PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. HEHS
PARACHUTE EQUIPMENT
Filed April 24, 1941

Serial No.
390,181
3 Sheets-Sheet 1

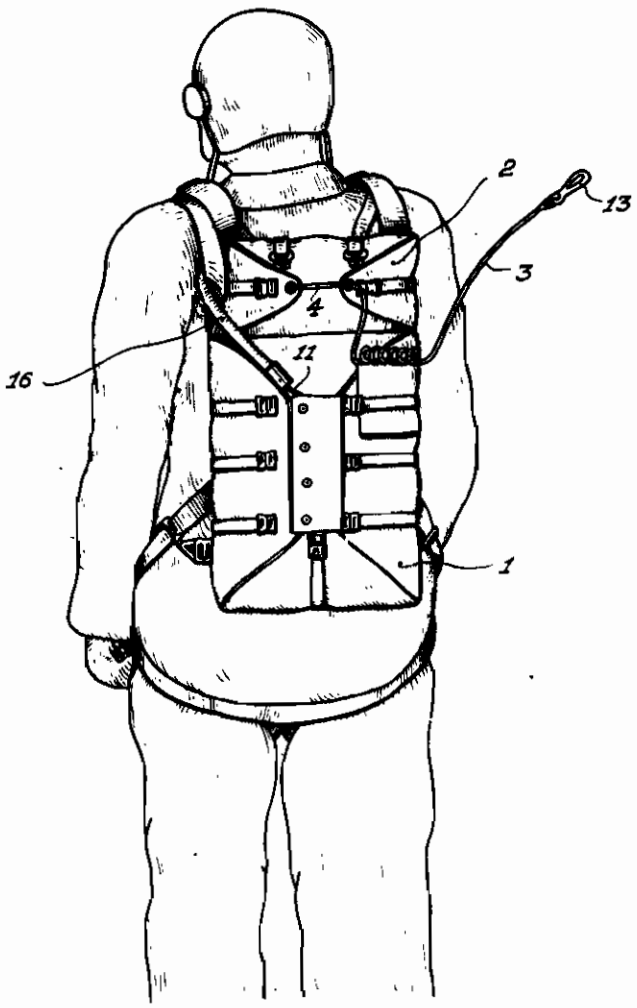

Fig. 1.

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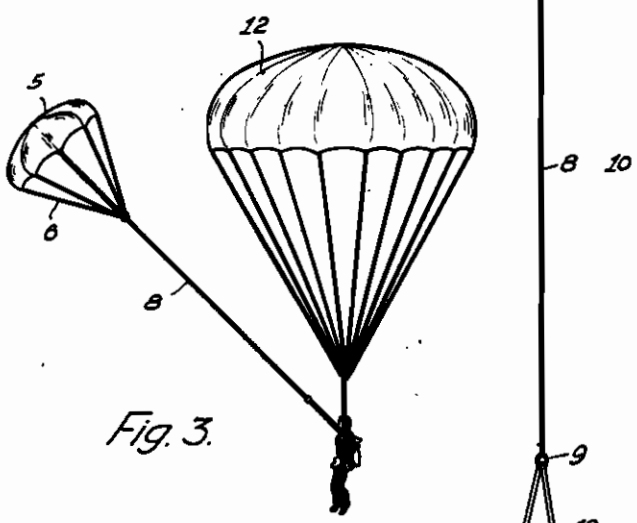

Fig. 3.

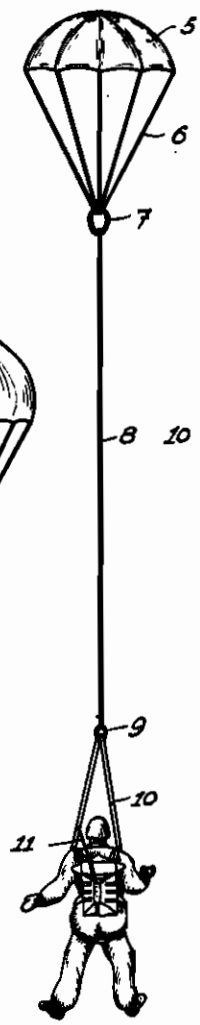

Fig. 2.

