

March 9, 1937.

H. L. ADAMS

2,073,438

HYDROPLANE VANE

Filed Nov. 22, 1932

2 Sheets-Sheet 1

Fig. 1.

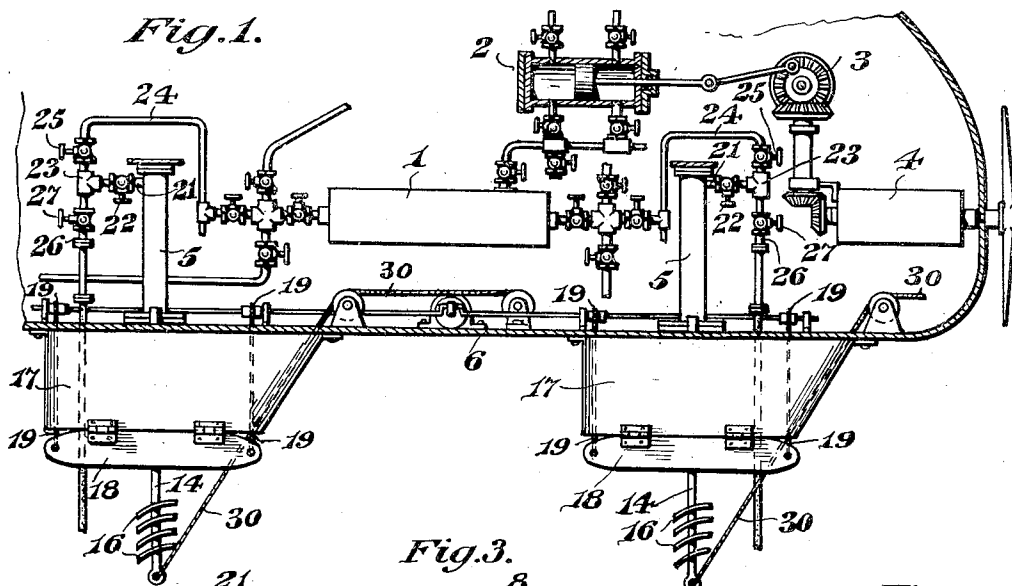


Fig. 3.

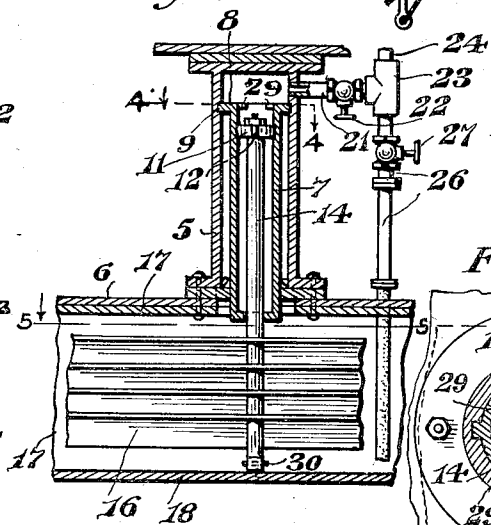


Fig. 6.

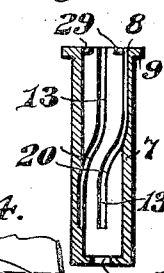


Fig. 4.

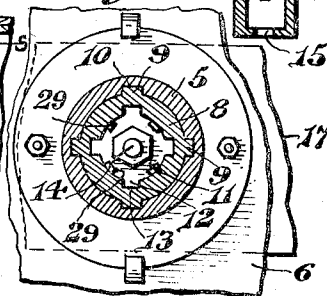
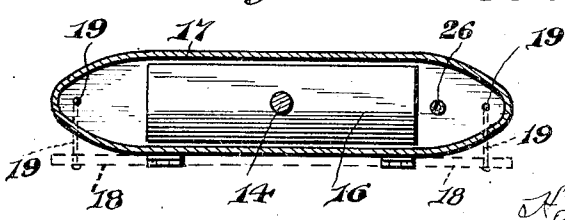


Fig. 5.



Inventor
H. L. Adams

March 9, 1937.

