

May 27, 1958

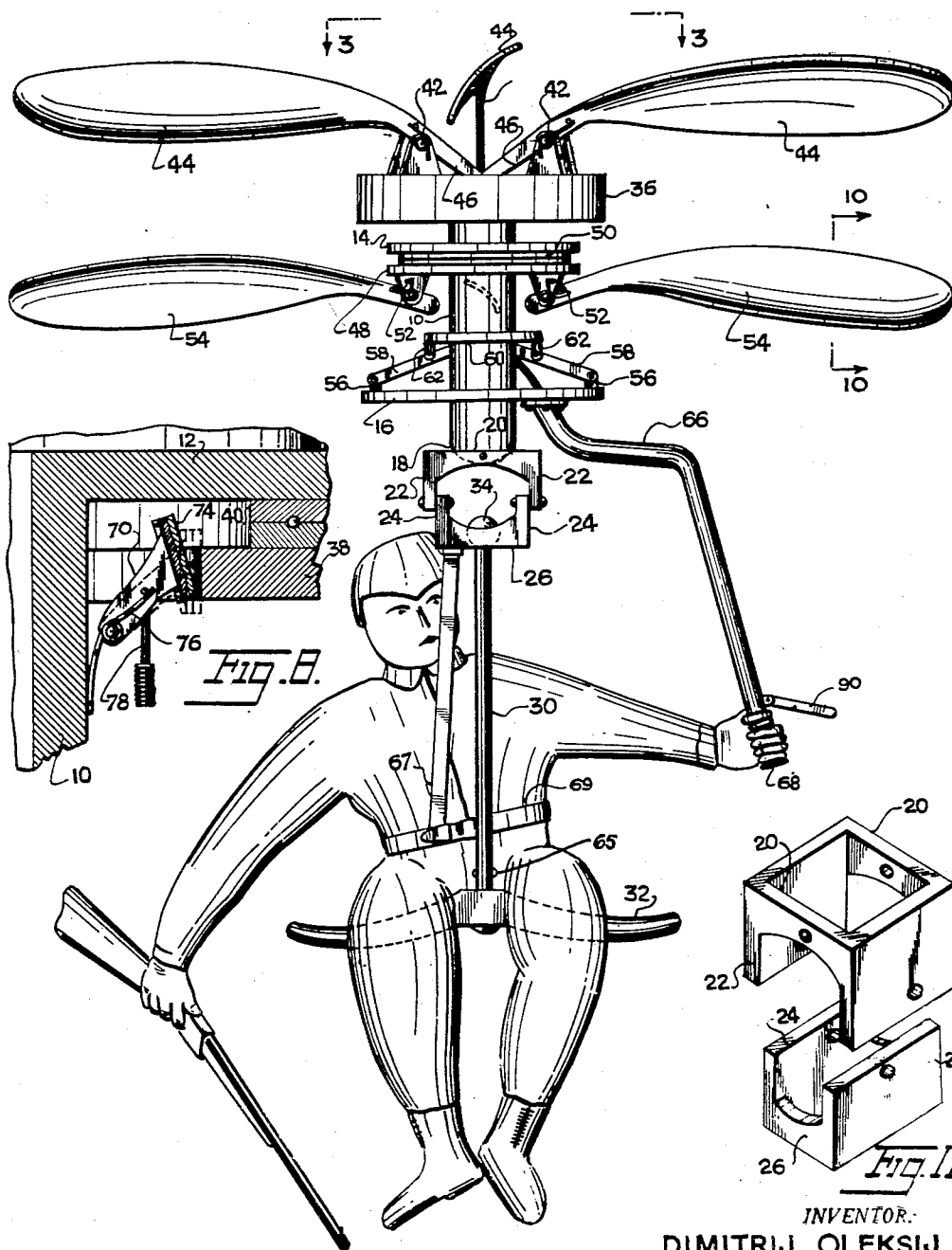
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2,836,383

