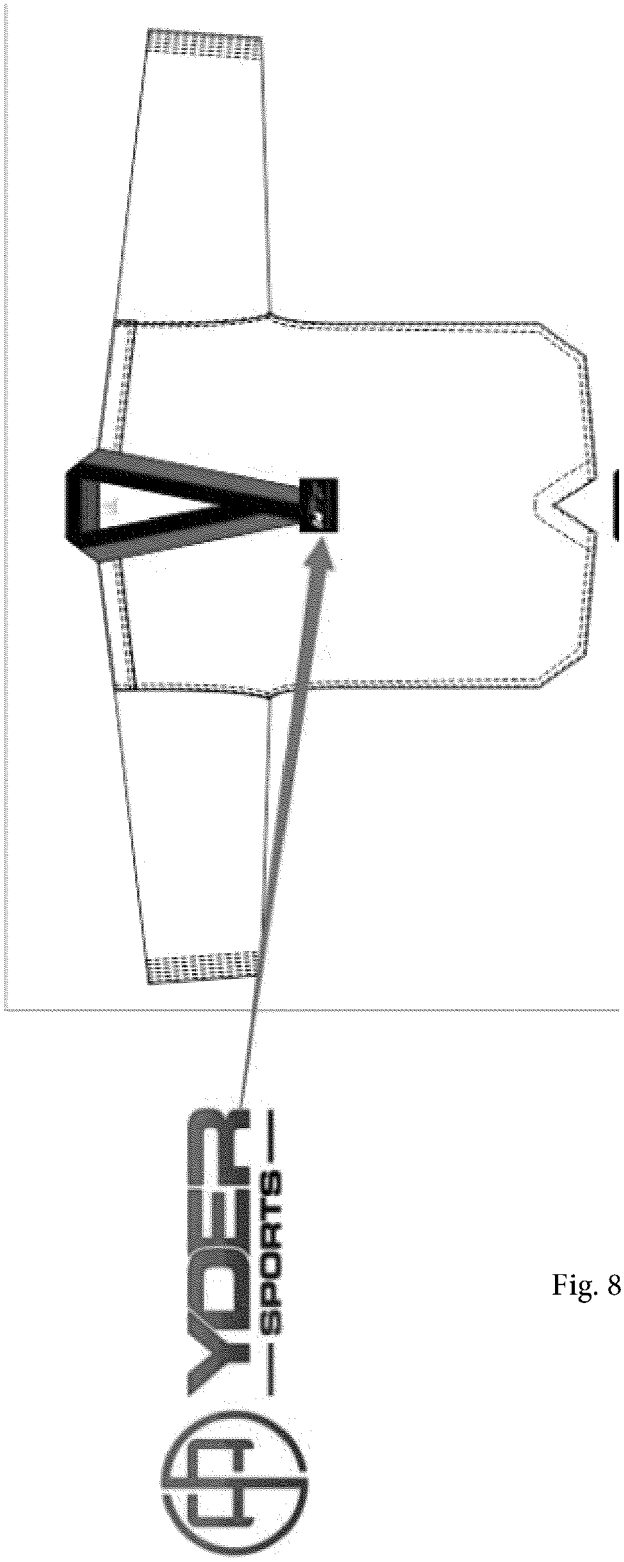

Fig. 8

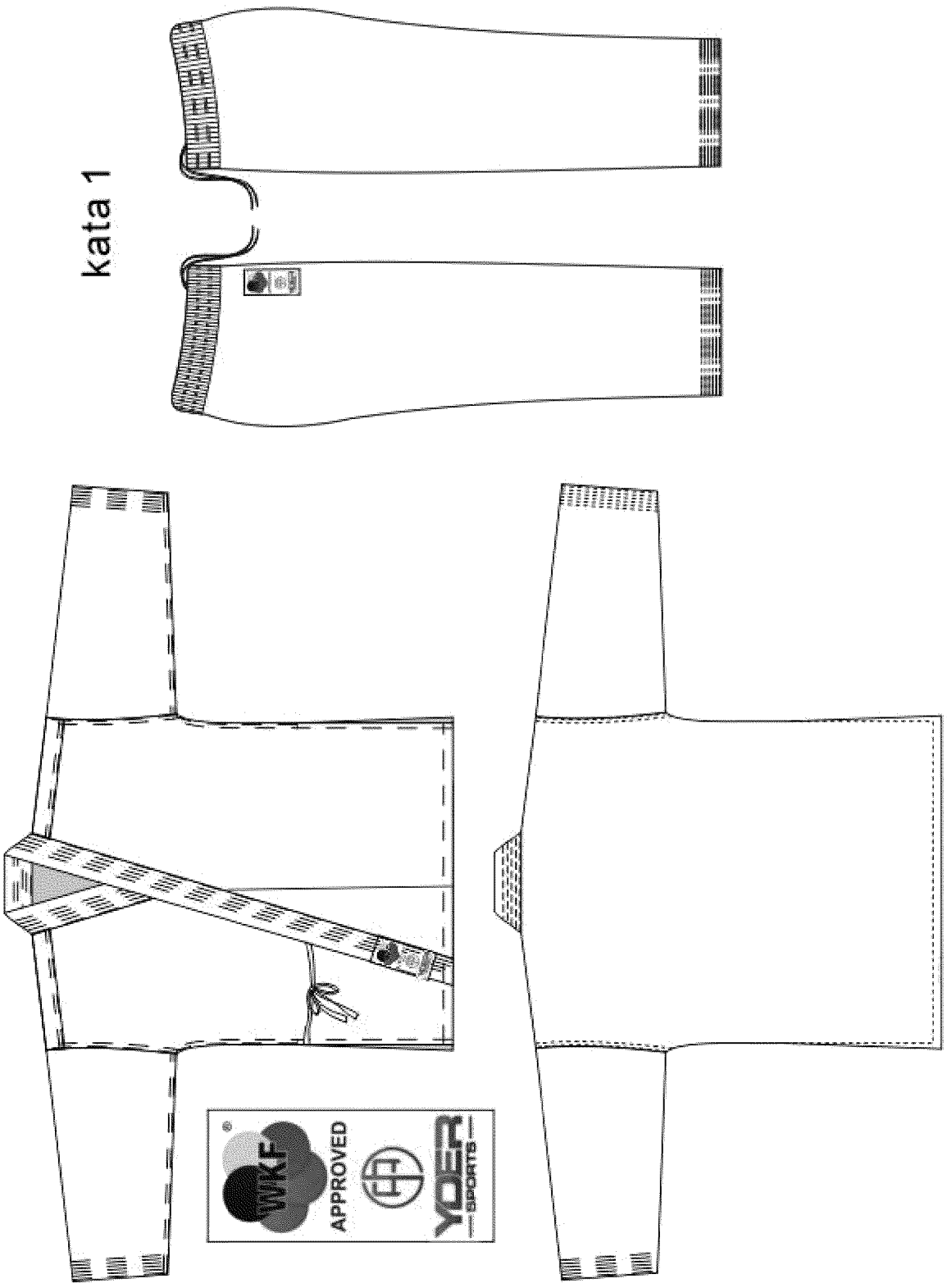

Fig. 9

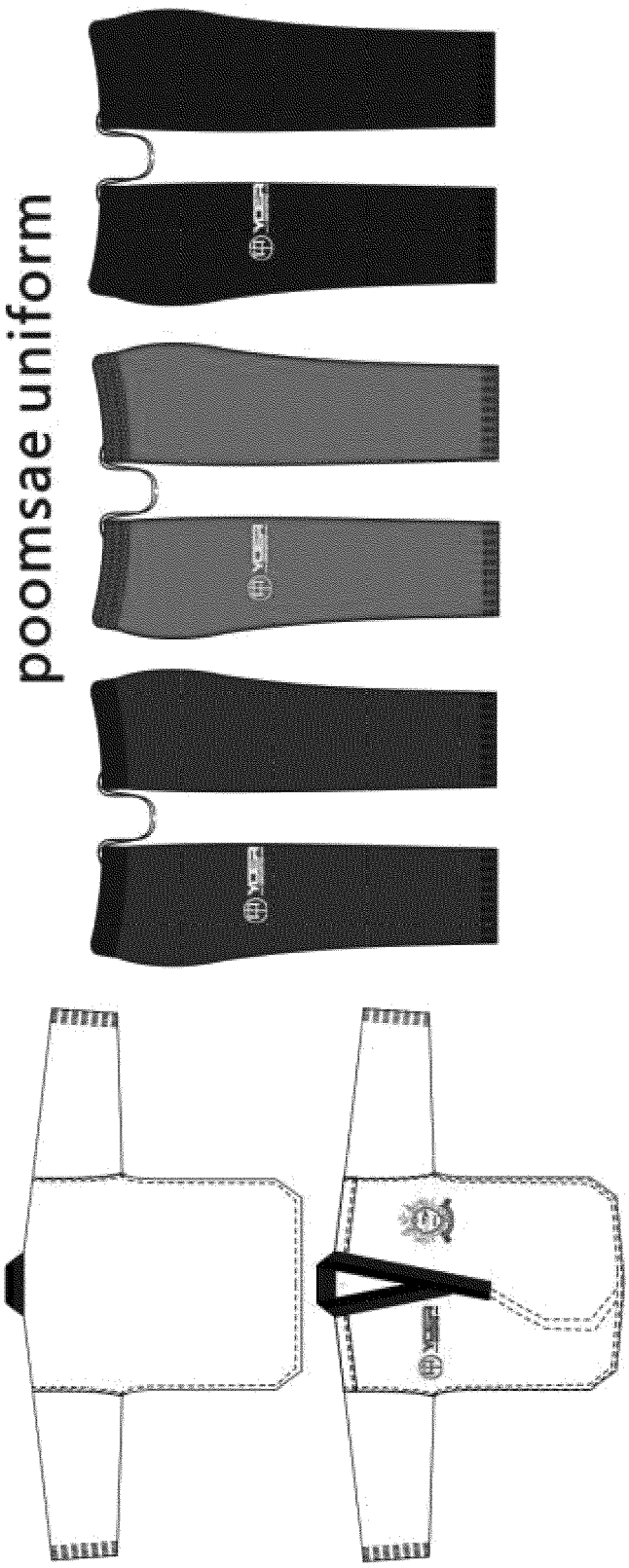

Fig. 10

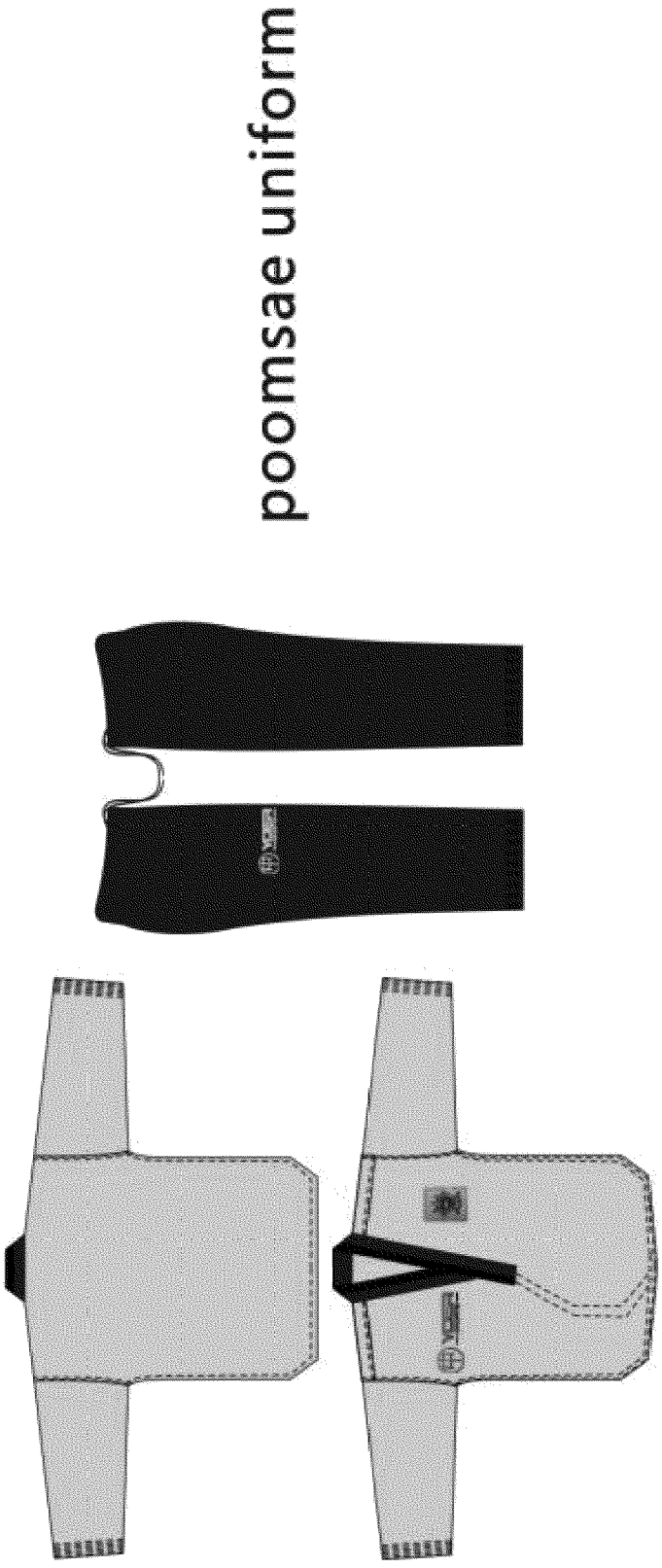

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 20 18 7008

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 108 724 859 A (HUAINAN RICHINA GARMENTS CO LTD) 2 November 2018 (2018-11-02) * figures 1,2 * -----	1-26	INV. A41D31/00 A41D1/08
X	US 2017/370033 A1 (OLSSON RANDY [US]) 28 December 2017 (2017-12-28) * paragraphs [0002], [0020]; figures 1,2 * -----	1-26	

TECHNICAL FIELDS SEARCHED (IPC)

A41D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 December 2020	van Voorst, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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01-12-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 108724859 A	02-11-2018	NONE	
US 2017370033 A1	28-12-2017	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82