W. G. LINDSAY.

AEROPLANE FABRIC AND PROCESS OF MAKING THE SAME.

APPLICATION FILED APR. 22, 1918.

1,325,363.

Patented Dec. 16, 1919.

2 SHEETS—SHEET 1.

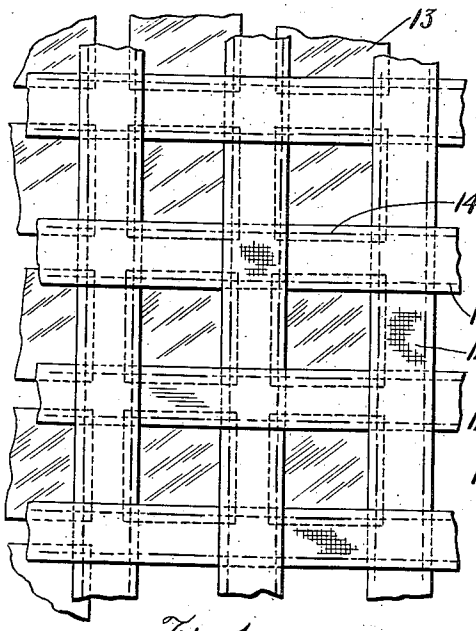


Fig: 1.

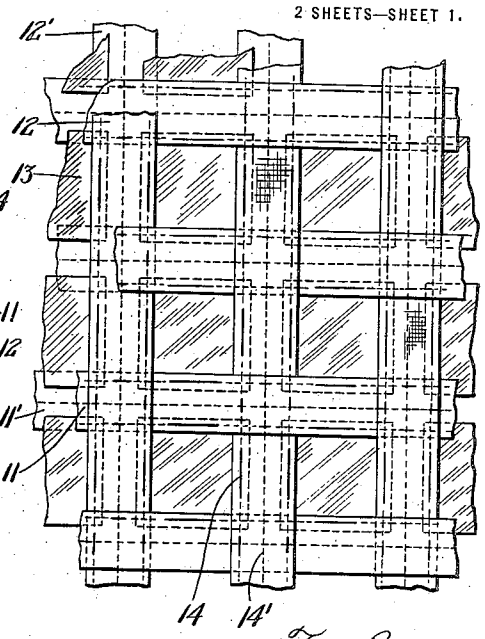


Fig: 2.

Fig: 3.

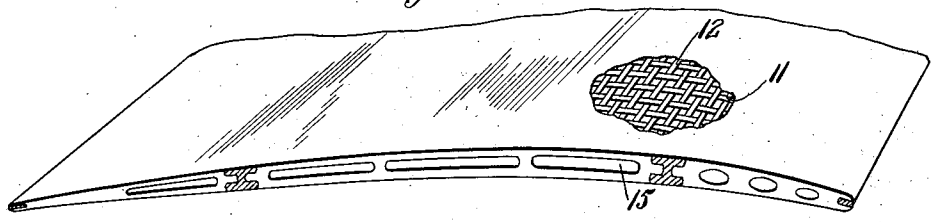


Fig: 4.

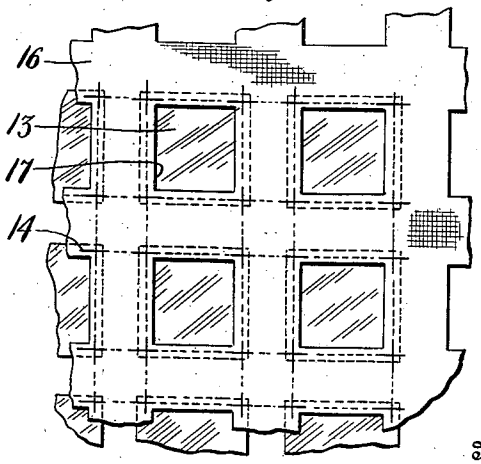
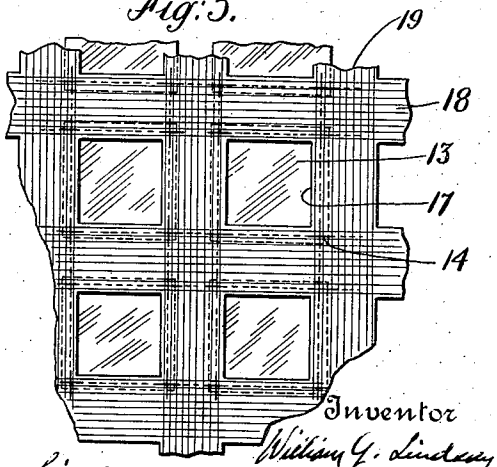


Fig: 5.



