Jan. 10, 1933. W. F. KAMMER 1,893,647

AIRPLANE LANDING SKI

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Fig. 1.

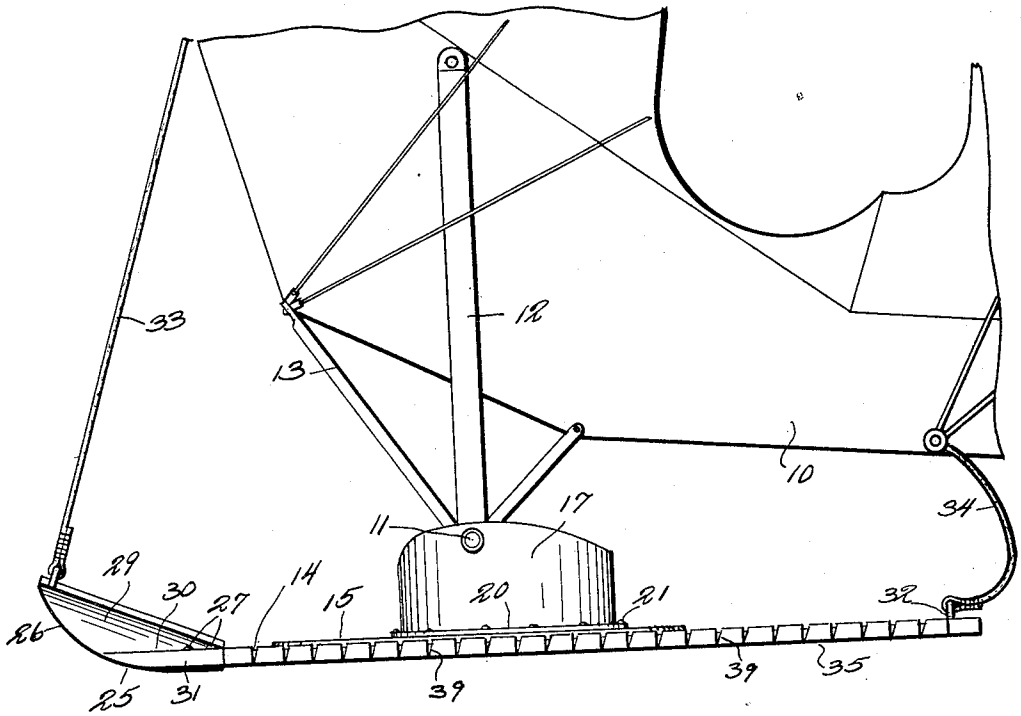
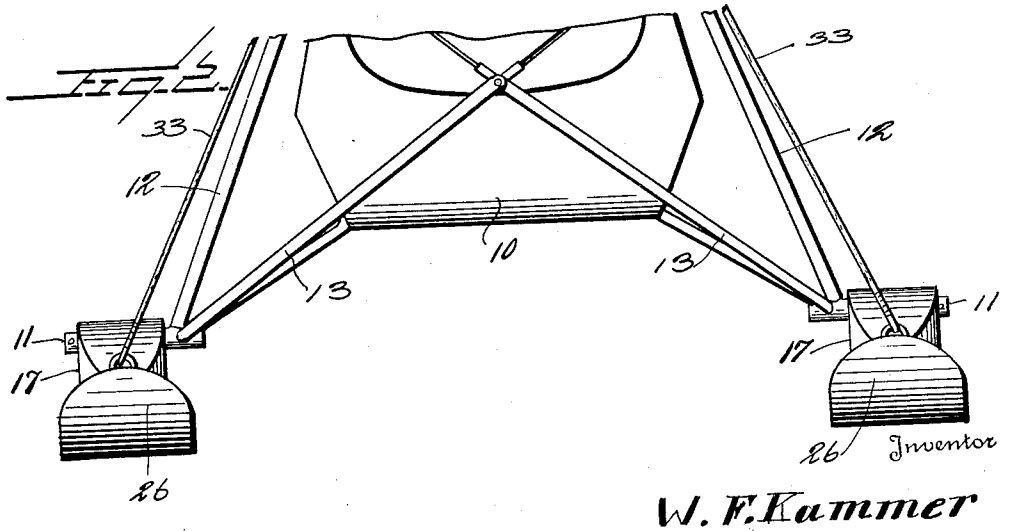


Fig. 2.



