March 14, 1950 G. L. FOGAL 2,500,170

RIBBON PARACHUTE

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FIG. 1.

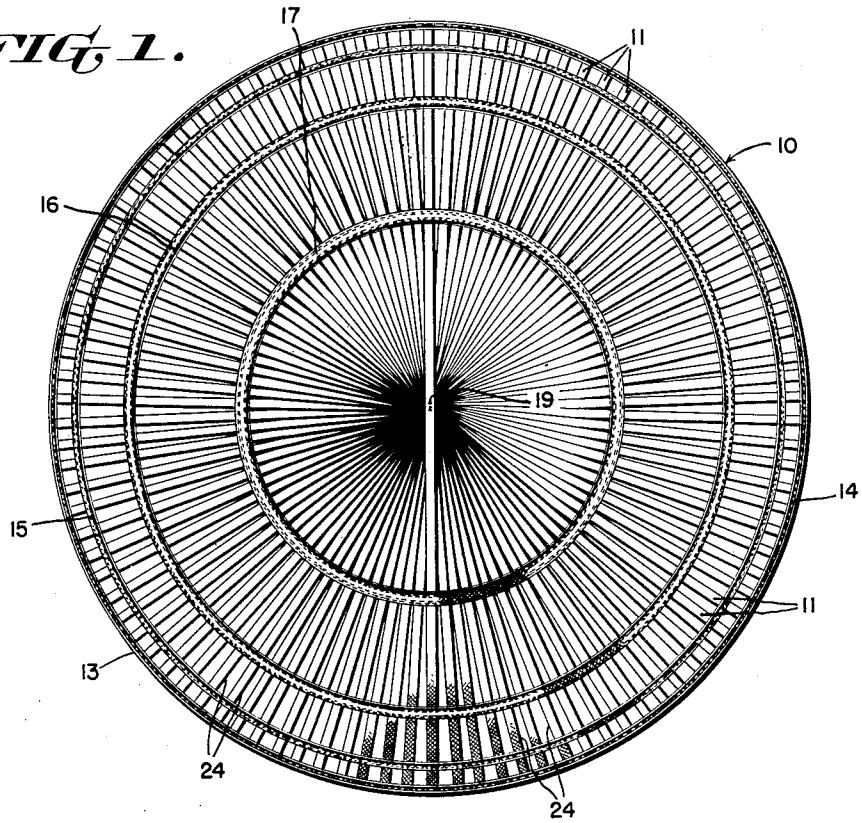
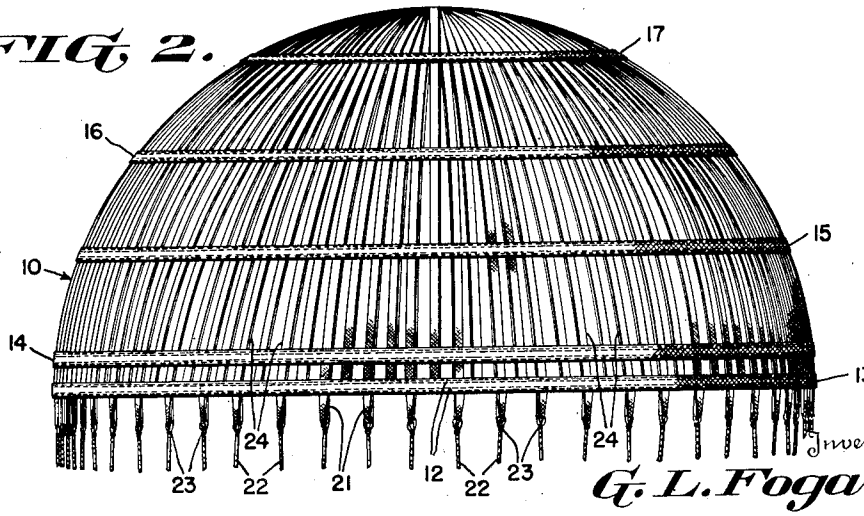


FIG. 2.



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FIG. 3.

