Feb. 26, 1946. J. HOJNOWSKI 2,395,548

HEATING MEANS FOR THE OUTER SURFACES OF AIRPLANES

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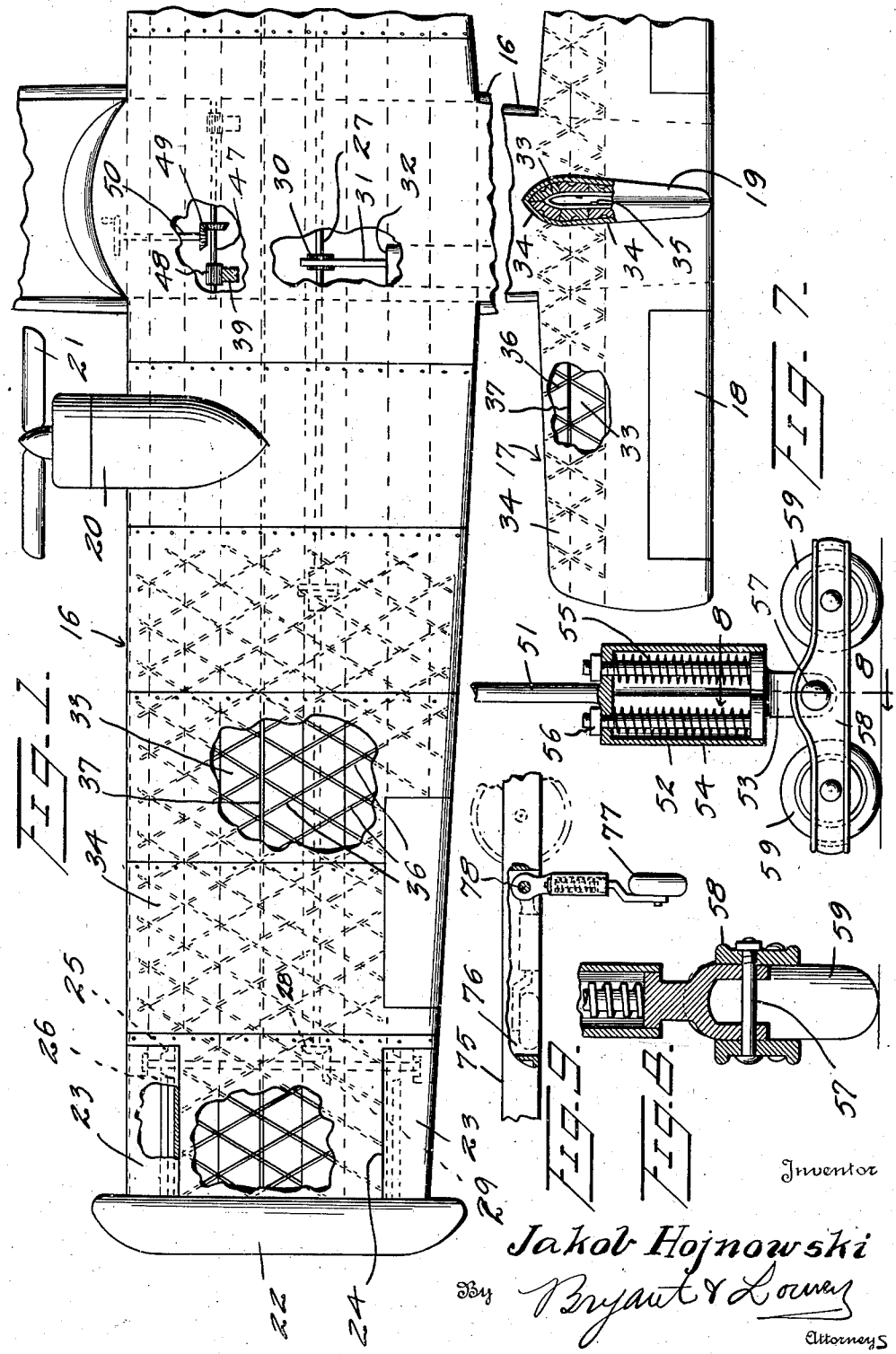


FIG. 1.