H. L. ADAMS

2,073,438

HYDROPLANE VANE

Filed Nov. 22, 1932

2 Sheets-Sheet 2

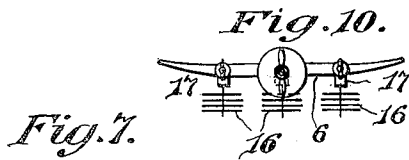


Fig. 8.

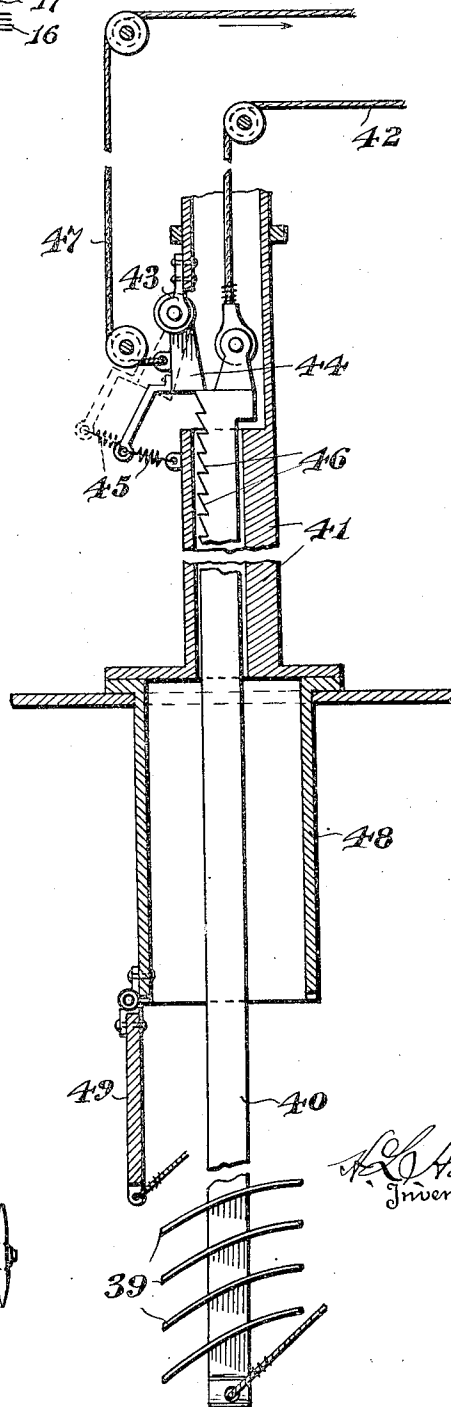
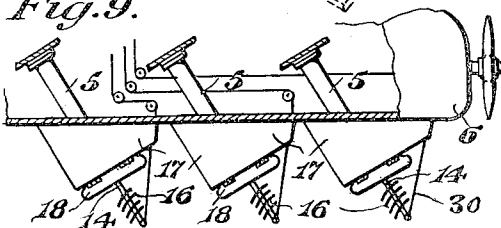


Fig. 9.



H. L. Adams
Inventor

UNITED STATES PATENT OFFICE

2,073,438

HYDROPLANE VANE

Herbert Luther Adams, Washington, D. C.

Application November 22, 1932, Serial No. 644,553

13 Claims. (Cl. 244-102)

This application is a continuation in part of my prior application filed April 14, 1921, Serial No. 461,412, which now has matured into Patent No. 1,888,418, dated November 22, 1932.

This invention relates to means for supporting flying machines on water.

The primary object of the invention is to provide a yieldable supporting means for flying machines to facilitate taking off from and landing on water, and to reduce tossing by the waves.

A further object of the invention is to provide a yieldable supporting means of the character aforesaid which is designed to automatically compensate for irregularity in the height of the waves.

A still further object of the invention is to provide a hydraulic telescoping device for supporting flying machines on water, in which both air and water may be employed for semi rigidly supporting the flying machine.

A still further object of the invention is to provide a hydraulic telescoping device as aforesaid which is designed to draw water thereinto either to serve as a cushion or to prevent any yielding movement of the device, in accordance with the rigidity desired.

A still further object of the invention is to provide means operable from the motive power of the flying machine for supplying compressed fluid to a hydraulic telescoping device of the character aforesaid.

