PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Tailless Aeroplane.

I, WILHELM LANGGUTH, of Stuttgarterstrasse am Walde, Böblingen i/Wurttemberg, Germany, a Citizen of the German Republic, do hereby declare the nature of this invention and in what manner the same is to be performed. to be particularly described and ascertained in and by the following statement:—

It is well known that, in an aeroplane in flight, the weight of the wings or supporting surfaces upon which the lifting forces act in an upward direction exerts a relieving action with respect to the bending stresses on the spars which carry the ribs or the wing covering. It follows that the absolute value of this relief action is greater for a heavy wing than for a light wing. It has already been proposed, in order to increase the relieving action exerted by the weight of the wings, to dispose some parts of the aeroplane, for instance the engines, the tanks etc., not in the fuselage but in the wings. It has also been proposed to utilise the central portion of the wings, that is the portion located immediately adjacent the fuselage for lodging useful loads.

It has previously been proposed, with a view to reducing bending stresses, to cause the whole active surface of aeroplanes to operate under the most uniform conditions, so that each square of said surface shall be loaded with a weight which is substantially equal to the total weight divided by the total lifting surface. With such an arrangement each unit of surface will carry the same load.

The object of the present invention is to produce a considerable reduction in the stresses to which the wing spars are subjected in tailless aeroplanes comprising wings and a load applied to said wings.

With this object in view the invention consists in a tailless aeroplane comprising wings and a load applied to said wings, in which provision is made for the useful load, taken in combination with the weight of the wings themselves to be distributed approximately in the same proportion, over the length of the wings, as the ascentional forces.

In carrying the invention into effect the useful load is preferably distributed inside the wings in such a manner that the centre of gravity of any given portion of the load, for instance the portion of the load comprised between two ribs of the wing structure, may coincide, either exactly or approximately, with the ascentional resultant or lift corresponding to the portion of the supporting surface within which is located said portion of the load. In that way the stresses to which the spars are subjected are relieved to a considerable degree by the action of the useful load. That balancing action may be such, in certain cases, for instance in airoplanes without tail, that at any point along the length of the wings the ascentional forces or lift acting in an upward direction are nearly wholly compensated for or equalized by the weight of the useful load acting in an opposite direction taken in combination with the weight of the wings themselves so that only relatively small transverse or bending stresses can exist in the wing structure. In order to avoid the secondary tensile stresses which might result from the transmission of the forces of a portion of the useful load from the covering or the ribs of the wings to the spars, which are the main girders of the wing structure, the useful load may advantageously be supported directly either on or within the spars, which, to this effect, may be built in an appropriate manner. When each wing of the aeroplane comprises several spars, these latter are preferably connected together through a certain number of passages.

A preferred embodiment of my invention will be hereinafter described with reference to the accompanying drawings, given merely by way of example, and in which:

Fig. 1 is a diagrammatical front view of a tailless aeroplane.

Fig. 2 is a plan view corresponding to fig. 1.

a and *b* designate the two wings of the aeroplane which are supported respectively by two pairs of spars *c d* and *e f*. The wing might as well comprise only one spar or a multiple system of spars. The spars may consist either of tubular

girders or of box-shaped girders having solid walls, or again of sectional irons which are connected together by means of lattice trussing, etc. . . . The space within the spars or between said spars is utilized, according to my invention, for receiving the useful load, which is distributed inside the wing, preferably in the vicinity of the tips of the wings, as far as the points of application of the resultant A of the ascentional forces, which are designated by F, or even further on (Fig. 1). I thus obtain the result that the forces N corresponding to the load, that is to the sum of the weight of the wing themselves and of the useful load are about equal to the ascentional forces acting in the opposite direction, at any point whatsoever along the wing. The approximation with which that result is obtained is all the more complete as the useful load is distributed in the wing portion lying outside or nearer the tip than the point of application of the resultant ascentional force, and the distribution of the load is the more uniformly adapted to the distribution of the ascentional forces.

It follows that the bending stresses to which the spars are subjected are reduced to a relatively low value, so that said spars do not need to be so strong as it is customary, and that accordingly the dead weight of the aeroplane may be considerably reduced. As the loads on the wings resulting from the useful load act directly upon the spars or even inside the spars, secondary tensile stresses are avoided. The construction of the spars with respect to the useful load to be supported may evidently vary. The spars may be so built as to form magazines for the dead useful load or chambers for the live useful load.

