April 20, 1943. F. SMITH 2,316,895

PARACHUTE AND PARACHUTE PACK

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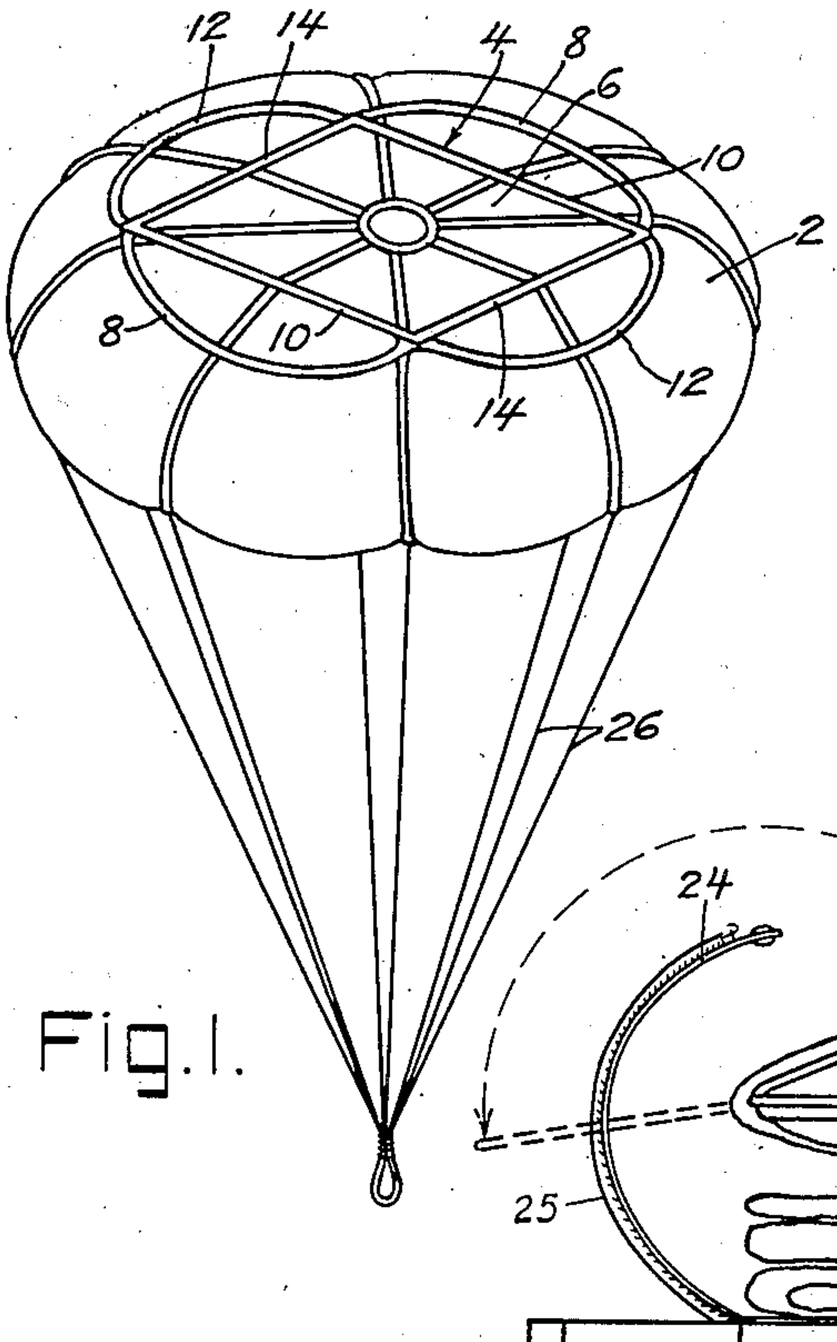

Fig. 1.

