E. PRASSONE AND L. AVORIO.

OBSERVATION KITE BALLOON.

APPLICATION FILED AUG. 12, 1918.

1,377,924. Patented May 10, 1921.

Fig. 1.

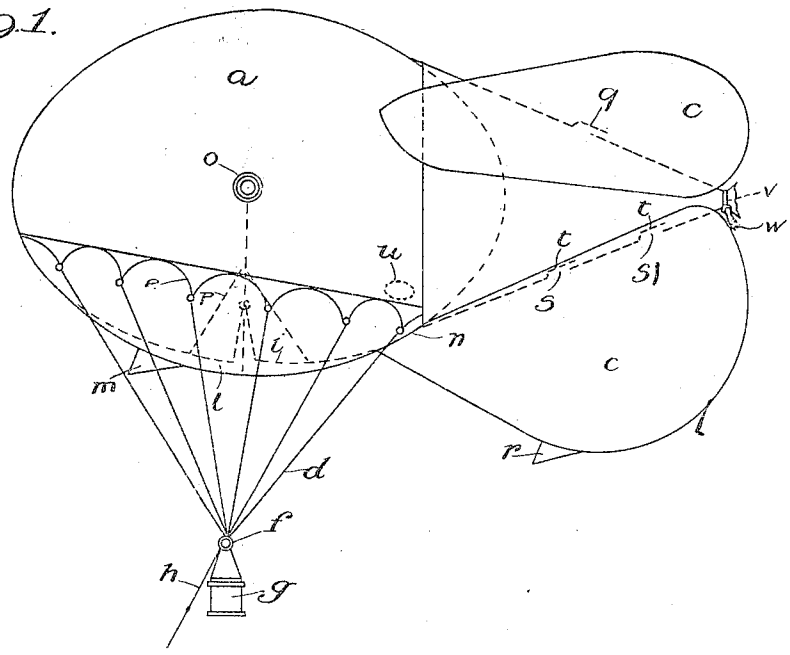
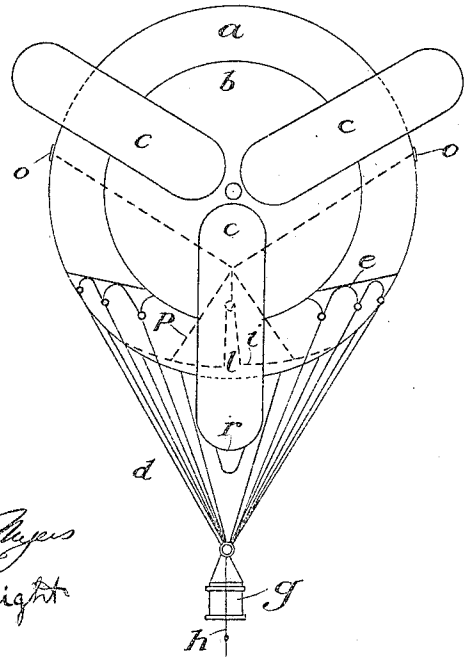


Fig. 2.



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OBSERVATION KITE-BALLOON.

1,377,924. Specification of Letters Patent. Patented May 10, 1921.

Application filed August 12, 1918. Serial No. 249,454.

To all whom it may concern:

Be it known that we, EUGENIO PRASSONE, civil engineer, and Major LUIGI AVORIO, of the Italian Army, both subjects of the King of Italy, and residing at Rome, in the Kingdom of Italy, have invented new and useful Improvements in Observation Kite-Balloons, of which the following is a specification.

The present invention relates to observation kite-balloons of the type in which stability is maintained by the action of the wind meeting the balloon combined with the pull of the mooring rope.

Up to the present such kite-balloons have been made of cylindrical or approximately cylindrical shape with rounded ends. This shape is however not the most suitable one as regards the weight of the system and it shows other disadvantages.

For instance, the weight of the envelop of the gas container or bag is very considerable in comparison with the volume of gas it contains. In consequence of the greater volume required to attain a certain altitude, it is necessary to use a heavier mooring rope. Moreover, separate suspensions are needed for the car and mooring rope respectively, and such balloons are not very easily transported. They also require a greater number of men to handle them and they offer a considerable target to the enemy's fire.

Another disadvantage of the said types is that in case of a breakage of the mooring rope the balloon will not retain its normal position; a cylindrical or elongated gas envelop will not retain its shape in the descent, the middle part bulging upward, such bulging naturally augmenting the rope tension. Another disadvantage is that a very long hanger is required for housing.

Still a further drawback of the old kite-balloons is that the stabilizing or rubber bags become inflated only when the balloon reaches a certain height and the wind supplies sufficient air. In the meantime the balloon wabbles.