DESCENDING PARACHUTE DEVICE

Filed Dec. 3, 1956

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

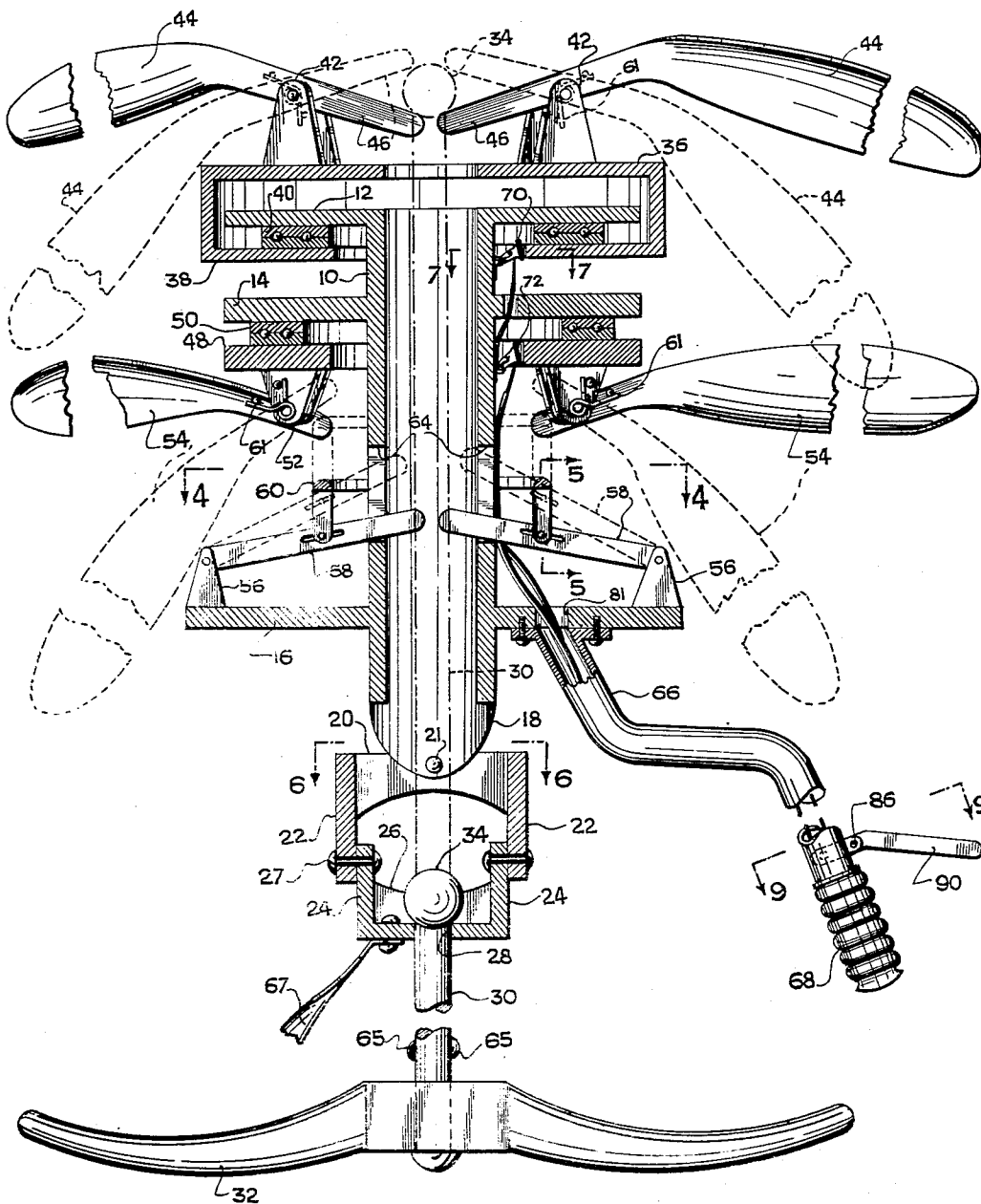


FIG. 2.

