

1,409,982.

Patented Mar. 21, 1922.
2 SHEETS—SHEET 1.

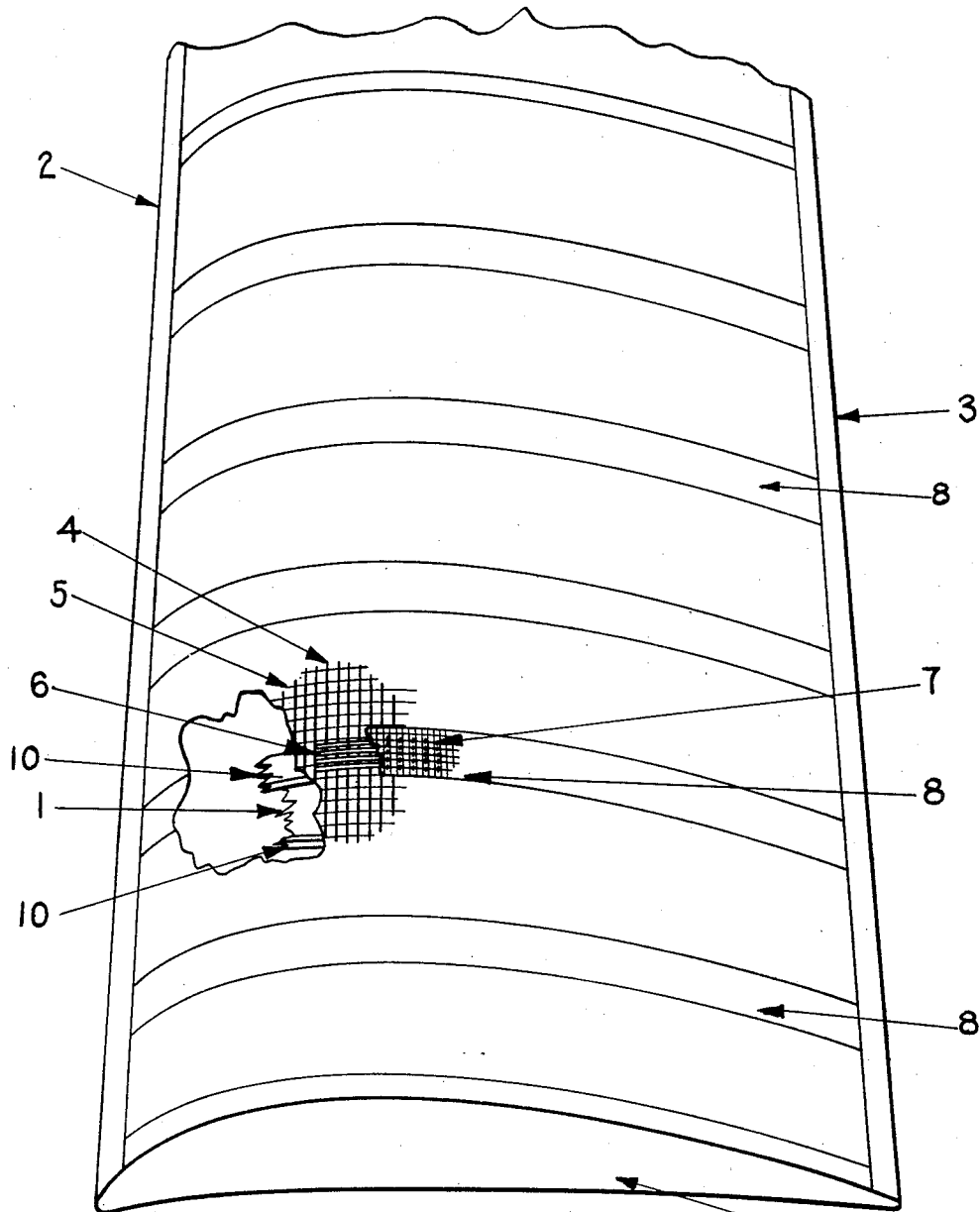


FIG. 1

Inventor,
Ernest D. Walen
By his attorneys,
Crosby & Co.

1,409,982.

Patented Mar. 21, 1922.
2 SHEETS—SHEET 2.

