

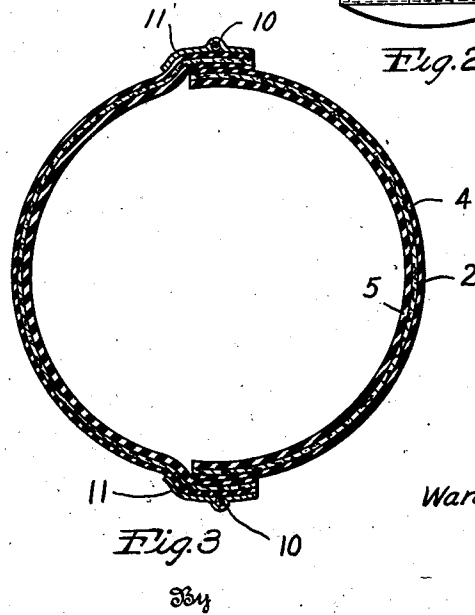
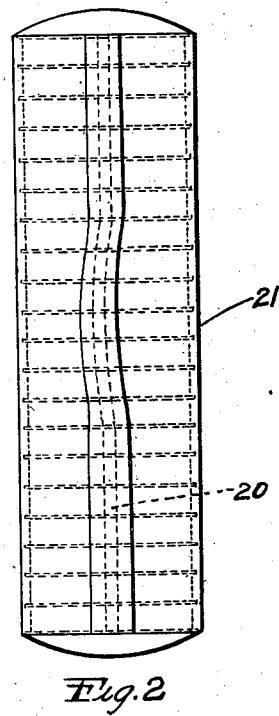
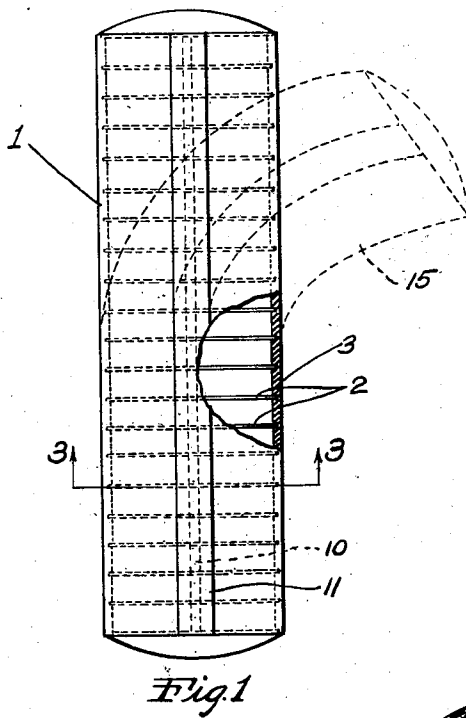
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STRUCTURE

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STRUCTURE

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3 Claims. (Cl. 2-2.1)

This invention relates to a fabric structure designed particularly for use in inflated garments, such as divers' suits and suits to be worn by aviators at high altitudes, etc. Such garments are customarily inflated to carry several pounds air pressure. When such garments are made of fabrics woven in the usual manner, the joints become objectionably rigid when inflated. The fabric of the present invention is designed to overcome such rigidity.

The structures of this invention are tubular or generally cylindrical in shape and comprise restricting elements such as cords which run circumferentially at spaced intervals. There are but two longitudinal tension members which may advantageously take the form of cords or cables. They are attached to opposite sides of the tube or cylinder, and both usually lie in a plane which passes through or near the axis of the cylinder. Such a structure may easily be flexed at right angles to the plane which passes through the longitudinal cords and is, therefore, particularly suitable for use as the trunk, arms, and legs of a suit. On the trunk the longitudinal cords will run from the armpits to the hips. On the arms, the longitudinal cords will run from points on the front and back of the shoulder to opposite sides of the wrists, parallel with the tendons. In the legs, the longitudinal cords will also be parallel with the tendons—one on the outside, and the other on the inside of each leg. This will permit relatively free forward bending of the trunk and flexing of the arms and legs at the elbows, wrists, knees, and ankles even though the longitudinal and circumferential cords are made taut by inflation.

The invention will be further described in connection with the accompanying drawing, in which Fig. 1 shows the cylindrical fabric structure in perspective with a part broken away, Fig. 2 is a view of a modified structure, Fig. 3 is a section on the line 3-3 of Fig. 1, and Fig. 3a shows an alternative method of uniting the longitudinal cords to the balance of the structure.

In forming such a fabric structure, the cords which run circumferentially are imbedded in a covering of rubber or other suitable flexible material, such as synthetic rubber, etc. There is no fabric in this covering other than the circumferential and longitudinal cords which have been mentioned. The coating of rubber inside of the cords may, for example, be 0.025 inch, and that outside may, for example, be 0.012 inch. The cords may be of nylon or viscose rayon or cotton or other suitable composition, and their

structure may be what is known in the art as 210's/3/2 (which means threads of 210 denier, 3 yarns per cable, and 2 cables per cord).