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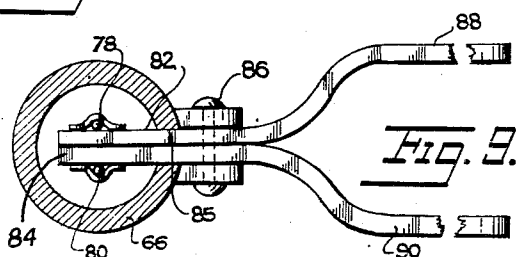
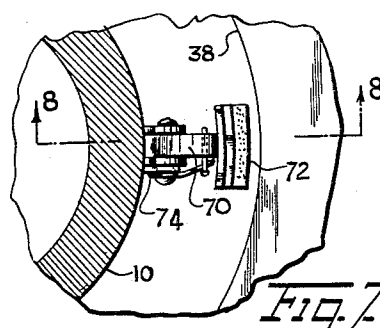
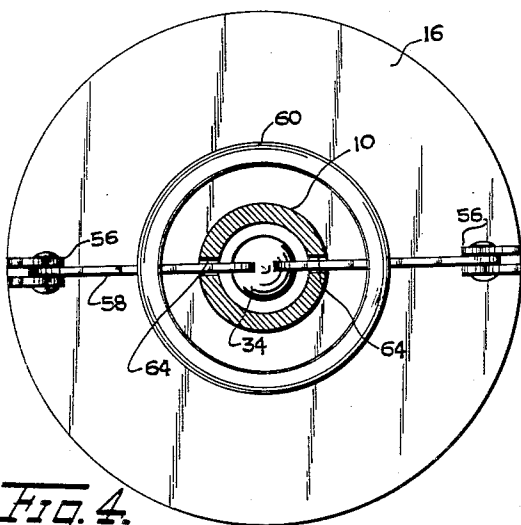
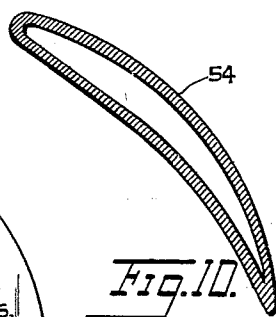
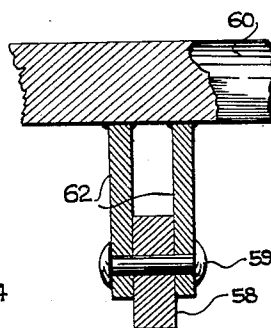
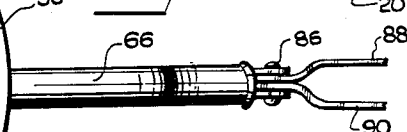
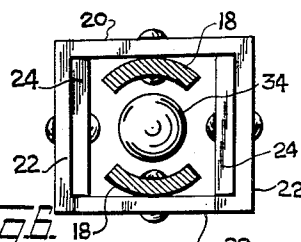
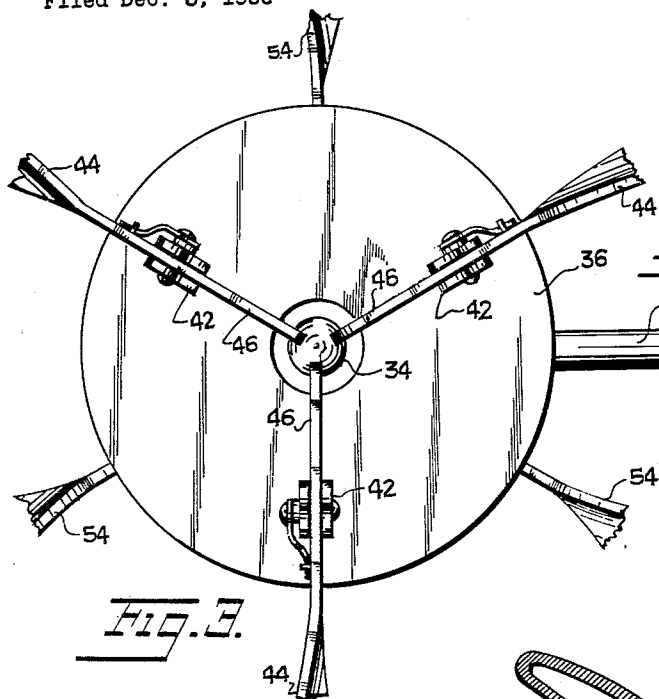
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3 Sheets-Sheet 3



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1

2,836,383

DESCENDING PARACHUTE DEVICE

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Application December 3, 1956, Serial No. 625,853

7 Claims. (Cl. 244—138)

This invention relates to a device for slowing one's descent toward the ground after jumping from an airplane, a high building, or the like.

