July 29, 1930.

J. F. AULD

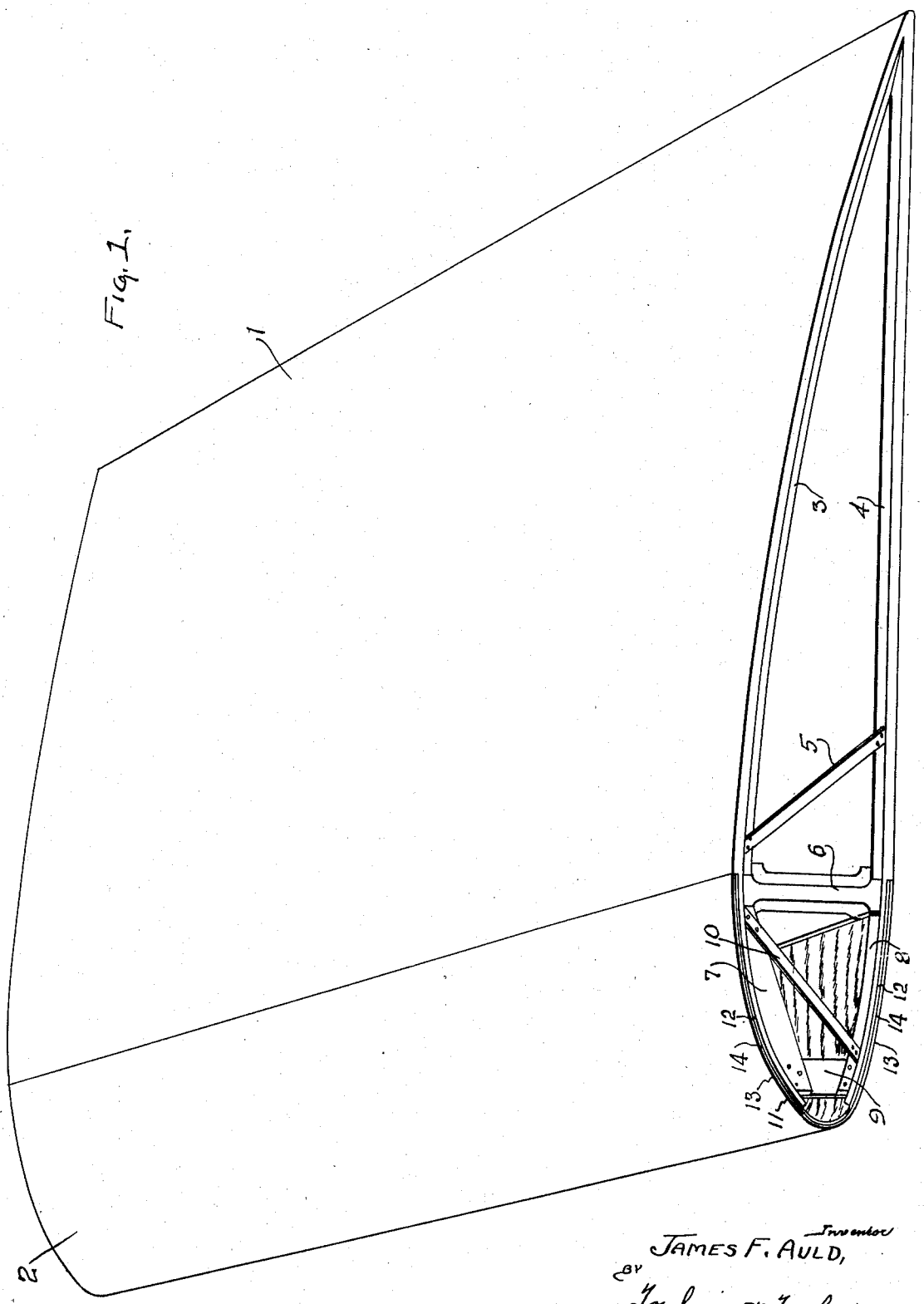
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AIRPLANE WING

Filed Nov. 24, 1928

3 Sheets-Sheet 1

Fig. 1.



