PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in or relating to Rip Cord Operating Devices for Parachutes

We, CAMBRIDGE INSTRUMENT COMPANY LIMITED, a Company registered under the laws of Great Britain, of 13, Grosvenor Place, London, S.W.1, and WILLIAM JAMES STALLAN, a British subject, of the Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to rip cord operating devices for parachutes and has for its object to provide forms of such devices which will ensure automatic action in the event of the wearer being unconscious whilst permitting operation to be performed by the wearer if conscious.

The invention consists in rip cord operating apparatus for parachutes embodying preferably adjustable means to delay the operation for a predetermined period of time after commencement of a jump, means to delay operation until a predetermined minimum and preferably adjustable height above ground is attained in the event of a jump originating at a height exceeding said minimum height and means enabling operation to be performed in the normal manner by a wearer if conscious.

The invention also consists in rip cord operating apparatus as set forth in the preceding paragraph wherein said first means comprises a catch controlled by spring operated time mechanism.

The invention also consists in rip cord operating apparatus as set forth in the first of the two preceding paragraphs wherein said second means comprises a catch adapted to be released by pressure sensitive bellows mechanism.

The invention also consists in rip cord operating apparatus as set forth in the first of the three preceding paragraphs wherein said third means comprises a Bowden wire or the like operable independently of the first two means.

The invention also consists in rip cord operating apparatus for parachutes substantially as hereinafter described.

In carrying the invention into effect according to one convenient form by way of example, we provide a spring driven clockwork motor comprising a train of gears. The highest speed spindle of this train carries a radial member terminating in a projecting piece lying parallel to the spindle. This projection, which may be termed catch No. 1, is used to stop the train from rotating until a cord is broken as the result of the wearer leaving the aeroplane, allowing the member which holds it to move. This member consists of a springy wire bearing on a rigid stop. This prevents any possibility of damage to the catch when it is being set. The highest speed spindle then makes about half a revolution, and the projecting piece may then come into contact with a lever operated by the aneroid chamber, this assembly being termed catch No. 2. If the pressure exceeds the predetermined amount, this catch is inoperative. When catches 1 and 2 are both released the train runs, thus giving the necessary time delay.

The first or winding spindle of the train carries a disc having a depression cut in its periphery and a lever suitably formed is arranged to fall into this depression at the end of the predetermined period, and in so doing releases another lever which is longer, this mechanism forming catch No. 3. Immediately after this, a projection on the disc makes contact with the fixed stop, and the clock is thus stopped.

The long lever which is released by catch No. 3 carries a small latch holding the spring. When the spring is compressed it is held in the compressed position by the movement of the small latch only, but it can only be released by the movement of the long lever. When the spring is released it pushes out the casing of a Bowden wire, and this effort is used in the

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opening of the parachute.

The speed of the clock is controlled by an inertia arm which is oscillated by a crank on the highest speed spindle. The length of the run is decided by the length of the wind, and therefore the time delay can be adjusted by turning the winding knob to the correct position as indicated by a calibrated scale.

This winding action is limited to just less than one revolution but the spring has previously been wound to the extent of several turns, thus giving a reasonably constant torque over the working range. As the adjustment of the winding knob may be in either direction a friction drive is introduced on the second spindle of the train. This drive must be strong enough to prevent it slipping when driven by a clock spring but light enough to be overcome easily when adjusting by hand.

Another knob outside the case is provided to change the point at which catch No. 2 operates. This knob moves the position of the fulcrum of the lever working in conjunction with the aneroid chamber.

It is necessary to provide a means of lifting the lever out of the depression in the disc when the clock is wound up without sacrificing the sharp undercut edge necessary for a clean drop into the depression. In order to effect this, the disc is made in two parts. One is very slightly smaller in diameter than the other, and free to rotate relative to it, but held by a spring against a stop. The free disc has a slightly undercut edge at the point of drop, whereas the fixed one has a slope. The lever therefore drops into the depression off the undercut edge, of the free disc, but on rewinding, the free disc is pushed out of position, allowing the lever to rise up the slope. When it gets to the highest level, the free disc will spring back into position as it is slightly smaller in diameter.

An additional device is fitted to prevent the operation of the mechanism if the time delay setting knob is turned to zero. This consists of a slotted link which connects catch No. 1 to the lever working on the periphery of the disc. This link prevents the lever from dropping into the depression until catch No. 1 is released.

The device operates in three stages:—

(1) When the man leaves the plane a cord is broken and this results in the release of a catch (catch No. 1).

(2) The man falls to a predetermined height, catch No. 2 is released by means of the increase in barometric pressure. If the jump takes place below the predetermined height No. 2 catch is inoperative and this stage is omitted.