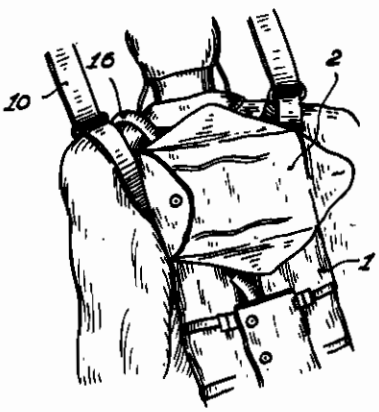

Fig. 4.

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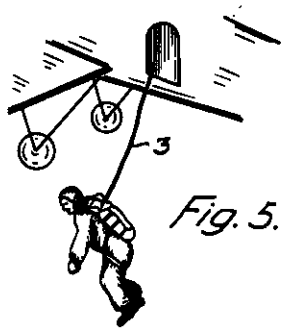

Fig. 5.

Fig. 6.

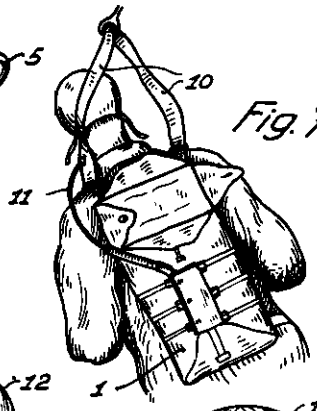

Fig. 7.

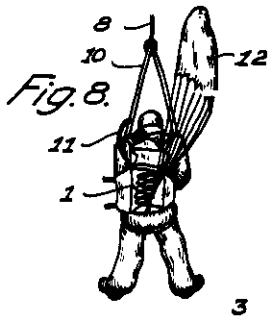

Fig. 8.

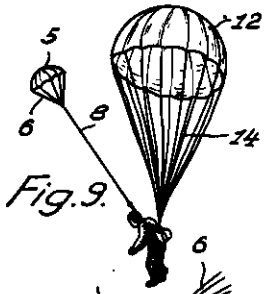

Fig. 9.

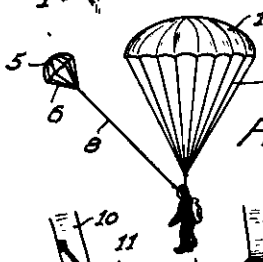

Fig. 10.

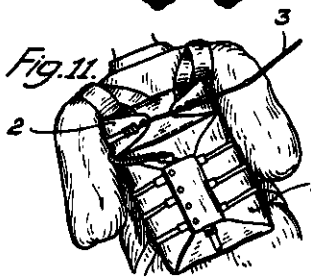

Fig. 11.

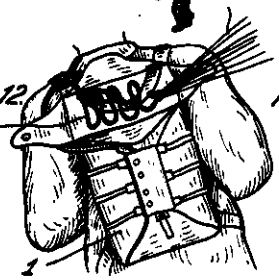

Fig. 12.

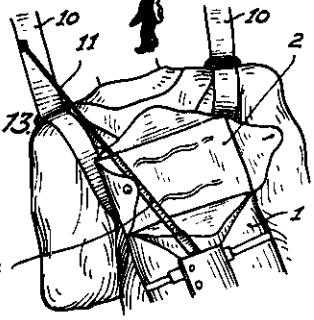

Fig. 13.

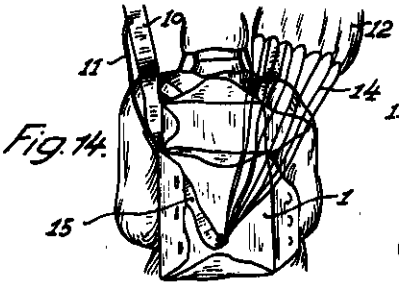

Fig. 14.

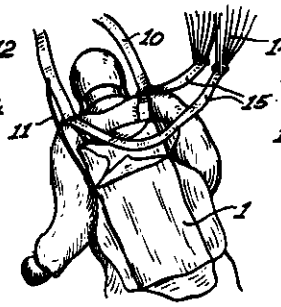

Fig. 15.

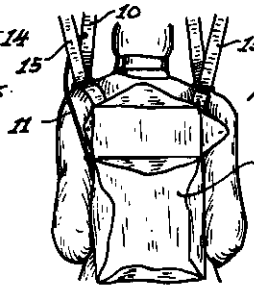

Fig. 16.

