Aug. 28, 1934. J. H. KINDELBERGER 1,971,613

TAIL WHEEL CONSTRUCTION

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Fig. 1.

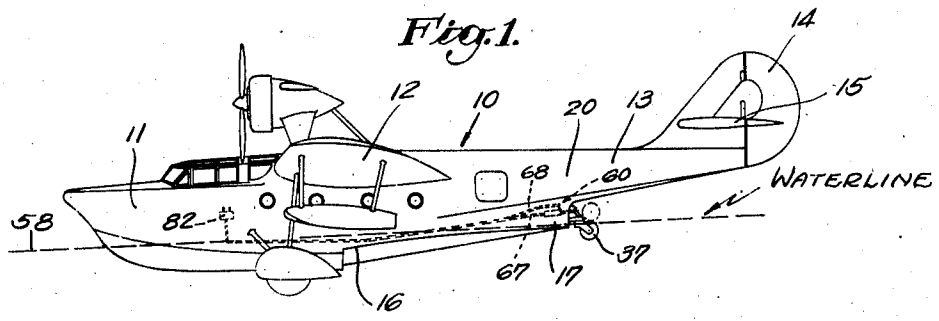


Fig. 4.

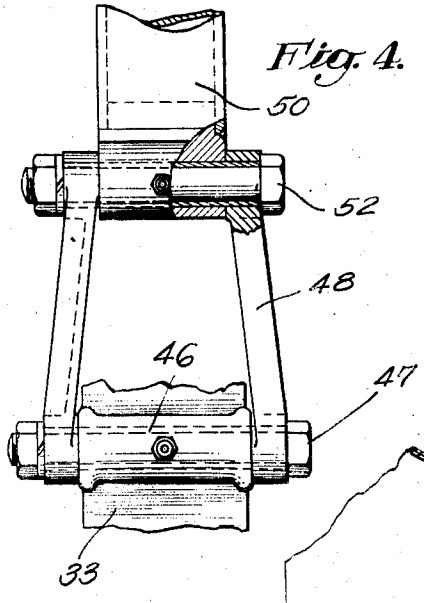
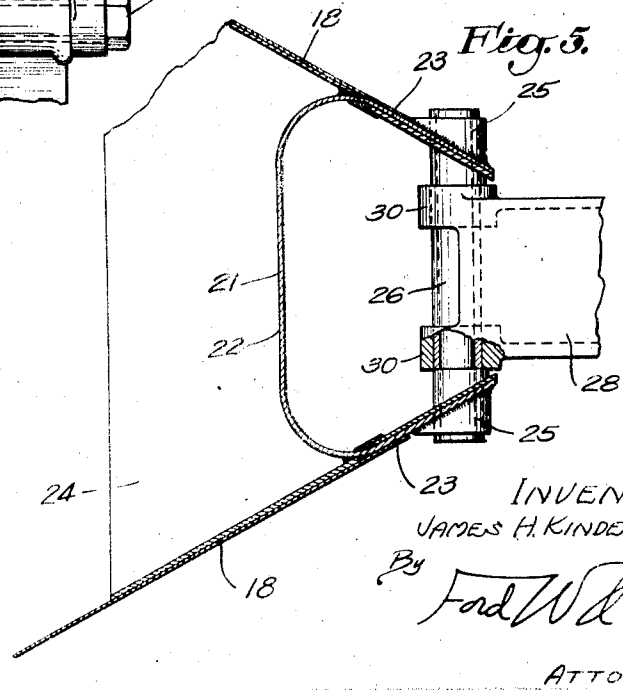


Fig. 5.



