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S. SWITLIK

2,367,244

PARACHUTE CANOPY

Filed Feb. 8, 1944

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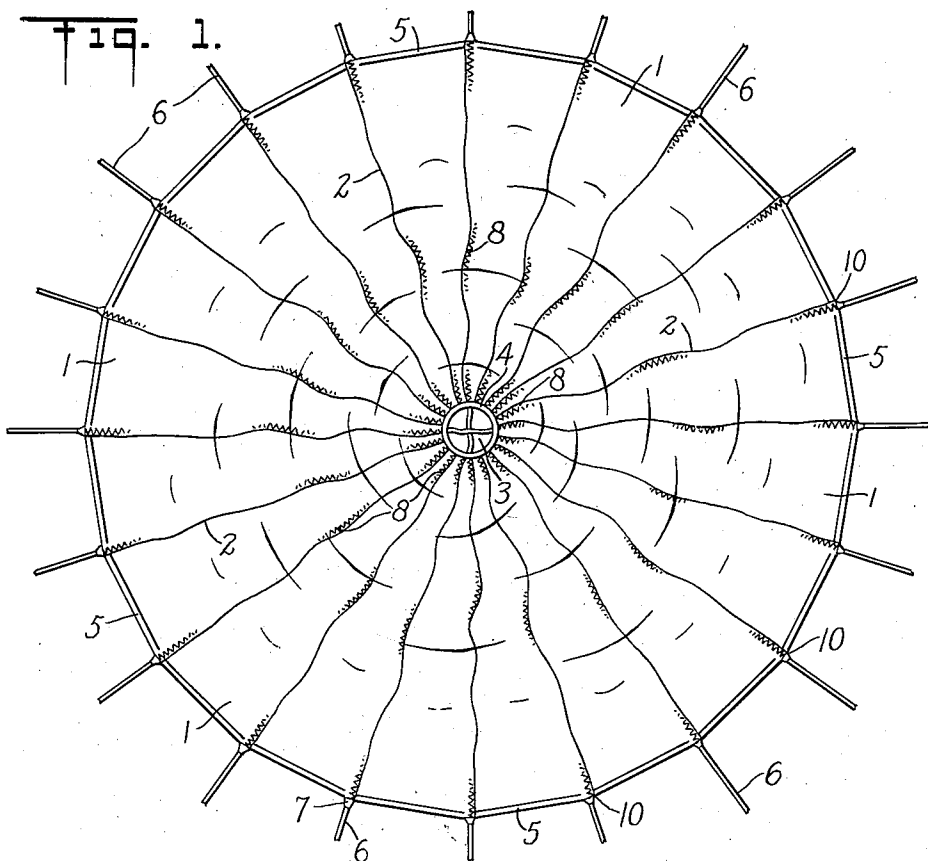
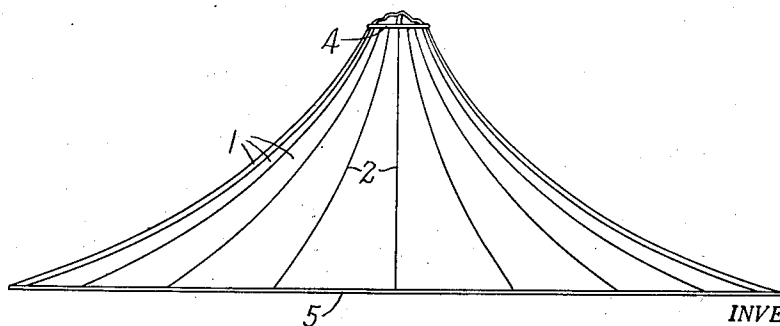


Fig. 2.