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2 SHEETS—SHEET 2.

Fig: 6.

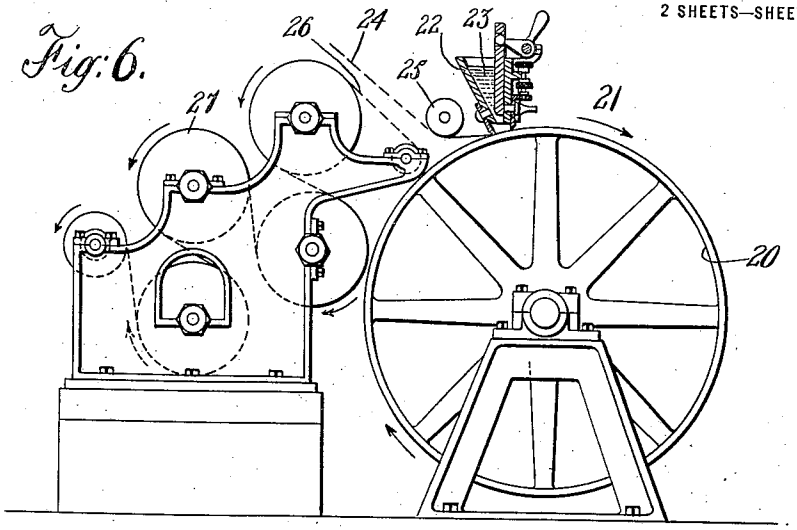


Fig: 7.

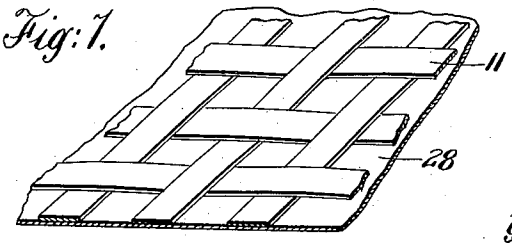


Fig: 8.

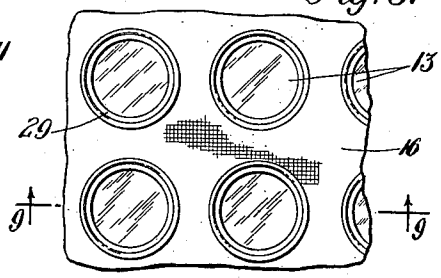
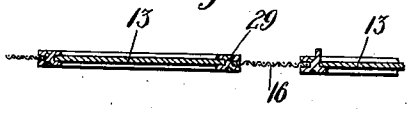


Fig: 9.



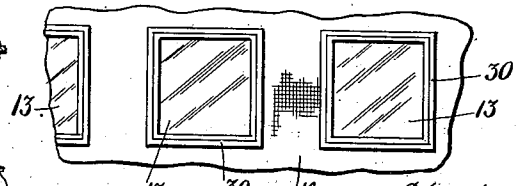


Fig: 10.

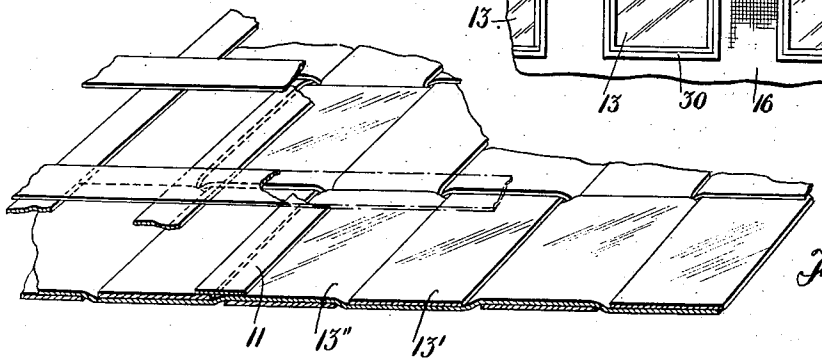
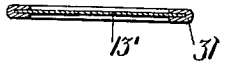


Fig: 11.

Fig: 12.



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UNITED STATES PATENT OFFICE.

WILLIAM GODSON LINDSAY, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE CELLULOID COMPANY, A CORPORATION OF NEW JERSEY.

AEROPLANE FABRIC AND PROCESS OF MAKING THE SAME.