(3) A time delay mechanism then works for a predetermined time and releases catch No. 3, which in turn releases the spring effecting the opening of the parachute.

The present invention provides means for opening parachutes which specifies the following conditions for safety:—

(1) The parachute does not open until a period has elapsed after the man has left the aeroplane. The period is adjustable between limits of say 3 and 15 seconds and this allows the speed of the man relative to the air to be reduced to the steady terminal velocity at which the parachute can be opened without risk.

(2) If the descent is from a great height the parachute does not open until the man is at a predetermined height from the ground, this height being adjustable between, say 8000 and 15000 ft. The purpose of this provision is to allow the man to pass as quickly as possible through the region where the oxygen concentration is below normal requirements.

(3) The device does not prevent the rip cord being used in the normal way by a man who is conscious.

Dated this 4th day of October, 1945.
MARKS & CLERK.

COMPLETE SPECIFICATION

Improvements in or relating to Rip Cord Operating Devices for **Parachutes**

We, CAMBRIDGE INSTRUMENT COMPANY LIMITED, a Company registered under the laws of Great Britain, of 13, Grosvenor Place, London, S.W.1, and WILLIAM JAMES STALLAN, a British subject, of the Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to rip cord operating devices for parachutes and has for its object to provide forms of such

devices which will ensure automatic action in the event of the wearer being unconscious whilst permitting operation to be performed by the wearer if conscious.

The invention consists in rip cord operating apparatus for parachutes embodying preferably adjustable means to delay the operation automatically for a predetermined period of time after commencement of a jump, means serving automatically to render inoperative said delay means until a predetermined minimum and preferably adjustable height above ground is attained in the event of a jump originating at a height exceeding said minimum height and means enabling operation to be performed in the normal manner by a wearer if conscious.

The invention also consists in rip cord operating apparatus as set forth in the preceding paragraph, wherein said first means comprises a catch controlled by spring operated time mechanism.

The invention also consists in rip cord operating apparatus as set forth in the first of the two preceding paragraphs wherein said second means comprises a catch adapted to be released by pressure sensitive bellows mechanism.

The invention also consists in rip cord operating apparatus as set forth in the first of the three preceding paragraphs wherein said third means comprises a Bowden wire or the like operable independently of the first two means.

The invention also consists in rip cord operating apparatus for parachutes as set forth in any of the four preceding paragraphs and substantially as hereinafter described with reference to the accompanying drawings.

Referring to the accompanying diagrammatic drawings:—

Figure 1 is a vertical sectional view of one convenient construction of rip cord operating apparatus embodying the present invention.

Figure 2 is a plan view thereof, and Figure 3 is a rear elevational view of a detail with rear frame plate removed.

In carrying the invention into effect according to one convenient form illustrated by way of example in Figures 1—3 of the accompanying drawings, we provide a spring driven clockwork motor comprising a train of gears. The highest speed spindle *a* of this train carries a radial member terminating in a projecting piece *b* lying parallel to the spindle. This projection, which may be termed catch No. 1, is used to stop the train from rotating until a cord is broken as the result of the wearer leaving the aeroplane, allowing a stop member *c* which holds it to move. This member consists of a springy wire bearing on a rigid wire stop *d* carried by a spindle *e*. This prevents any possibility of damage to the catch when it is being set. When the spindle *e* is rotated in clockwise direction from the position shown in Figure 1, the catch No. 1 is released and the highest speed spindle *a* then makes about half a revolution, the projecting piece *b* then coming into contact with the end *f* of a lever *g* operated by an aneroid chamber *h*, this assembly being termed catch No. 2. If the pressure exceeds a predetermined amount, however, this catch is inoperative, i.e., the projecting piece *b* is not arrested by the end *f*. When catches 1 and 2 are both released the train runs, thus giving a time delay in accordance with the extent to which a winding disc *i* has previously been turned.

The first or winding spindle *j* of the train carries a disc *k* having a depression *m* cut in its periphery and the end *n* of a cranked lever *o* pivoted at *p* is arranged to fall into this depression at the end of the predetermined period, in so doing tilting a releasing lever *q*, this mechanism forming catch No. 3. Immediately after this, a projection *r* on the disc makes contact with the fixed stop *s* on a bar *t* and the clock is thus stopped.

The long lever *q* which is released by catch No. 3 is pivoted at *u* and carries a small spring-urged pivoted latch *v*. The latch *v* serves to retain a plunger *w* in the position of Figure 1, i.e., with a spring 2 strongly compressed within a barrel member *x*. Release of the spring 2 is effected by release movement of the small latch *v* which in turn is effected by the movement of the long lever *q*. When the spring 2 is released it pushes out the plunger *w* and exerts a strong pull on a Bowden wire 3, this effort being used in the opening of the parachute.