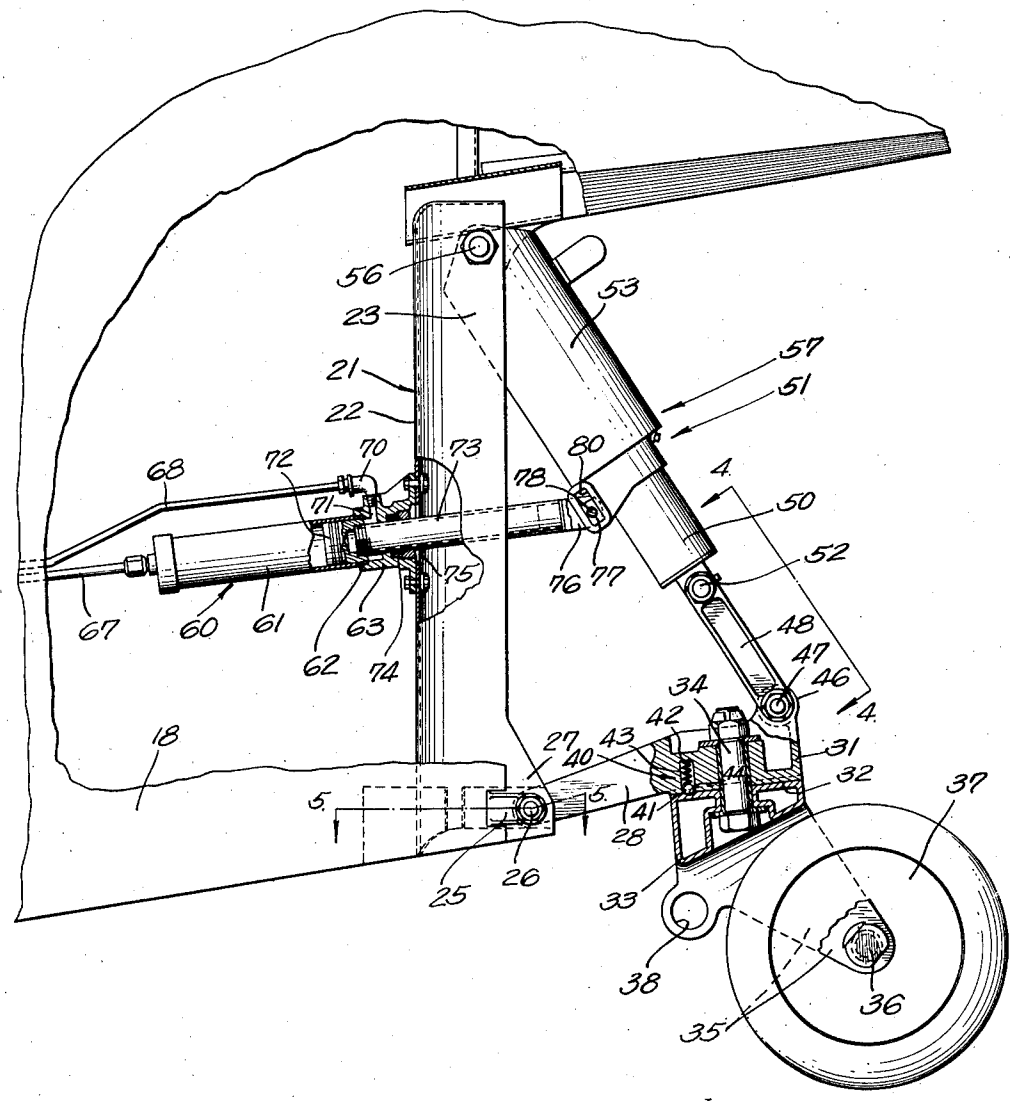
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Aug. 28, 1934. J. H. KINDELBERGER 1,971,613

TAIL WHEEL CONSTRUCTION

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Fig. 2.