Parachutes, commonly used for slowing one's descent, are usable only from aircraft, and require that the jump be made from a substantial height in order to allow time for the parachute to open, and gradually descend vertically, with only a small amount of control, at most, being possible so far as movement in a lateral direction is concerned. These are undesirable features of a conventional parachute, in view of the fact that when a parachute is used in military operations, one's inability to control the direction in which the parachute moves may result in his falling into enemy hands on landing. Further, the substantial distance from which one must jump gives the enemy ample time to observe the descent and as a result, many of the jumpers are often killed by enemy fire while still in the air.

The main object of the present invention is to provide a device for slowing one's descent that will have none of the disadvantages noted above, and hence will be far better suited for military operations than the conventional parachutes heretofore employed.

Another object is to provide a descent-slowng device that will be swiftly adjustable between operative and inoperative positions.

Another object is to cause the device, when it is adjusted to a fully inoperative position, to be collapsed into a compact article capable of being carried readily on one's back, without difficulty.

Another object is to provide a light, inexpensive device of the character described that will be at the same time fully efficient for its intended purposes.

Another object is to form the device in such a manner that as distinguished from conventional parachutes, it will be difficult to see when in the air, and will present a minimum target for enemy fire.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a front elevational view of a device according to the invention, as it appears when in use.

Fig. 2 is a longitudinal sectional view through the device on an enlarged scale, portions being broken away, the parts being shown in full lines in use position and in dotted lines in collapsed position.

Fig. 3 is a top plan view of the device.

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

Fig. 5 is a still further enlarged, detail sectional view on line 5—5 of Fig. 2.

Fig. 6 is a transverse sectional view on line 6—6 of Fig. 2.

Fig. 7 is a greatly enlarged detail sectional view of a brake means, taken substantially on line 7—7 of Fig. 2.

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Fig. 8 is a sectional view, the scale being enlarged over that of Fig. 7, substantially on line 8—8 of Fig. 7, the brake means being shown in full and dotted lines in released and applied positions respectively.

Fig. 9 is an enlarged, detail sectional view on line 9—9 of Fig. 2.

Fig. 10 is a greatly enlarged sectional view through one of the blades, on line 10—10 of Fig. 1.

Fig. 11 is an enlarged, exploded perspective view of a universal joint included in the device.

In its broadest aspects, the invention includes a stator on which the user is supported, and contrarotating rotors carried by the stator and including pivoted blades so pitched as to be caused to rotate as the device descends through the air, to slow the descent.

The stator includes a tube 10 formed open at its opposite ends and integral at its upper end with an outwardly directed top flange 12. The tube, intermediate its ends, has an intermediate flange or collar 14, and adjacent the lower end of the tube there is integrally formed thereon a bottom flange 16. All the flanges are of circular configuration, and lie in planes perpendicular to the length of the tube.

Integrally formed on the lower end of the tube are diametrically opposite bearing extensions 18, and suspended from the bearing extensions is a universal connection. The universal connection includes an upper member shown to particular advantage in Fig. 11, having opposed crossbars 20 provided with aligned bearing openings receiving pivot pins 21, whereby the crossbars are connected to the depending extensions 18. Integral with the crossbars are depending bearing plates 22, embracing a lower member having side walls 24 connected at their ends by crossbars 26.

The side walls 24 have aligned bearing openings receiving connecting pins 27, said pins 27 being extended normally to the axis defined by the pins 21 to provide the desired universal joint or connection.

The lower member is provided with a bottom wall, having a center opening 28 in which is vertically slidable an elongated support bar 30, to the lower end of which is connected a seat bar 32 on which the user supports himself in the manner shown in Fig. 1. Rigidly secured to the upper end of the support bar 30 is a ball element 34 which limits the slidable movement of the support bar downwardly within the universal connection.