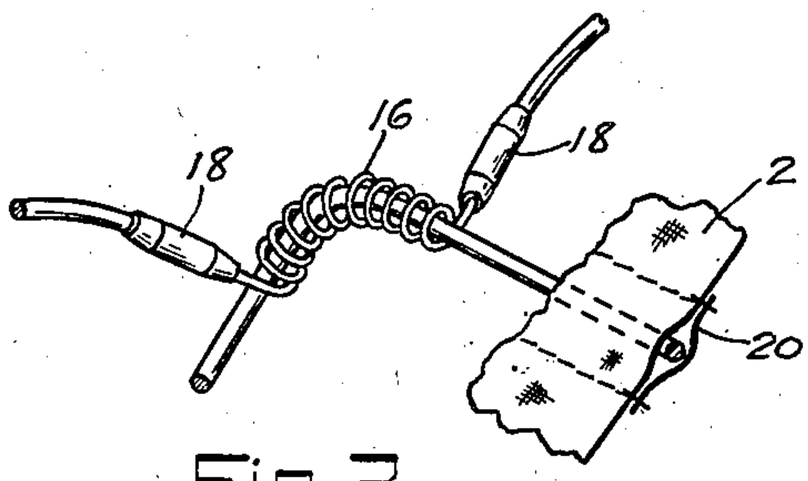

Fig. 3.