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3 Sheets-Sheet 2

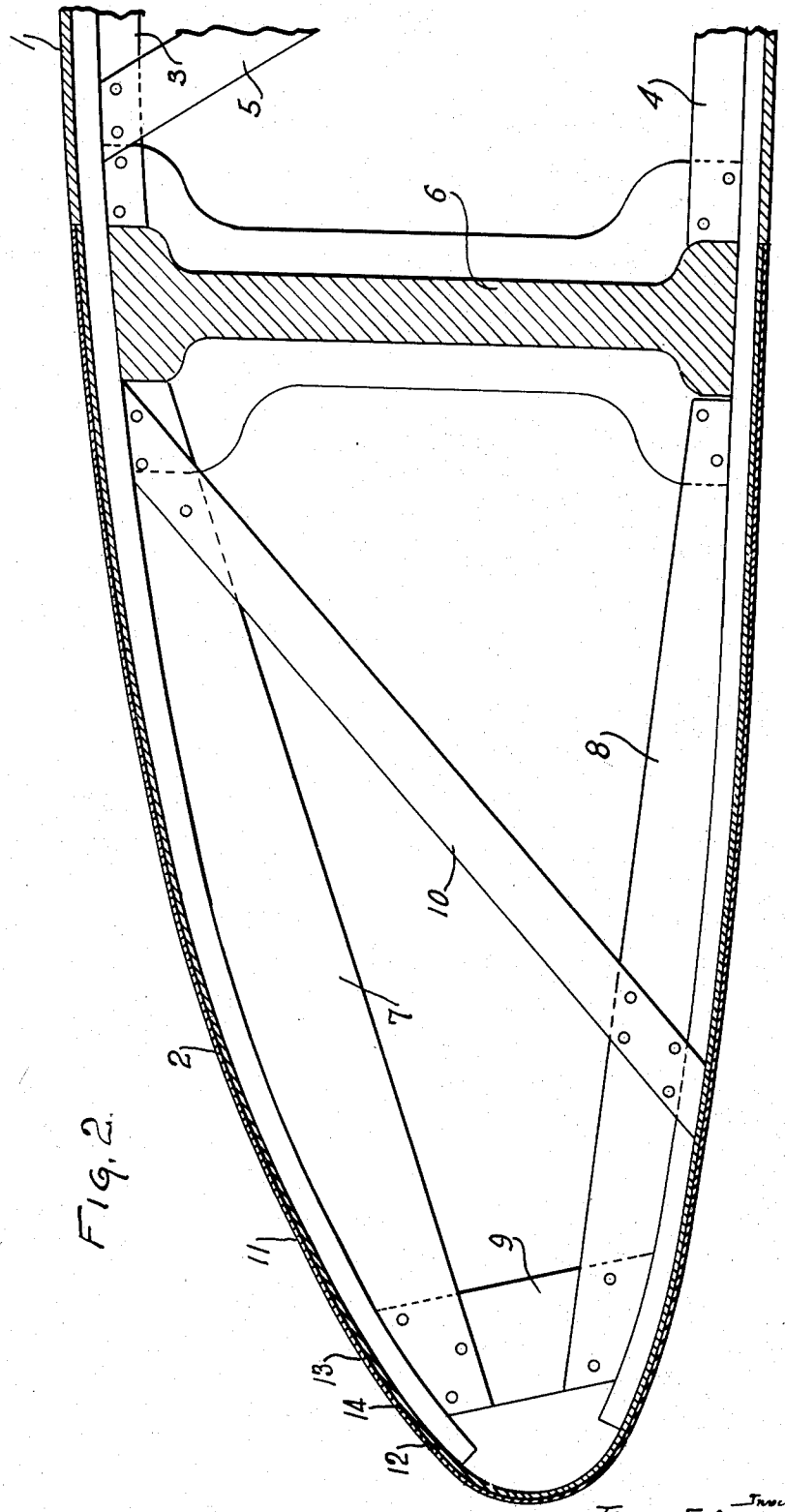


Fig. 2.

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July 29, 1930. J. F. AULD 1,771,567

AIRPLANE WING

Filed Nov. 24, 1928 3 Sheets-Sheet 3

Fig. 3.