Inventor

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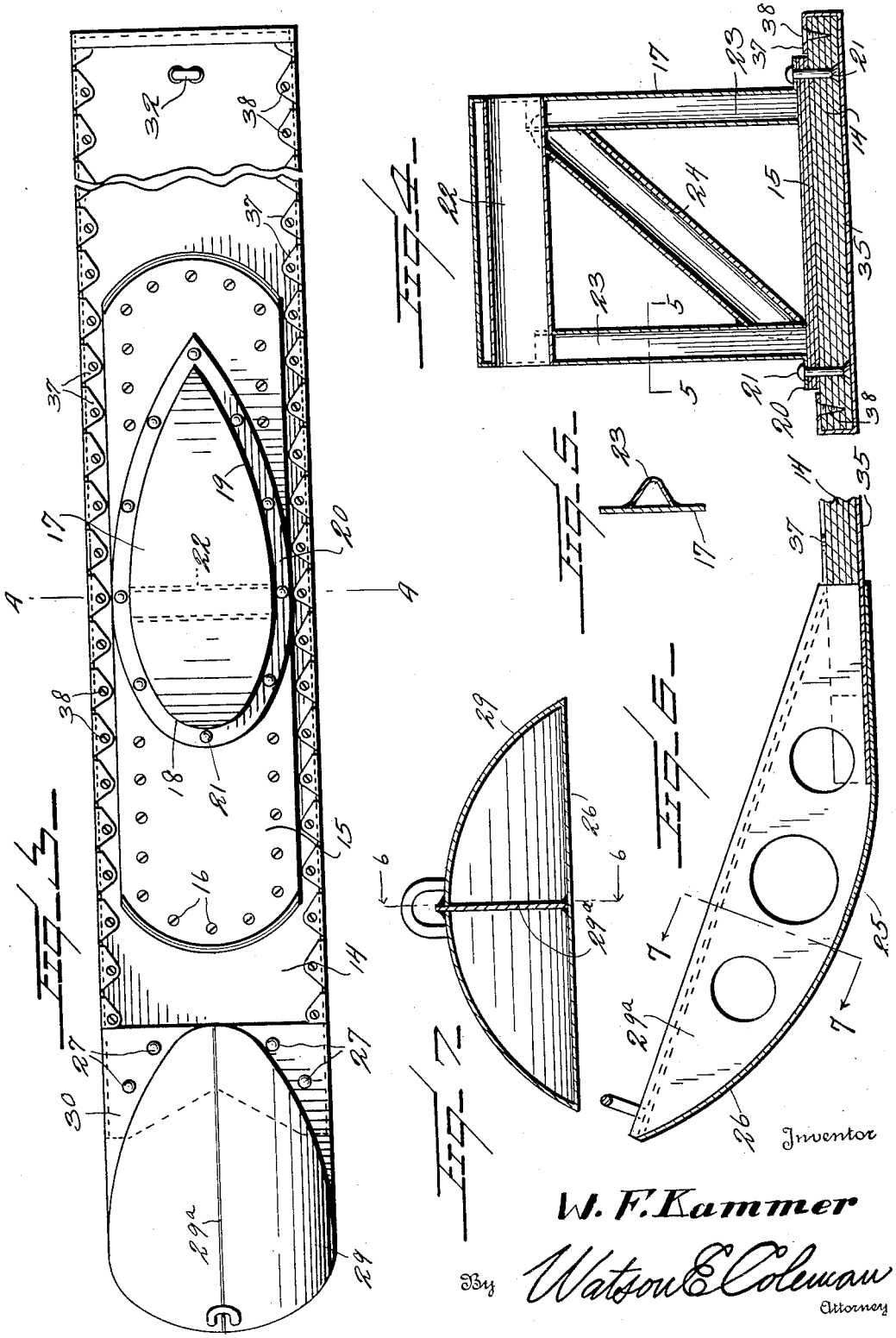
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AIRPLANE LANDING SKI

Filed March 10, 1932 2 Sheets-Sheet 2



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1,893,647

UNITED STATES PATENT OFFICE

WILLIAM F. KAMMER, OF WENATCHEE, WASHINGTON

AIRPLANE LANDING SKI

Application filed March 10, 1932. Serial No. 598,066.