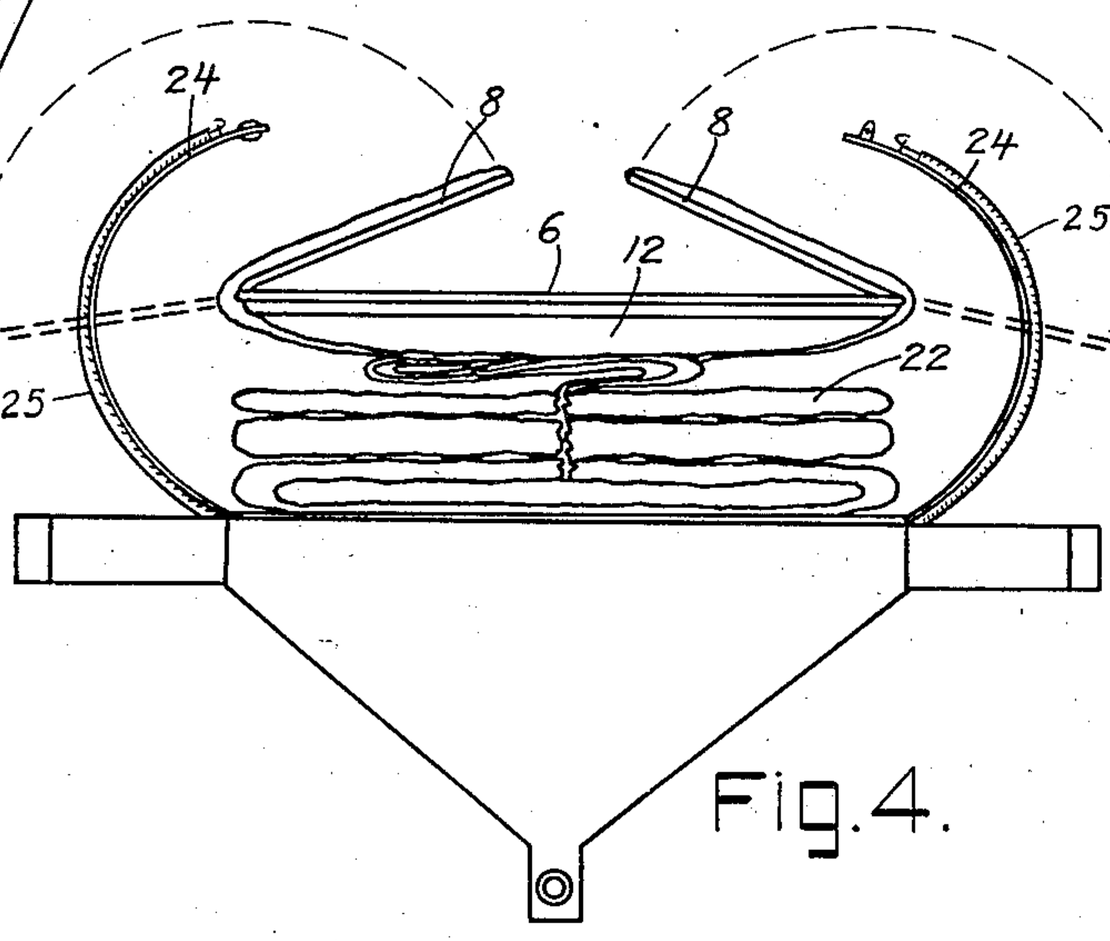

Fig. 4.

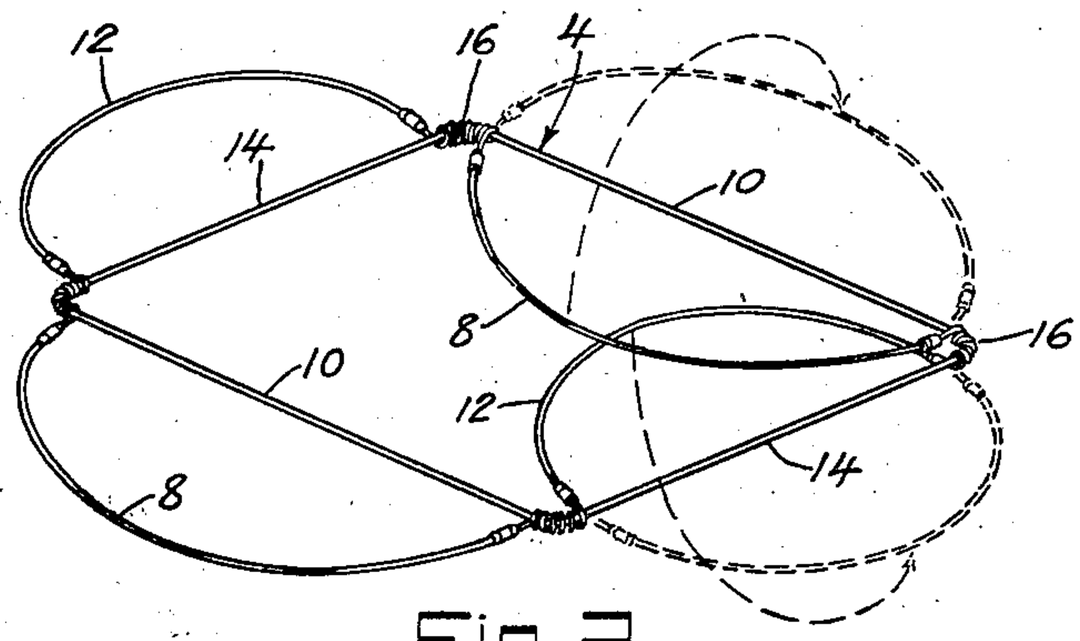

Fig. 2.

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PARACHUTE AND PARACHUTE PACK

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22 Claims. (Cl. 244—148)

My invention relates to parachutes and parachute packs and particularly to constructions which insure rapid opening of a parachute pack and prevent or reduce faulty opening of the pilot chute or main canopy of a parachute.

In order to cause the canopy of a parachute to be drawn out from the pack in which it is folded before use, it is usual to provide a pilot chute in the form of a small parachute attached to the peak of the main canopy and arranged to be exposed immediately on opening the pack. The pilot chute is thus quickly caught by the air currents and retarded while the user carrying the pack continues to fall causing the folds of the main canopy to be drawn out to a position in which they in turn will be caught by the air currents so that the parachute will open.