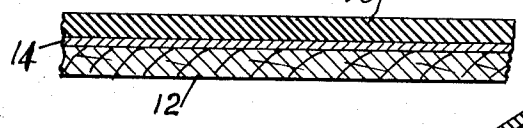
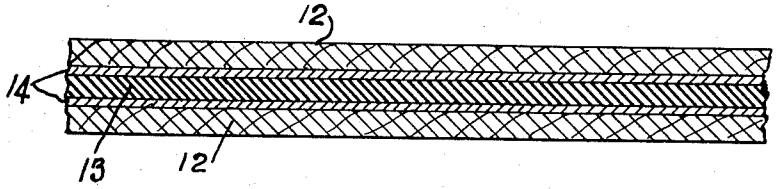


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE

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AIRPLANE WING

Application filed November 24, 1928. Serial No. 321,595.

This invention relates to improvements in airplane wings.

It more particularly relates to improvements in the covering for airplane wings, especially the nose thereof, and has for its object the production of a composite covering composed of a layer or veneer of wood and a layer or sheathing of metal, preferably aluminum, united by a suitable adhesive binder.

This covering has the following, among other distinctive characteristics: It is light, flexible to a degree, durable and strong, and of so smooth an exterior as to offer the least frictional resistance when the planes are going through the air at the high speeds they attain. This covering will yield to blows or impacts of considerable force and spring back or recover its original shape when relieved of contact with the opposing object. It will not warp or lose its shape due to the effects of weather. It keeps its shape and does not tend to straighten out or pull away from the frame. It is much stronger than plywoods and more durable than canvas. It is easily workable and easily formed around large and small radii. It can be formed into plane-shapes without extensive steaming and can be readily glued, or nailed without drilling or countersinking, to the framing of the wing.

As just stated, this composite structure, due to the bendability of the wood veneer and of the metallic or alloy sheathing, can be formed or bent to conform to the desired shape of the wing surface, even the nose or frontal portion of the wing; and when so bent this structure will retain its shape without tendency to spring back.

These qualities are due to the structure and materials of this covering,—the structure consisting of an inner lining and an outer sheathing, and the materials consisting of a wood veneer on the inner or under side and a sheathing of aluminum or equivalent metal or alloy on the outer side, the sheathing affording smoothness and strength, and the veneer and sheathing together affording yieldability to blows by giving inwardly to blows, and having capacity to spring back to normal position, the veneer of wood contributing principally to this latter quality.

The structure further includes, by preference in this respect, a binder between the veneer and the sheathing consisting of celluloid in sheet form partially dissolved on its surfaces by any suitable solvent; the partial dissolution forming gummy or adhesive surfaces and the undissolved remainder constituting a bendable element integral with the binder element proper.

While I have illustrated and set forth herein my improved covering as applied to airplane wings, it is to be understood that this covering is applicable also to the horizontal and vertical controls and to ailerons as well. Indeed, the covering finds utility on any of the plane surfaces of a flying machine, whatever be their particular character or kind.

Referring to the drawings:

Figure 1 is a perspective view of an airplane wing embodying this invention.

Figure 2 is a cross section of the nose of the wing, similar to that shown in Figure 1.

Figure 3 is an edge view of the cover material, showing the layers of wood and metal, and the intervening binding material.

Figure 4 is an enlarged cross section of the nose point.

Figure 5 is a view showing a modified form of covering in which there are two layers of wood with an intervening layer of metal.

In Figure 1 there is shown an airplane wing in perspective. The wing is composed essentially of the framework and the cover. The rear part of the wing in the present instance is indicated by the numeral 1, while the nose part is indicated by the numeral 2. The rear part of the wing has an upper rib member 3 and a lower rib member 4. These members are held in spaced relationship and are braced by means of a brace 5.

The point where the rear of the wing and the nose part come together is supported and held apart by trusses 6. These trusses are upright substantially in relation to the main body of the wing. The nose part of the wing has a forwardly extending upper front rib 7. It has also a forwardly extending lower

rib 8. These ribs approach each other and at their front ends are united by a cross piece 9. The front frame of the wing also has a brace member 10.

