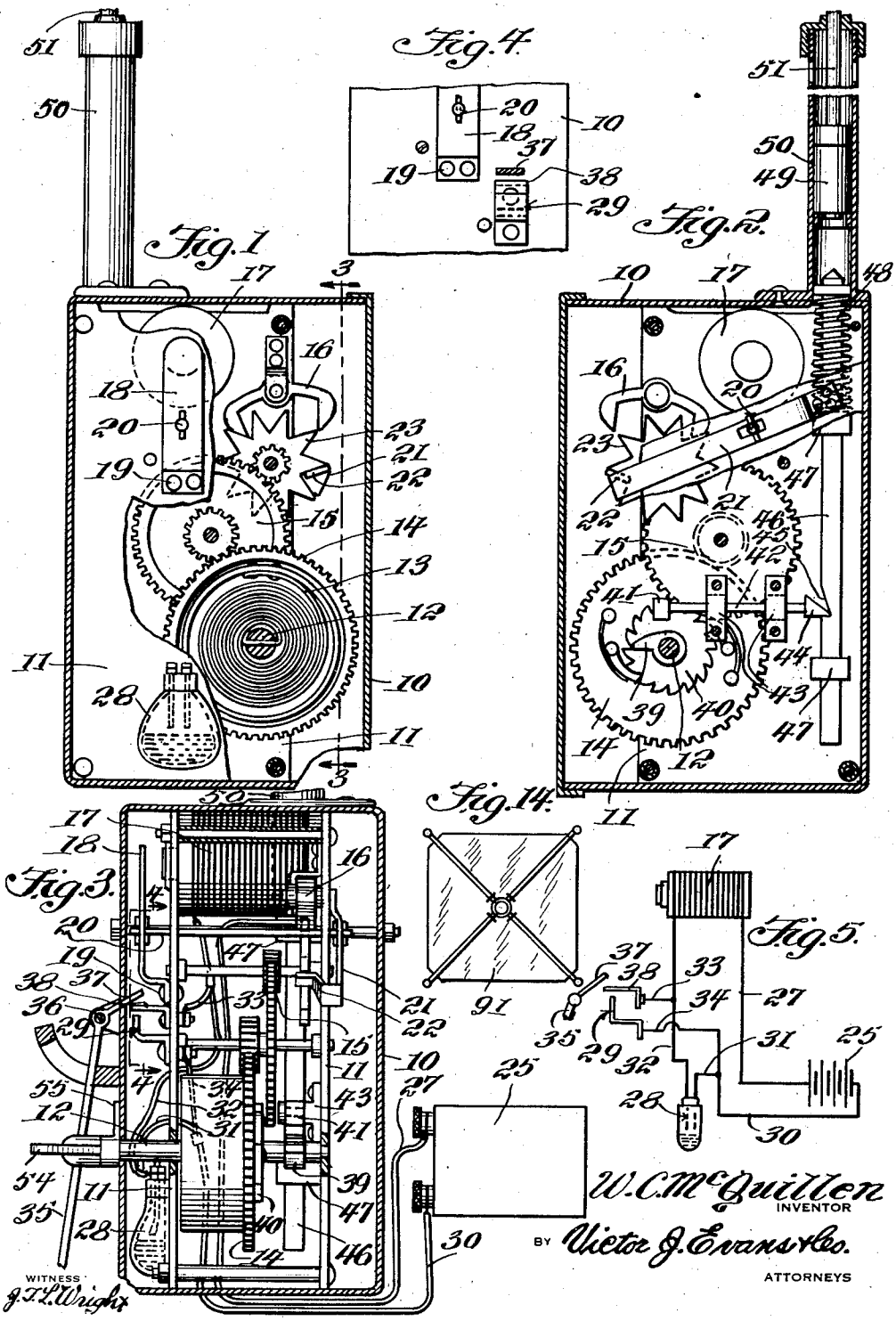
Oct. 10, 1939. W. C. McQUILLEN 2,175,634

