Aug. 28, 1928. 1,682,204

W. WAIT, JR

AEROPLANE RADIATOR

Filed Oct. 26, 1922

FIG. 1.

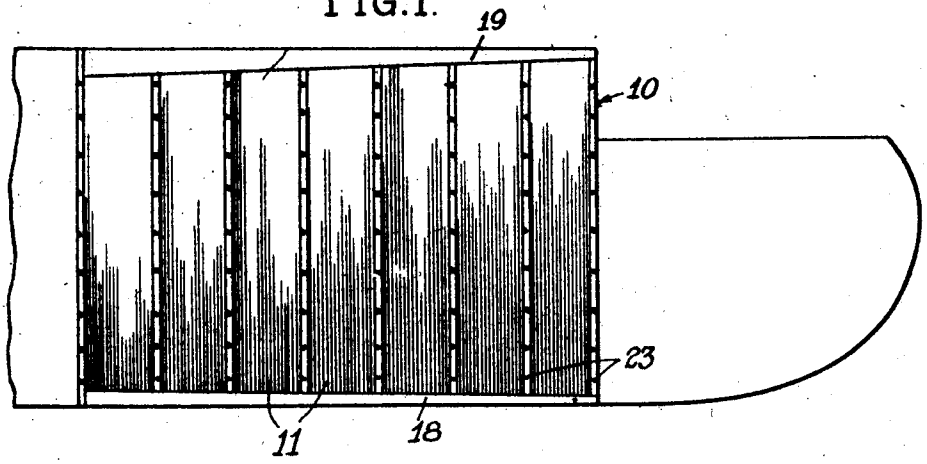


FIG. 2.

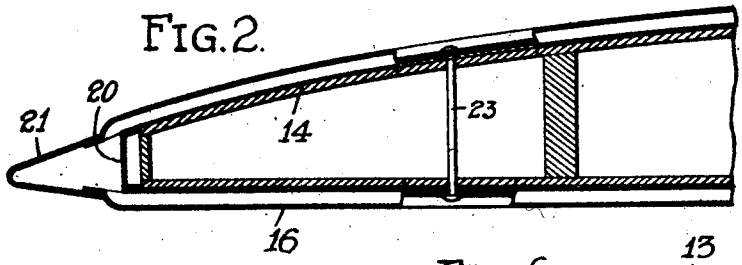


FIG. 3.

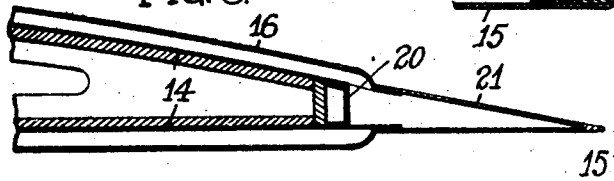


FIG. 6.



FIG. 7.

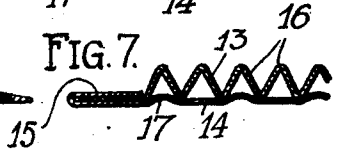


FIG. 4.

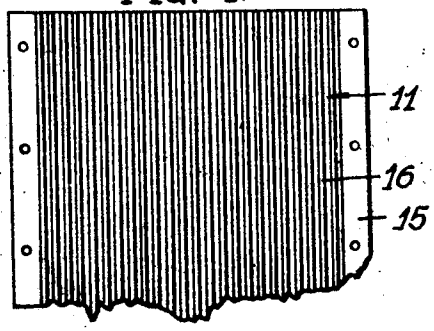
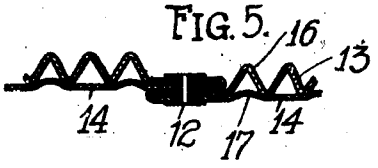


FIG. 5.



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Patented Aug. 28, 1928. 1,682,204

UNITED STATES PATENT OFFICE.

WILLIAM WAIT, JR., OF GARDEN CITY, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CURTISS AEROPLANE AND MOTOR COMPANY, INC., OF GARDEN CITY, LONG ISLAND, NEW YORK, A CORPORATION OF NEW YORK.

AEROPLANE RADIATOR.

Application filed October 26, 1922. Serial No. 597,073.

My invention relates to "skin" or "surface" type radiators and more particularly to aeroplane radiators of wing or aerofoil form.

An object of the invention is to improve the construction, arrangement, and organization of radiators thus particularized with a view to reducing both cost and labor incident to the manufacture thereof.