The pilot chutes most commonly used heretofore have had a wire frame provided with ribs, similar to those of an umbrella, and spring means which urge the ribs outward to positions in which they extend radially from the peak of the pilot chute canopy. In order to enclose the pilot chute within the pack it is collapsed, just as an umbrella is folded, against the action of the spring means and is placed upon the top of the folds of the main canopy. Thereafter the flaps of the pack which enclose the main canopy and pilot chute are folded over and held in place by means releasable by a "rip cord." Heavy rubber bands are attached to the pack flaps and placed under tension in folding the pack so that on release the bands draw the flaps open quickly to expose the pilot chute and main canopy.

This type of pilot chute does not always operate satisfactorily for the reason that the ribs of the frame sometimes puncture the main canopy or become tangled in or covered by the folds thereof. In such cases the pilot chute may not open at all or it may prevent or retard opening of the main canopy. If the frame is bent after the pack is folded or during the packing operations the movable parts may jam so that the pilot chute will fail to open or will open only slowly. Moreover when the pack flaps are released and the pilot chute frame springs open from its collapsed position the ribs in opening out radially throw the pilot chute outward in a "somersault" fashion. This somersaulting of the pilot chute frequently causes the shroud lines of the pilot chute to become tangled with the frame and to extend over the pilot chute canopy or to be so tangled with the folds of the main canopy of the parachute as to delay opening thereof.

Those pilot chutes of the prior art which have no frame and no means to hold or force the canopy thereof open are unsatisfactory because they are slow to open and often are blanketed from the air currents by the main canopy as it falls from the opened pack.

In other prior constructions the pilot chute has served as the cover of the parachute pack and has been caused to spring outward from the pack upon the release thereof. However such pilot chutes have necessarily been formed of canvas or other material which is strong enough to confine the parachute and heavy enough to resist wear. For this reason pilot chutes which serve as a cover or are not enclosed within the parachute pack have been so heavy that they function very poorly.

In order to overcome these objections to constructions of the prior art I have invented a new type of pilot chute which is adapted to be enclosed within a parachute pack but which is maintained at all times with at least a portion of its canopy extended to be caught by air currents and drawn away from the user as soon as the pack is opened. Furthermore, the frame of the pilot chute is so formed that there are no sharp ribs or parts to puncture or become entangled in the main canopy while the form and extended area of the pilot chute canopy prevent it from slipping under or being covered by the folds of the main canopy.

Constructions embodying my invention preferably also include means for throwing open the flaps of the pack in which the parachute is confined so as to assist or replace the heavy rubber bands heretofore provided for this purpose and also may include means for projecting the pilot chute from the pack in such a manner that it will emerge in substantially a straight line or at least without such a somersault action as to cause the shroud lines thereof to extend over its canopy or become fouled with the frame or tangled with each other.

One of the objects of my invention is to eliminate or reduce the danger of fouling of the shroud lines of a pilot chute.

A further object of my invention is to provide a novel type of pilot chute adapted to be enclosed within a parachute pack while having a portion of the canopy thereof always maintained in an extended position.

Another object of my invention is to insure rapid and effective separation of a pilot chute from a parachute pack.

Another object of my invention is to provide a

parachute pack with novel means for throwing open the flaps of the pack.

A further object of my invention is to provide a pilot chute with novel means for projecting the pilot chute from a parachute pack when the pack is opened.

These and other objects and features of my invention will appear from the following description thereof in which reference is made to the figures of the accompanying drawing.

In the drawing:

Fig. 1 is a perspective of a typical form of pilot chute embodying my invention as it appears when fully opened.

Fig. 2 is a perspective of the form of frame embodied in the parachute in Fig. 1.

Fig. 3 is a perspective on an enlarged scale showing a portion of the construction illustrated in Fig. 2, and

Fig. 4 is a side elevation of a partially closed parachute pack with a pilot chute of the type illustrated in Fig. 1 contained therein.