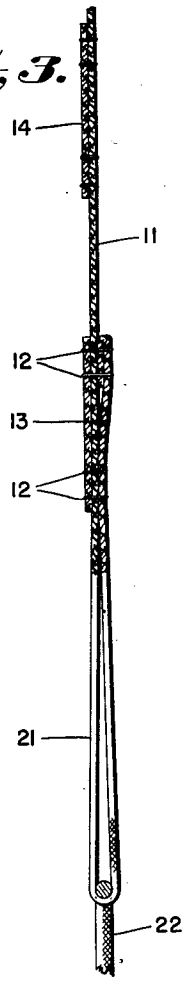


FIG. 4.

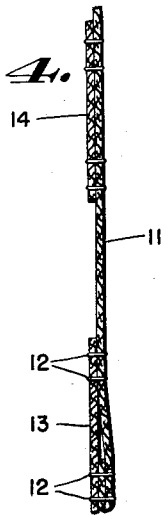


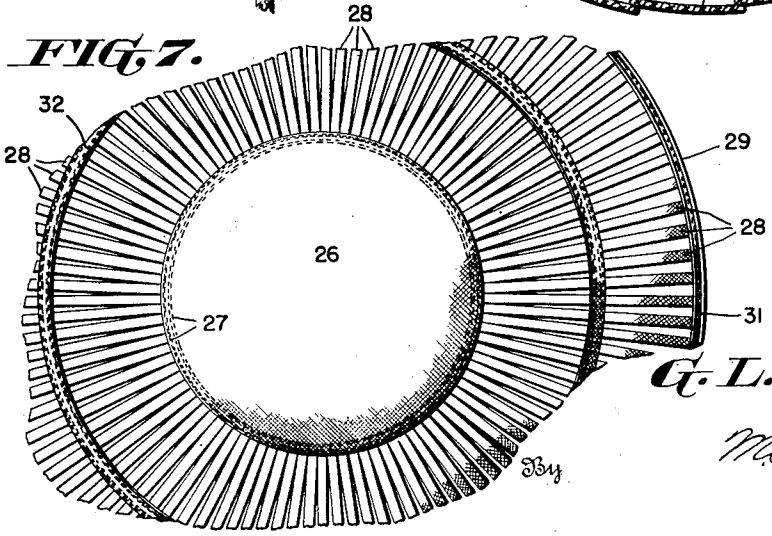
FIG. 5.



FIG. 6.



FIG. 7.



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RIBBON PARACHUTE

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Application March 3, 1948, Serial No. 12,842

9 Claims. (Cl. 244—145)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The present invention relates generally to parachutes and more particularly to parachutes having a ribbon type canopy.

In the devices of the prior art it has been the practice to provide ribbon type parachutes with a central opening in the crown of the canopy. Such arrangement is particularly disadvantageous during the opening of the parachute in that insufficient air may be trapped in the canopy to ensure the opening thereof.

In the parachute of the present invention this disadvantage is overcome by forming the canopy in such a manner that the center or crown portion thereof is closed and has low porosity, while the remainder of the canopy has a progressive increase in porosity from the crown portion toward the peripheral edge thereof. The aforementioned result is attained by the use of a plurality of ribbons attached in spaced relation at the peripheral edge of the canopy to a circumferential tape or band, such that each ribbon is secured to the band at points diametrically opposite and the ribbons are crossed at the crown of the canopy. There is provided between each pair of adjacent ribbons by reason of the spacing thereof a substantially pyramidal slit having its base or widest portion at the circumferential tape and a progressive diminution of width in a direction toward the crown portion of the canopy and ending at a point spaced therefrom. The ribbons are additionally secured to a plurality of tapes arranged circumferentially around the canopy at points intermediate the crown portion and the peripheral edge thereof.

It will be apparent from the foregoing that there has been provided a canopy for a parachute which will open readily during the launching operation and will be stable in operation during the descent thereof.

An object of the present invention is to provide a new and improved ribbon type canopy for a parachute combining the qualities of surety of opening during the launching and stability in flight during the descent thereof.