A further object of the invention is to so relate the corrugated sheets and the water passages or cells formed thereby that expansion and contraction due to temperature changes may occur without in any way disrupting or otherwise injuriously affecting the necessary multiplicity of joints.

A still further object of the invention is the placement of the skin or surface type radiator directly upon the outer covering of the wing framework in such manner that the radiator per se does not under any circumstances constitute a structural part of the wing. Thus organized, exceedingly light material can be used in the construction of the radiator since its relation to the wing is such that the operating strains and stresses set up in the wing are kept entirely apart from the radiator disposed thereover.

Other objects of the invention are, to construct the radiator in sections, to join the sections together by overlapping the edges thereof, and to provide headers common to the total number of sections, each header constituting a substantial portion of the wing or aerofoil itself, and each, from a construction standpoint, comprising separate channeled metal strips fastened respectively to the juxtaposed sheets defining the water passages or cells.

In the drawings, wherein like reference characters denote like or corresponding parts;

Figure 1 is a plan view of the skin or surface type radiator illustrating the manner in which it is mounted upon an aeroplane wing;

Figures 2 and 3 are enlarged detail sectional views taken on the lines 2—2 and 3—3 respectively of Figure 1;

Figure 4 is an enlarged plan view of one of the corrugated metal plates forming a part of one of the radiator sections;

Figure 5 is an enlarged transverse vertical sectional view of portions of adjacent radiator sections showing the manner in which the edges thereof are overlapped and adjacent sections fastened together; and

Figures 6 and 7 are detail sectional views showing the relative arrangement of the corrugated plates, as well as the manner in which the extended edge of one of said plates is folded upon and fastened to the other.

In the embodiment of the invention selected for illustration, the radiator, designated in its entirety as 10, is preferably built up from a plurality of radiator sections 11, each of which is of substantially a duplicate construction. The sections 11, in the assembly of the complete radiator, are placed edge to edge, with adjacent edges in overlapping contact as indicated in Figure 5, the overlapped portions being rigidly fastened together by eyelets or rivets 12 which penetrate all of the several thicknesses of metal provided at the various joints.

The radiator sections per se each comprise separate metal sheets 13 and 14, 13 denoting the outer metal sheet, and 14 the inner. The inner metal sheet 14 is preferably wider than the outer metal sheet 14 to the end that a water-tight seal along the edges of the several sections may be obtained by folding the extended portion, designated as 15, over and upon the top face of the outer sheet or plate 13 as indicated in Figure 7. Thus folded, the contacting portions of the folded parts are soldered together.

The metal sheets or plates 13 and 14 are both corrugated, the corrugations formed in the outer metal plate being the deeper. Such deeper corrugations are designated as 16, whereas the shallow corrugations formed in the plate 14 are designated as 17. The two plates, in the construction of the radiator sections, are laid one upon the other, and in the finished product, may be described as juxtaposed. Preferably the corrugations 16 and 17 both extend outwardly or away from the face of the wing or aerofoil over which the radiator is laid, the relative arrangement of the corrugations being such that the shallow corrugations 17 enter the deeper corrugations 16 to thereby define the necessary number of water passages or cells. When thus positioned, the juxtaposed sheets or plates are fastened together by effecting a solder-joint along the several parallel points of contact therebetween. In this way the

necessary number of water passages or cells are readily and quickly obtained.

The purpose of corrugating the inner metal plate or sheet 14 is to allow for expansion and contraction due to temperature changes, it having been found in practice that the use of a flat plate causes the solder-joint to pull apart or break when expansion or contraction occurs.

While the inner plate of each radiator section is wider than the outer plate, the outer plate in each instance is the longer (see Figures 2 and 3). This difference in length admits of the ready formation of headers 18 and 19 through the use of channeled strips 20 and 21. The channeled strips 20 serve to join together the inner plates at both the leading and trailing edge of the wing, whereas the channeled strips 21 serve to join the outer plates 13. The shape accorded the channeled strips is of course determined by the specific profile or contour desired in the wing. Thus organized, the headers 18 and 19 may be made to serve the total number of radiator sections and may be built up from the channeled strips 20 and 21 by solder-joints at the points where the metal plates and channeled strips engage.