The upper rotor 36 is in the form of a shallow inverted cup element having a center opening aligned with the bore of the tube, the depending side wall of the cup element being integrally formed at its lower edge with an inwardly directed flange 38, to which is connected the lower race of a ball bearing 40, the upper race of which is connected to the top flange 12 of the stator.

Fixedly secured to the top surface of the cup-shaped rotor disc are pairs of upstanding ears 42, angularly spaced about the marginal portion of the disc 120° apart. A top set of pitched blades 44 is carried by the ears or brackets 42, with the blades of the top set having at their inner ends extensions 46 pivotally connected intermediate their ends to their respective brackets, and projecting at their free ends inwardly into the space above the center opening of the disc 36.

The blades 44 are so pitched that when swung outwardly to their full line positions of Fig. 2, they will be caused to rotate, as the device moves towards the ground, with the pitch of the blades being such as to slow the downward movement of the device when the blades rotate with the disc 36 in the manner described.

A lower rotor includes a disc 48, connected at its top surface to its lower race of a ball bearing 50, the upper race of which is connected to the underside of the flange 14. Depending from and fixedly secured to the disc 48

are angularly spaced pairs of ears or brackets 52, to which are pivotally connected blades 54 pitched oppositely to the blades 44. The purpose of the contra-rotating blades is to counteract any tendency toward torque that might otherwise tend to cause the stator to rotate. The torque of the upper set of blades neutralizes the torques of the lower set and vice versa, to prevent said rotation of the stator. The inner ends of the blades 54 terminate adjacent the wall of the tube 10 as shown in Fig. 2, and in this connection, means are provided for swinging the blades 54 to a collapsed position shown in dotted lines in Fig. 2.

The means for swinging blades 54 to their collapsed positions includes diametrically opposed, upwardly projecting pivot brackets 56 to which are pivotally connected aligned arms 58. Arms 58 (see Fig. 4) swing in a common plane perpendicular to the plane of bottom flange 16, between the full and dotted line positions shown in Fig. 2.

Above the arms a ring 60 of half-round cross section is rigid, at diametrically opposite locations thereon, with depending connecting brackets 62. These are arranged in pairs (Fig. 5) and the brackets of each pair embrace the intermediate portion of the associated arm 58. Connecting pins 59 extend through openings of the brackets and through elongated slots formed in the arms, providing sliding pivotal connections of the brackets 62 to the arms 58.

The inner ends of arms 58 project into diametrically opposite longitudinal slots 64 of tube 10, which limit the swinging movement of the arms between their opposite extreme positions.

Normally, the arms gravitate to their lower, inoperative, full line positions shown in Fig. 2. When raised, however, in a manner to be discussed in detail hereinafter, they elevate the ring 60. The ring then engages the inner ends of the blades 54, and biases the blades from the full to the dotted line position of the blades shown in Fig. 2. This causes the blades to be comparatively closely spaced from the stator, the same being true of the upper set of blades 44, so that the apparatus can be conveniently packed and carried on the user's back while awaiting use.

Considering the manner in which the device is used, reference should be had to the full and dotted line positions of support bar 30. To collapse the device one need merely to shift the support bar upwardly within tube 10. As a result, ball element 34 engages the inner ends of arms 58 and cams said inner ends upwardly within the tube. The ball element then passes the inner ends of the arms 58 as it continues its movement upwardly within tube 10, and thereafter the arms 58 tend to drop back to their normal position. However, they are prevented from moving fully back to their normal position in view of the fact that bar 30 will be now disposed within tube 10. Arms 58, thus, engage diametrically opposite portions of bar 30 as shown in dotted lines in Fig. 2, thus holding the blades 54 in their collapsed positions. As the bar continues its movement upwardly within tube 10 the bar element ultimately engages blades 44 and cams the same upwardly to the dotted line position of Fig. 2. The ball element remains in this position, thus holding the blades 44 also in collapsed position.