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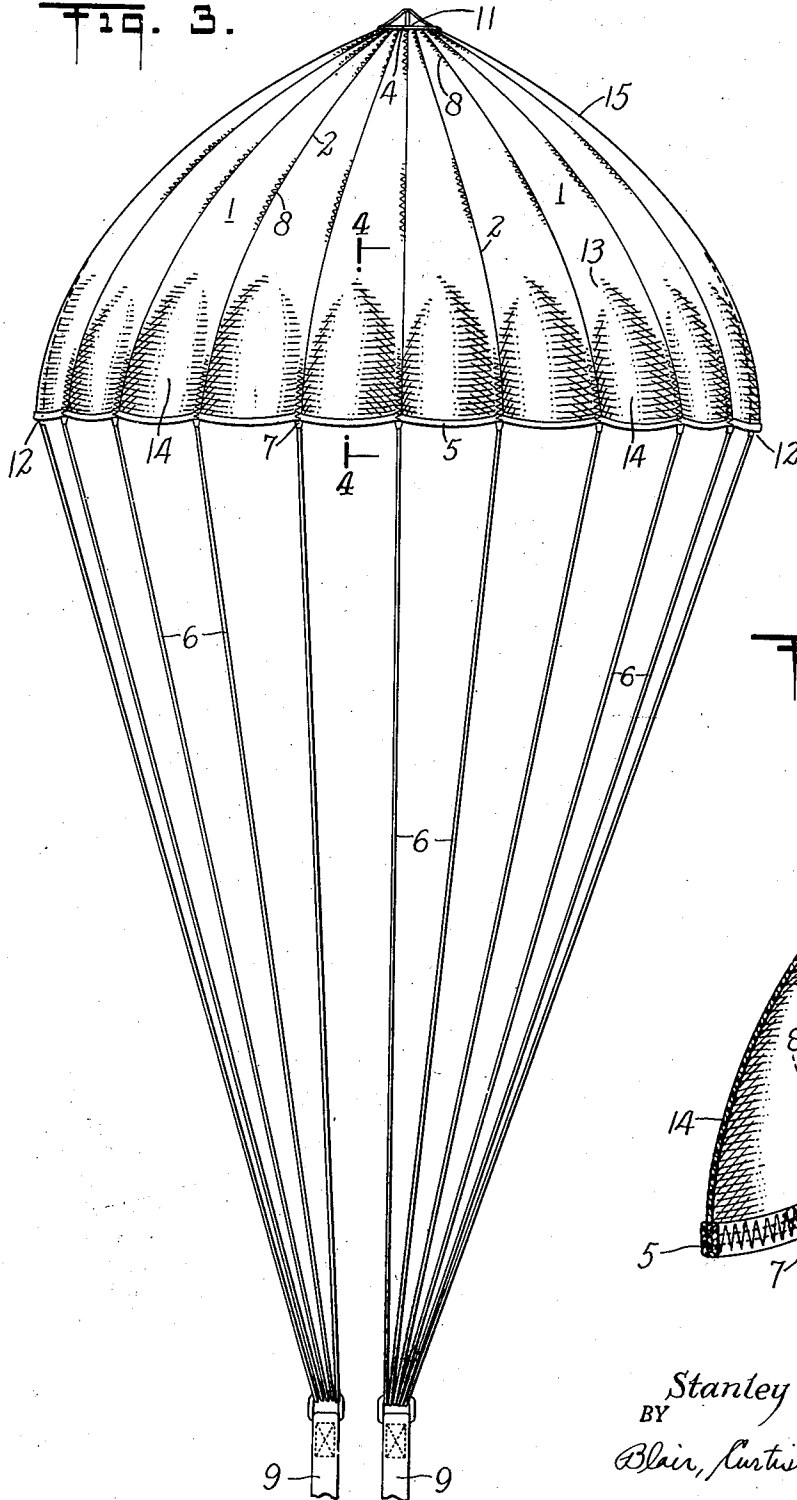
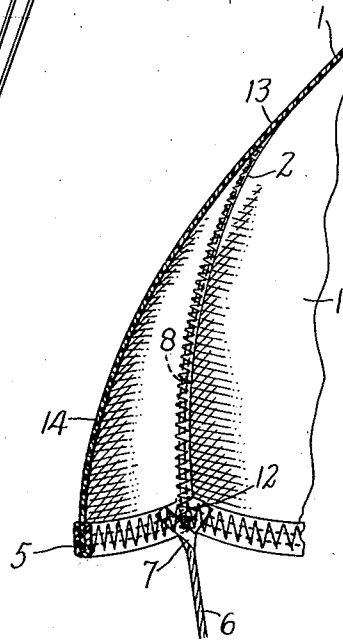