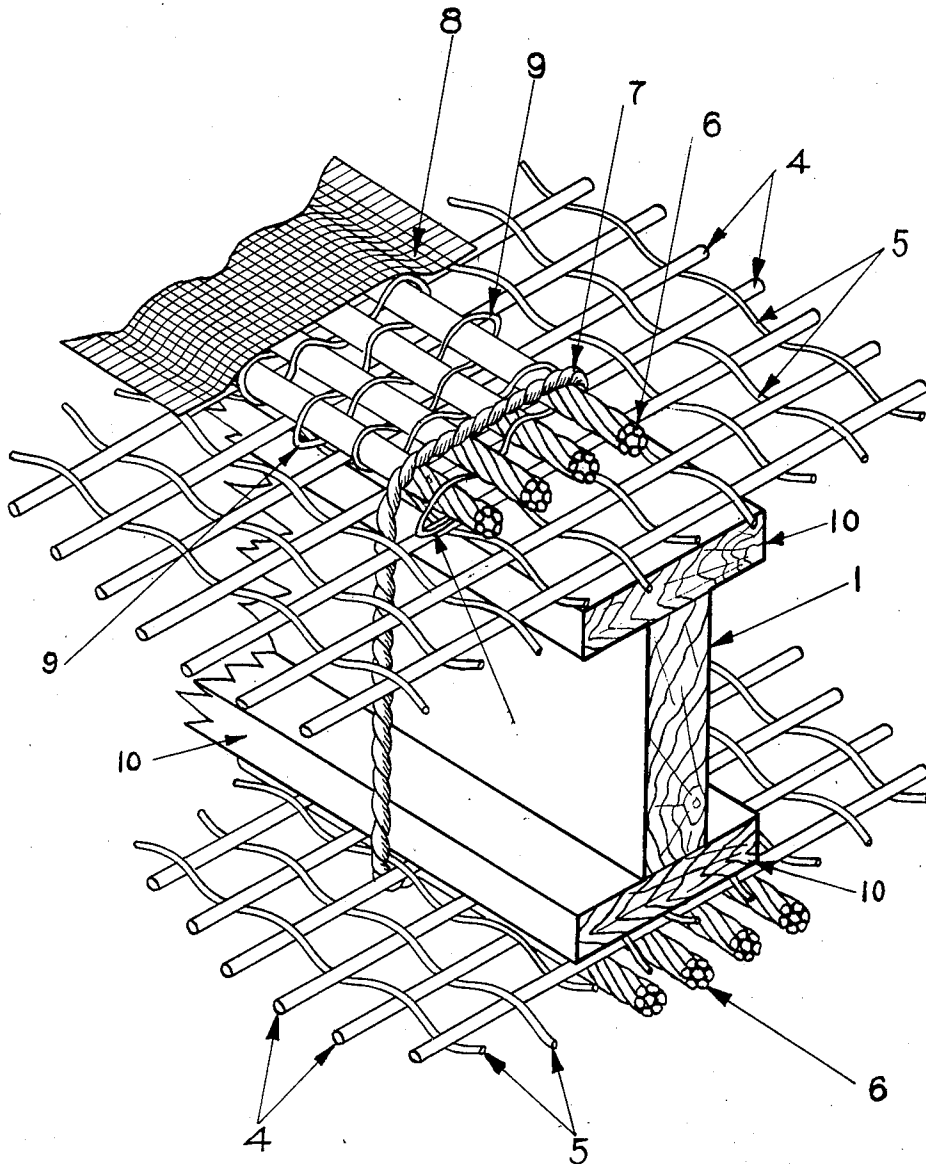


FIG. 2

Inventor,
Ernest D. Walen
By his attorneys,
Wm. O. Adams

UNITED STATES PATENT OFFICE.

ERNEST D. WALEN, OF GLOUCESTER, MASSACHUSETTS.

AIRPLANE WING.

1,409,982.

Specification of Letters Patent.

Patented Mar. 21, 1922.

Application filed September 10, 1919. Serial No. 322,891.

To all whom it may concern:

Be it known that I, ERNEST D. WALEN, of Gloucester, in the county of Essex and State of Massachusetts, a citizen of the United States, have invented a new and useful Improvement in Airplane Wings, of which the following is a specification.

My invention consists primarily in a wing comprising the usual frame running the length thereof and having ribs connecting the long sides of the frame, the whole covered with a textile fabric in which the warp is of finer yarns running crosswise of the wing while the filling is of comparatively heavy cords which run lengthwise of the wing. It also comprises means for attaching the fabric to the wing.

My invention will be understood by reference to the drawing, in which—

Figure 1 is a perspective view of a portion of the wing of an airplane, it being understood that the wing may extend in either direction as far as may be desirable.

Fig. 2 is a view on an enlarged scale of a portion of one of the ribs, showing the manner of attachment of the fabric thereto, the fabric being shown greatly magnified to indicate its construction.

In each view the fabric is shown diagrammatically, that is to say, the fabric itself is a closely woven fabric.