A cord spirally imbedded in a cylindrical structure might prove advantageous. However, it is quite feasible to have the circumferential cords run parallel. In the structure 1 shown in the drawing, the cords 2 run parallel and are imbedded in the rubber coating 3. The structure is perhaps best shown in Fig. 3 where the coating 3 is broken down to show an outer coating of rubber 4 and an inner coating of rubber 5 on each side of the cord 2. In Fig. 1, the rubber coating is broken away in such a manner as to show the cords 2 apart from the coating. In the trunk of a suit these cords 2 may be spaced about 0.040 inch apart. In the arms and legs they may be 0.125 inch apart.

In forming the cylindrical structure, a sheet comprising the cords imbedded in the coating is cut to a desired length, and the cut edges are then brought together and cemented. Then, a permanent bond is formed between the overlapping edges. The overlap preferably coincides with the longitudinal strengthening cord 10. The cords are treated with a suitable adhesive, such as an isocyanate or a mixture of latex and casein or other adhesive composition known in the art to bind them to the rubber covering and prevent separation on inflation.

The longitudinal cord may, for example, be nylon, cotton, rayon or steel cable of suitable size to withstand the longitudinal tension. It may be united to the structure in any suitable manner. In Fig. 3 the longitudinal cords 10 are held in place by narrow strips of binding tape 11 which are cemented to the cords and also to the outer surface of the rubber covering. The union is advantageously made by an adhesive cement which will give a permanent bond. An alternative method of bonding the cords is shown in Fig. 3a in which a portion of the fabric adjacent one edge thereof is folded back upon itself to form a pocket which carries the longitudinal cord. The edge portion folded back is bonded to the outer surface of the fabric in the manner indicated and a tape is placed over the bond.

The cords 3, which run circumferentially, limit the expansion of the structure when inflated. They in no way hamper flexing of the structure in the direction indicated by the dotted line 15 in Fig. 1. Longitudinal expansion is limited by the longitudinal cords 10, and these in no manner interfere with flexing in the direction indicated. A suit which is formed of several such

structural members gives the wearer relatively free movement. For example, a trunk built as shown in Fig. 1 with the longitudinal cords 10 running into the armpits permits the wearer to bend forward almost unhampered. An aviator wearing such a suit can sit or stand without straining. Arms made in this way may be flexed at the elbows and wrists if the longitudinal cords 10 connect the opposite ends of the joint on which the wrists flex and the opposite ends of the elbow and proceed from there to the shoulder.

Similarly, if one of the longitudinal cords on the leg extends from the hip to the outside of the knee and the outside of the ankle and the other cord is on the opposite side of the leg structure, the leg may be easily bent, regardless of the amount of pressure maintained within the suit.

It is not necessary that the longitudinal cords be perfectly aligned on the central axis. Fig. 2 shows how flexing in one direction may be facilitated if the longitudinal cords on both sides of the structure are made to diverge from the side of the structure which is lengthened by flexing. (In the drawing the amount of divergence is exaggerated.) For example, if the structure shown in Fig. 2 is an arm, and on bending the elbow, it is flexed toward the center of the sheet, such bending is facilitated by having the longitudinal cords 20 on opposite sides of the structure diverge from the side of the structure 21 at approximately the mid point. At the middle of such a structure where the longitudinal cords both diverge from the side 21, it is easier to bend away from the side 21 than if the longitudinal cords were perfectly straight and were diametrically opposite one another on the central axis throughout their length.

What I claim is:

1. A generally tubular body formed of a flexible plastic material reinforced with a plurality of cords extending in a substantially circumferential direction to limit circumferential expansion of the tubular body and two flexible inextensible tension members extending longitudinally of said tubular body and arranged in substantially opposed relation to each other, said tension members being attached to said plastic material to limit longitudinal expansion of the tubular body but at the same time to permit the body when inflated to be bent in a plane substantially perpendicular to a plane passing through both of said tension members.

2. A generally tubular body of a flexible plastic material having a plurality of substantially uniformly spaced cord-like elements imbedded in the material to limit the circumferential expansion of the body and a pair of inextensible tension members disposed in and extending substantially axially of the tubular structure, one on each side thereof and substantially opposite each other, for limiting the longitudinal expansion of the body.

3. A hollow generally cylindrically-shaped inflatable body formed of two substantially superposed coextensive plies of flexible plastic material having cord-like reinforcing disposed between said plies and extending circumferentially of the body to limit circumferential expansion thereof, said plies having overlapping substantially diametrically opposed joints bonded together, and a flexible inextensible tension member extending along each of said joints to limit longitudinal expansion of the body, each of said tension members being held in place by a binding tape secured to said plastic material.

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