FIG. 7.

FIG. 8.

FIG. 9.

Inventor

Jakob Hojnowski

By Bryant & Lowrey

Attorneys

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Fig. 3.

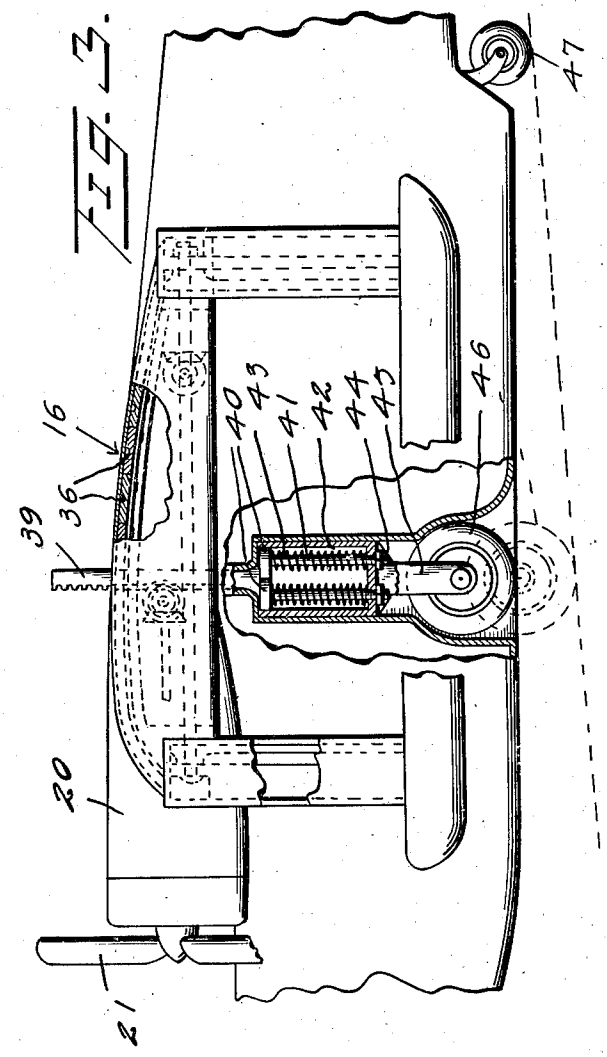
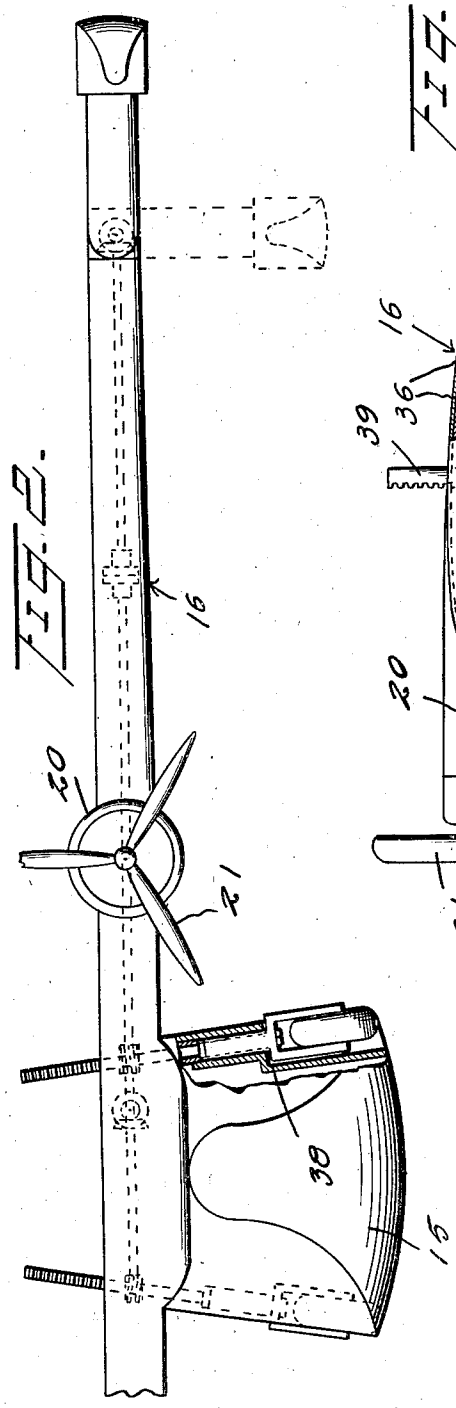


