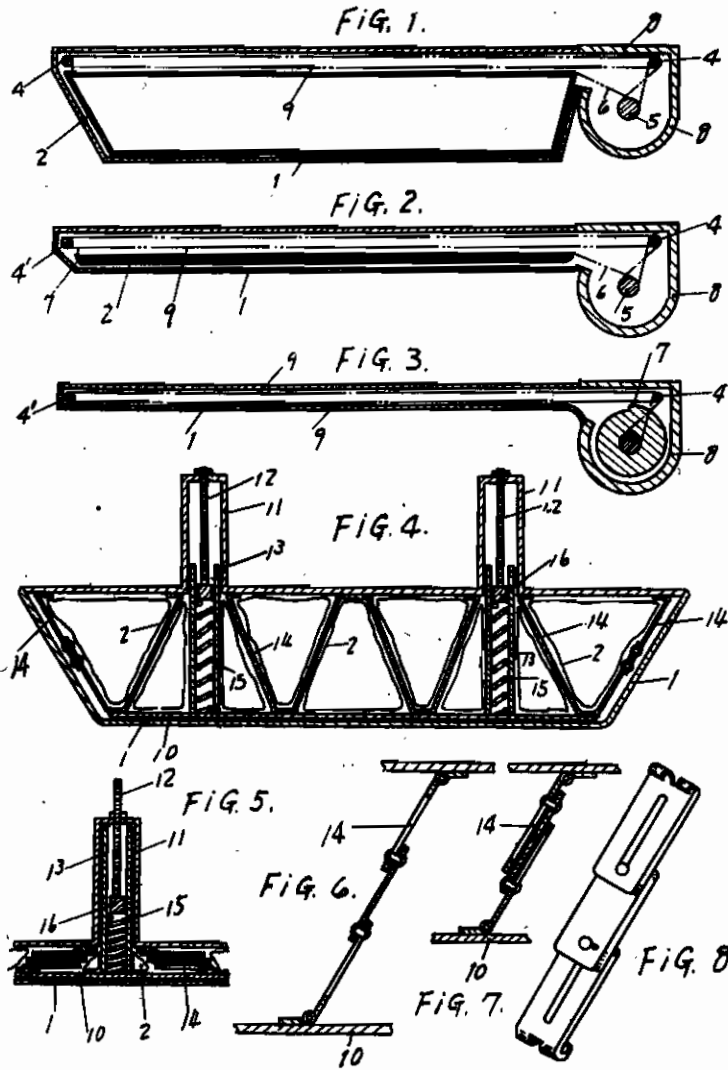


PUBLISHED  
MAY 25, 1943.  
BY A. P. G.

T. NAKAGAWA  
AEROPLANE FLOAT CAPABLE OF BEING  
EXPANDED AND CONTRACTED  
Filed Nov. 20, 1940

Serial No.  
366,353



Toyoaburo Nakagawa  
INVENTOR

BY *Attorney*  
his ATTORNEY.

# ALIEN PROPERTY CUSTODIAN

## AEROPLANE FLOAT CAPABLE OF BEING EXPANDED AND CONTRACTED

Toyosaburo Nakagawa, Shimonoseki, Yamaguchi-ken, Japan; vested in the Alien Property Custodian

Application filed November 20, 1940

This invention relates to improvement in aeroplane float of the type wherein the float itself is capable of being readily expanded or contracted as occasion demands and has for its object the provision of an aeroplane float of such type which is of relatively simple construction and can be, on flying, contracted in a flat state to decrease air resistance thereof but expanded, on alighting, to avoid the shock due to the collision with water surface and to prevent the constructions and instruments from being damaged.

Another object of the invention is to provide an aeroplane float capable of deforming, owing to the elasticity thereof in response to the variation in height of water surface to insure the stability of the aeroplane.

Further object of the invention is to provide an aeroplane float of such type which would not lose the function for a float even if a part thereof will be damaged.

For realization of the object set forth, the aeroplane float according to this invention is characterized by the combination of one or more envelopes capable of being evacuated and charged with air and outer elastic cover enclosing whole of the envelopes so that it may be evacuated to flat on the occasion of its disengagement while on alighting it may be charged with air to expand in the form of a complete float.

The invention is more particularly described with reference to the accompanying drawings which show, by way of example two forms of embodiment, in which

Fig. 1 shows a longitudinal section of first embodiment according to the invention in the engaging state,

Fig. 2 shows similarly a longitudinal section thereof in the state in which the envelope have been evacuated,

Fig. 3 shows similarly a longitudinal section thereof in the state in which the envelope evacuated have been held in a taking-up chamber.

Fig. 4 shows a longitudinal section of second embodiment according to the invention in the engaging state,

Fig. 5 shows a longitudinal section of a part of the embodiment in the disengaging state in which only inclined links are different from those shown in Fig. 4,

Fig. 6 shows a longitudinal section of one inclined link in its extended state.

Fig. 7 shows a longitudinal section thereof in its contracted state.

