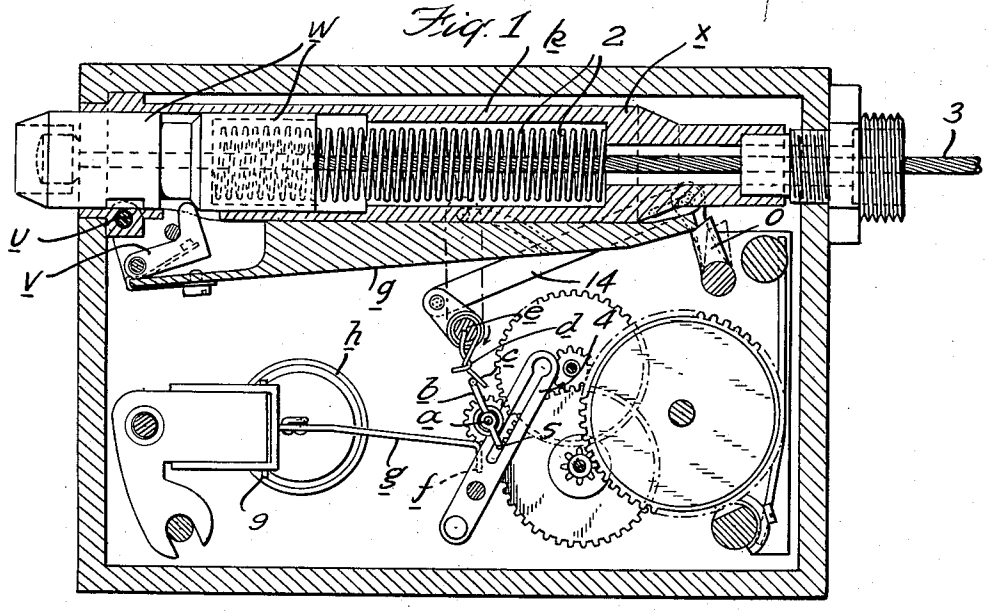
Feb. 5, 1952 W. J. STALLAN 2,584,164

RIP CORD OPERATING DEVICE FOR PARACHUTES

Filed Sept. 19, 1947

Fig. 1



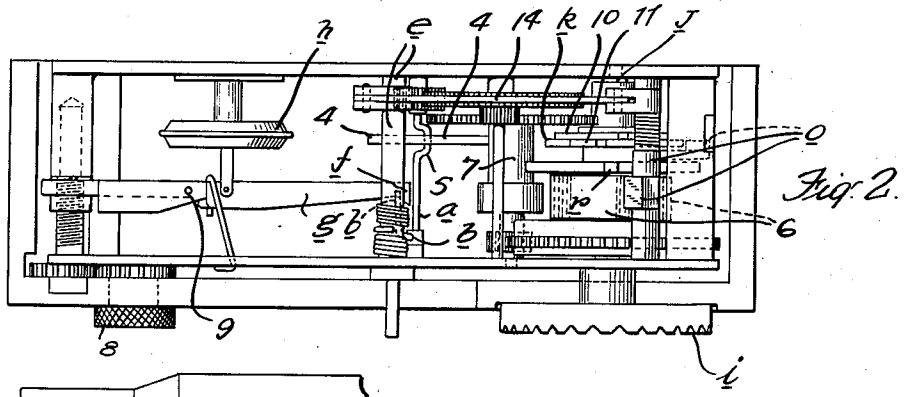


Fig. 2.

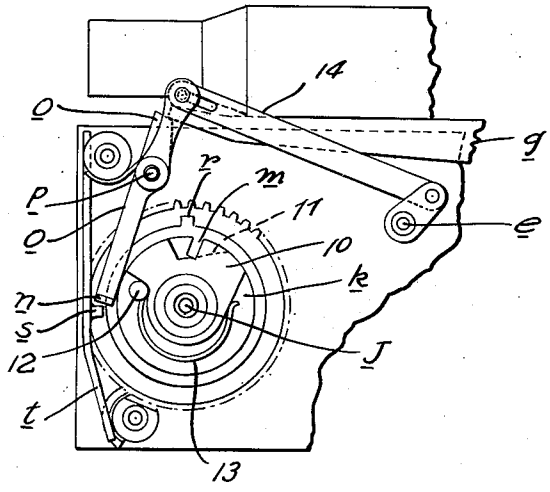


Fig. 3.