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Published May 25, 1943

Serial No. 390,181

ALIEN PROPERTY CUSTODIAN

PARACHUTE EQUIPMENT

Ákos Hehs, Szekesfehervar, Hungary; vested in the Alien Property Custodian

Application filed April 24, 1941

It is well known that, when making descents by parachute from aircraft flying at high speeds, it is possible that the opening of the parachute will result in inadmissibly high forces of inertia being set up, which will endanger the safety of the parachutist and cause damage to the parachute. As regards the parachute, an additional point that has to be taken into consideration is that during the period of its opening the parachute will constantly alter its shape so that it is not possible to make provision for the uniform distribution of the load during that period, and that therefore the parachute may suffer damage in those cases also when the descent by parachute is effected at such flying speeds as would in other respects be permissible for the parachute.

Experience has shown that the body of a healthy human person will bear, without suffering any injury, positive or negative accelerations of a certain magnitude, for instance negative accelerations by which its initial velocity is reduced, within the few seconds of descent, to between 1/6th and 1/7th of its original figure. These accelerations are determined by the forces set up when the parachute opens. It is well known that the magnitude of these forces may be computed from the load multiple, the formula of the latter being the following:

$$T=\frac{v-v_s}{g.t}+1$$

In this formula v is the speed of the aircraft at the moment when the parachutist takes the leap, v_s the velocity of descent of the parachute, which in general amounts to 6 metres per second, g the gravitational acceleration=9.81 m/sec^2 and t the time required for the parachute to open and for the velocity of the parachutist to be braked in the total extent required, the said time amounting, generally, in the case of a specific load of the parachute of 2 kilograms per square metre, to 2 seconds. From this well-known formula, the highest aircraft speed permissible for effecting descents by parachute results at the figure of roughly 233 kilometres per hour. It follows herefrom that at flying speeds slightly exceeding 250 km per hour, descents by parachute with automatic release of the parachute can no longer be effected with the desired degree of safety for the parachutist and may only be effected with release by hand. On the other hand, the training of the crews for this last-named method of descent by parachute requires a great deal of time and therefore this method is one which as a rule is not directly available. On the other hand it is in most cases not feasible to reduce the flying speed at the moment when the parachutist takes the leap to the figure of about 250 km per hour indicated above.

The purpose of the invention is to eliminate this drawback. For this purpose there is provided in the parachute equipment according to the invention, in addition to the usual large cap, at least one braking surface of smaller size, and this surface is arranged and dimensioned in such a manner as to cause it to come into action before the large cap opens, thereby reducing the high initial velocity of the parachutist to a figure admissible from the point of view of the sudden load it will cause to be placed on the main cap.

The load, consisting of one great shock produced in the case of the usual type of parachute comprising one single cap only, will owing to the arrangement referred to above be divided into two consecutive smaller loads between which, moreover, a braking effect will be exercised, so that the total of the two loads will be smaller than the load which would be set up in a parachute of the type used up to now. The appropriate dimensioning of the braking surface coming into play first will, on the other hand, even at the highest flying speeds which it has been possible to reach up to now, enable both shocks to be reduced to such figures as will not endanger either the parachute or the safety of the parachutist.

Preferably the additional braking surface and the main cap will be mutually connected in such a manner that the complete opening of the braking surface should at the same time cause the closing device of the main cap to become released, such release being effected by positive motion. As the additional braking surface will continuously retard the velocity of descent, the main cap will unfold more slowly than it would in the known types of parachutes. Tests have shown that the time, amounting to about 4 seconds, required for the full opening of both caps is sufficient for causing the velocity of descent and thereby the load multiple to be reduced in such an extent as to place no detrimental stresses on the main cap, and for weakening the second shock also in such an extent as to ensure that it will not endanger the safety of the parachutist.

Release by hand may, however, be provided for the main cap instead of release, effected through

positive motion, by the additional braking surface. In this case a further reduction of the load multiple and thereby of the shock produced may be obtained by an appropriately retarded release of the main cap. This will result in the important advantage as compared to the usual type of parachutes that at the time when the main cap is being released by hand, the descent of the parachutist will owing to the effect of the additional braking surface take place in the vertical direction, almost without any oscillation or pendulum movement.

It will be advantageous to employ grappling-ropes of a short length only for the additional braking surface, which latter should preferably be constructed in parachute form likewise, and to provide a rope between the said grappling-ropes and the harness of the parachutist, the length of the said rope being approximately equal to that of the grappling-ropes of the main cap. This will assure the unhampered unfolding of the main cap and will prevent any entanglement of the grappling-ropes of the main cap with those of the additional braking surface.

An embodiment exemplifying the parachute according to the invention is represented on the accompanying drawing.

Fig. 1 shows the parachute equipment mounted on the back of the airman.