This invention relates to airplane landing gear and particularly to skis used in place of landing wheels for the purpose of allowing the airplane to land on snow or ice.

One of the objects of the present invention is to so design the ski that there will be very little drag created by the support for the ski axle, that this support will have a stream line shape and to so form the top of the axle support that it has a curve approximately the same as the curvature of the upper face of a wing, thereby providing a lifting surface of one square foot per ski.

A further object is to provide a ski in which there is absolutely no drag or resistance behind the axle when traveling in deep snow as there is no accumulation of snow at this point.

A further object is to so form the tip of the ski that it is closed, thus again preventing the accumulation of snow and ice behind the rounded forward end of the tip, the tip being so formed that the snow slides off, thus lessening the load when the ship leaves the ground.

A further object is to so construct the tip as to provide a very rigid structure of great strength for the weight of material required and to provide a metal shoe fitting against the under side of the wooden runner of the ski so attached to the bottom of the ski that the metal shoe will give with the flexible runner instead of cracking at the bending point.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a side elevation of the forward portion of an airplane showing my improved ski in elevation;

Figure 2 is a front elevation of the airplane with the skis therefor;

Figure 3 is a top plan view of one of the skis;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a section on the line 5—5 of Figure 4;

Figure 6 is a longitudinal section of the forward end of the ski taken on the line 6—6 of Figure 7;

Figure 7 is a section taken on the line 7—7 of Figure 6.

Referring to these drawings, 10 designates the body of the airplane which may be of any suitable character, as for instance a tractor biplane or monoplane and 11 designates the axle upon which the landing gear, in this case skis, are mounted. This axle is supported by means of the main brace 12 and the triangularly arranged braces 13. The particular arrangement of braces, however, forms no part of my invention.

The landing ski proper, of which, of course, there are two, one on each side of the body of the plane, comprises the runner 14 which is made preferably of fir and preferably of plywood, though I do not wish to be limited to this.

Attached upon the upper face of the runner 14 is a sheet or layer of plywood designated 15 which is attached thereto by means of brass screws 16, the forward edge of this layer 15 being preferably rounded and beveled as shown most clearly in Figure 3.

Mounted upon this layer 15 and intermediate the full length of the runner adjacent the middle thereof is an axle housing or support designated generally 17. This is made of sheet steel and as illustrated in Figure 3, it is stream line in plan, that is, it has a relatively bluntly rounded front wall 18 which extends rearward and inward in a relatively flat curve as at 19. This wall having the portions 18 and 19 is provided with a flange 20 whereby the housing may be attached to the runner by screws 21. Looking at this housing or axle support from the side, it will be seen that the front wall extends upward for approximately 4½ inches and then extends upward and rearward to a point immediately above the axle and then downward and rearward to the extreme rear of the housing. Thus the aspect of the upper portion of the housing 17 viewed from the side is that of a forward and rear section of an airplane wing. The purpose of giving this curvature to the upper wall of the housing or support is to cause the air striking the front of the hous-

ing to discharge upward and rearward, thus creating an area of low pressure immediately above the top of the housing to thus create a lifting force on the housing. In actual practice, this housing or support 17 will have a total length of approximately sixteen inches.

The axle 11 extends through this housing and specifically through a steel tube 22 having its ends welded or otherwise engaged with the outer walls of the housing or support. This steel tube is disposed slightly below the upper wall of the housing and is braced by the two vertical V-shaped members 23 extending upward from the bottom of the housing and welded to the side walls, as shown most clearly in Figure 4. These vertical members 23 are further braced by a diagonally arranged steel tube 24 welded at its opposite ends to the members 23 and to the tube 22 as shown in Figure 5.

