Jan. 16, 1923. 1,442,323.

M. T. BRUSH.

REENFORCED FABRIC FOR AIRCRAFT.

FILED AUG. 1, 1919.

Fig. 1.

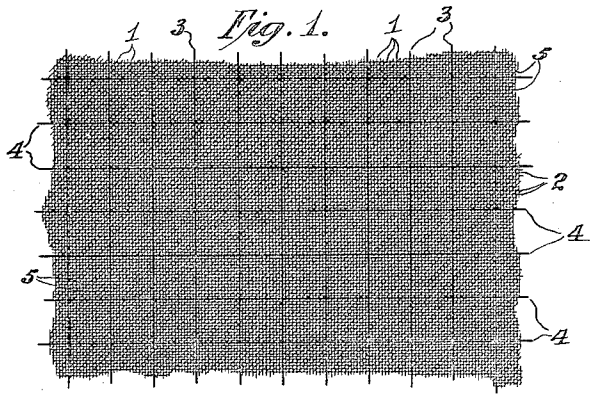


Fig. 2.

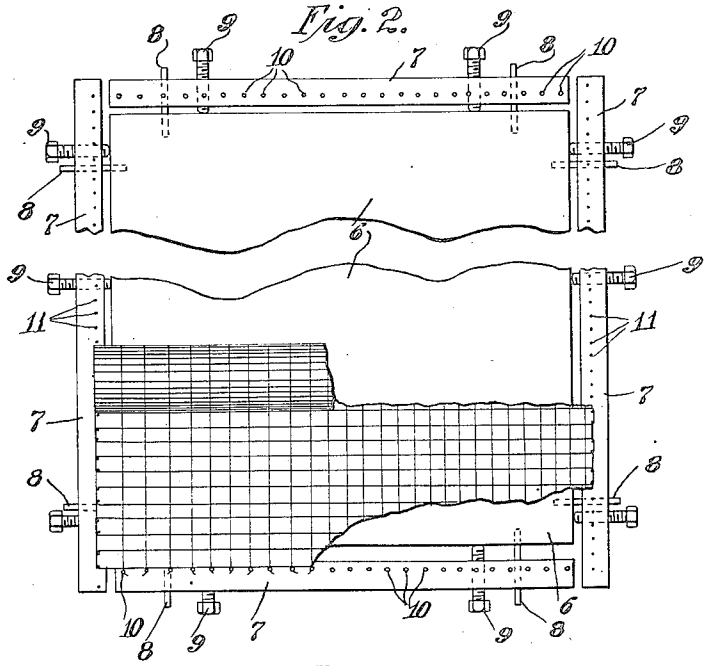
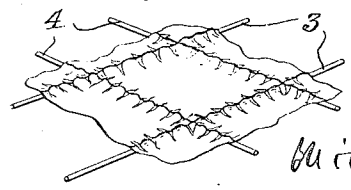


Fig. 3.



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UNITED STATES PATENT OFFICE.

MITTIE TAYLOR BRUSH, OF DUBLIN, NEW HAMPSHIRE.

REENFORCED FABRIC FOR AIRCRAFT.

Application filed August 1, 1919. Serial No. 314,683.

To all whom it may concern:

Be it known that I, MITTIE TAYLOR BRUSH, a citizen of the United States, residing in Dublin, in the county of Cheshire and the State of New Hampshire, have invented certain new and useful Improvements in Reenforced Fabrics for Aircraft, of which the following is a specification.

My present invention relates to a wire reenforced fabric for use in aircraft, both for the gas envelopes of balloons and as the covering for the wings of airplanes and the control planes of all kinds of aircraft.

The so-called "balloon cloth" used for balloon envelopes, as now generally made in accordance with Government and other specifications, consists of two or three plies of light cotton fabric placed on the bias to give increased strength and rubberized after a thorough cleansing and shrinking, to provide a coating or film of rubber which will render the cloth substantially impervious to gases and at the same time will protect the cotton threads from the weakening effects of moisture, and has a maximum weight of seven to eight ounces per square yard. The standard cloth used in aeroplane construction is lighter, weighing usually from three to four ounces per square yard, and is coated with varnish or "dope" to render it fairly air tight and also to protect the fabric from moisture, usually after the fabric has been secured in place, since the dope causes a shrinkage of the fabric which will stretch it tight upon the frame.

In order to limit tears which may be started in the covering surfaces, it has heretofore been proposed to employ, for aeroplane coverings, a fabric reenforced at intervals in one or both directions by stronger threads, of the same kind as those of which the fabric is woven or of a different textile nature or even of metal, and it has been suggested that such reenforced fabric could be secured more firmly to the framework than ordinary fabrics by fastening the reinforcing threads under the heads of the tacks ordinarily used for the purpose. Such a covering secured in the manner stated has not proven practicable, however, and, notwithstanding the urgent need for something of the kind during the past few years, has never been used so far as I am aware and the standard practice has remained as above stated.

In an earlier application filed by me on the 23rd day of January, 1919, Serial No. 272,633, I have shown and described a covering for aircraft in which the usual linen or cotton cloth is reenforced by the insertion therein at intervals of one or two inches of wires, preferably "piano wire" of No. .004 to .006 gauge which combines lightness with great tensile strength and is practically rustproof, the ends of which are secured to the frames by special fasteners by means of which they can be stretched slightly and then secured to the frame under tension without being cut or otherwise injured; and, as therein pointed out, the wires should be stretched and fastened before the application of the surfacing material, since I had discovered that the shrinkage of the fabric thereby produced which otherwise would cause the wires to check would then simply straighten out the slight wrinkles or puckers in the fabric due to the stretching of the wires and so give to the covering when finished a smooth tight surface.