Any suitable means can be provided for retaining the bar in its dotted line position, and in the illustrated example the bar is shown as being provided with a pair of diametrically opposite rod detents 65, that are spring biased radially outwardly of the bar 30 adjacent the seat bar 32. Detents 65 will temporarily be pressed inwardly by the edge of opening 28 and after moving above opening 28 will return to their normal position, to releasably hold the bar 30 against return movement to its lower, use position. A positive pulling force exerted by a user tending to withdraw the bar from the tube has the effect of overcoming the spring force of the detents, so that they

will again retract as they move downwardly through opening 28.

As bar 30 is withdrawn, the blades 44 and 54 are once again permitted to swing to their use positions, and it will be understood that suitable spring means can be provided, as shown, tending to normally dispose the blades 44 and 54 in said use positions thereof. For example, torsion springs 61 can be looped about the pivotal connection of the blades to their associated support brackets. One end of said torsion springs can be engaged with the brackets and the other ends have engagement with the blades, the springs being tensioned to normally swing the blades upwardly from their collapsed positions.

It is to be further noted that when the ball element moves downwardly within tube 10, the ring 60 may be manually grasped and lifted a short distance to swing the arms 58 upwardly sufficiently to permit the ball element 34 to move downwardly past the arms.

When the device is in use, the jumper is seated on bar 32 in the position shown in Fig. 1, and a safety belt is provided for him including a strap 67 connected at its upper end to the lower member of the universal joint and at its lower end to a safety belt 69 engageable about the waist of the jumper.

A full control over the path of descent is afforded by the apparatus through the provision of a control handle 66 flanged at its upper end and fixedly secured at the upper end thereof to the underside of bottom flange 16. Control bar 66, at its lower end, has a grip or handle 68 which is grasped by the user and which is spaced outwardly from bar 30 due to the fact that the control bar is of angular formation as shown in Fig. 1.

To control the path of descent, the user may swing the bar 66 in any direction. This tilts the stator out of its normally vertical position, so that the path of downward movement is correspondingly tilted to take a course having a lateral component. Or, if winds are blowing the device laterally, tilting of the stator can be used to compensate therefor.

The device also includes a brake, including separate brake means for the respective sets of blades. The purpose of the brake means of the blades is to permit the jumper to turn either to the right or to the left about the axis of the stator. The arrangement is such that either the upper or the lower set of blades can be slowed in respect to the other set, so that full neutralization of the torque of the opposite rotating sets of blades no longer exists, thereby causing controlled rotation of the stator and hence of the jumper.

The brake means has been shown to particular advantage in Figs. 2, 7, 8 and 9. It includes upper and lower braking arms 70, 72 respectively (Figures 2 and 7) provided upon the side wall of tube 10; and swinging in planes normal to the planes of rotation of the upper and lower rotor discs 36, 48. Arms 70, 72 at their outer ends have arcuate brake shoes provided with friction-producing, asbestos facings 74 curved correspondingly to and engaging against the adjacent edges of the rotor discs when the brake arms are swung from their normal, released positions shown in full lines in Fig. 8 to their dotted line, applied positions shown in the same figure of the drawing.

The brake arms are normally biased to their released positions by springs 76 coiled about the pivot pins of the brake arms. One leg of each spring slidably engages tube 10, while the other leg bears against a projecting end of a brake-applying, flexible steel cable. The brakes are separately controlled, with the cables of the upper and lower brakes being designated at 78, 80, respectively, (Figs. 8 and 9). As will be noted from Fig. 8, the cables are connected to the intermediate portions of the arms, and are housed in flexible sheaths, that are connected to the tube 10 by suitable clips and extend downwardly through an opening 81 provided in bottom flange 16 in

registration with the upper end of the control bar 66. The control bar is hollow (Fig. 2) with the cables extending downwardly therein to a location adjacent grip 68.

Referring to Fig. 9, rigid with the control bar 66 are spaced pivot brackets embracing side-by-side, independently swingable, operating levers 82, 84 fixedly connected to the cables 78, 80 respectively. The connection of the cables to the levers may be adjusted to place the cables under a selected normal tension.

The levers swing upwardly and downwardly in a longitudinal slot 85 provided in the wall of the bar 66, and exteriorly of the bar merge into outwardly diverging handles 88, 90 adapted to be grasped by the user to exert pull on a selected cable for the purpose of applying the brake arm connected thereto.