Fig. 4.



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PARACHUTE CANOPY

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Application February 8, 1944, Serial No. 521,521

8 Claims. (Cl. 244-145)

This application is a continuation in part of my application Serial No. 385,293, filed March 26, 1941.

The invention relates to a parachute canopy.

An object of the invention is to produce a canopy which is so constructed that when it is inflated in use to retard the falling of the load, whether the parachute be for personnel or cargo use, the incidental oscillations are of low magnitude.

A further object of the invention is to produce a parachute canopy which will quickly inflate in use, which is susceptible of steering without detrimental partial collapse, and which will, per unit area, have a greater retardation effect on a given load than the standard personnel canopies in use today.

A further object of the invention resides in so constructing the canopy that in use the air currents to which the canopy is subjected during descent will be so directed and dissipated that a great stability is attained, and so that the shock of opening will be relatively small.

With these and other objects in view, which will appear as the description progresses, the invention resides in the combination and arrangement of parts set forth in the claims:

In the drawings I have shown an embodiment of my invention wherein:

Figure 1 is a top plan view showing the outline of the canopy skirt when the skirt is completely extended to its full diameter on a flat surface and when the canopy is not in use;

Figure 2 is a diagrammatic side elevation showing the position that the canopy will assume when its peak is lifted while the skirt remains completely extended to its full diameter on a flat surface, and when the canopy is not in use;

Figure 3 is a side elevation of the canopy inflated in use while it is retarding the fall of the load, the suspension lines and harness being indicated; and

Figure 4 is a sectional view showing the form of the scallops that form around the skirt of the canopy when the parachute is in use.

In Figure 1 the canopy is illustrated as being formed of a plurality of substantially triangular panels 1, which are secured together at 2 along the long edges of the panels by any of the well known, suitable and acceptable seams. The panels terminate, preferably, at their apices in spaced relation to each other, leaving a vent opening 3, which ultimately lies at the top of the canopy. The edge of this vent opening is provided with a reinforcement 4, of flexible material

such as a binding tape, secured in any well known, suitable and acceptable manner to the panel apices so that the vent opening is free to distort during the use of the canopy. The edge of the skirt of the canopy is preferably reinforced by tape at 5 and by the commonly used reinforcing stitching.

Suspension lines 6 extend within or along each of the seams 2 as at 8, and are securely attached to, or closely adjacent to, the edge of the skirt of the canopy as at 7, and fixedly to the canopy as by stitching, for instance, between the point of securement 7 and the vent 3.

The portion 6 of each suspension line may be of the presently accepted braided form and the portion 8 may be an integral extension of the portion 6, or the portion 8 may be of a non-stretchable tape form attached to the portion 6 either directly or through the canopy.

These suspension lines 6-8 terminate, as suspension lines, short of the vent 3. However, certain of the lines may extend across the vent loosely for the attachment of the pilot parachute (as shown in dotted lines), but these loose portions do not act as suspension lines because of their looseness, and, indeed, they may be dispensed with and the pilot parachute attached to separate lines that are secured to the edge 4 of the vent and loosely bridge the vent.

The suspension lines may be brought together in two groups in the usual manner and attached to the lift webs 9 of the harness.