I have found, however, that my invention is of broader scope, for later experiments have shown that I can obtain a finished reenforced covering for aircraft which is both smooth and flat, or a balloon cloth reenforced in one or more of its plies or even made of a single ply of reenforced fabric which meets all the requirements, by merely holding the wires tight enough during the cleansing process preliminary to rubberizing or the surfacing process, as the case may be, to prevent their becoming checked by the shrinking of the fabric thereon.

The invention will be understood by reference to the accompanying drawings, which form a part of the application, and in which—

Figure 1 is a view of a piece of balloon cloth or finished airplane covering, made according to and embodying my invention; Fig. 2, a plan view of a table or frame with a piece of interwoven yarn and wire fabric thereon, illustrating a practical means for holding the wires to prevent checking during the shrinking of the fabric in its treatment after it comes from the loom; and Fig. 3, a perspective view, on an enlarged scale, of a small piece of similar fabric in which the textile threads have been fulled upon the wires in the loom during the process of weaving.

In the finished product, illustrated in Fig. 1, the warp and woof yarns or textile threads

are represented by the light lines 1 and 2, the reinforcing wires interwoven therewith are represented by the heavier lines 3 and 4, and the rubber or other surfacing material which to a certain extent permeates the fabric is represented by the diagonal lines 5.

As already intimated, the wire I have found best adapted for the purpose is piano wire, and I prefer to use a spring wire of .006 or even .004 gauge, a size scarcely if at all larger than the yarn, in order to thereby obtain a fabric with an even surface which, as required in balloon cloth, will take a smooth even coating of rubber, and when used for aeroplane coverings will keep the skin friction at a minimum; and I have found, in the practice of my invention, that the best results are obtained by stretching the wires slightly and holding them thus under tension while the fabric is shrinking during its subsequent or finishing treatment. But, by suitably regulating the tension of the threads in the loom, the fabric can be so woven that there will be a slight and even fulling of the yarns upon the wires, as indicated in Fig. 3, and in such case it will usually be found sufficient merely to hold the wires tight so long as there is any shrinking of the yarns while the fabric is being finished as balloon cloth or is being treated with the dope used for aeroplane coverings. In any event, the wires are to be prevented from checking during the shrinking of the yarns, since this, if allowed, will produce a puckering up of the finished fabric.

The wires may be secured against checking in any suitable way, but in Fig. 2 I have shown a flat finishing table or frame which I have found convenient for the purpose. The table consists of a flat body portion 6 and four strips 7 which are mounted to slide upon rods 8 set into the edges of the body-piece, are adjustable with respect thereto by means of the screw-bolts 9, and are provided with suitable fasteners 10, those shown in my earlier application for example, at the two ends and with pins 11 on the sides. The yarn and wire fabric is laid, as it comes from the loom, upon this table, each looped end of the transverse wires in the selvage edges of the fabric being placed over the pins on the side strips and the ends of the longitudinal wires secured by the fasteners to the end strips, and then the wires are suitably tightened by turning up the screw-bolts and are thus held while the fabric is being cleansed or otherwise treated and so long as there is any shrinkage.

In the manufacture of balloon cloth, all of the shrinking of the yarns usually occurs during the drying of the fabric after it has been cleansed; after which the fabric can be removed from the table and rubberized in the usual way, using, however, rollers of hard rubber or wood rather than of steel. But if the rubber composition used should be such as to cause any further shrinkage, the fabric should be finished upon the table while the wires are held tight.

What I claim as new, and desire to secure by Letters Patent, is—

1. The process of making a reenforced fabric for aircraft which comprises forming the fabric of yarns with wires interwoven therein at intervals and then holding the reinforcing wires tight during the shrinkage of the yarns in finishing the fabric.

2. The process of making a wire reenforced textile fabric for aircraft which comprises weaving the fabric with fine wires incorporated at intervals therein and then, as a step in the finishing thereof, shrinking the fabric while the reinforcing wires are held to prevent their being checked thereby.

3. The process of making a wire reenforced textile fabric for aircraft which comprises weaving the fabric with fine wires incorporated at intervals therein and then, as a step in the finishing thereof, shrinking the fabric while holding the reinforcing wires independently thereof to prevent their being checked by the shrinkage.

4. The process of making a smooth wire reenforced textile fabric for aircraft which comprises weaving the composite fabric of yarn and fine piano wire, fastening the wires only, to hold them tight, and giving to the fabric the treatment which causes a shrinkage of the yarns while the wires are so held.

5. The process of making reenforced balloon cloth which consists in weaving a textile fabric with fine piano wire inserted at intervals therein, tensioning the wires to cause a slight fulling of the textile fabric thereon, cleansing and shrinking the textile fabric while the wires are thus held therein under tension, and finally rubberizing the composite fabric.

6. As a new article of manufacture, a smooth reenforced fabric for aircraft comprising a textile fabric which is reenforced at intervals by fine wires and which has been shrunk and finished without causing the wires to check.

7. As a new article of manufacture, a smooth reenforced fabric for aircraft comprising a composite fabric of yarn and fine piano wire in which the yarns have been shrunk while the wires were held tight to prevent their checking.

8. As a new article of manufacture, a wire reenforced balloon cloth comprising a woven fabric having fine piano wires incorporated therein at intervals and which has been rubberized after the fabric has been cleansed and shrunk while the wires were secured to prevent their checking.

MITTIE TAYLOR BRUSH.