A still further object of the invention is to provide a yieldable telescoping supporting device for flying machines which is designed to present a maximum resistance to forward motion of the machine when the device is extended into the water, and to present minimum resistance to air when the device is retracted and the machine is in flight.

A still further object of the invention is to provide an extendible and retractible supporting device for flying machines which may be locked in a desired position to meet varying conditions of the waves.

Several embodiments of a device in accordance with this invention are illustrated in the accompanying drawings, in which:

Figure 1 is a fragmentary sectional view of a flying machine showing a device in accordance with this invention associated therewith.

Figure 2 is an enlarged vertical section through the telescoping supporting device as seen from the front, with a dotted line showing of the vanes when extended.

Figure 3 is a vertical section through the sup-

porting device, taken at a right angle to Figure 2.

Figure 4 is a section taken on the line 4-4 of Figure 3.

Figure 5 is a section taken on the line 5-5 of Figure 3.

Figure 6 is a longitudinal section through the inner cylinder shown in Figures 2 and 3.

Figure 7 is a fragmentary vertical section through a modified form of supporting device.

Figure 8 is a fragmentary vertical section through another modified form of supporting device.

Figure 9 is a reduced diagrammatic view showing the supporting devices disposed at an inclination.

Figure 10 is a reduced elevation of a flying machine embodying this invention.

By way of illustration, a pair of vertically disposed telescoping supporting devices are shown in Figure 1, although any number of such devices as desired may be employed, and they may be set at an inclination as shown diagrammatically in Figure 9. As herein shown, the supporting devices are operated by compressed fluid supplied from a container 1 which may be charged by a pump 2 operatively connected by means of suitable gearing 3 with the engine 4 for the flying machine.

Each of the supporting devices includes a cylinder 5 located within the fuselage and suitably secured to the floor 6 thereof. Slidably mounted within the cylinder 5 is an inner cylinder 7, preferably having at its upper end a head 8 provided with projections 9 fitting within grooves 10 formed in the inner face of the cylinder 5.

Slidably mounted within the inner cylinder 7 is a piston 11 having projections 12 fitting in grooves 13 found in the inner face of the inner cylinder 7. Secured to the piston 11 is a piston rod 14 which extends through a central opening 15 in the bottom of the cylinder 7. Secured to the projecting lower portion of the rod 14 are a plurality of vanes 16 which are of materially greater length than width in order that the resisting surfaces thereof presented to the air or water may be varied by partial rotation of the vanes.

Preferably the vanes 16, when in retracted position, will be enclosed within a streamline housing 17 provided at the bottom thereof with an outwardly swinging door 18 which may be closed by suitable cables 19. The housing 17 depends from, and is suitably secured to, the bottom 6 of the fuselage.

Owing to the projections 9 and 12, and to the

grooves 10 and 13, the vanes 16 are disposed lengthwise of the fuselage when retracted and crosswise thereof when extended. Preferably this is accomplished by extending the grooves 10 in the cylinder 5 in straight lines lengthwise of the cylinder for co-operation with the projections 9 to prevent any relative rotary movement between the cylinders 5 and 7, and by providing the grooves 13 with spiral central portions 20 for co-operation with the projections 12 to rotate the piston 11 a quarter turn during the extending and retracting movements of the vanes. The vanes 16 are set at an inclination to the rod 14, and preferably are slightly arcuate, in order to present a maximum of resisting surface to the water when extended.

The inner cylinder 7 and piston 11 are operated lengthwise of the cylinder 5 by means of fluid pressure admitted to the cylinder 5 adjacent the top of the latter. The fluid enters through a pipe 21 having a valve 22, and connected to its outer end to a T 23. Connected with the T 23 is a pipe leading from the container 1 and having a valve 25, and also connected with the T 23 is a pipe 26, preferably flexible, which is provided with a valve 27, and which is of sufficient length to reach the water when the flying machine is resting thereon. Suitable stops 28 are provided adjacent the bottom of the cylinder 5 to prevent the head 8 from being forced through the open lower end of the cylinder 5, and similar stops 29 are provided adjacent the top of the cylinder 7 to prevent the piston 11 from being withdrawn through the open upper end of the cylinder 7. Preferably a flexible brace 30 will be secured to the lower end of the piston rod 14, such brace extending forwardly and upwardly to the fuselage where it may be adjustably secured in any suitable manner.