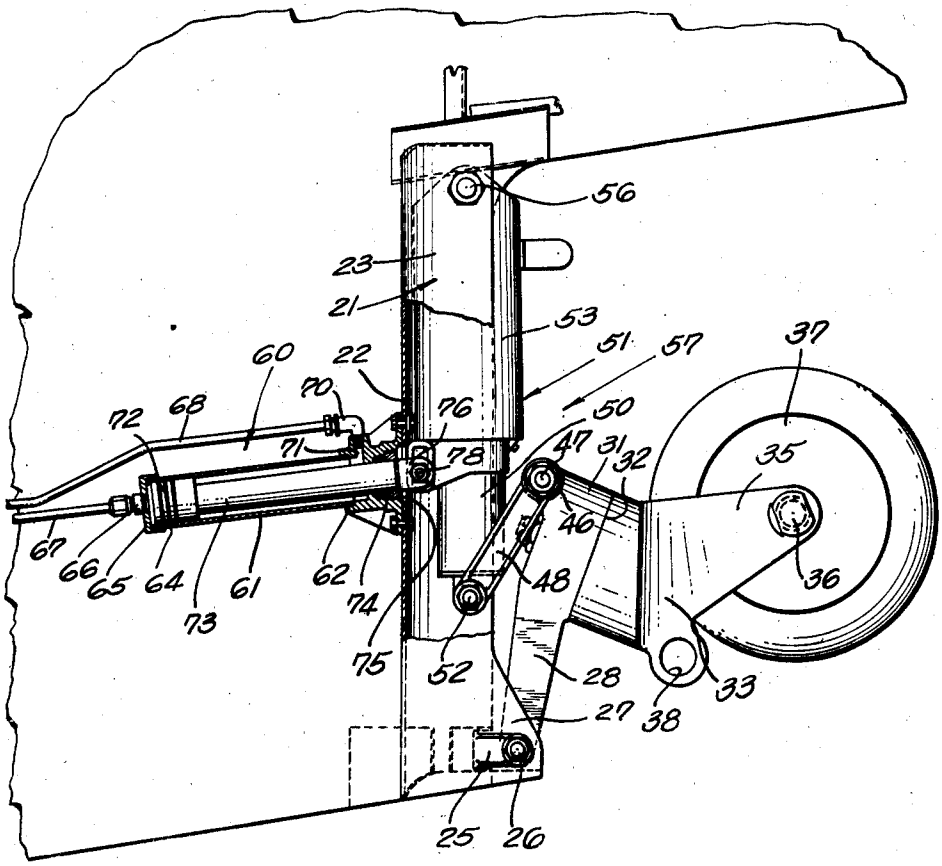
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Fig. 3.



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UNITED STATES PATENT OFFICE

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TAIL WHEEL CONSTRUCTION

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2 Claims. (Cl. 244—2)

My invention relates to a retractile wheel mechanism suitable for use on aerial vehicles such as airplanes, and especially suitable for control of the tail wheel of amphibian airplanes.

In the construction of amphibian airplanes it is customary to employ a gondola capable of floating on the water and to provide such gondola with a pair of wheels near the forward end and a single wheel near the rearward end commonly termed the "tail wheel". On airplanes of this character it is very difficult, if not impossible, to take off from quiet water due to the fact that the tail wheel, projecting downwardly into the water, produces a drag and retards the speed of the airplane along the surface of the water in preparation of a take-off.

It is an object of my invention to provide a retractile wheel mechanism especially suitable for use with the tail wheel of an amphibian airplane, by which such tail wheel may be moved between a retracted position clear of the water line of the gondola and an extended position in which it will engage a solid landing surface such as the surface of a landing field.

It is an object of the invention to provide a simple retractile wheel mechanism of the above character in which the wheel is resiliently supported in extended position so as to cushion the shocks incurred in making a field landing. It is preferable to have the tail wheel supported so that it may swing relative to an upright or substantially vertical axis to permit steering of the airplane over the ground.

A further object of the invention is to provide a retractile wheel mechanism in which the wheel is secured to a swingable member having one of its ends pivotally secured to the body structure of the airplane so as to swing on a relatively horizontal axis, and having its other end engaged by a collapsible oleo strut which may be collapsed or extended to carry the swingable member between retracted and extended positions, and which resiliently supports the swingable member when such swingable member is in extended position.

It is a further object of the invention to provide a device of the foregoing character in which the collapsible strut is collapsed by a folding movement of its respective parts and has means for actuating the strut which may be readily and positively controlled from the cockpit of the gondola, and it is a further object of the invention to provide in a device of this character simple actuating means which may be concealed within the gondola housing at the tapered rearward portion thereof.

Further objects and advantages of the invention will be made evident throughout the following part of the specification.

Referring to the drawings, which are for illustrative purposes only,

Fig. 1 is an elevational view showing an amphibian airplane equipped with a retractile tail wheel mechanism embodying my invention.

Fig. 2 is an enlarged fragmentary elevational view showing the mechanism with the tail wheel thereof in extended position.

Fig. 3 is a view similar to Fig. 2 showing the tail wheel in retracted position.