Each runner 14 at its forward end is upwardly rounded at 25 and attached to the forward end of the runner is a steel tip designated generally 26. This tip extends beneath the runner for a portion of its length and is riveted thereto as at 27. It then extends forward and upward in a curve to a point approximately six inches above the under face of the runner and to any desired distance in front of the runner and then extends rearward and downward at 28. The metal tip or nose is laterally curved from the ridge 28 downward and laterally toward the lateral margins of the runner at 29. A longitudinally extending web 29*a* extends from end to end of the tip and is welded to the metal thereof. This tip at its forward end has a width equal to that of the runner but the transversely curved portion of the tip becomes narrower and narrower toward the rear so as to provide flanges on each side of the rear end of the tip, the flanges being designated 30, these flanges being engaged by the rivets 27. The lateral margins of these flanges 30 are downwardly turned as at 31 over the side edges of the runner. This construction prevents the tip from collecting snow or ice back of its forward upwardly turned end, any ice or snow which may be discharged upon this tip or nose moving rearward and laterally outward and thus being discharged from the ski. The tip is hollow and, therefore, has relatively little weight but the construction makes it particularly strong. An eye 31 is attached to the forward end of each tip and a similar eye 32 is attached to the rear end of each ski. Cables 33 and 34 extend upward from these eyes to suitable portions of the body of the ship, one of these cables being always slack. When the ship comes to rest on the snow, landing skis take a horizontal position and the forward cables 33 are then taut while the rear cables are slack. In landing, however, the skis may take an upwardly and forwardly inclined position, in which case, the rear cables are taut and the front cables slack. This construction provides for a relatively slight movement of the landing skis to conform to the surface of the snow when a landing is being made.

The under face of the runner 14 is sheathed with a sheet of metal designated 35. This sheathing of metal preferably extends the full length of the ski, but I do not wish to be limited to this. The lateral margins of the sheet of metal are brought up around the margins of the runner 14 and then angularly bent over upon the face of the ski. Preferably these overturned portions of the runner will be slitted at 36 to define a plurality of adjacent lugs or ears 37, these having an approximately triangular form. Through these ears, the screws 38 pass. Each of these ears upon one edge is beveled as at 39.

After the sheathing has been put in place, the tip 26 is slipped on to or over the end of the ski and has a driving fit thereon. It extends over the end of the ski about four inches and is secured there by four rivets as previously described. By reason of the fact that the tip extends beyond the end of the sheathing, there will be no danger of snow getting under the metal sheathing and causing the sheathing to become loose and tear off.

It will be noted that the slits 36 extend to the bottom of the runner and as shown in Figure 1 are beveled off on one side of the slit, this bevel extending to the bottom edge of the ski runner. This bevel edge thus defines one side of the slit only, the other side of the slit being defined by an edge which extends at right angles to the face of the runner.

This construction of the metal shoe causes it to give to the flexible runner instead of the metal cracking at the bending point. The metal bend also protects the edge of the runner when the snow is crusted, thus preventing the crust from wearing away the edges of the runners.

Figure 4 shows the tube 24 extending downward from the outside of the ski toward the inside thereof so that this member 24 takes a tensile load or stress instead of being under compression when the runner strikes the snow in landing or in leaving the snow. In other words, the ski should be so installed that the member 24 will extend from the outside at the top to the inside at the bottom.

It will be seen that the construction which I have illustrated provides a tip and axles supporting fitting which are adapted to increase the efficiency of the plane not only in the air but on the ground and that there is very little drag created by the axle fitting or support as it is stream line in shape and has, as a matter of fact, the shape of the

stream line tube used in airplane construction. The top of this axle fitting has the same curvature as the curvature of the upper side of a wing and thus provides a lifting surface over one square foot for each ski. The tip is a closed tip which prevents the accumulation of snow and ice behind the rounded part of the tip. The transversely curved part of the tip with the downwardly and laterally inclined webs represents a rigid structure of very great strength for the weight of material required. There is no drag or resistance of the ski on the axle even when traveling in deep snow as there is no accumulation of snow at this point. The tip being rounded on top and the axle housing extending rearward and inward and being rounded on top, the snow slides off, thus lessening the load or entirely reducing it when the ship leaves the ground or at any stage of its flight. These skis have been used in actual practice and I have demonstrated the facts above stated.

I claim:—

1. An airplane ski having an axle mounting formed of sheet metal, the mounting having side walls and a top wall, the mounting being stream line in plan and having its upper wall extending upward and rearward and then downward and rearward, an axle tube extending through the side walls adjacent the upper wall of the mounting, hollow braces attached to the side walls and extending upward to and engaged with said tube, and an intermediate tubular brace extending diagonally upward from the lowest part of the first named braces to the upper part of the other braces.