1,325,363. Specification of Letters Patent. Patented Dec. 16, 1919.

Application filed April 22, 1918. Serial No. 229,390.

To all whom it may concern:

Be it known that I, WILLIAM GODSON LINDSAY, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Imrovements in Aeroplane Fabric and Processes of Making the Same, of which the following is a specification.

The principal object of my invention is to provide a new and improved light transmitting covering or substitute for doped fabric, for the planes of flying machines which shall possess requisite strength and flexibility. This and various other objects of my invention will be made apparent in the following specification and claims taken with the accompanying drawings. In these drawings I have shown a limited number of specific embodiments of my invention. It will be understood that modifications may be made falling within its scope. Referring to the drawings,

Figure 1 is a fragmental view of one form of my improved fabric;

Fig. 2 shows a modification in which the tapes employed are doubled;

Fig. 3 is a view showing an aeroplane wing with my improved fabric thereon;

Fig. 4 shows a modification in which holes are punched out of the cloth;

Fig. 5 shows a modification in which the fabric is woven so as to leave holes therein;

Fig. 6 is an elevation of apparatus for assembling certain elements of my improved fabric;

Fig. 7 is a perspective view showing a modification, in which interwoven tapes and a continuous sheet of transparent material are employed;

Fig. 8 shows a modification in which the transparent members are assembled with the cloth by means of gromets;

Fig. 9 is a section as indicated by the line 9 on Fig. 8;

Fig. 10 is a view showing a modification of Fig. 8 in which the windows are square instead of round.

Fig. 11 is a perspective view in which interwoven strips of transparent flexible material are employed, and

Fig. 12 shows a modification of Fig. 11.

Referring to Fig. 1, I arrange a plurality of spaced tapes 11 as shown, and weave with them a transverse system of tapes 12, thus forming a fabric with a large number of regularly arranged open squares. Either before or after weaving the tapes together, I may apply a suitable fireproofer, for example ammonium phosphate. I cut pieces of transparent flexible material 13, each a little larger than the open spaces in the fabric and place these as windows 13, sewing them all around the edges as indicated by the stitching 14. The transparent flexible material 13 may be a suitable cellulose composition. Next I coat the tapes and the edges of the windows over on both sides with a coating of dope. For the dope I may use nitro-cellulose or acetyl-cellulose with or without such substances as triphenyl phosphate, or any other suitable transparent doping agent. The resultant fabric built up in this way has great strength in proportion to its weight, local ruptures do not tend to spread, and it is transparent. One advantage of such transparency is that the fabric may be used as an aeroplane cover to give low visibility and also afford a wide range of vision for the aviator.

The modification shown in Fig. 2 is similar to that of Fig. 1, except that the tapes are laid double with the edges of the windows 13 between them. That is, one system of crossing tapes 11 and 12 is woven together and fireproofed, next the windows 13 are applied, and then their edges are overlaid by the other system of crossing tapes 11′ and 12′. The edges of the windows are stitched in as shown at 14 and the tapes are stitched through between the windows as at 14′.

The tapes 11 and 12 may be woven on a suitable frame or loom or they may be woven directly on the aeroplane frame, the tapes 11 being passed forward and backward, around and around the wing frame and the tapes 12 interwoven transversely therewith. In this way the fabric can be built up on the aeroplane frame as shown in Fig. 3.

Referring to Fig. 4, a continuous cloth is taken and the regularly spaced square holes 17 are punched out and then the windows 13 are secured in place by the stitching 14. The holes are cut so as to leave continuous warp threads and continuous weft threads between them.

The cloth may be built up as shown in Fig. 5 by spacing the warp yarns 18 and

spacing the weft yarns 19 so as to leave the square holes 17 between them and then the windows 13 may be secured by the stitching 14 as already described.

The tape or cloth fabric as shown in Fig. 1 for example, is indicated at 24 in Fig. 6. This fabric may be fed under the roll 25 and passed around the drum 20. Cellulose composition dissolved in a suitable solvent 23 is contained in the vessel 22 and is flowed in a continuous film upon the fabric 24 on the drum 20. The drum 20 rotates in the direction of the arrow 21 and the solvent is dried out of the cellulose composition so that when the fabric is stripped from the drum at 26, it has intimately united therewith a continuous coating of cellulose composition and it is then passed over the drying rolls 27. The product is indicated semi-diagrammatically in Fig. 7, where 28 represents the continuous sheet of adherent transparent cellulose composition. The square spaces between the tapes 11 and 12 form the transparent windows.