The speed of the clock is controlled by a slotted inertia arm 4 which is oscillated by a crank 5 on the highest speed spindle *a*. The length of the run is decided by the extent of the wind, and therefore the time delay can be adjusted by turning the winding knob *i* to the correct position as indicated by a calibrated scale (not shown).

This winding action is limited to just less than one revolution but the spring 6 has previously been wound to the extent of several turns, thus giving a reasonably constant torque over the working range. As the adjustment of the winding knob may be in either direction a friction drive 7 is introduced on the second spindle of the train. This drive must be strong enough to prevent it slipping when driven by the clock spring 6 but light enough to

be overcome easily when adjusting by hand.

Another knob 8 outside the case is provided to change the point at which catch No. 2 operates. This knob moves the position of the fulcrum 9 of the lever *g* working in conjunction with the aneroid chamber *h*.

It is necessary to provide a means of lifting the lever *o* out of the depression *m* in the disc *k* when the clock is wound up without sacrificing the sharp undercut edge necessary for a clean drop into the depression. In order to effect this, the disc is made in two parts associated with a further disc *n* free to rotate relative to the disc *k* but held by a spring 13 against a stop 12. The disc *k* has a peripheral cam surface 11 whereby the lever *o* is lifted free of the notch *m* on rewinding. When the lever end *n* gets to the highest level, the free disc 10 will spring back into position as under the action of spring 13.

An additional device is fitted to prevent the operation of the mechanism if the time delay setting knob is turned to zero. This consists of a slotted link 14 which connects catch No. 1 to the lever *o*. This link prevents the lever end *n* from entering the notch *m* unless catch No. 1 has been released.

The device operates in three stages:—

(1) When the man leaves the plane a cord is broken and this results in the release of catch No. 1.

(2) The man falls to a predetermined height, catch No. 2 is released by means of the increase in barometric pressure. If the jump takes place below the predetermined height No. 2 catch is inoperative and this stage is omitted.

(3) A time delay mechanism then works for a predetermined time and releases catch No. 3, which in turn releases the spring effecting the opening of the parachute.

The present invention provides means for opening parachutes which specifies the following conditions for safety:—

(1) The parachute does not open until a period has elapsed after the man has left the aeroplane. The period is adjustable between limits of say 3 and 15 seconds and this allows the speed of the man relative to the air to be reduced to the steady terminal velocity at which the parachute can be opened without risk.

(2) If the descent is from a great height the time delay mechanism does not begin to operate until the man is at a predetermined height from the ground, this height being adjustable between, say 8000 and 15000 ft. The purpose of this provision is to allow the man to pass as quickly as possible through the region where the oxygen concentration is below normal requirements.

(3) The device does not prevent the rip cord being used in the normal way by a man who is conscious.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Rip cord operating apparatus for parachutes embodying preferably adjustable means to delay the operation automatically for a predetermined period of time after commencement of a jump, means serving automatically to render inoperative said delay means until a predetermined minimum and preferably adjustable height above ground is attained in the event of a jump originating at a height exceeding said minimum height and means enabling operation to be performed in the normal manner by a wearer if conscious.

2. Rip cord operating apparatus as claimed in Claim 1, wherein said first means comprises a catch controlled by spring operated time mechanism.

3. Rip cord operating as claimed in Claim 1, wherein said second means comprises a catch adapted to be released by pressure sensitive bellows mechanism.

4. Rip cord operating apparatus as claimed in Claim 1, wherein said third means comprises a Bowden wire or the like operable independently of the first two means.

5. Rip cord operating apparatus for parachutes as claimed in any of Claims 1—4 substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 4th day of October, 1946.