AUTOMATIC PARACHUTE OPENER

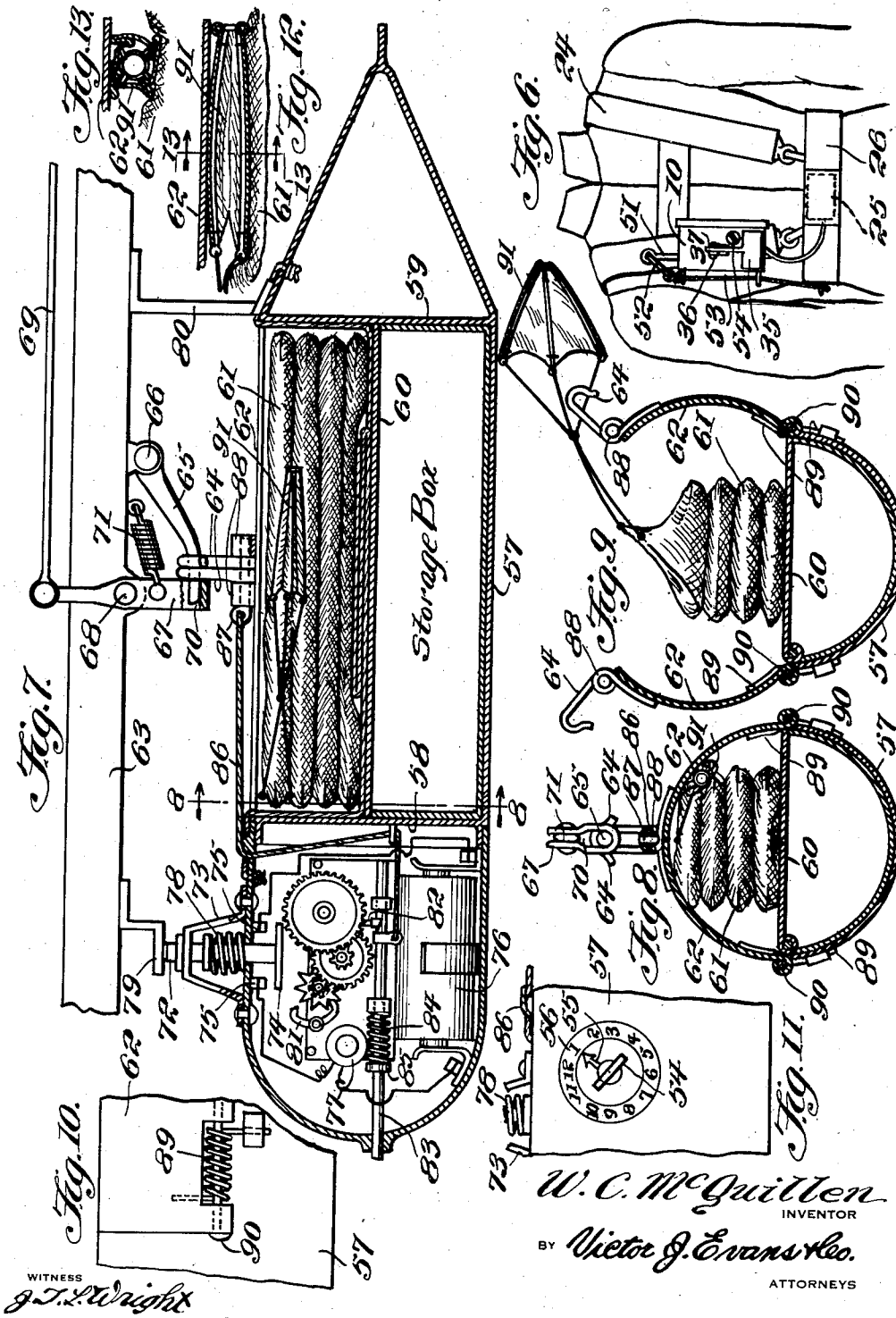
Filed Nov. 15, 1938 2 Sheets-Sheet 1



Oct. 10, 1939. W. C. McQUILLEN 2,175,634

AUTOMATIC PARACHUTE OPENER

Filed Nov. 15, 1938 2 Sheets-Sheet 2



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AUTOMATIC PARACHUTE OPENER

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4 Claims. (Cl. 244—150)

This invention relates to automatic parachute openers and has for an object to provide simplified apparatus which may be applied to the harness of any conventional parachute and may be adjusted to automatically open at a specified time interval after the person wearing the harness clears the aircraft regardless of the position assumed by the wearer.