When the canopy is spread out to its full diameter on a flat surface, such as the floor, for instance, the edge of the canopy skirt will form substantially a circle, or more accurately perhaps, the edge of the skirt will form a polysided figure which may be circumscribed by a circle that touches the intersections 10 of the bases of the panels.

In the illustrated embodiment the combined lengths of each of two opposite panels, plus the diameter of the vent, is greater than the diameter of the above referred to circle when the skirt rests upon a flat surface, has its diameter completely extended, and is not in use. Or, otherwise stated, a line drawn along the altitudes of two opposite panels from one point on the edge of the skirt to the diametrically opposite point on the edge of the skirt is longer than the diameter of the above referred to circle when the skirt rests upon a flat surface, has its diameter completely extended and is not in use, whether or not the vent be at the apex of the canopy. Because of this relationship the material of the

canopy within the perimeter of the skirt, when the latter is extended as above described, will lie in folds upon the supporting surface, as indicated in Figure 1, so that the peak of the canopy may be drawn upwardly into such a position as shown in Figure 2, while the diameter of the skirt remains the same as when the canopy is in the condition illustrated in Figure 1 and described in connection therewith.

When the canopy is inflated, in use, and is suspending a falling body, it takes substantially the form illustrated in Figure 3 of the drawings, the outline of which is defined by a curve from the skirt to the peak, which, while not strictly an inverted catenary curve, may be defined as substantially a catenary curve with a rising peak 11 midway between its ends.

The weight of the load and the retardation effect of the air pressure on the canopy causes the suspension lines to draw the edge of the skirt inwardly at the seams as indicated at 12, and this drawing effect extends upwardly from the edge of the skirt part way, though not all of the way, to the peak, as, for instance, to a point 13.

Because of this inward drawing of spaced portions of the edge of the skirt, the edge of each of the panels between the suspension lines scallops outwardly as at 14. These scallops 14 are curved in cross section and gradually decrease in depth and width from the edge of the skirt upwardly toward the peak of the canopy, each terminating substantially at the point 13, which is far closer to the edge of the skirt than to the peak of the canopy, leaving a relatively smooth inside and outside surface of the area 15 between the ends of the scallops and the vent throughout the periphery of the canopy.

I have found in actual practice that when the combined lengths of opposite panels, plus the diameter of the vent when the latter is used, is substantially two and one half to three times the radius of the circle to which I have referred, all of the advantages and objects of the invention which have been above pointed out are attained, but this definite relationship is not critical since there may be a variation of the relationship so long as the broad principle which I have enunciated above is maintained, and therefore I merely give these proportions as illustrative of one embodiment of the invention and not by way of limitation.

What I claim is:

1. A parachute assembly including a canopy consisting of a plurality of substantially triangular panels seamed together along their longitudinal edges to form a substantially circular skirt and terminating in spaced relation at their upper ends to form a vent, the combined altitudes of opposite triangles plus the diameter of the vent being greater than the diameter of the skirt when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at and above the skirt and at the seams between the panels and terminating, as suspension lines, short of the vent whereby when the canopy is inflated in use its outline is defined by rising curves that intersect to form a pointed peak at the top of the canopy, the upper portion of the canopy is smooth from the peak toward the skirt and the skirt is provided with scallops that decrease in depth toward and merge with the smooth portion.

2. A parachute assembly including a canopy consisting of a plurality of substantially triangu-

lar panels seamed together along their longitudinal edges to form a substantially circular skirt, the length of a line drawn along the altitudes of two opposite panels from one point at the edge of the skirt to a diametrically opposite point at the edge of the skirt being greater than the diameter of the skirt of the canopy when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at the skirt and along the seams and terminating, as suspension lines, short of the peak of the canopy whereby when the canopy is inflated in use its outline is defined by rising curves that intersect to form a pointed peak at the top of the canopy, the upper portion of the canopy is smooth from the peak toward the skirt and the skirt is provided with scallops that decrease in depth toward and merge with the smooth portion.