The radiator, it will be noted, instead of providing an outer covering for the wing framework, is directly mounted upon the outer covering of the wing. In other words, the wing itself is made as a complete unit and the radiator mounted thereon as an outer skin or covering entirely independent of the wing covering, which is provided for strength. Thus organized, exceedingly light material may be used in the radiator construction, since the radiator per se does not, nor is it designed to carry even a fractional part of the stresses set up in the wing structure in the operation of the machine. It will be further noted, that the spacing of the metallic connections between the juxtaposed plates is such that a separate connection is provided for each corrugation in the outer corrugated plate, and since the connections in each instance are metallic, preferably solder-connections, a very efficient means for readily dissipating heat, is produced.

The means for fastening the folded edges of the radiator sections to the outer covering of the wing, and the means for fastening the folded portions of the radiator plates together to provide the necessary water-tight seal preferably consists of metallic eyelets spaced along the lapped portions of the radiator sections, separate eyelets being provided for the several radiator sections. These eyelets, designated as 12, not only provide a metallic connection between the juxtaposed plates, but in addition effectually seal the openings formed therein through which the fastening bolts 23, provided for holding the radiator sections upon the wing, are adapted to extend. The fastening bolts 23 enter the eyes of the eyelets and extend entirely through the wing.

A radiator characterized as above disclosed may be produced with a minimum of labor and at comparatively low cost, since the radiator complete comprises only the enumerated parts; i. e., the channeled strips used in the formation of the headers and the corrugated plates used in the formation of the cooling surface or cooling area. If desired, and where the skin or surface type radiator is placed against both the top and bottom surface of the wing, thru-bolts 23 may be employed as a means for fastening the opposed sections upon the wing.

This application being the companion of an application filed concurrently herewith in my name with that of Harvey C. Mummert as joint inventors of the process or method of constructing radiators as herein set forth, such method or process will not be herein described. Suffice it to say that such radiators offer a minimum of resistance when used on an aeroplane and have proven, by actual test, to solve that problem in aeroplane design which has given engineers in the past the greatest of concern.

While I have described my invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. I aim in the appended claims to cover all such modifications and changes.

What I claim is:—

1. The combination with a structural element of an aeroplane, of a radiator fastened to said element and of a construction such that an outer skin-like covering therefor is provided, said radiator comprising a plurality of separately formed radiator sections placed edge to edge and fastened one to the other whereby one or more of said sections may be independently removed and replaced at will, each radiator section comprising juxtaposed corrugated metal plates in direct engagement one with the other along spaced lines of contact determined by the size of the corrugations of one of said plates, fastening means for uniting the two corrugated plates along said spaced lines of contact whereby each radiator section is sub-divided into a plurality of separated water passages or cells, and headers common to a plural number of said radiator sections, said headers being likewise separately formed and substantially wedge-shaped in cross section and having their direction of greatest length at an angle to the direction of greatest length of said sections.

2. A radiator for aeroplanes comprising a plurality of radiator sections arranged respectively upon opposite faces of an element

of said aeroplane to provide therefor an outer covering, the radiator sections in each instance being placed edge to edge and substantially parallel, and headers substantially wedge-shaped in cross section carried jointly by said radiator sections.

3. A radiator for aeroplanes of aerofoil section comprising a plurality of separately formed radiator sections fastened together edge to edge and providing in the aggregate an outer skin-like covering for that part or portion of the aeroplane over and upon which the radiator sections are laid, separately formed headers, substantially wedge-shaped in cross section, so disposed with respect to said radiator sections as to unite said sections respectively adjacent to the leading and to the trailing edge of said aerofoil, said headers and said radiator sections being separately removable at will, and a means for subdividing the radiator sections, longitudinally of their length, into a plurality of water passages or cells, through which a liquid cooling agent is adapted to pass from one to the other of said headers.

4. A surface type radiator for aeroplanes comprising juxtaposed plates, one of which is corrugated to provide a plurality of water passages or cells, said plates being folded one upon the other along the edges thereof to provide a water-tight seal, devices engaging the folded portions of said plates for fastening said plates together, and means engaging in apertures formed in said fastening devices for holding the radiator in place.

5. A surface type radiator for aeroplanes comprising two metallic plates, one of which is corrugated to provide a plurality of water passages or cells, and fastening devices for sealing the edges of the juxtaposed plates together, said fastening devices being in the form of eyelets having bolts passing through the eyes of said eyelets.

In testimony whereof I hereunto affix my signature.

WILLIAM WAIT, JR.