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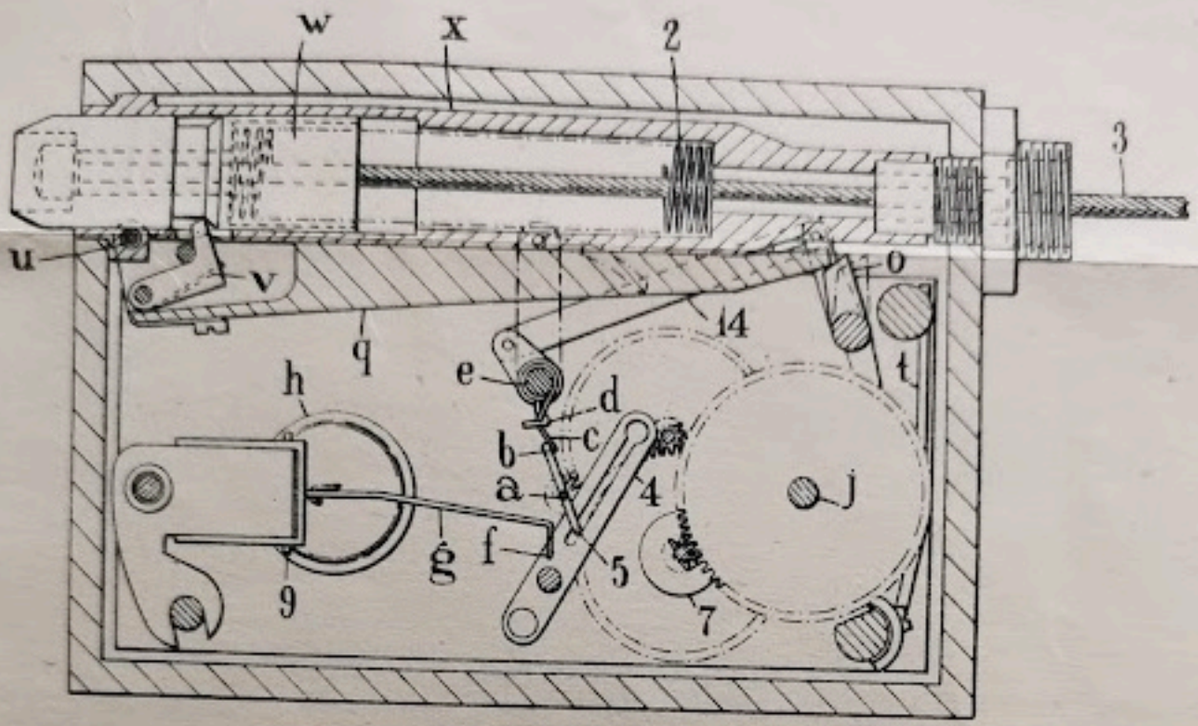

Fig 1

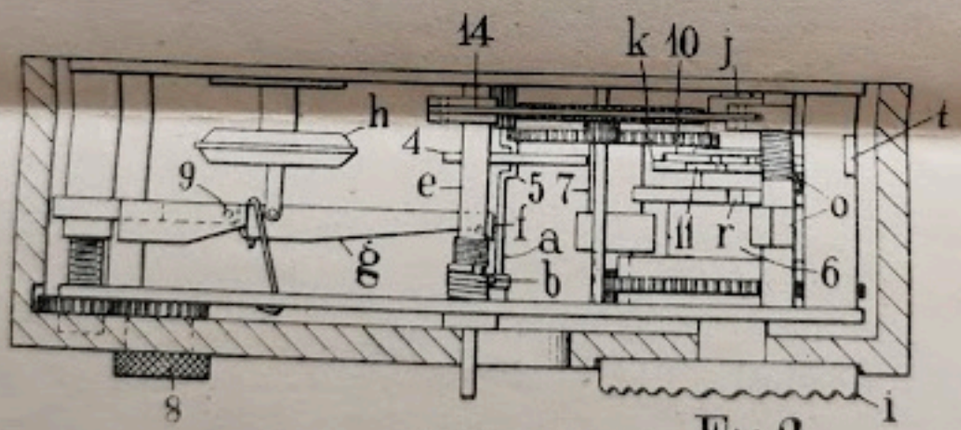

Fig 2

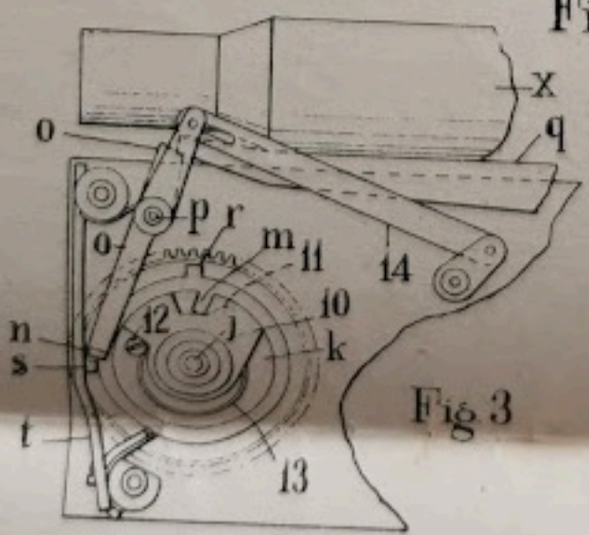

Fig 3

H.M.S.O. (Ty. P.)