The object of the present invention is to avoid these drawbacks, by reducing to a minimum the weight of the balloon in relation to its cubical capacity, at the same time assuring the greatest stability with the simplest construction.

According to the invention we use a spherical gas container or bag, which shape gives the smallest superficial area for a given volume and at the same time enables a given degree of strength and security to be obtained with a lighter fabric. With said spherical gas container or bag we combine a conical or pointed appendage which serves the double purpose of reducing the wind resistance and of stabilizing the system. The conical or pointed appendage is filled with air and we provide means to assure the permanent shape of said appendage. We provide said appendage with the stabilizing or rudder bags which are automatically kept inflated. In the spherical gas bag we supply an air ballonnet. We further provide means for preventing automatically any increase of pressure, above a certain pre-determined limit, in the air ballonnet, in the conical or pointed appendage, and in the stabilizing or rudder bags, no matter how high the wind pressure may become, and we provide means for preventing the air escaping from said parts when the pre-determined limit is not reached. The suspension is attached to the envelop by means of catenaries, and a single suspension suffices for both the car and the mooring rope.

We have however found that in practice a perfectly spherical shape is not essential to obtain all the advantages which are desired, but that an envelop of slightly spheroidal, elongated ellipsoidal, ovoid or similar shape can be used, provided the longitudinal axis of the spheroid or ellipsoid is little longer than the transversal diameter. Hereafter, in the following specification, as well as in the claims, the said shape will be briefly referred to as a moderately elongated form; it being understood that said term will mean a slightly spheroidal; an ovoidal, an ellipsoidal, or whatever other moderately elongated form. Although the lifting power per unit of volume is slightly diminished in consequence of the increased weight of the envelop, there is on the other hand a diminution of wind resistance and an increase of stability more than sufficient in practice to compensate for the aforesaid slight disadvantage.

In order to more clearly understand the invention, reference is made to the accompanying drawings, which show by way of example one way of carrying out the invention.

In said drawings Figure 1 shows a side view of the kite-balloon.

Fig. 2 is a rear view.

The balloon consists of a spherical gas container or bag —*a*— provided with a conical or pointed appendage —*b*— of light fabric, which need not be gas tight as it is only intended to retain air.

The conical or pointed appendage is provided with three stabilizing or rudder bags —*c*— arranged at 120° apart. The suspension which is attached to the envelop consist of a very limited number of ropes —*d*— connected to the envelop by means of catenaries —*e*— attached at the height of the upper limit of the ballonnet.

The ropes —*d*— meet in one point —*f*— to which the car —*g*— and the mooring rope —*h*— are attached.

The conical or pointed appendage —*b*— and the stabilizing or rudder bags —*c*—, which are only intended to contain air, (which enters through an opening —*n*—). Any suitable means may be employed for closing the opening *v*. As shown in the drawing it is closed by a cord *w* tied about the end of the appendage. The two upper bags are in free communication with the conical or pointed appendage, while the lower stabilizing bag is in communication with the conical or pointed appendage through the opening —*s*— provided with a non-return flap valve of fabric —*t*— which allows air to pass from the lower stabilizing bag into the conical or pointed appendage but not vice versa. By this means the conical or pointed appendage and the upper stabilizing or rudder bags can be inflated to obtain their proper shape by means of a small hand blower or fan before the balloon leaves the ground.

The gas is totally contained in a spherical or spheroidal bag which has in its lower part a dome shaped diaphragm —*i*— which is intended to give place to an air ballonnet —*l*— when the balloon is only partially filled with gas, for instance, in descending. The air enters the ballonnet through an opening —*m*—. The ballonnet is also in communication with the lower stabilizing or rudder bag through the opening —*n*—. Near the equatorial line the gas bag is provided with a valve —*o*— which can be opened by means of valve lines —*p*— actuated by the diaphragm of the ballonnet. A valve —*q*— of fabric arranged in the upper part of the conical or pointed appendage is regulated in such way as to prevent the air pressure from exceeding a certain pre-determined maximum. The opening —*n*— prevents the pressure in the ballonnet —*l*— exceeding the limit allowed by the regulating valve —*q*—; otherwise a dangerous increase in pressure might be set up in the gas bag, because if the ballonnet contains air the diaphragm fails to operate the valve —*o*—. The balloon is inflated with gas through the opening —*u*— and the cone and upper stabilizing or rudder bags are previously inflated with air through the opening —*v*— which remains closed during the ascension.