Fig. 2 represents the stage at which the additional braking surfaces has already opened.

Fig. 3 shows the caps in the opened condition during the descent.

Fig. 4 shows the arrangement for releasing the main cap by hand.

Figs. 5 to 16 show the operation of the parachute equipment according to the invention from the moment when the leap is taken up to the moment at which the main cap has opened completely; notably Figs. 5 to 10 show the whole equipment with the parachutist, whilst Figs. 11 to 16 show details, particularly the containers, in the various stages during the descent.

The main cap is encased in the usual way in the pocket 1, whilst the additional braking surface is encased in the pocket 2, located above the pocket 1. The releasing cord 3 of the pocket of the additional braking surface is fixed, coiled in its greatest part, in an easily detachable manner on the back of the pocket 1 and is hooked into the airplane by means of the snap-hook 13. When the leap is taken, the releasing cord 3 will open the closing device 4, of the usual type, of the pocket 2, so that the additional braking surface 5 (Figure 2), which in the example assumed is constructed in the form of a small-sized parachute, will unfold. The grappling-ropes 6 of the cap 5 are connected, across a thimble 7, with the rope 8, the length of which is approximately equal to that of the grappling-ropes of the main cap. The rope 8 is, at its lower end, connected, across the thimble 9, with the harness of the parachutist.

On the left-hand loop of the strap 10 of the harness the releasing cable 11 for the pocket of the main cap is fixed in such a manner that when the strap 10 is stretched this will cause the closing device of the pocket of the main cap to be opened through the releasing cable 11, so that the main cap 12 will open likewise. This transitional condition existing before the opening of the main cap is represented on Fig. 4, in which 11 denotes the releasing cable of the main cap. The braking cap has already opened, the additional braking surface 5 assuming the oblique position shown on Fig. 3. The area of this additional braking surface is substantially smaller than that of the main cap 12; the mutual proportion of the two may be, for instance 4 to 36; in this case the axis of the additional braking surface will during the descent deviate laterally at an angle of about 45 degrees from the vertical direction. This additional braking surface will thus exert a damping or steadying influence on the whole system, particularly it will damp the oscillating or pendulum motion, thus enabling the total surface area of the two caps to be chosen at a smaller figure, for the same velocity of descent, than with the types of parachute known up to now. Figs. 5 to 16 show the automatic operation of the parachute equipment. Fig. 5 illustrates a moment immediately following the taking of the leap, at which moment the releasing cord 3 becomes tensioned, whereupon the pocket 2 becomes torn open and the braking surface 5 is released, as shown on Figs. 5 and 6 as well as on Figs. 11 and 12. The grappling-ropes 6 of the braking surface 5 are becoming tensioned and are extracting the rope 8 from the pocket 2. After the rope 8 has become tensioned, the strap 10 also becomes tensioned, (Fig. 7). The fact of the strap 10 becoming tensioned will, through the releasing cable 11 (Fig. 13), cause the pocket 1 of the main cap 12 to become torn open. The main cap 12 escapes from the pocket (Figs. 8 and 14), the grappling-ropes 14 of the main cap become tensioned and the strap 15 connected with these grappling-ropes will likewise be torn out from the pocket 1 (Fig. 9). After both caps 5 and 12 have opened (Fig. 10), the two straps 10 and 14 will also have become tensioned (Fig. 16).

If it is desired that the main cap should be opened by hand and not automatically by the braking surface, the releasing cable of the main cap will not, as shown on Fig. 13, be connected with the strap 10 of the braking surface, but will, as shown on Fig. 4, be conducted, in a manner per se known, inside a metal tube 6 over the shoulder of the parachutist to his breast side.

Another important advantage of the equipment according to the invention consists in that, as soon as a very short time will have elapsed after the opening of the additional braking surface, the parachutist will continue his descent in the vertical direction. When effecting descents by parachute in groups e. g. in the case of parachute troops) and releasing the main cap by hand, this arrangement will enable the parachutists to fix their attention on the commander and open their caps simultaneously, which method of procedure will result in a substantial reduction of the degree of dispersion.

It follows from what has been said above that the equipment will enable safe descents to be effected also in case of high flying speeds and in case the aircraft has descended to a low level in approaching its object.

The invention is of course not limited to the employment of one single additional braking surface. It would, for instance, also be possible that braking surfaces, opening when the leap is taken, should be provided on both shoulders of the parachutist.

AKOS HEHS.