Another object is to provide a parachute canopy in which the porosity thereof is progressively increased from the crown portion toward the peripheral edge of the canopy.

Still another object is to provide a new and improved parachute canopy in which a ribbon material of uniformly low porosity is used in such a manner as to provide a progressive increase in porosity from the crown to the peripheral edge of the canopy.

A further object is to provide a ribbon type

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canopy for a parachute in which the shroud lines are secured to the ribbons forming the canopy in a strong and simple manner.

A still further object is to provide a new and improved parachute canopy which is strong, durable, and economical to manufacture.

Still further objects, features and advantages will be apparent to those skilled in the art from the following specification, taken in connection with the accompanying drawings in which:

Fig. 1 is a plan view of a preferred embodiment of the present invention;

Fig. 2 is a side elevation of the device of Fig. 1;

Fig. 3 is a vertical sectional view through a looped end of one of the ribbon members and illustrating the attachment of a shroud line thereto;

Fig. 4 is a vertical sectional view of an opposite end of one of the ribbon members;

Fig. 5 is a cross sectional view through several of the ribbons at the points of attachment to one of the spacer tapes;

Fig. 6 is a cross sectional view through several of the ribbons at the outer confines of the low porosity crown portion; and

Fig. 7 is a top plan view of an alternative form of the parachute of the present invention.

Referring now to the drawings in which like numerals of reference are employed to indicate like parts throughout the several views, the canopy is indicated generally as at **10** and comprises a plurality of low porosity fabric ribbons **11**, the ends thereof being attached at diametrically opposite points by stitching **12** to a circumferential tape or band **13**, the band **13** forming the peripheral edge of the canopy.

Circular spacing tapes **14**, **15**, **16**, and **17** are arranged in spaced relation around the canopy **10** and are attached by stitching to the ribbons **11** at the points of intersection as at **18**. The ribbons **11** are stitched together at their point of intersection at the crown of the canopy **10** as at **19**.

One end of each of the ribbons **11** may extend beyond the band **13** to form a loop **21**, the ends thereof being secured by the aforementioned stitching **12**. Shroud lines **22** are respectively secured to the loops **21** in a strong and simple manner as at **23**, each shroud line being turned back on itself to form a loop linked with the loop formed on the end of the ribbon.

As will be apparent from the drawings, each of the ribbons **11** is spaced from the adjacent ribbons at the point of attachment to the circumferential band **13**, thus forming a plurality of

substantially pyramidal slits **24** therebetween having their widest portions or bases at the band **13** and becoming progressively narrower as they extend toward the crown portion of the canopy. Each slit **24** ends at the outer confines of the crown portion of the canopy, thus providing a crown portion having low porosity, the remainder of the canopy having a progressively increasing porosity from the outer confines of the crown portion to the circumferential band **13** by reason of the progressive widening of the slits **24** in a direction toward the band **13**.

In Fig. 7 of the drawings there is illustrated an alternative form of the present invention in which a unitary crown portion of the canopy indicated at **26** is formed of one or more pieces of low porosity fabric. Attached by stitching **27** at the periphery of the crown portion **26** is a plurality of ribbons **28**. The ribbons **28** are secured in predetermined spaced relation to a circumferential tape **29** which forms the peripheral edge of the canopy. Spacing tapes **31** and **32** are secured to the ribbons **28** at points intermediate the crown portion and the peripheral edge.

It is, of course, understood that it is desirable in a parachute canopy to provide means for ensuring the opening thereof during the launching operation. In the canopy of the present invention the opening of the canopy is ensured by providing a crown portion therefor having a low order of porosity, which is the result of the crossing of the ribbons at the crown portion in the preferred form or the use of low porosity fabric to form the crown portion in the alternate form of the invention. It has also been found desirable to have sufficient porosity in the remainder of the canopy to permit air to pass therethrough in sufficient quantity to prevent spilling of the air at the peripheral edge of the canopy. In accordance with the present invention the slits between the ribbons present a vent of progressively increasing width from a circle spaced from the crown to the peripheral edge, thereby providing a sufficient resistance to the passage of air in the body of the canopy to support the load carried by the parachute and a sufficient porosity adjacent the peripheral edge to prevent spilling of the air under the edge of the canopy.