If it is desired to operate the device by means of fluid pressure only, valves 22 and 25 are opened while valve 27 remains closed, which permits the fluid to enter the cylinders 5 and 7 to yieldingly resist upward movement of the vanes. If it is desired to operate the device by means of water only, the pipe 26 is permitted to enter the water upon which the aircraft is resting with all the valves closed, then the valves 27 and 22 are opened so that water will be drawn into the cylinders by the falling movement of the vanes. When sufficient water has been drawn into the cylinders to provide the desired amount of resistance desired, the valve 27 may be closed, and following this, the valve 25 may be opened if desired, in order that the upward movement of the vanes may be cushioned both by water and compressed fluid. The amount of water admitted into the cylinders is governed by the desired rigidity of resistance. In some cases it may be desirable to prevent any upward movement whatever of the vanes, in which event the cylinders are completely filled with water, and the valve 22 is then closed. Suitable piping with valves as shown broken away in Figure 1 will be provided in order that the container 1 and pump 2 may be utilized for supplying either pressure or suction to any hydraulic apparatus which may be carried by the aircraft.

The initial movement of the vanes 16 in leaving the housing 11 is free from any rotary movement due to the extension of the grooves 10 in a straight line lengthwise of the cylinder 5, and also due to the straight line upper portions of the grooves 13 in the cylinder 7. After the vanes have cleared the housing, the projections 12 enter

the spiral portions 20 of the grooves 13 whereby the vanes are rotated 90 degrees.

In Figures 7 and 8 are shown examples of extendible and retractable vanes which are mechanically operated, and which may be locked in the position desired. In the device shown in Figure 7, the vanes 31 are secured between a pair of supports 32 which are suitably connected at their upper ends by means of a top piece 33 which may be a separate piece, or integral with the supports, as desired. The upper ends of the supports 32 slidably extend into a stationary cylinder 34 having its inner face formed with ratchet teeth 35. Co-acting with the teeth 35 are a pair of pawls 36 pivotally mounted on the top piece 33.

When it is desired to extend the vanes, the pawls are disengaged by means of a pair of cables 37 secured thereto, after which the supports 32 may be payed out by means of a pair of cables 38 secured to the top piece 33. When the cables 37 are released, the pawls 36 engage the adjacent teeth 35 to prevent any upward movement of the supports 32. If desired, the supports 32 may be tilted to vary the angle of the vanes 31. To accomplish this result, one of the cables 38 is held taut while the other cable 38 is released, at the same time drawing up the companion cable 37 to release the pawl 36 secured thereto. The released cable 38 is then payed out until the released pawl 36 will engage the ratchet teeth 35 one notch lower than the point of engagement of the other pawl with the teeth.

In the device shown in Figure 8, the vanes 39 are secured to a support 40 having its upper end slidably extending into a casing 41, and having a cable 42 secured to the upper end thereof. Pivotaly mounted adjacent a suitable opening 43 in the casing 41 is a pawl 44 which is normally urged inwardly by means of a spring 45 into position to engage ratchet teeth 46 on the support 40. The pawl may be released when desired by means of a cable 47 secured thereto to enable the support 40 to be drawn in or payed out by means of the cable 42. If desired a housing 48 having a door 49 may be provided to enclose the vanes 39 when retracted.

I have shown an apparatus embodying my invention in several general forms but do not wish to be understood as limiting myself strictly to the precise details of construction herein before described. I do not wish to be held to exact shapes or dimensions or to any particular combination of parts but wish to be free to use any part herein or described or covered by the class with any other parts or part whether shown herein or elsewhere.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent is:—

1. In a flying machine, a multiple telescoping stem depending from the machine and formed with an opening, a compressed fluid device, a pipe in communication with said opening, said pipe having a branch connected with said compressed fluid device and further having another branch extending downwardly and of sufficient length to reach the water when the machine is resting on the water, valve means for controlling communication between said pipe and stem and also between said pipe and its branches, and hydroplane vanes attached to the lower portion of said stem.

2. In a flying machine, a hollow telescoping supporting device depending from the machine and formed with an opening, a compressed fluid device, a pipe in communication with said open-

ing, said pipe having a branch connected with said compressed fluid device and further having another branch extending downwardly and of sufficient length to reach the water when the machine is resting on the water, and valve means for controlling communication between said pipe and hollow supporting device and also between said pipe and its branches.