Fig. 2.



Inventor
Jokob Hojnowski
By Bryant & Lowry
Attorneys

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Fig. 4.

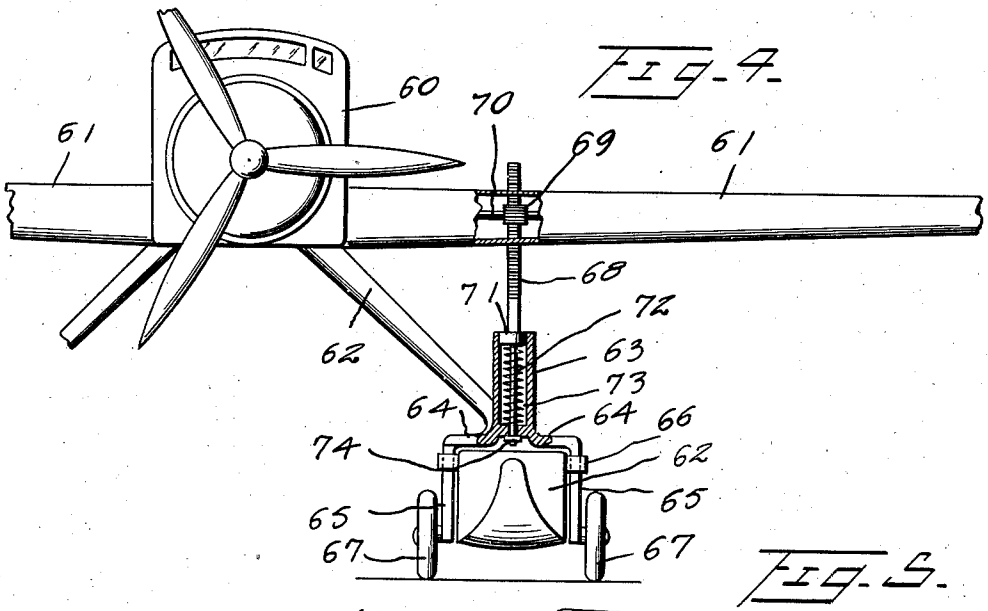


Fig. 5.

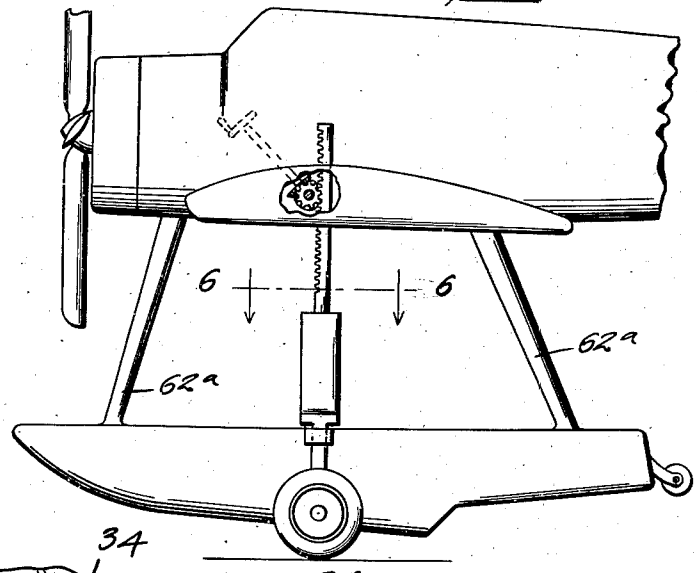


Fig. 6.