A further object is to provide apparatus of this type which may be applied to a receptacle for dropping food or other articles and which may be adjusted to release the parachute at a predetermined distance above the ground to permit the receptacle being landed more accurately at its destination.

A further object is to provide a device of this character which may be formed of a few strong simple and durable parts, which will be inexpensive to manufacture, and which will not easily get out of order.

With the above and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings forming part of this specification,

Figure 1 is a longitudinal sectional view through the casing of an instrument constructed in accordance with the invention, and showing the operating parts in side elevation.

Figure 2 is a longitudinal sectional view through the casing of the instrument and showing the opposite side of the working parts from that shown in Figure 1.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a detail sectional view taken on the line 4—4 of Figure 1 showing the vane operated switch.

Figure 5 is a diagrammatic view of the electrical connections of the device.

Figure 6 is a front elevation of a harness in operative position and equipped with an automatic parachute opener constructed in accordance with the invention.

Figure 7 is a longitudinal sectional view of a modified form of the invention applied to a storage receptacle.

Figure 8 is a cross sectional view taken on the line 8—8 of Figure 7 showing the covers of the parachute receptacle closed.

Figure 9 is a cross sectional view similar to Figure 8 but showing the covers open.

Figure 10 is a detail view in elevation showing the hinge string of one of the parachute covers.

Figure 11 is a detail front elevation of the shaft and pointer for indicating lapse of time before opening of the parachute.

Figure 12 is a detail longitudinal sectional view showing the pilot chute in closed position.

Figure 13 is a cross sectional view taken on the line 13—13 of Figure 12.

Figure 14 is a bottom plan view of the pilot chute open.

Referring now to the drawings in which like characters of reference designate similar parts in the various views, 10 designates a casing in which is mounted a clockwork mechanism comprising side plates 11, a main shaft 12 journaled in the side plates and upon which a main spring 13 is coiled for actuating the shaft. As is customary the shaft is equipped with a gear 14 which actuates a gear train 15 terminating in an escapement 16, these parts being conventional.

An electro-magnet 17 is mounted between the side plates at the top of the casing and the resilient armature 18 of the magnet is rigidly secured at one end to one of the side plates as shown at 19 in Figure 3. The armature is equipped with a pin 20 which extends at a right angle to the armature and is equipped at the free end with a latch bar 21, best shown in Figure 2 as being secured at one end to the other side plate and having an inturned lug 22 which engages between the teeth of the escapement wheel 23. When the magnet is energized the armature is attracted and moves the latch bar 21 to dislodge the lug from between the teeth and permit the escapement to operate in the usual manner under the influence of the main spring 13.

The electro-magnet is energized to release the escapement and start the clockwork mechanism operating just as the wearer of the parachute harness 24, shown in Figure 6, clears the aircraft in any position, either upright or inclined. For this purpose a battery 25 is secured to the belt 26 of the harness. One side of the battery is connected by a conductor wire 27 to one end of the electro-magnet coil. A mercury switch 28, and a vane operated switch 29, are connected in parallel with the other end of the coil through the medium of a conductor wire 30 leading from the other side of the battery and respective wires 31—32 for the mercury switch and wires 33—34 for the vane operated switch, as best shown diagrammatically in Figure 5. A vane 35 is hinged

at one end to an end wall of the casing as shown at 36 in Figure 3 and is provided at the upper end with a finger 37 which depresses the spring switch contact 38 of the vane operated switch into contact with the stationary contact of this switch when the wind gets under the vane should the person fall in upright position, to close the circuit to the electro-magnet. Should the person fall in any other position the mercury switch will operate to close the circuit.