In that form of my invention illustrated in the drawing the pilot chute has a canopy 2 provided with a stiff rectangular frame 4 which serves to maintain the central portion 6 of the canopy continuously extended. Foldable wings 8 project from the sides 10 of the frame and are adapted to be folded upward and inward onto the top of the portion 6 of the canopy so that they will lie in the position indicated in Fig. 2. Other foldable wings 12 project from the ends 14 of the frame 4 and are adapted to be folded down and inward so as to lie beneath the portion 6 of the canopy when the pilot chute is folded.

The foldable wings 8 and 12 are urged outward to the positions indicated in Fig. 1 by suitable means such as springs 16 which are coiled about the frame 4 and have the ends of the wing frames secured thereto by coupling members 18 or the like. The frame is secured to the fabric of the canopy by tape 20 or other fastening means which preferably cover the frame completely so that none of its parts are exposed to engage the main canopy of the parachute or the folds of the pilot chute.

The tape 20 is secured to the fabric of the canopy by stitching along its edges as shown in Fig. 3. By covering the entire frame and the frame elements of the foldable wings as well as the springs which urge the wings toward their extended positions the metal members are firmly held in place with respect to the canopy and the tape serves to reinforce the frame and to resist against distortion or bending of the frame so that relatively thin light weight parts may be used.

In enclosing the pilot chute in a parachute pack the wings 8 are folded inward and over the center portion 6 of the canopy as shown in Fig. 4 while the wings 12 are folded inward beneath the frame and center portion of the pilot chute canopy. Thereafter the pilot chute is placed on the top of the folded main parachute canopy 22 and the flaps 24 of the pack are folded over the collapsed pilot chute and secured in place.

When the parachute is used the flaps 24 of the pack are released by the usual "rip cord." When elastic bands 25 are used these draw the flaps away from the pilot chute and main canopy so that they may be exposed to the air currents quickly. These elastic bands are secured on the outside of the cover as is well known in the prior art. This opening of the pack is facilitated by the upper wings 8 which open outward under the action of the springs 16 as shown in Fig. 4, and if desired the springs 16 may be relied upon entirely to throw open the pack flaps so that even if no elastic bands are used or if they are weak, broken or disconnected from the pack flaps the flaps will be thrown open to discharge the parachute.

The lower inwardly turned wings 12 of the pilot chute operate independently of the wings 8 and serve to project the pilot chute from the pack so that it will be caught by the air stream immediately and thereby draw the main canopy quickly from the pack into a position in which it will open readily and properly. Since the wings 12 act simultaneously and are located at opposite ends of the frame the pilot chute emerges outward from the pack in substantially a straight line or at least without any such somersault motion that fouling of the shroud lines 26 over the canopy is likely to occur.

The action of the pilot chute in drawing out the main canopy of the parachute is assured under all conditions of operation by reason of the large area of the pilot chute canopy continuously maintained in an extended position. Thus when exposed to the air stream the pilot chute will in all cases be retarded so as to act as an "air anchor" even though the foldable wings should fail to open or are omitted from the construction altogether.

The rectangular shape of the frame 4 illustrated is such as to provide a relatively strong top for the folded main canopy and one which can be forced down bodily thus rendering packing of the parachute much easier than heretofore and serving to strengthen the pack and protect the folded parachute therein. However, the shape of the frame may be varied considerably to conform to the shape of any desired pack or to improve the functioning of the pilot chute or main canopy. Furthermore while the use of both the side wings 8 and the end wings 12 is preferred either or both sets of wings may be omitted or either or both sets may be folded over on top of the frame and the center portion 6 of the pilot chute canopy or may be folded inward beneath the frame and canopy as desired. Any number, size and shape of foldable wings may be used and the means employed to actuate the same are capable of innumerable modifications. Furthermore, the manner of attaching the pilot chute to the main canopy and the form and shape of the pilot chute canopy may be varied as desired. In view thereof it should be understood that the particular form of my invention shown in the drawing and described above is intended to be illustrative of my invention and is not intended to limit the scope thereof.