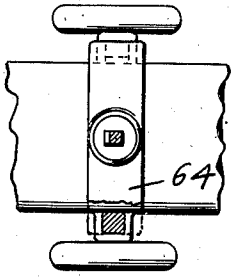
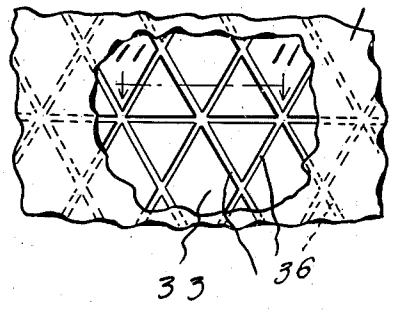


Fig. 10.



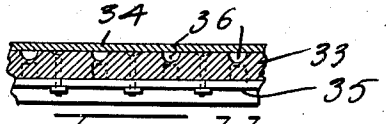


Fig. 11.

Inventor

Jakob Hojnowski

By Bryant & Lowry

Attorneys

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2,395,548

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HEATING MEANS FOR THE OUTER SURFACES OF AIRPLANES

Jakob Hojnowski, Nekoosa, Wis.

Application October 15, 1943, Serial No. 506,392

3 Claims. (Cl. 244—134)

This invention relates to certain new and useful improvements in heating means for the outer surfaces of airplanes.

An object of the present invention is to provide a seaplane wherein the pontoon elements of the plane are associated with the outer end tips of the wings to normally lie in the plane of the wing without disturbing the streamline contour thereof and being capable of manual operation for downward swinging movements to occupy positions below the plane of the wings for the support of the seaplane when alighting on water.

A further and important object of the invention is to provide heating means for the wings and empennage of a plane, preferably a plane of the hydro-type, the wings and empennage of such planes usually embodying an internal structure of brace bars and struts covered by a skin of fabric or metal, with the heating means adapted for delivering heated air or products of combustion in contact with the inner surfaces of said skins for the heating of the latter and prevention of the formation of weighty ice thereon.

A still further object of the invention is to provide a seaplane of the foregoing character equipped with retractible landing gear that may be associated with the fuselage, wings or pontoons of the plane.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the drawings:

Figure 1 is a fragmentary top plan view of a seaplane constructed in accordance with the present invention, parts thereof being broken away and shown in section to illustrate the heating means for the wings and empennage, the pontoons for the plane being associated with the outer ends of the wings,

Figure 2 is a fragmentary front elevational view showing one of the wing end pontoons by dotted lines lowered to its alighting position,

Figure 3 is a fragmentary side elevational view, partly broken away and in section, showing the wing end pontoon lowered to alighting position and the normally retracted landing gear wheels projected as indicated by dotted lines,

Figure 4 is a fragmentary front elevational view of another type of seaplane with landing gear wheels associated with a pontoon,

Figure 5 is a fragmentary side elevational view of the form of seaplane shown in Figure 4,

Figure 6 is a detail sectional view taken on line 6—6 of Figure 5,

Figure 7 is a detail sectional view of a modified construction of landing gear, showing an intermediately pivoted frame for a pair of landing gear wheels,

Figure 8 is a detail sectional view taken on line 8—8 of Figure 7,

Figure 9 is a fragmentary elevational view showing a retractible landing gear associated with a wing,

Figure 10 is a fragmentary top plan view of one of the wings shown in Figure 1 and partly broken away to show the hot air passages underlying the covering or skin of the wings, and

Figure 11 is a detail sectional view taken on line 11—11 of Figure 10.