Fig. 4 is a partly sectioned fragmentary elevation taken as indicated by the line 4—4 of Fig. 2.

Fig. 5 is an enlarged fragmentary cross section taken as indicated by the line 5—5 of Fig. 2.

The amphibian airplane 10 shown in Fig. 1, as an example of the type of aerial vehicle on which the invention may be employed, is provided with a gondola 11 from which wings 12 are extended. This gondola 11 has a rearwardly extending tail portion 13 which supports the rudder 14 and the stabilizer 15. That portion of the gondola 11, which may be called the keel portion 16, that engages the water when a landing on a body of water is made, is shorter than the tail portion 13 of the gondola and has its stern 17 disposed beneath an intermediate portion of the tail portion 13. At the stern 17 the side walls 18, Fig. 5, of the keel portion 16 are converged below the intermediate portion 20 of the tail structure 13 and are preferably joined to an upright structural member or uprightly extending supporting means 21 of channel shape. This structural member 21 has a vertical front wall or web 22 from which side walls 23 are rearwardly bent and curved inwardly to agree with the convergence of the side walls 18. The member 21 is joined to the side walls 18 and to the bottom wall 24 of the keel portion 16 in watertight relation so as to prevent entry of water into the gondola at this point. By the use of fittings 25 a tubular shaft 26 is supported in horizontal, laterally extending position between the lower ends 27 of the side walls 23.

A swingable member 28 is provided with bearing members 30 at its inner end which engage the intermediate portion of the tubular shaft 26 so that such swingable member may rotate in a vertical plane between the extended position in which it is shown in Fig. 2 and the retracted position in which it is shown in Fig. 3. The outer end 31 of the swingable member 28 is provided with a downwardly presented circular face 32 against

which a forked wheel bracket 33 is turnably secured by an upright pivot means consisting of a bolt 34 which extends substantially vertically when the swingable member 28 is in extended position as shown in Fig. 2. The bracket 33 has downwardly and rearwardly extending forks 35 the outer ends of which carry an axle pin 36 for supporting a wheel 37. When the wheel 37 is in engagement with the ground, the bracket 33 may swing laterally on the upright axis refined by the pin 34 to permit steering of the airplane on the ground. The bracket 33 may be provided with one or more loops or eyes 38 through which ropes or cables may be passed for tying or anchorage purposes. Detent means 40 are provided for resiliently holding the bracket 33 in alignment with the longitudinal axis of the gondola 11, this detent means consisting of a ball 41 forced resiliently downwardly in an opening 42 by means of a spring 43 to engage a pocket 44 in the upper face of the bracket 33. At the outer end of the swingable member 28 a laterally extending tubular portion 46 is formed to receive a pivot means which may be in the form of a bolt 47 for securing the lower end of a link means 48 to the outer end of the swingable member 28. The upper end of the link means 48 is pivotally secured to the lower or movable part or slidable element 50 of an oleo strut element or oleo strut means 51 by means such as a bolt 52. The oleo strut element comprises in addition to the movable part 50 an upper part or pivoted element 53 which is preferably of tubular form and has an opening in the lower end thereof through which the movable part 50 slides. The interior structure of the oleo strut is not shown for the reason that the various resilient connections employed in oleo construction are well known to the art, it being understood that the part 50 is resiliently maintained in a position projecting from the upper part 53 so that when excessive loads or shock forces are applied through the wheel 37 to the oleo strut element, due to the engagement of the wheel with the ground, the movable part 50 may yield upwardly, thereby cushioning the shocks which would otherwise be directly transmitted to the body structure of the airplane.

By use of a laterally extended horizontal bolt 56, the upper end of the part 53 is pivotally secured to the upper ends of the side walls 23 of the member 21. The link means 48 and the oleo strut element 51 comprise a collapsible or foldable strut 57 capable of supporting the swingable member 28 in a desired position of retraction or extension. It will be noted that the link means has a length approximately one-third the length of the oleo strut element 51 and that when the oleo strut element 51 is swung from the diagonal position in which it is shown in Fig. 2 to the vertical position in which it is shown in Fig. 3, the link means 48 swings downwardly and forwardly with the result that the swingable element 28 is moved into a raised or retracted position and the wheel 37 is raised above the water line 58 of the gondola 11.