In the drawings, 1 represents a rib constructed as usual with a vertical member and top and bottom caps 10. 2 is the entering edge or portion of the frame and 3 is the trailing edge. The ribs form the long opposing sides of rectangles, the shorter opposing side and the end ribs being solid as at 11, comprising portions of the frame. The fabric comprises what I term cords 4 made of heavier yarns which serve as filling for the warps 5 which are made of lighter yarns. The frame is covered with this fabric. 6 are cords held together by filling 9, the whole forming a reinforcing tape which in the structure shown is of substantially the width of the top cap 10.

It will be noted that the cords 4 are considerably heavier than the warp yarns 5. These cords and warp are woven together into a close fabric, the warp yarns serving the purpose of preventing excessive dope penetration as well as holding the cords together. The cords 4, which may be made of mercerized cotton yarns, flax, or other fibers, because of their stiffness and bulk will lie

practically straight and since they cover the shorter dimension of a rectangle defined by two adjacent ribs and the entering and trailing edge of the wing they will carry the stresses of flight. In other words, the greater part of the strain or stress on the fabric will be borne by the heavy or relatively straight filling cords 4 running lengthwise of the wing.

The warp 5 of the fabric when placed on the frame in the manner described and fastened as hereinafter described, will be subjected to very little of the stress of flight and serves the purpose when made sufficiently strong, of causing a tear once started to be directed across the much stronger filling cords 4, thus more or less limiting its extent. This is due to the difference in curvature and in stretch between the filling cords and the warp yarns when applied as described.

The cords 4 which are relied upon to take the main stress are tied to the ribs in much the usual manner except that the heavy cord tape 6 is constructed and placed over the fabric parallel with and above the top cap of the rib. The cords of this tape run lengthwise of the rib and are held together by a filling comprising a much finer yarn which may preferably be woven so that every other pick protrudes as shown at 9. These protruding picks form loops by means of which the tape is more securely fastened by the usual dope to the cords 4.

The covering is attached to the frame at each rib by passing a lacing cord 7 between the cords 4 over the tape 6 and around the rib in the usual manner. This reinforcing tape 6 serves to fasten the cords 4 securely to the wing frame and further distributes the load, otherwise usually concentrated at the lacing point, over the entire number of cords 4, as many of these reinforcing tapes being used as are desirable. The usual dope and finishing tape are then applied in any convenient manner.

This fabric has proved exceedingly useful in the art. A wing so covered has proved in practice to be strong, light and of very high tear resistance, and by means of it a frame may be very tightly covered.

As an example of materials from which such a fabric may be made, the cords 4 may be of 2/60's mercerized long staple cotton yarn arranged 98 picks per inch, the warp 5 being 1/60's long staple cotton yarn ar-

ranged 88 threads per inch, interlaced with the cords 4. The reinforcing tape 6 may be made of 14 ends of 17's/3/3/4 ply long staple cotton yarn, with 16 picks of 2/20's long staple cotton yarn. The lacing cord may be of 17/3/3/4 ply long staple cotton yarn. These proportions are those of materials which have been used and thoroughly tested in practice in the construction of a wing giving excellent results, but I do not mean to limit myself to a fabric the elements of which are exactly as described.

What I claim as my invention is:—

1. An airplane wing consisting of a frame comprising longitudinal and transverse ribs, and a fabric secured to said frame and composed of interwoven relatively light yarns running crosswise of the wing, and relatively heavy and strong straighter cords running lengthwise of the wing, said heavy and strong cords largely receiving and resisting the stresses of flight.

2. An airplane wing having a frame covered with a fabric comprising a filling formed of cords running the length of said frame and attached together by warps composed of finer yarn, a reinforcing tape laid over said fabric upon and parallel with the ribs and comprising cords running lengthwise of said tape, and means for combining said reinforcing tape and said fabric with said ribs.

3. An airplane wing having a frame

covered with a fabric comprising a filling formed of cords running the length of said frame and attached together by warps composed of finer yarn, a reinforcing tape laid over said fabric upon and parallel with the ribs, said reinforcing tape comprising warps of fine yarn and filling of heavier yarn, said heavier yarn running parallel with said ribs, and means for combining said reinforcing tape and said fabric with said ribs.

4. An airplane wing having a frame covered with a fabric comprising a filling formed of cords running the length of said frame and attached together by warps composed of finer yarn, a reinforcing tape laid over said fabric upon and parallel with the ribs, and means for combining said reinforcing tape and said fabric with said ribs, said means comprising lacing cords passing over said fabric and around said ribs.

5. An airplane wing fabric composed of interwoven relatively light yarns to be disposed crosswise on an airplane wing, and relatively heavy and strong cords which are straighter than the lighter yarns and which relatively heavy and strong cords are to run lengthwise of an airplane wing.

6. A tape for use in attaching the fabric to an airplane wing having a warp comprising comparatively heavy cords and a filling of finer yarn having protruding picks forming loops adapted for the purpose set forth.

ERNEST D. WALEN.