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RIP CORD OPERATING DEVICE FOR PARACHUTES

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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 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

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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 a 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 crank 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 10 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 parachute does not open until the man is at a predetermined height from the ground, this height being adjustable between, say 8,000 and 15,000 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 my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a power accumulator to operate said rip cord, a connector engaging said rip cord with said power accumulator, a detent restraining the release of power from said power accumulator, a delay meter for locking said detent against release during a predetermined delay, said delay meter including a power accumulator and a governor limiting the rate of release of power from said power accumulator of the delay meter, and dual stops each of which is adapted to hold the delay meter against starting its measurement of the delay, a barometric motor primarily responsive to the existing barometric pressure of the surrounding atmosphere connected to one of said stops to remove it from holding relation to said delay meter in response to a predetermined barometric pressure, and a mechanical connection to the other stop extending to the exterior of said device for removing it from blocking relation when the wearer starts his descent.

2. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a mainspring for operating the rip cord, a connector engaging said spring with said rip cord, a detent normally holding said spring against the operating power accumulated therein, a delay meter including a meter-operating spring, a handle for winding the meter spring to a predetermined extent, adjustable release means under the control of said handle for controlling the delay period of said relay meter, a torque-reducing gear train connecting said meter spring to a high speed rotor, a projection on said high speed rotor for engaging a stop to restrain operation of said delay meter, a governor limiting the velocity of said gear train, and a connection between said delay meter and said detent operated by the delay meter at the end of its delay to release said detent from its restraining position relative to the main spring.

3. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a power accumulator to operate said rip cord, a connector engaging said rip cord with said power accumulator, a detent restraining the release of power from said power accumulator, a delay meter for locking said detent against release during a predetermined delay, dual stops each of which is adapted to hold the delay meter against starting its measurement of the delay, said delay meter comprising a power accumulator, a continuously operable torque-reducing gear train, an acceleration resistant non-blocking velocity control on a high speed member of said gear train, and a projection from a high speed member of said gear train adapted to abut said dual stops in their blocking positions whereby to prevent starting its delay measurement, a barometric motor primarily responsive to the existing barometric pressure of the surrounding atmosphere connected to one of said stops to remove it from holding relation to said delay meter in response to a predetermined barometric pressure, and a mechanical connection to the other stop extending to the exterior of said device for removing it from blocking relation when the wearer starts his descent.

4. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a power accumulator to operate said rip cord, a connector engaging said rip cord with said power accumulator, a detent restraining the release of power from said power accumulator, a delay meter for locking said detent against release during a predetermined delay, dual stops each of which is adapted to hold the delay meter against starting its measurement of the delay, a continuously operable torque-reducing gear train, a slotted pendulum and a crank on a high speed member of said gear train slidably engaged in said slot

to oscillate the pendulum when said shaft rotates, whereby to limit velocity of said gear train without ever blocking its rotation, and a projection from a high speed member of said gear train adapted to abut said dual stops in their blocking positions whereby to prevent starting its delay measurement, a barometric motor primarily responsive to the existing barometric pressure of the surrounding atmosphere connected to one of said stops to remove it from holding relation to said delay meter in response to a predetermined barometric pressure, and a mechanical connection to the other stop extending to the exterior of said device for removing it from blocking relation when the wearer starts his descent.

5. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a power accumulator to operate said rip cord, a connector engaging said rip cord with said power accumulator, a detent restraining the release of power from said power accumulator, a delay meter for locking said detent against release during a predetermined delay, said delay meter including a power accumulator and a governor limiting the rate of release of power from said power accumulator of the delay meter, said delay meter being connected to the detent through a slotted member connected with the delay meter to move therewith and a feeler member riding on the surface of said slotted member adapted to drop into said slot and positioned to drop therein only at the end of the delay metering operation and including a latch connected to said feeler member positioned to lock said detent so long as the feeler member rides the surface of the slotted member and to move away to free said detent when the feeler drops into the slot, and dual stops each of which is adapted to hold the delay meter against starting its measurement of the delay, a barometric motor primarily responsive to the existing barometric pressure of the surrounding atmosphere connected to one of said stops to remove it from holding relation to said delay meter in response to a predetermined barometric pressure, and a mechanical connection to the other stop extending to the exterior of said device for removing it from blocking relation when the wearer starts his descent.

6. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a mainspring for operating the rip cord, a connector engaging said spring with said rip cord, a detent normally holding said spring against the operating power accumulated therein, a delay meter including a meter-operating spring, a handle for winding the meter spring to a predetermined extent, adjustable release means under the control of said handle for controlling the delay period of said delay meter, a torque-reducing gear train connecting said meter spring to a high speed rotor, a projection on said high speed rotor for engaging a stop to restrain operation of said delay meter, a governor limiting the velocity of said gear train, a connection between said delay meter and said detent operated by the delay meter at the end of its delay to release said detent from its restraining position relative to the main spring, a barometric motor responsive primarily to the existing barometric pressure of the surrounding atmosphere, a lever engaged by said motor and carrying a stop movable into and out of the path of the projection on the high speed rotor, and an adjustable fulcrum for said lever,

whereby to adjust the pressure at which the stop moves out of the path of said projection.

7. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a mainspring for operating the rip cord, a connector engaging said spring with said rip cord, a detent normally holding said spring against the operating power accumulated therein, a delay meter including a meter-operating spring, a handle for winding the meter spring to a predetermined extent, adjustable release means under the control of said handle for controlling the delay period of said delay meter, a torque-reducing gear train connecting said meter spring to a high speed rotor, dual stops positioned to engage a projection on said high speed rotor to stop its rotation, said gear train being free to rotate except for said stops, a barometric motor connected to one of said stops to move it into and away from the pattern of rotation of the projection on the high speed rotor, a connection to the exterior of said device for removing the other of said stops from said pattern of rotation, a governor limiting the velocity of said gear train, and a connection between said delay meter and said detent operated by the delay meter at the end of its delay to release said detent from its restraining position relative to the main spring.

8. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a mainspring for operating the rip cord, a connector engaging said spring with said rip cord, a detent normally holding said spring against the operating power accumulated therein, a delay meter including a meter-operating spring, a handle for winding the meter spring to a predetermined extent, adjustable release means under the control of said handle for controlling the delay period of said delay meter, a torque-reducing gear train connecting said meter spring to a high speed rotor, a projection on said high speed rotor for engaging a stop to restrain operation of said delay meter, a governor limiting the velocity of said gear train, and a connection between said delay meter and said detent operated by the delay meter at the end of its delay to release said detent from its restraining position relative to the main spring, said connection between the delay meter and the detent comprising a slotted disk connected to said meter spring to be moved thereby as the spring runs down, an arm positioned and adapted to drop into said slot only when the meter spring has run down to the end of its predetermined delay, a spring biasing said arm into said slot and a connection between said arm and said detent adapted to release said detent when the arm drops into said slot.

9. An operating device for connection to a rip cord on a parachute without disabling its ordinary manual control, which comprises a mainspring for operating the rip cord, a connector engaging said spring with said rip cord, a detent normally holding said spring against the operating power accumulated therein, a delay meter including a meter-operating spring, a handle for winding the meter spring to a predetermined extent, adjustable release means under the control of said handle for controlling the delay period of said delay meter, a torque-reducing gear train connecting said meter spring to a high speed rotor, a projection on said high speed rotor for engaging a stop to restrain operation of said delay meter, a governor limiting the velocity of

said gear train, and a connection between said delay meter and said detent operated by the delay meter at the end of its delay to release said detent from its restraining position relative to the main spring, said connection between the delay meter and the detent comprising a compound disk having a slot extending inward from its periphery, a connection from the gear train to said disk whereby it is rotated therewith, an arm positioned and adapted to drop into said slot when it reaches the position to which it is turned by movement of the gear train to the end of its metered delay, means resiliently pressing said arm against the disk, a lock connected to said arm locking said detent against release while said arm is riding on the edge of the disk and releasing said detent when the arm drops into the slot, said disk including a cam member adjacent the slotted member rotatable coaxially therewith and relative thereto, a resilient connection between the cam member and the slotted member normally holding them with said slot registering

with a correspondingly low area of the cam and having a rising slope circumferentially adjacent said slot whereby relative rotation between them will cam the arm out of the slot.

WILLIAM JAMES STALLAN.

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