Fig. 8 shows a perspective view thereof.

Like letters indicate like parts throughout the drawings.

Referring to the first embodiment shown in Figs. 1-3, the aeroplane float is consisted of an outer elastic cover 1 made of any suitable material and fixed to the aeroplane at appropriate parts thereof, for instance, under side the body or wing and one or more envelopes 2 which is (or are) fully enclosed in aforesaid cover. The cover 1 is communicated with an envelope taking-up chamber 3 which is made of, for instance, steel plate and arranged at a position adjacent the open end of the cover.

Of a pair of pulleys 4, 4', both being rotatably connected with each other through an endless belt 8, the pulley 4' is arranged inside the float at one end thereof opposed to the taking-up chamber 3, whilst the other pulley 4 is arranged inside the chamber 3 and connected rotatably through a cross belt with a rotating shaft 5 mounted inside the taking-up chamber 3. Said shaft 5 is driven by means of any suitable power transmission device (not shown in drawing). The envelope 2 is fixed, on the one hand, to the rotating shaft 5 through a string and the like 6, on the other hand fixed to the endless belt 8 at the position 7 thereof.

According to this embodiment, on the occasion of its disengagement, for instance, on flying, the envelope 2 exhausted may be kept in the strong taking-up chamber 3 as shown in Fig. 3. In the case of the float being engaged, for instance, on alighting, the envelope is at first, in accordance with the movement of the endless belt 8 driven by the shaft 5, pulled out of the chamber into the contracted cover 1 as shown in Fig. 2, thereafter it is expanded together with the cover 1 by means of air charging as shown in Fig. 1.

The envelope shown in Figs. 1-3 may be divided by partitions into several separate air chambers so that even if a part of the envelope will be damaged the residual air chambers may fully display the function as a float.

According to this invention it is possible to juxtapose a number of envelopes and to take up on a common rotating shaft in a common taking-up chamber by means of each endless belt belonging to each separate envelopes. Of course a large number of each separate float as shown in drawings, can be equipped at any suitable positions of the aeroplane.

In the second embodiment shown in Figs. 4-8 the elastic cover 1 made of the material similar to that shown in Figs. 1-3 encloses the float which is carried by the hollow supports 11 fixed

to the aeroplane at any appropriate parts thereof. The bottom plate 10 of the aeroplane is carried by the hollow sliding support 13 which may be upwardly and downwardly guided in the supports 11 through the screw bolts 12 engaged with the hollow support 11. The bottom plate is connected with the top plate of the float through a number of inclined links 14 each of which can be extended or shortened at will. Between them a suitable number of envelopes 2 are placed. The float of this type is usually in expansion condition as shown in Fig. 4 due to the action of the spring 15 placed in the hollow sliding support 13.

According to this embodiment on the occasion of its disengagement, for instance, on flying, the envelopes are at first evacuated and at the same time the screw bolts 12 are partly screwed out, whereby the sliding support 13 engaging with the head 16 of the bolt 12 may be raised in the hollow support 11, consequently the bottom plate 10 also may be raised towards the top plate opposing the action of the spring 15, as the result of which the float, owing to the contraction of the elastic cover 1, may be brought into flat state as shown in Fig. 5 (the construction and arrangement of the inclined links differ from those shown in Fig. 4). On the contrary in the case of the float being engaged, for instance, on alighting, through the reverse rotation of the screw bolt 12 and the air charging in the envelopes the float may be brought into expansion state as shown in Fig. 4.

It will be appreciated that the float according to the invention is, on flying, in flat state, so that air resistance acting on the float can be diminished. If the floats are arranged on the underside the wing, the flat float will have the same effect as that of the under side of the wing so that the charging amount of the aeroplane will

be increased. Owing to the elasticity of the cover, particularly in the embodiment shown in Figs. 4-8 owing to the elasticity of inclined links, buffer action of springs and the like, the aeroplane equipped with the float of the invention is subjected to minimum shock, even if it should collide with water surface on alighting, so that the constructions and instruments of aeroplane can be prevented from the damage. As the float according to this invention may be varied in its shape in response to the variation in the height of water surface, the aeroplane installed with this float has a good stability. Even supposing that the cover will damage the aeroplane has no risk of sinking due to a number of envelopes remained.

Further the float according to the invention has a light draft, so that the taking-off of the aeroplane is very easy. In the embodiment shown in Figs. 1-3 if the envelope will be divided by means of partitions into a number of separate chambers or will be increased in its number, the float will not lose the function even if some of envelopes are damaged. In particular, in the first embodiment the envelope is held while flying in a rigid envelope taking-up chamber, so that there is diminished the risk of damage of the envelope by shot and the like. In the second embodiment the bottom surface of the float can be made in wide area, so that the rolling and overturning of the aeroplane on alighting may be avoided.

It will be appreciated that the floats above described are merely two preferred embodiments according to the invention, but that many modifications may be effected without departing from the scope of the invention.

TOYOSABURO NAKAGAWA.