3. In a flying machine, a hollow telescoping supporting device, depending from the machine and formed with an opening, a compressed fluid device, a pipe in communication with said opening, said pipe having a branch connected with said compressed fluid device and further having another branch extending downwardly and of sufficient length to reach the water when the machine is resting on the water, valve means for controlling communication between said pipe and hollow supporting device and also between said pipe and its branches, and means connecting said compressed fluid device with the motive power supplying means of the flying machine for supplying said device with fluid pressure.

4. In a flying machine, a telescoping supporting device depending from the machine, means for extending and retracting said device, hydroplane vanes attached to the lower portion of said device, and means forming a part of said device for rotating said vanes during the extending and retracting movements of the device.

5. In a flying machine, a telescoping supporting device depending from the machine, means for extending and retracting said device, hydroplane vanes of greater length than width attached to the lower portion of said device with the vanes lengthwise of the line of flight when said device is retracted, and means for rotating said vanes through an arc of 90° to position the vanes crosswise of the line of flight when said device is extended.

6. In a flying machine, a telescoping supporting device depending from the machine and including a cylinder and a rod slidably extending into the cylinder, said cylinder having its inner surface formed with spirally extending grooves, projections carried by said rod and fitting into said grooves, hydroplane vanes attached to said rod below said cylinder, and means for moving said rod lengthwise of said cylinder.

7. In a flying machine, a telescoping supporting device depending from the machine, hydroplane vanes of greater length than width attached to the lower portion of said device with the vanes lengthwise of the line of flight, a streamline housing for said vanes, means for extending and retracting said device to move the vanes out of and into the housing, and means for rotating the vanes through an arc of 90° following the movement of the vanes out of the housing.

8. In a flying machine, a telescoping supporting device depending from the machine, hydroplane vanes of greater length than width attached to the lower portion of said device with the vanes lengthwise of the line of flight, a streamline housing for said vanes, an outwardly opening door normally closing the bottom of the

housing, means for extending and retracting said device to move the vanes out of and into the housing, and means for rotating the vanes through an arc of 90° following the movement of the vanes out of the housing.

9. In a flying machine, a telescoping supporting device depending from the machine and including an outer member and an inner member slidable in the outer member, hydroplane vanes attached to the inner member below the outer member, means for sliding the inner member with respect to the outer member, and coacting locking means carried by the members for maintaining the inner member in a desired position relative to the outer member.

10. In a flying machine, a telescoping supporting device depending from the machine and including an outer member and an inner member slidable in the outer member, hydroplane vanes attached to the inner member below the outer member, means for sliding the inner member with respect to the outer member, ratchet means formed on the outer member, and pawl means carried by the inner member for coaction with said ratchet means to maintain the inner member in a desired position relative to the outer member.

11. In a flying machine, a telescoping supporting device depending from the machine and including an outer member and an inner member slidable in the outer member, hydroplane vanes attached to the inner member below the outer member, means for sliding the inner member with respect to the outer member, ratchet means formed on the inner member, and pawl means carried by the outer member for engagement with said ratchet means to maintain the inner member in a desired position relative to the outer member.

12. In a flying machine, a hollow telescoping supporting device depending from the machine and formed with an opening, a pipe in communication with said opening and being of sufficient length to extend into the water when the machine is resting on the water to provide for admission of water into said device when the latter is extended, and a valve in said pipe for preventing the exhaustion of water from said device.

13. In a flying machine, a landing and take off device comprising a multiple telescoping stem formed with an opening, a valved pipe in communication with said opening, a T connection for said pipe, a compressed fluid device, a valved pipe extending from the compressed fluid device to said T connection, means operatively connecting the compressed fluid with the motive power for the flying machine to supply fluid pressure to said compressed fluid device, a valved, flexible pipe secured to and depending from said T connection, said flexible pipe being of sufficient length to extend into the water when the flying machine is resting on the water, hydroplane vanes attached to the lower part of said stem, and an adjustable brace secured to the lower end of said stem and extending diagonally forward and upward therefrom.

HERBERT LUTHER ADAMS.