The product as shown in Fig. 7 can also be made by cementing flat sheets of cellulose composition 28 with a tape fabric 11—12.

Continuous cloth 16 may be punched with regularly spaced holes 17 and the windows 13 secured in place by metal frames 29, like gromets, as shown in Figs. 8 and 9. The holes may be punched square if preferred and the windows 13 secured therein by square frames clamped over their edges as shown in Fig. 10.

Strips of transparent flexible material 13′ and 13″ may be woven together as indicated in Fig. 11, the edges covered by reinforcing tapes 11 and 12, cemented in place, and a coat of dope or varnish applied over the tapes. If this fabric is employed on an aeroplane, it will of course be in double thickness, going around the wing frame, and the side opposite the tapes 11 and 12 may be the inside. The edges of the strips 13′ and 13″ may be reinforced by binding tapes 31 as shown in Fig. 12.

Instead of employing my improved fabric for the whole aeroplane cover, it may be used locally only in such place or places as may be considered advantageous to afford proper range of vision for the aviator.

It will be seen that in these various embodiments of my invention, I have provided a transparent fabric of adequate strength that will reduce the visibility of the aeroplane covered therewith, and increase the range of vision of the aviator.

I claim:—

1. A fabric having spaced openings therethrough, in combination with flexible transparent sheet like material across said openings secured to the fabric, and a coating of dope.

2. A fabric having regularly arranged and spaced openings therethrough, a fireproofing agent impregnating said fabric, transparent sheet like material adjacent to said fabric and lying across said openings, means securing said material to said fabric, and a coating of dope.

3. In combination, a system of parallel spaced tapes, another system of parallel spaced tapes interwoven therewith leaving open squares between them, windows of transparent flexible cellulose composition across said open squares, means securing the edges of the windows to the tapes, and a coating of dope.

4. In combination, a system of parallel spaced tapes, another system of parallel spaced tapes interwoven therewith leaving open squares between them, square windows of transparent flexible cellulose composition across said open squares and overlapping the edges of the tapes, thread stitched through the edges of the windows and the tapes to secure them together, and a coating of dope.

5. In combination, an aeroplane frame, spaced tapes wrapped around the same, other spaced tapes transverse thereto and interwoven therewith, said tapes treated with a fireproofing agent, windows of transparent sheet cellulose composition having their edges fastened to said tapes across the openings therebetween, and a coating of dope.

6. In combination, an aeroplane frame, spaced tapes wrapped around the same forwardly and backwardly, other spaced tapes interwoven therewith transversely so as to leave open squares between them and flexible transparent sheet like material across said interwoven tapes and secured thereto, and a coating of dope on said tapes.

7. In combination, an aeroplane frame, a fabric secured thereto and having spaced openings therethrough, a fireproofing agent impregnating said fabric, flexible transparent sheet like material across the openings of said fabric and secured to the fabric, and a coating of dope on the fabric.

8. In combination, a system of parallel spaced tapes, another system of parallel spaced tapes interwoven therewith leaving open squares between them, windows of transparent flexible cellulose composition across said open squares, additional tapes duplicating those already mentioned and respectively adjacent thereto with the edges of the windows between the tapes, means securing the windows and the tapes together, and a coating of dope.

9. In combination, a fabric having spaced openings therethrough and having double thickness, flexible transparent sheet like material across said openings and between the two thicknesses of the fabric, and a coating of dope.

10. In combination, a fabric having two

thicknesses of interwoven spaced tapes, transparent flexible sheet like material between the two thicknesses of tapes, means securing the tapes and said material together, and a coating of dope.

11. The process of making a transparent fabric suitable for aeroplane covers, which consists in weaving spaced tapes leaving open squares between them, fireproofing the tapes, passing the woven tapes over a drum, flowing a plastic cellulose composition evenly on said system of tapes on the drum, drying the same and thus forming a continuous layer of the cellulose composition securely united with the tape network.

12. The process of making a transparent fabric suitable for aeroplane covers, which consists in passing over a drum a cloth fabric having spaced openings therethrough, meanwhile flowing upon said cloth fabric upon the drum an evenly distributed layer of plastic cellulose composition, partially drying the same, stripping the cloth fabric and the layer of cellulose composition from the drum and further drying the same, thus forming a continuous layer of the cellulose composition securely united with the cloth fabric and extending across the openings therethrough.

WILLIAM GODSON LINDSAY.