3. A parachute assembly including a canopy consisting of a plurality of substantially triangular panels seamed together along their longitudinal edges to form a substantially circular skirt, the length of a line drawn along the altitudes of two opposite panels from one point at the edge of the skirt to a diametrically opposite point at the edge of the skirt being two to three times greater than the radius of the skirt of the canopy when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at the skirt and along the seams and terminating, as suspension lines, short of the peak of the canopy whereby when the canopy is inflated in use its outline is defined by rising curves that intersect to form a pointed peak at the top of the canopy, the upper portion of the canopy is smooth from the peak toward the skirt and the skirt is provided with scallops that decrease in depth toward and merge with the smooth portion.

4. A parachute assembly including a canopy consisting of a plurality of substantially triangular panels seamed together along their longitudinal edges to form a substantially circular skirt, the length of a line drawn along the altitudes of two opposite panels from one point at the edge of the skirt to a diametrically opposite point at the edge of the skirt being greater than the diameter of the skirt of the canopy when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at the skirt and along the seams and terminating, as suspension lines, short of the peak of the canopy whereby when the canopy is inflated in use its outline is defined by an inverted substantially catenary curve pointed at its middle, the upper portion of the canopy is smooth from the peak toward the skirt and the skirt is provided with scallops that decrease in depth toward and merge with the smooth portion.

5. A parachute assembly including a canopy consisting of a plurality of substantially triangular panels seamed together along their longitudinal edges to form a substantially circular skirt, the length of a line drawn along the altitudes of two opposite panels from one point at the edge of the skirt to a diametrically opposite point at the edge of the skirt being two to three times greater than the radius of the skirt of the canopy when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at the skirt and along the seams and terminating, as suspension lines, short of the peak of the canopy whereby when the canopy is inflated in use its outline is defined by an inverted substantially catenary curve pointed

at its middle, the upper portion of the canopy is smooth from the peak toward the skirt and the skirt is provided with scallops that decrease in depth toward and merge with the smooth portion.

6. A parachute assembly including a canopy 5 consisting of a plurality of substantially triangular panels seamed together along their longitudinal edges to form a substantially circular skirt, the length of a line drawn along the altitudes of two opposite panels from one point at the edge of the skirt to a diametrically opposite point at the edge of the skirt being greater than the diameter of the skirt of the canopy when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at the skirt and along the seams and terminating, as suspension lines, short of the peak of the canopy whereby when the canopy is inflated in use its outline is defined by rising curves that intersect to form a pointed peak at the top of the canopy, said canopy having when inflated scallops that decrease in depth from the skirt toward the peak.

7. A parachute assembly including a canopy consisting of a plurality of substantially triangular panels seamed together along their longitudinal edges to form a substantially circular skirt, the length of a line drawn along the altitudes of two opposite panels from one point at

the edge of the skirt to a diametrically opposite point at the edge of the skirt being greater than the diameter of the skirt of the canopy when the canopy is extended to its fullest extent but uninflated, load suspension lines attached to the canopy at the skirt and along the seams and terminating, as suspension lines, short of the peak of the canopy whereby when the canopy is inflated in use its outline is defined by an inverted substantially catenary curve pointed at its middle, the canopy when inflated having scallops that decrease in depth from the skirt toward the peak.

8. A parachute canopy comprising a plurality of elongated trapezoidal panels joined along their longitudinal edges to form a polysided skirt at the bottom and a vent at the top, the sum of the altitudes of opposite panels plus the diameter of the vent being greater than the diameter of a circle circumscribing the skirt when the uninflated canopy is extended to its fullest extent in a single plane, suspension lines attached to said canopy adjacent the seams thereof respectively but terminating short of said vent whereby when the canopy is inflated in use its upper portion rises to a well-defined peak at said vent, and means at the top of said canopy adjacent said vent to form an attachment for a pilot parachute.

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