2. An airplane ski having a wooden runner and a hollow metallic tip, the bottom wall of the tip extending upward and forward from the bottom of the runner, the top of the tip being approximately V-shaped in cross section, the ridge of the upper wall of the tip extending downward and rearward, the upper wall of the tip being transversely flanged to fit over the upper surface of the runner, the tip being riveted to the runner.

3. An airplane ski having a wooden runner, a hollow sheet metal axle mount mounted upon the upper surface of the runner, midway of its ends, the mount being stream line in plan and having its upper wall extended upward and rearward in a curve and then downward and rearward in a curve, the forward end of the runner having a hollow metallic tip attached thereto, the bottom wall of the tip extending upward and forward, and the upper wall of the tip being formed to deflect snow laterally off the runner.

4. An airplane ski consisting of a wooden runner formed of plywood, a plywood strip attached to the upper face of the runner, a hollow sheet metal axle mounting flanged at its lower edge for attachment to the runner, the axle mounting being stream line in plan and the upper wall of the mounting being upwardly and rearwardly curved and then downwardly and rearwardly curved, and a hollow sheet metal tip attached to the forward end of the runner, the lower wall of the tip being upwardly and forwardly curved and the upper wall of the tip being laterally bent to provide downwardly and rearwardly extending ridge, the upper wall being flanged at its lower edge to fit over the runner and be attached thereto, and a medially disposed longitudinally extending web in alinement with said ridge.

5. An airplane ski having a wooden runner, an axle mount on the runner and an upwardly extending tip on the runner, the under face of the runner being provided with a metallic shoe extending the length of the runner, the lateral margins of the shoe being bent upward along the thickness of the runner and then being bent over on top of the runner, the portion extending over on top of the runner being formed to provide a plurality of approximately triangular lugs separated from each other by slits, the slits extending to the lower edge of the ski runner.

6. In an airplane, a landing ski having a metallic sheathing extending the entire length of the ski, the lateral margins of the sheathing being bent upward over the thickness of the ski and being bent over on top of the ski and attached to the ski, and a hollow sheet metal tip formed to fit over the forward end of the ski and extending rearward beneath said sheathing and being riveted thereto and to the ski.

7. An airplane ski having a runner, sheathing extending the full length of the runner and extending over on the top face of the runner and being attached thereto, the forward end of the runner being rounded upward and forward, and a sheet metal tip fitting over the forward end of the runner and projecting beyond the same and riveted thereto, the bottom of the tip extending upward and forward, the top of the tip being downwardly and rearwardly inclined, the tip being riveted to the runner and sheathing.

8. An airplane ski having a runner and an axle mounted on the runner, the forward end of the runner constituting a tip extending upward in a curve and then extending downward and rearward to a point in front of the axle mounting, the downwardly and rearwardly extending portion of the tip being transversely rounded and extending downward to the face of the runner whereby a closed tip is provided.

9. An airplane ski having a runner horizontally straight throughout its length, a sheet metal tip into which the forward end of the runner is inserted, the bottom of said tip forward of the forward end of the runner extending upward and forward in a curve,

the upper end of said tip being downwardly and rearwardly inclined and being transversely bowed and being attached to the forward end of the runner.

10. An airplane ski having a runner horizontally straight throughout its length, a sheet metal tip into which the forward end of the runner is inserted, the bottom of said tip extending upward and forward, the tip then extending downwardly and rearwardly and being attached to the forward end of the runner, said downwardly and rearwardly extending portion of the tip being transversely bowed and a longitudinally extending brace being disposed within the tip and engaging the bottom of the tip and the top of the tip and extending longitudinally of the tip.

11. An airplane ski having a runner, an axle mount on the runner, stream line in plan, the upper face of said mount being curved upward to a point above the axle bearing and then downward and rearward, the forward end of the runner having a closed tip extending upward and forward in a curve and then downward and rearward, the upper face of said tip being transversely curved.

In testimony whereof I hereunto affix my signature.

WILLIAM F. KAMMER.