The advantages of our new construction of kite-balloons, as against the older types are the following:

(1) These kite-balloons can ascend to a greater altitude than is possible with balloons of any other known type of equal gas capacity. In other words a given altitude can be reached with a smaller volume of gas; there is a great economy, because less fabric is required; and for the same even the gas is economized. The consumption is further reduced because it is possible in any case to start the balloon not entirely filled with gas as its shape is maintained through the air chambers which may be filled before the ascension owing to their special valve closure. There is also a considerable financial advantage in the manufacture of these balloons owing to the very simple construction of the gas bag and suspension. The kite balloon can be more easily transported, fewer men are required for handling it, not to mention the advantage that the balloon presents a considerably smaller target than the ordinary kite balloons, and the necessary trench for its mooring in open space is smaller. These remarks also refer to hangars, same being of much smaller longitudinal dimensions.

(2) Owing to the special shape of the aforesaid balloon the stability obtained is very great thus allowing the same to be used for observation purposes in the greatest of winds.

(3) Moreover, both the conical or pointed appendage and the upper stabilizing or rudder bags are inflated before the balloon leaves the ground, consequently the balloon rises straight and does not wabble like the ordinary type of kite balloon which only becomes stable when it has reached a certain height and the wind has inflated the bags. The balloon being in shape since the very beginning of the maneuver constitutes a considerable advantage, as all wabbling is avoided in the transport and at the initiation of the ascension. The whole arrangement being very compact and the number of suspension ropes limited, the wind resistance is considerably reduced, and therefore lighter mooring cable may be used. Furthermore in case the mooring cable should break, the new kite-balloon will behave exactly like an ordinary spherical balloon. Moreover, in the descent all deformation of air pockets in the balloon is avoided, and the descending speed may be therefore considerably augmented.

(4) The balloon rises deviating from the vertical less than the other types do, consequently the altitude attained is higher.

(5) In view of the spherical shape of the

gas bag the mooring guy, general maneuvering and transport can be effected very easily by means of the maneuvering ropes connected in proximity to the equatorial line. During such operations the conical or pointed appendage —*b*— and the stabilizing or rudder bags —*c*— can be easily deflated.

Claims:

1. An observation kite-balloon consisting of a gas container or bag of moderately elongated shape connected with a conical or pointed appendage with stabilizing or rudder bags, the conical or pointed appendage and the stabilizing or rudder bags being filled with air.

2. An observation kite-balloon in which the envelop containing the gas is of moderately elongated shape and is provided with suspensions, to which envelop is connected an air filled pointed appendage provided with stabilizing bags.

3. An observation kite-balloon in which the envelop containing the gas is of moderately elongated shape and is provided with suspensions, to which envelop is connected an air-filled pointed appendage provided with stabilizing bags, said stabilizing bags having valves which allow them to be inflated with air before the balloon rises.

4. An observation kite-balloon in which the envelop containing the gas is of moderately elongated shape and is provided with suspensions and with a ballonnet, to which envelop is connected an air-filled pointed appendage provided with stabilizing bags; the lower stabilizing bag and the pointed appendage being provided with air passages through which they are put in communication.

5. An observation kite-balloon in which the envelop containing the gas is of moderately elongated shape and is provided with suspensions and with a ballonnet, to which envelop is connected an air-filled pointed appendage provided with stabilizing bags; the lower stabilizing bag and the pointed appendage being provided with air passages and an air valve being provided in the pointed appendage, said valve preventing any increase of pressure above a predetermined limit in the air ballonnet, in the pointed appendage and in the stabilizing bags, no matter how high the wind pressure may become.

6. An observation kite-balloon in which the envelop containing the gas is of moderately elongated shape and is provided with suspensions and with a ballonnet, to which envelop is connected an air-filled pointed appendage provided with stabilizing bags; the lower stabilizing bag and the pointed appendage being provided with air passages; an air valve in the pointed appendage and a non-return valve between the pointed appendage and the lower stabilizing bag for preventing the escape of the air from the appendage and from the upper stabilizing bags, thus securing the permanent shape of said parts when inflated.

7. An observation kite-balloon in which the envelop containing the gas is of moderately elongated shape and provided with suspensions and with a ballonnet, to which envelop is connected an air-filled pointed appendage provided with stabilizing bags; the lower stabilizing bag and the pointed appendage being provided with air passages; an air valve in the pointed appendage, a non-return valve between the pointed appendage and the lower stabilizing bag, an opening, together with closing means for the same, in the pointed appendage, through which air can be admitted for inflating the appendage and the upper rudder bags which bags are in free communication with the appendage.

In testimony whereof we have signed our names to this specification.

EUGENIO PRASSONE.
LUIGI AVORIO.

Witnesses:
LETTENO LABOCCETTA,
GALDINO CARTONI.