As illustrated in Figures 1, 2 and 3, the seaplane comprises a fuselage 15, lateral wings designated in general by the reference character 16, an empennage 17 equipped with the usual elevators 18, and a perpendicular rudder 19. Each wing carries a motor 20 equipped with a propeller 21.

As illustrated in Figures 1, 2 and 3, a pontoon is pivotally associated with the outer tip end of each side wing 16 and normally occupies a position in the plane of the wing and in the streamline contour thereof. Each pontoon comprises a float chamber or element 22 carrying adjacent each end thereof a laterally directed arm 23 set into mitered portions 24 formed in the leading and trailing edges of the wing to normally form parts of the wing contour, the ends of the arms 23 spaced from the float element 22 being attached as at 25 to a cross shaft 26 journaled intermediate the ends thereof in suitable bearings within the outer end of the wing 16.

Any appropriate means may be provided for the operation of the pontoons for shifting them from the streamlined positions shown in Figures 1 and 2 to the dotted line position shown in Figure 2 and full line position shown in Figure 3, and one form of such means comprises a shaft 27 extending transversely of the fuselage 15 and longitudinally of the wings 16 to carry at each outer end thereof a bevel gear 28 meshing with a beveled gear 29 on the pivot shaft 26 of the pontoon. The rotation of the shaft is effected by the provision of a gear 30 fixed thereon within the fuselage 15 and rotated by a rack bar 31 extending from the element 32 that may comprise an air motor or other operating mechanism. It will be understood that upon rotation of the shaft 27 by the rack bar drive and gear connections

31 and 30, the pivot shafts 26 of the end pontoons will be rotated for lowering the pontoon floats 22 to the positions shown in Figures 2 and 3.

An important feature of the invention resides in the provision of means for heating the wings 16, empennage 17, and rudder 19 to prevent the formation of ice thereon and the general structure of the wings, empennage and rudder is similar to the extent of comprising top walls for the wing and empennage and side walls for the rudder, preferably formed of wooden slats or bars 33 upon which are mounted outer coverings of sheet-like material 34 that may be of metallic, fabric, plastic or other appropriate material. The wooden slats or bars 33 are retained in edge-abutting wall-like formations by strap irons 35 or the like and, as shown more clearly in Figures 1, 3, 10 and 11, the outer faces of the wooden slats or bars 33 are provided with crossed grooves 36 opening upon the covering material 34. As shown more clearly in Figures 1 and 10, the edge-abutting boards or slats 33 are laid in sections to provide an intervening longitudinally extending channel or groove 37 between the sections that extend longitudinally of the wings 16 and empennage 17 and through which channels heated air from a suitable source within the fuselage or exhaust gases are moved to flow from said channels 37 through the crossed grooves 36 and in contact with the coverings 34 to heat the latter and prevent the formation of ice thereon.

The landing gear for the form of invention illustrated in Figures 1, 2 and 3 comprises the formation of housings or chambers 38 in opposite sides of the fuselage 15 for the normal housing of extensible landing gear as illustrated in Figures 2 and 3. The landing gear at each side of the fuselage comprises a rack bar 39 perpendicularly extending through the fuselage and carrying at its lower end a cross head 40 having a pair of rods 41 depending therefrom and extending at their lower ends through the bottom of a cup-shaped member 42 located within housing 38, each of the rods 41 being surrounded by a coil spring 43 between the cross head 40 and bottom wall of the cup-shaped member 42 with the lower extended ends of the rods 41 threaded for the reception of nuts 44 to vary the tension on the springs 43. The cup-shaped member 42 carries a depending fork 45 in which is journaled a single landing wheel 46, the fuselage, of course, carrying the usual tail landing gear wheel 47. To effect raising and lowering movements of the landing gear from the full line retracted and housed positions shown in Figures 2 and 3, there is provided, as illustrated in Figures 1 and 3, a shaft 47 journaled transversely of the fuselage and carrying a pair of gear wheels 48 that mesh with the rack bars 39, the shaft 47 being rotated by the meshing gears 49 interposed between the shaft 47 and the hand-operated shaft 50.