The time interval through which the clockwork mechanism is allowed to operate before release of the parachute is controlled through the medium of a cam 39 which is fixed to the inner end of the main shaft 12. This cam revolves as a unit with the shaft and ratchet gear 40 thereof and is disposed outside of the ratchet gear in position to impinge against the head 41 of a pin 42 which is slidably mounted in guides 43 on one of the side plates and is terminally equipped with a tooth 44. The tooth 44 engages in a notch 45 formed in a firing pin 46 which is disposed to slide longitudinally through the casing in guides 47. When the cam 39 impinges against the head 41 of the pin 42 or trigger as it may be called, the trigger is withdrawn from the notch 45 and the firing pin is released to be moved by its control spring 48 to explode a cartridge 49 carried in a barrel 50 which projects from one end of the casing. The explosion of the cartridge drives a plunger 51 outwardly in the barrel, and as best shown in Figure 6 the end of the plunger is connected to the conventional ring 52 on the rip cord 53 of the parachute which in the present embodiment of the invention is not illustrated as it is of the type worn either as a seat or as a back rest. Pulling of the rip cord permits the conventional parachute spring to open the parachute flap and release the pilot chute which pulls out the parachute as will be understood.

The main shaft extends exteriorly beyond the casing and is equipped with a winding key 54 as shown in Figures 3 and 11. Also the main shaft is equipped at the winding key with a pointer 55 which moves over an annular scale 56 displayed on the wall of the casing and graduated in seconds or other time intervals. By turning the key until the pointer indicates any desired time interval the main spring will be wound to a corresponding degree so that it will unwind under control of the escapement 16 during the predetermined time interval before the cam 39 strikes the head 41 of the trigger 42 to release the firing pin.

In Figure 7 there is shown a modified form of the invention for use in connection with parachute delivery of parcels, food, and other material. In this form of the invention a streamlined casing 57 is divided into forward and rear compartments through the medium of transverse partitions 58 and 59 and is divided into upper and lower central compartments through the medium of a longitudinal partition 60. The forward compartment receives the clock operated mechanism for timing the release of the parachute. In the upper central compartment is stored the packed parachute 61 and the top of this compartment is closed by hinged covers 62, best shown in Figure 9, which are normally closed as shown in Figure 8 and are opened after a predetermined lapse of time subsequent to release of the casing from the bracket 63 which suspends the casing from the aircraft (not shown).

The covers are provided with respective hooks 64 which are disposed in alignment when the covers are closed to hook over a bracket arm 65 which is hinged at one end to the bottom of the bracket 63 as shown at 66. The bracket arm 65 is normally held stationary through the medium of a latch bar 67 which is pivoted intermediate its ends on the bracket 63, as shown at 68. The upper end of the latch bar is equipped with a cable 69 which terminates within convenient reach of the person responsible for the release of the parachute. The lower end of the latch bar is equipped with an opening 70 which receives the end of the hinged bracket arm 65 in advance of the registering hooks 64 as best shown in Figure 7. When the operator pulls the cable 69 the lower end of the latch bar 67 will be rocked outwardly against the tension of its controlling spring 71 which is connected at one end to the latch bar and at the other end to the bracket 62 and which normally holds the latch bar in latched position. When the latch bar 67 is swung outwardly it disengages from the hinged bracket arm 65 allowing the latter to gravitate and release the casing 57.

Immediately upon the casing being released the time controlled mechanism operates to govern the time period through which the casing will fall before the doors are opened to release the parachute. For this purpose a single switch is employed comprising a plunger 72 which is slidably mounted in a bracket 73 disposed on the top of the casing over the front compartment. The plunger projects within the compartment and terminates in a switch contact 74 which bridges stationary switch contacts 75 to close the circuit from the battery 76 to the electro-magnet 77 of the time controlled releasing mechanism.

The plunger is spring pressed outwardly through the medium of a helical spring 78 which is sleeved upon the plunger and normally bears against a stop 79 carried by the bracket 63. This stop holds the front end of the casing against vibration when the apparatus is being transported and coacts with a similar stop 80 which depends from the bracket 63 and engages the rear end of the casing, for the same purpose.