This structure, composed of ribs, braces and trusses forms the framework of the airplane wing and supporting surface for the covering. The surface covering is in many instances canvas or metal. In the present instance, the nose portion is composed of a layer of wood and metal, preferably aluminum, united by some suitable binding material, and is indicated in the present drawings by the numeral 11. The wood part of the covering material is indicated by the numeral 12, while the metal layer is indicated by the numeral 13, and the intervening binder by the numeral 14.

It will be observed that the covering here described and used is composed of a plurality of layers, one of which is of wood, another of metal or alloy, and the third of celluloid.

These layers are superimposed upon each other without treatment of any kind. Heat and pressure are then applied to a sufficient extent to partially dissolve the celluloid, preferably in sheet form, to constitute the binder. It is found that usually 140 to 150 degrees centigrade temperature, and a pressure of 500 pounds per square inch are about right for the effective binding of the materials. The heat and pressure are usually maintained for a period of thirty minutes to sixty minutes. If the celluloid sheet be partially dissolved before it is made part of the composite stock, less heat and pressure may be used in the formation of the composite stock.

These values, of course, will depend upon the operating condition and upon the nature of the surfaces to be joined and the thicknesses of the bodies to be united. In general, however, the above mentioned temperatures and pressures are about right for developing the most satisfactory degree of adhesiveness on the celluloid sheet surfaces for the purposes for which this invention is specifically applied.

The layer of wood is usually thicker than the layer of metal, but the relative thickness of the two may be adapted to the conditions and purposes under which and for which covering is to be used. As shown in the drawings the layers are relatively thin and united by celluloid, but if the circumstances demand, each layer may be composed of heavier and thicker material, properly held together by a binder.

While this cover of metal-wood material is particularly adapted for use on the nose of the wing, it is well adapted for covering the whole of the wing, and in this use it readily regains its shape after blows and knocks.

The composite stock thus formed of a layer of wood and a layer of metal is well adapted to form the cover for the frame of an airplane wing, because of the fact that it can stand hard knocks, and if it becomes dented will regain its normal shape or can be easily pressed back in shape.

While the layers of wood and metal are here described as being held together by partially dissolved celluloid, any other suitable binder can be used, the particular character of binder being variable, though the celluloid sheets partially dissolved are far preferable as they afford a most effective and lasting binder, and as the undissolved portion constitutes a bendable element integral with the binder element proper.

For the purpose of giving a different finish or of increasing its strength and durability, the cover may be made of outer layers of wood and an intervening layer of metal, preferably aluminum, united by the usual binder. This form of cover is shown in Figure 5, and has the same general qualities as are found in the two-ply cover.

The essential feature of this invention lies in the cover for the frame of an airplane wing composed of a composite stock that will retain and regain its normal shape though it has been subjected to hard knocks and blows.

I desire to comprehend within my invention such modifications as may be clearly embraced within my claims and the scope of my invention.

Having thus fully described my invention, what I claim is new and desire to secure by Letters Patent, is:

1. In an airplane wing, a frame, and a cover therefor, said cover being composed of a layer of wood, a layer of metal, and an intervening layer of celluloid as a binder.

2. In an airplane wing, a frame, and a cover therefor, said cover being composed of a layer of wood, a layer of aluminum and an intervening layer of celluloid as a binder.

3. In an airplane wing, a nose part, a frame for said nose, and a cover for said frame, said cover being composed of a layer of wood, a layer of metal and an intervening layer of celluloid.

4. In an airplane wing, a nose part, a frame for said nose, and a cover for said frame, said cover being composed of wood and a layer of aluminum and an intervening layer of celluloid as a binder.

5. In a flying machine, a composite surface covering, comprising an inner layer or veneer of wood, an outer sheathing of aluminum, and an adhesive between the veneer and the sheathing consisting of celluloid in sheet form having its surfaces partially dissolved, whereby outer smoothness and strength of low frictional resistance and inner support and reacting yieldability, all with lightness, are afforded.

6. An airplane wing nose consisting of a

composite surface covering, comprising an inner layer or veneer of wood, and outer sheathing of aluminum, and an adhesive between the veneer and the sheathing consisting of celluloid in sheet form having its surfaces partially dissolved, whereby outer smoothness and strength of low frictional resistance and inner support and reacting yieldability, all with lightness, are afforded

In testimony whereof, I affix my signature.

JAMES FREDERICK AULD.