In lieu of the single wheel landing gear shown in Figures 1 to 3, the landing gear arrangement illustrated in Figure 7 may be employed and in this form of invention the landing gear comprises a shaft 51 carrying a rack portion at its upper end (not illustrated) and having at its lower end an inverted cup-shaped member 52. A block 53 is slidable in the cup-shaped member 52, being normally positioned at the lower end thereof and carrying a pair of upstanding rods 54 surrounded by coil springs 55 and having their upper threaded ends extending through the top wall of the member 52 for the reception of spring tension-varying nuts 56. The block 53 is pivotally mounted as at 57 intermediate the ends of a saddle 58 that carries at opposite ends thereof ground wheels 59, it being understood that the pivotal mounting of the saddle 58 for the spaced ground wheels 59 provides spaced ground-engaging points for each landing gear element.

In the form of invention illustrated in Figures 4, 5 and 6, the seaplane comprises a fuselage 60 having side wings with a pontoon 62 supported beneath each wing 61 by means of struts 62a or the like. The landing gear for this type of seaplane is associated with each pontoon and comprises a tubular member 63 carrying a cross arm 64 at its lower end above the pontoon 62 with a leg 65 depending from each outer end of the cross arm and extending through an adjacent guide 66 on the pontoon, the lower end of each leg 65 carrying a ground wheel 67. A rack bar 68 extending through each wing 61 and engaged with a pinion 69 on the shaft 70 for the operation thereof, carries at its lower end a disk 71 normally disposed within the upper end of the tubular member 63 and carrying beneath said disk 71 a rod 72 surrounded by a coil spring 73 with the lower end of the rod 72 threaded and extending through an opening in the bottom wall of the tubular member for the reception of a nut 74.

The landing gear illustrated in Figure 9 is associated with the wing 75 of the plane and said wing is provided with a bottom opening chamber 76 for the reception of the landing gear leg and wheel combination 77 that is pivotally supported at one end as at 78 within the chamber 76, any preferred form of operating means being provided for moving the landing gear elements 77 from the full line position to the housed dotted line position illustrated.

From the above detailed description of the invention, it is believed that the construction and operation thereof will at once be apparent and while there are herein shown and described the preferred embodiment of the invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

I claim:

1. In a seaplane of the character described, a fuselage carrying side wings and an empennage, and landing gear, the upper walls of the wings and tail of the empennage and outer wall of the rudder being formed of wooden bars, a skin covering overlying and contacting the bars, the faces of the wooden bars adjacent the skin covering being grooved and means for forcing heated fluid through said grooves in contact with the skin covering to prevent the formation of ice on the latter, said bars being arranged in groups with the bars of each group edge abutting and a restricted channel between the groups through which the heated fluid is passed for delivery to said grooves.

2. In a seaplane of the character described, a fuselage carrying side wings and an empennage, and landing gear, the upper walls of the wings and tail of the empennage and outer wall of the rudder being formed of wooden bars, a skin covering overlying and contacting the bars, the faces of the wooden bars adjacent the skin covering being grooved and means for forcing heated fluid through said grooves in contact with the skin covering to prevent the formation of ice on the latter and said grooves being arranged in criss-cross relation.

3. In a seaplane of the character described, a fuselage carrying side wings and an empennage, and landing gear, the upper walls of the wings and tail of the empennage and outer wall of the rudder being formed of wooden bars, a skin covering overlying and contacting the bars, the faces of the wooden bars adjacent the skin covering being grooved and means for forcing heated fluid through said grooves in contact with the skin covering to prevent the formation of ice on the latter, said bars being arranged in groups with the bars of each group edge-abutting and a restricted channel between the groups through which the heated fluid is passed for delivery to said grooves, and said grooves being arranged in criss-cross relation.

JAKOB HOJNOWSKI.