As previously described when the electro-magnet is energized it releases the previously described escapement 81 to start the clockwork mechanism and when the previously described cam lodges against the trigger 82 the latter is withdrawn from the plunger 83 which is slidably mounted in the front compartment of the casing. Upon withdrawal of the trigger the plunger is moved forwardly through the medium of a helical spring 84 which is sleeved on the plunger between stop collars 85, movement of the plunger pulling the cable 86 which is attached to the plunger at one end and which carries a latch pin 87 at the opposite end. The latch pin is normally engaged in eyes 88 formed at the lower ends of the hooks 64 to hold the hooks stationary until withdrawal of the latch pin whereupon helical springs 89, best shown in Figure 10 as sleeved upon the hinge pintles 90 of the doors 62, exert tension upon the doors to spread the doors to wide open position. At this moment a pilot chute 91, having spring wire ribs, springs out and opens, simultaneously assisting opening movement of the doors 62, and pulls after it the parachute 61.

The time interval through which the clockwork mechanism will continue to run is governed by winding of the clockwork mechanism main shaft, previously described and shown in Figure 11 until the pointer 55 registers with the time

designating character on the dial 55, as also previously described.

Since the operation of the parts has been described as the description of the parts progressed it is thought that the invention will be fully understood without further explanation.

What is claimed is:

1. In an automatic parachute opener, a support, a time responsive escapement on the support, means connected to the escapement for holding the escapement stationary, an electro-magnet controlling said means to release the escapement for actuation when the parachute is initially dropped from aircraft, a parachute releasing cord, time responsive means connected to the cord and controlled by actuation of the escapement to release the parachute after a predetermined time period has elapsed subsequent to dropping of the parachute, a source of electricity, and a mercury switch connected in circuit with said source of electricity and with said electro-magnet adapted to energize the electro-magnet when the parachute is initially dropped from aircraft.

2. In an automatic parachute opener, a support, a time responsive escapement on the support, means connected to the escapement for holding the escapement stationary, an electro-magnet controlling said means to release the escapement for actuation when the parachute is initially dropped from aircraft, a parachute releasing cord, time responsive means connected to the cord and controlled by actuation of the escapement to release the parachute after a predetermined time period has elapsed subsequent to dropping of the parachute, a source of electricity, a vane operated switch, a mercury switch, and conductors connecting both switches in parallel with the source of electricity, and with the electro-magnet, said switches being adapted to energize the electro-magnet when the parachute is initially dropped from the aircraft regardless of the position of the wearer in the air.

3. In an automatic parachute opener, a support, a time responsive escapement on the support, a latch member slidably mounted on the support and engaging the escapement to hold the escapement stationary, an electro-magnet, an armature for the magnet connected to said latch pin and adapted to move the latch pin to release the escapement for actuation when the electro-magnet is energized, time responsive cam means, a trigger connected to said means, a parachute releasing cord, a plunger connected to said cord for pulling the cord, a barrel connected to said support in which the plunger works, an explosive cartridge in said barrel beneath the plunger adapted to actuate the plunger when fired, a spring pressed firing pin slidably mounted on said support projecting into the barrel for exploding the cartridge, said trigger normally engaging said firing pin and holding the pin in cocked position against the tension of its controlling spring, said cam means releasing the trigger to permit the firing pin to move to firing position after a predetermined time period has elapsed subsequent to dropping of the parachute, a source of electricity, and switch means connected in circuit with said source of electricity and with said electro-magnet adapted to energize the electro-magnet when the parachute is initially dropped from the aircraft.

4. The combination of a casing, partitions in the casing dividing the casing into compartments, a packed parachute in one compartment, spring pressed hinged doors closing the last named compartment, means for detachably securing said casing to an aircraft, means for manually releasing said securing means to permit the casing to drop, a clockwork mechanism in one of said compartments including an escapement, a main spring, and a winding shaft for the spring, means connected to the escapement for normally holding the escapement stationary, means for releasing the escapement holding means when the casing is initially dropped from aircraft, means for holding said doors closed against the tension of the controlling springs of the doors, door releasing means connected to the last named means and time responsive means connected to said winding shaft and to said door releasing means controlled by actuation of the escapement to operate the door releasing means after a predetermined time period has elapsed subsequent to dropping of the casing.

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