I claim:

1. A parachute pack comprising a main parachute, a pilot chute connected to said main parachute and having a frame of substantially the same size and shape as the outline of the pack and serving to maintain a portion of the canopy of the pilot chute extended at all times and a flexible enclosure for said main parachute and pilot chute, said enclosure having a part thereof movable to release the pilot chute and main parachute, said main parachute and pilot chute being arranged within said enclosure with the extended portion of said pilot chute on top of the folds of the main parachute and adjacent the movable part of said enclosure and with said frame extending about the edges of the pack within the enclosure to preserve the shape of the pack.

2. A pilot chute having a canopy and a frame for the canopy so formed and connected thereto as to maintain a portion thereof extended at all times, a plurality of wings each having a frame element extending substantially the full width thereof and movably connected at its opposite ends to said frame to move other portions of said canopy to extended positions and spring means for urging said wings toward their extended positions.

3. A pilot chute comprising a canopy having a rigid frame connected thereto and serving to maintain the central portion of said canopy extended and a plurality of movable wings each having an arcuate frame element pivotally connected at its opposite ends to said frame for movement to positions in which they extend other portions of said canopy, said wings being movable into positions in which they overlie the central portion of the canopy and means for urging said wings toward their extended positions.

4. A pilot chute comprising a canopy having a polygonal rigid frame connected thereto and serving to maintain the central portion of said canopy extended and a movable wing pivotally connected to each side of said frame for movement to a position in which it extends another portion of said canopy, said wings each having a frame element extending substantially the full width thereof and pivotally connected at its opposite ends to said frame for movement into position in which it overlaps the central portion of the canopy, and means for urging said wings toward their extended positions.

5. A pilot chute comprising a canopy, a frame connected to said canopy and serving to maintain the central portion thereof extended, a plurality of wings pivotally connected to said frame and movable to positions in which they extend other portions of the canopy, certain of said wings being movable into positions in which they overlie the central portion of said canopy, and others of said wings being movable into positions in which they lie beneath the central portion of said canopy, and springs connected to said wings and frame and arranged to urge the wings which overlie the central portion of the canopy in directions upward and outward to extended positions and to urge the wings which lie beneath the central portion of the canopy in directions downward and outward to extended positions.

6. A parachute pack comprising a main parachute folded into a generally rectangular form, a pilot chute connected to the main parachute and having a rigid frame corresponding in size and shape of outline to the general outlines of the folded main parachute, said pilot chute being located within the pack and on top of the main parachute, and a flexible cover for said pack extending about the main parachute and pilot chute and supported by the frame of the pilot chute whereby the generally rectangular shape of the pack is preserved in use.

7. A pilot chute comprising a canopy, a frame of generally rectangular form connected to said canopy and serving to maintain the central portion thereof extended, a pair of wings one of which is pivotally connected to each of two opposite sides of said frame and foldable into positions in which they overlie the central portions of said canopy, a second pair of wings one of which is pivotally connected to each of the two remaining sides of said frame and foldable into positions in which they lie beneath the central portion of said canopy and means connected to said wings normally urging the first mentioned pair of wings upward and outward from the central portion of the canopy into positions in which they extend outward therefrom and urge the second mentioned pair of wings downward and outward from the central portion of said canopy into extended portions.

8. A parachute pack comprising a main parachute, a pilot chute connected to said main parachute and having a frame of substantially the same size and shape in outline as the pack and serving to maintain a portion of the canopy of the pilot chute extended at all times, a flexible enclosure for said main parachute and pilot chute, said enclosure having a portion thereof movable to expose the pilot chute for release thereof, said main parachute and pilot chute being arranged within said closure with the pilot chute adjacent the movable portion of the enclosure and with said frame extending about the edges of the pack beneath said movable portion to preserve the shape of the pack.

9. A pilot chute having a canopy with a frame connected thereto and serving to maintain the central portion of the canopy extended at all times, said frame being in the form of a polygon, wings extending from each side of the polygon and having frame elements pivotally connected at the opposite ends thereof to the polygonal frame adjacent the ends of each side of the frame, and spring means urging said frame elements and wings to extended positions.