It may be observed that although the tube 10 will be tilted in a selected direction to an inclined position, the jumper tends to be supported upon the bar 32 with bar 32 in a horizontal position. This is by reason of the fact that the universal connection previously described maintains support bar 30 in a substantially vertical position at all times.

Referring to Fig. 10, blades 54 are of hollow, thin-walled construction. In manufacture of the device, the blades would be filled with compressed air, after which the opening through which the air is injected into the blades is sealed. The compressed air adds stiffness or rigidity to the blades without adding weight to any appreciable degree, so that thinner and softer material may be used for the blades than would ordinarily be possible.

The construction has the further advantage that the hollow blades are buoyant in water, so that should the jumper drop into a body of water, the device will have the adaptability to support him therein.

With further reference to the brakes, it may be noted that when a brake is applied, the stator will be caused to turn in the direction of rotation of that set of blades to which the braking action is applied. In order to land, both brakes are applied thereby stopping the blades from rotating and thus protect the pilot from injury.

The device, it should be noted, may be used from aircraft both for military and non-military purposes, and can be accurately controlled during descent. Further, it can be used in descents from bridges, high buildings, etc., since it operates immediately as descent begins, hence being usable at minimum heights, even as low as twenty or thirty feet, as distinguished from conventional parachutes, which can be used only at heights sufficient to permit the same to open.

Still further, the device has the desirable characteristic that it can be made of any light metal or other suitable material, and is well adapted for standardization and mass production.

Further, a desirable feature of the device, particularly as regards its use in military operations, is found in its low visibility when in use, and its further characteristic of presenting only a small target area. When the user has landed, the device can be collapsed swiftly and packed on his back, ready for reuse an unlimited number of times.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted

on the stator tending to rotate the stator, said device further including means on the support controllable by a user to reduce the speed of one rotor relative to the speed of the other rotor, thus to develop to a selected, adjusted extent torque on the stator tending to rotate the same in a correspondingly selected direction, comprising brake shoes pivoted upon the stator adjacent the respective rotors, and cables extending from the respective brake shoes and operable selectively by a user for applying the shoes to their associated rotors independently of each other.

2. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted on the stator tending to rotate the stator, said stator including a tube, the rotors including discs spaced longitudinally of the tube and supported by the stator for rotation about the tube, the blades of the respective rotors being pivotally attached to the discs for swinging movement between extended, use positions and collapsed positions adjacent the tube, one set of blades being formed with extensions at their inner ends extending radially inwardly of the tube, said support including a bar telescoping within the tube and disposed for cammingly engaging the extensions on telescoping of the bar into the tube, in a direction to swing the blades of said one set to collapsed positions.

3. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted on the stator tending to rotate the stator, said stator including a tube, the rotors including discs spaced longitudinally of the tube and supported by the stator for rotation about the tube, the blades of the respective rotors being pivotally attached to the discs for swinging movement between extended, use positions and collapsed positions adjacent the tube, one set of blades being formed with extensions at their inner ends extending radially inwardly of the tube, said support including a bar telescoping within the tube and disposed for cammingly engaging the extensions on telescoping of the bar into the tube, in a direction to swing the blades of said one set to collapsed positions, the other set of blades being formed with extensions at their inner ends, said device including means for swinging the blades of said other set to collapsed positions, including a cam ring circumposed about and shiftable longitudinally of the tube, arms pivoted on the stator in position to shift the cam ring longitudinally of the tube in one direction responsive to the swinging of the arms in a corresponding direction, said arms projecting radially inwardly of the tube and being engageable by the support bar by telescoping of the bar into the tube to swing the arms in said one direction thereof, the cam ring being disposed for engaging the extensions of the blades of said other set to bias the blades of said other set to collapsed position.

4. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted on the stator tending to rotate the stator, said device further including a control handle rigid with the stator and projecting outwardly from the stator to be grasped by the user, whereby to effect selective tilting of the stator, for correspondingly tilting the planes of rotation of the rotors to control movement of the device in a lateral di-

rection, said device further including means for slowing the speed of rotation of one rotor relative to the speed of the other rotor, to adjustably develop torque on the stator tending to rotate the same in a selected direction, comprising brakes individually pivoted upon the stator adjacent their respective rotors, cables connected to the brakes for swinging the same into engagement with the rotors, said cables extending within the control handle, and handle levers pivotally attached to the control handle and connected to the respective cables for selective application of the brakes to the rotors.

5. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted on the stator tending to rotate the stator, said stator including an elongated tube integrally formed, at locations spaced longitudinally thereof, with outwardly directed, planiform flanges, said rotors being rotatably supported upon the respective flanges, the blades of the rotors being pivoted for swinging movement between extended and collapsed positions, said support including a bar telescoping within the tube and formed interiorly of the tube with a ball element, the blades of one set having extensions projecting radially inwardly of the tube in position to be cammingly engaged by the ball element on telescoping of the bar into the tube, for swinging the blades of said one set to collapsed positions.

6. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted on the stator tending to rotate the stator, said stator including an elongated tube integrally formed, at locations spaced longitudinally thereof, with outwardly directed, planiform flanges, said rotors being rotatably supported upon the respective flanges, the blades of the rotors being pivoted for swinging movement between extended and collapsed positions, said support including a bar telescoping within the tube and formed interiorly of the tube with a ball element, the blades of one set having extensions projecting radially inwardly of the tube in position to be cammingly engaged by the ball element on telescoping of the bar into the tube, for swinging the blades of said one set to collapsed positions, said stator further including a flange integrally formed on the tube in spaced relation to the first-named flanges of the tube, the descent-slowng device including means for swinging the blades of the other set to collapsed positions, including arms pivoted on the last-named flange, a cam ring engageable by the arms on swinging of said arms in one direction, said ring being disposed for cammingly engaging the blades of said other set on shifting of the ring by the arm, the ball element being disposed for engaging said arms on telescoping of the support bar into the tube, a universal connection carried by the stator, said universal connection including an upper member

pivotally connected to the stator for swinging movement about an axis extending transversely of the stator, and a lower member pivotally connected to the upper member for swinging movement about an axis normal to the axis of swinging movement of the upper member, said support sliding in the lower member of the universal connection longitudinally of and within the stator between collapsed and extended positions respectively.

7. A descent-slowng device comprising a stator, a support for a user carried thereby, and a pair of rotors on the stator each including a set of blades, the blades of one set being pitched oppositely to the blades of the other set, for contrarotation of the rotors to neutralize the effect of torque developed by the rotors and exerted on the stator tending to rotate the stator, said stator including an elongated tube integrally formed, at locations spaced longitudinally thereof, with outwardly directed, planiform flanges, said rotors being rotatably supported upon the respective flanges, the blades of the rotors being pivoted for swinging movement between extended and collapsed positions, said support including a bar telescoping within the tube and formed interiorly of the tube with a ball element, the blades of one set having extensions projecting radially inwardly of the tube in position to be cammingly engaged by the ball element on telescoping of the bar into the tube, for swinging the blades of said one set to collapsed positions, said stator further including a flange integrally formed on the tube in spaced relation to the first-named flanges of the tube, the descent-slowng device including means for swinging the blades of the other set to collapsed positions, including arms pivoted on the last-named flange, a cam ring engageable by the arms on swinging of said arms in one direction, said ring being disposed for cammingly engaging the blades of said other set on shifting of the ring by the arm, the ball element being disposed for engaging said arms on telescoping of the support bar into the tube, a universal connection carried by the stator, said universal connection including an upper member pivotally connected to the stator for swinging movement about an axis extending transversely of the stator, and a lower member pivotally connected to the upper member for swinging movement about an axis normal to the axis of swinging movement of the upper member, said support sliding in the lower member of the universal connection longitudinally of and within the stator between collapsed and extended positions respectively, said device further including a control handle rigid with the last-named flange of the stator, said control handle being of angular formation and projecting laterally outwardly from the last-named flange for adjustably tilting the stator in a selected direction, to correspondingly control lateral movement of the stator during descent.

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