In the embodiment shown in the figures, in which each wing comprises two spars *c*, *d* and *e*, *f*, it is advantageous to connect the spars by means of passages so as to permit easy access from one magazine or chamber into another one. The parts of the wings or spars which, due to their small height, cannot be entered by persons, for instance the tips of the wings, are preferably used as magazines for granular or powdery goods (shipped in bulk) or liquid goods. Said spaces may also serve especially as fuel tanks.

While I have disclosed what I deem to be preferred embodiment of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of my invention as comprehended within the scope of the appended claims.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A tailless aeroplane comprising wings and a load applied to said wings, in which provision is made for the useful load, taken in combination with the weight of the wings themselves to be distributed approximately in the same proportion, over the length of the wings, as the ascentional forces.

2. A tailless aeroplane comprising wings, at least one spar in each wing adapted to be used as a magazine or chamber for the useful load, said load taken in combination with the weight of the wings structure being so distributed as to correspond substantially with the ascentional forces acting upwardly upon the wings so as to substantially balance them over the length of the wings, whereby the bending and shearing stresses exerted upon the spars are reduced to a minimum.

3. A tailless aeroplane according to claim 2, comprising a plurality of spars in each wing and passages extending transversely with respect to said spars for connecting them together.

Dated this 11th day of March, 1932.
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Fig. 1.

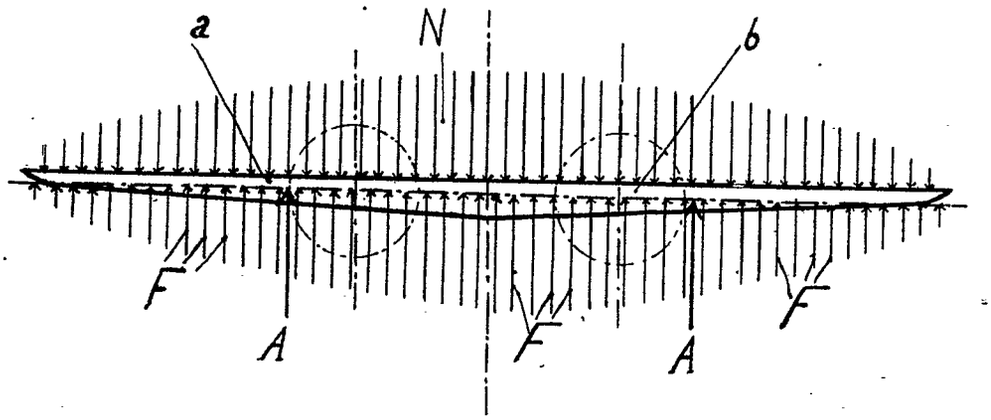
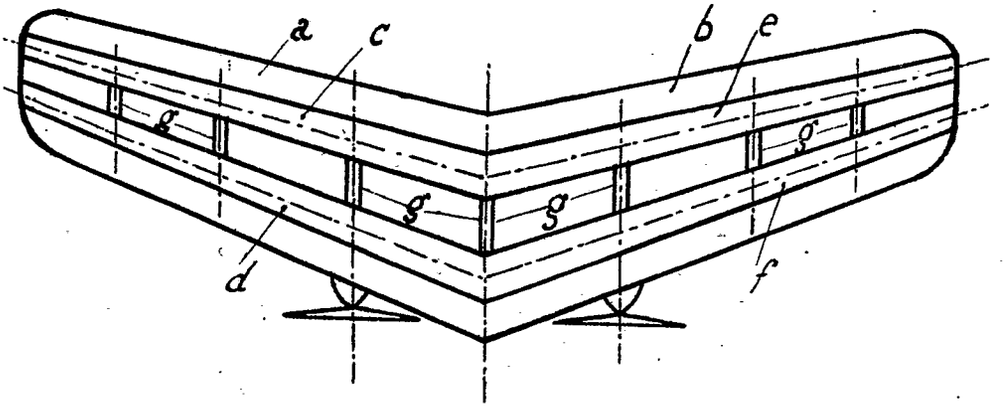


Fig. 2.



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