The invention includes actuating or operating means 60 which may be actuated to hold the members 48 and 51 of the strut element 57 in rectilinear arrangement as shown in Fig. 2 and to cause a folding movement of these parts 48 and 51 into the respective positions in which they are shown in Fig. 3. As shown in Figs. 2 and 3, the actuating means 60 includes a cylinder 61, the threaded rightward end 62 of which is secured to a bracket 63 which is mounted on the wall 22 of the channel-shaped supporting member 21. The leftward or outer end 64 of the cylinder 61 is closed by a cap 65 having a connection 66 for a fluid line 67. Another fluid line 68 is connected to the opposite end of the cylinder through a connector 70 communicating with an opening 71 formed in the fitting 63. A piston 72, having a tubular piston rod or operating arm 73 extending therefrom, passes through a packing member 74 in the bracket 63 and through an opening 75 in the wall 22. The outer or rightward end of the piston rod or operating arm 73 is provided with a forked member 76 carrying a slide block 77 on a lateral pin 78. The slide block 77 is slidable in an elongated opening 80 provided at the lower end of the member 53 of the oleo strut element 51. As the operating arm 73 moves from retracted position as shown in Fig. 3 to extended position as shown in Fig. 2, the block 77 slides relatively vertically in the opening 78.

As shown in Fig. 1, the fluid lines 67 and 68 are carried forwardly within the gondola 11 to a valve means 82 connected with a suitable source of fluid, such as oil under pressure, such valve means being adapted to open one of the fluid lines for discharge when fluid under pressure is introduced into the other of the fluid lines. Accordingly, when fluid under pressure is delivered through the pipe 67, the piston 72 will be forced rightwardly from the position in which it is shown in Fig. 3, thereby extending the collapsible strut 57, and when fluid is introduced into the line 68, the piston 72 will be moved from the position in which it is shown in Fig. 2 to its position of Fig. 3, swinging the oleo strut element 51 into substantially vertical position and thereby producing a folding of the strut 57 to raise the wheel 37 into retracted position. Retraction and extension of the wheel 37 is accomplished by movement of the swingable member 28 between the positions in which it is shown in Figs. 2 and 3. In extended position the swingable member 28 is resiliently held and may yield vertically due to shocks applied upwardly to the wheel. The pivot means 26 of the swingable member 28 is disposed forwardly from the wheel 37, the result being that the shocks applied to the wheel due to rolling over a ground surface are transmitted essentially to the oleo strut element 51.

Although I have herein shown and described my invention in simple and practical form, it is recognized that certain parts or elements thereof are representative of other parts, elements, or mechanisms which may be used in substantially the same manner to accomplish substantially the same results; therefore, it is to be understood that the invention is not to be limited to the details disclosed herein but is to be accorded the full scope of the following claims.

I claim as my invention:

1. In an airplane, a retractible tail wheel construction which consists of: a supporting means; a swingable member pivotally connected to said supporting means; a landing wheel connected to said swingable member; an oleo strut means pivotally connected to said supporting means, said oleo strut means including a pivoted element which is pivoted to said supporting means, and a slidable element; link means connecting said swingable member to said slidable element of said oleo strut means; and operating means connected to said pivoted element of said oleo strut means for moving the parts of said tail wheel construction between extended and retracted positions and

for holding said pivoted element of said oleo strut means in a fixed position when the parts of said tail wheel construction are in extended position.

2. In an airplane, a retractible tail wheel construction which consists of: a supporting means; a swingable member pivotally connected to said supporting means; a landing wheel connected to said swingable member; an oleo strut means pivotally connected to said supporting means, said oleo strut means including a pivoted element which is pivoted to said supporting means, and a slidable element; link means connecting said swingable member to said slidable element of said oleo strut means; a rigid operating rod connected to said pivoted element of said oleo strut means for moving the parts of said tail wheel construction between extended and retracted positions and for holding said pivoted element of said oleo strut means in a fixed position when the parts of said tail wheel construction are in extended position; and operating means for sliding said rigid operating rod to cause same to move the parts of said tail wheel construction between extended and retracted positions.

JAMES H. KINDELBERGER.