10. A pilot chute having a canopy with a frame connected thereto and serving to maintain the central portion of the canopy extended at all times, said frame being in the form of a polygon, wings extending from each side of the polygon and having frame elements pivotally connected at the opposite ends thereof to the polygonal frame adjacent the ends of each side of the frame, and spring means coiled about said frame and having the opposite ends thereof connected to the frame elements of adjacent wings to urge adjacent frame elements and wings in opposite directions toward extended positions.

11. A pilot chute having a canopy with a polygonal frame connected thereto and serving to maintain the central portion of the canopy extended at all times, frame elements for extending other portions of the canopy and springs coiled about the frame at the corners of the frame, the opposite ends of the springs being connected to different frame elements whereby said elements are urged in opposite directions toward extended positions.

12. A pilot chute comprising a canopy, a frame connected to the canopy and serving to maintain the central portion of the canopy extended at all times, a spring coiled about said frame and two additional frame elements pivotally movable with respect to said frame to extend other portions of the canopy and connected to the opposite ends of said spring whereby said additional frame elements are foldable in opposite directions into position in which one element overlies the central portion of the canopy and the other element lies beneath the central portion of the canopy and both elements are urged in opposite directions toward extended positions.

13. A pilot chute comprising a canopy, a frame of generally rectangular form connected to said canopy and serving to maintain the central por-

tion of the canopy extended at all times, springs coiled about said frame at the corners thereof, and additional frame elements extending substantially the full length of each side of the frame and connected at opposite ends thereof to the springs at the corners of the frame whereby said adjacent frame elements are urged in opposite directions toward extended positions but are pivotally movable with respect to said frame and against the action of said springs into positions overlapping the central portion of the canopy.

14. A pilot chute embodying a rectangular frame together with two arcuate frame elements one of which is pivotally connected at both ends to a different one of two opposite edges of the rectangular frame.

15. A pilot chute embodying a rectangular frame together with four arcuate frame elements each of which is pivotally connected at both ends to a different edge of the rectangular frame.

16. A pilot chute embodying a rectangular frame together with arcuate frame elements each of which is pivotally connected at both ends to a different one of two opposite edges of the rectangular frame with the ends of said elements located adjacent the corners of the frame.

17. A pilot chute comprising a rectangular frame together with four arcuate frame elements each of which is pivotally connected to a different edge of the rectangular frame, and spring means connected to adjacent frame elements for urging them toward extended positions.

18. A pilot chute embodying a rectangular frame with arcuate frame elements pivotally connected to each edge of the frame and springs coiled about said frame and having the opposite ends thereof connected to adjacent arcuate frame elements to urge them in opposite directions toward extended positions.

19. A pilot chute comprising a rectangular frame with a supplemental frame element pivotally connected to each edge thereof and spring means connected to said supplemental frame elements for urging them to extended positions, said spring means serving to swing one frame element upward from a plane including said rectangular frame and about the edge to which it is connected and to swing an adjacent frame element from said plane and downward about the edge to which it is connected.

20. A pilot chute comprising a rectangular frame with a frame element pivotally connected to each edge thereof and oppositely directed spring means carried by said frame and connected to adjacent frame elements for urging adjacent elements in opposite directions from a plane including the rectangular frame and about the edges to which they are connected to extended positions.

21. A pilot chute comprising a rectangular frame with a frame element pivotally connected to each edge thereof and a coil spring having the opposite ends thereof connected to adjacent frame elements for urging said elements in opposite directions.

22. A pilot chute comprising a rectangular frame with a supplemental frame element pivotally connected to each edge thereof, and spring means connected to said supplemental frame elements for swinging the frame elements adjacent opposite edges of the frame upward from a plane including said rectangular frame and to an extended position and for swinging the frame elements adjacent the other edges of the frame downward from said plane and to extended positions.

FLOYD SMITH.