The spacing between the ribbons may be varied during the manufacture thereof to provide different degrees of porosity or permeability to meet a wide variety of load and launching conditions.

It is also understood that the shape of the canopy can be varied from substantially flat to hemispherical shape in cross section by changing the length of the ribbons with relation to the diameter of the canopy.

While the device of the present invention has been described and shown in particularity with relation to a preferred embodiment and one alternative form thereof, it is understood that the device is susceptible to modifications and changes as may appear to those skilled in the art without departing from the spirit and scope of the appended claims.

The device of the present invention may be made and used by or for the Government of the United States of America for governmental purposes without payment of royalties thereon or thereof.

What is claimed and desired to be secured by Letters Patent is:

1. A parachute comprising, in combination, a circumferential tape member forming the peripheral edge thereof, a plurality of ribbons having their ends secured to said tape member at uniformly spaced and diametrically opposite points thereon, each of said ribbons having a loop formed at one end thereof and extending a distance beyond the tape member, and a plurality of shroud lines respectively attached to said loops.

2. A parachute having a canopy comprising, in combination, a circumferential tape member forming the peripheral edge of said canopy, a plurality of ribbons secured in spaced relation to each other at their opposite ends to said circumferential tape member at diametrically opposite points thereon, a plurality of circular spacing tapes of different diameters attached to said ribbons for maintaining the ribbons in predetermined spaced relation while the parachute is in descent, and a plurality of shroud lines respectively secured to one end of each of said ribbons and adjacent said circumferential tape member.

3. A canopy for a parachute comprising, in combination, a circumferential tape member, a plurality of ribbons having their end portions attached to said tape member in predetermined spaced relation with respect to each other, and means for securing all of said ribbons at the point of their mutual intersection thereby to provide a progressive increase in porosity of the canopy from the crown portion thereof to the circumferential tape member.

4. A canopy for a parachute comprising, in combination, a circumferential tape member forming the peripheral edge of said canopy, a plurality of ribbons having their end portions secured to said tape member at regular intervals therealong, means for securing all of said ribbons together at their mutual point of intersection at the crown portion of said canopy, and a plurality of hoops composed of fabric material and of different diameters attached to said ribbons for maintaining the ribbons in predetermined spaced relation while the parachute is in descent.

5. A canopy for a parachute comprising, in combination, a circumferential tape member and a plurality of ribbon devices, each of said devices having the ends thereof secured to said tape member at intervals therealong and forming said canopy.

6. A canopy for a parachute comprising, in combination, a circular crown portion composed of fabric material, a plurality of ribbons, each of said ribbons being secured at one end thereof to said crown portion, a circular tape secured at intervals therealong to the other ends of said ribbons thereby to form a skirt for said parachute of progressively increasing porosity from said crown portion to said tape, and means on said ribbons for securing a plurality of shroud lines thereto.

7. In a parachute of the class described, a crown portion of low porosity, a hem, a skirt portion comprising a plurality of ribbons secured to said hem to intervals and at said crown portion, and a plurality of hoops composed of fabric material stitched to said ribbons intermediate said hem and crown portion for maintaining the ribbons in predetermined spaced relation whereby the porosity of the skirt is progressively decreased from the hem to said crown portion during the descent of the parachute.

8. A canopy for a parachute comprising, in combination, a circumferential tape member, and a plurality of ribbon devices, each of said devices having the ends thereof respectively secured to

said tape at diametrically opposite points thereon to form said canopy.

9. A canopy for a parachute comprising, in combination, a circumferential tape member, and a plurality of ribbon devices, each of said devices having the ends thereof secured at diametrically opposite points to said tape, said devices being spaced from each other at the tape.

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The following references are of record in the file of this patent:

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