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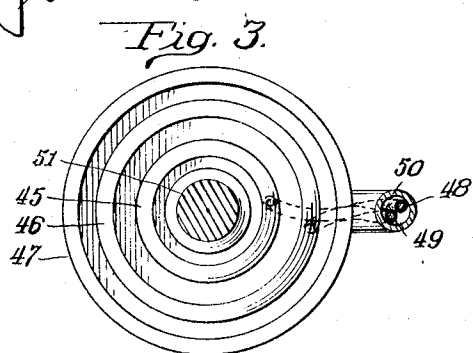
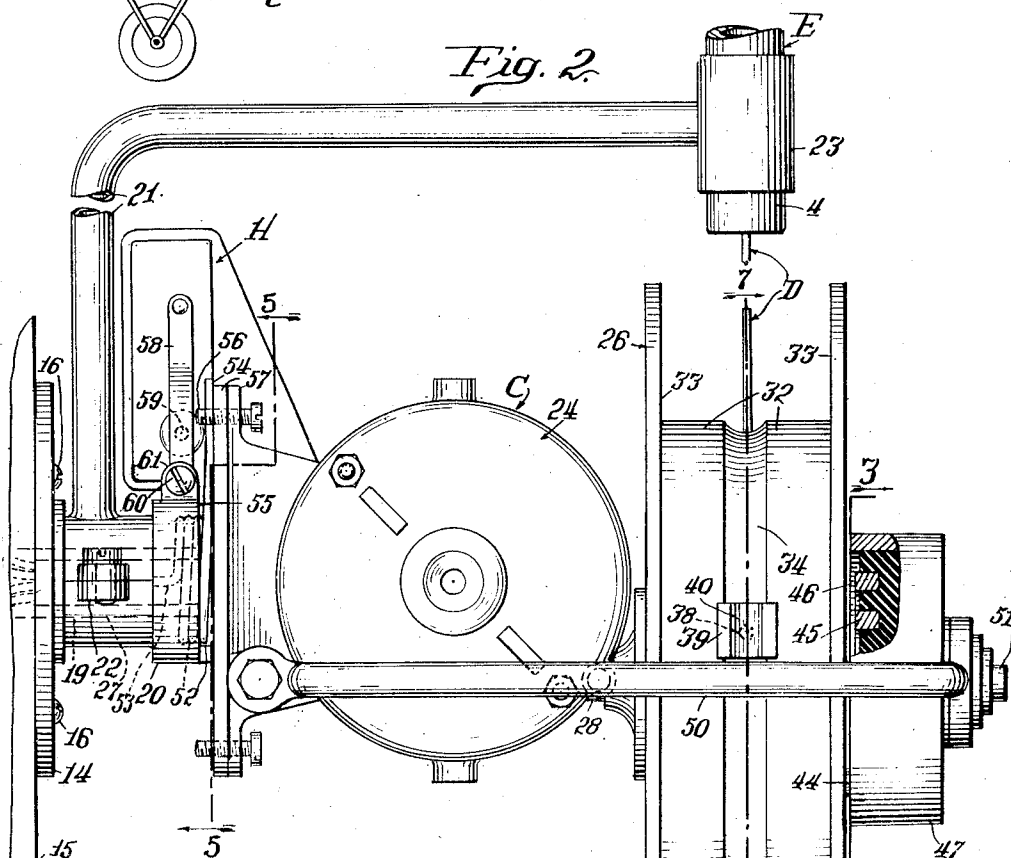
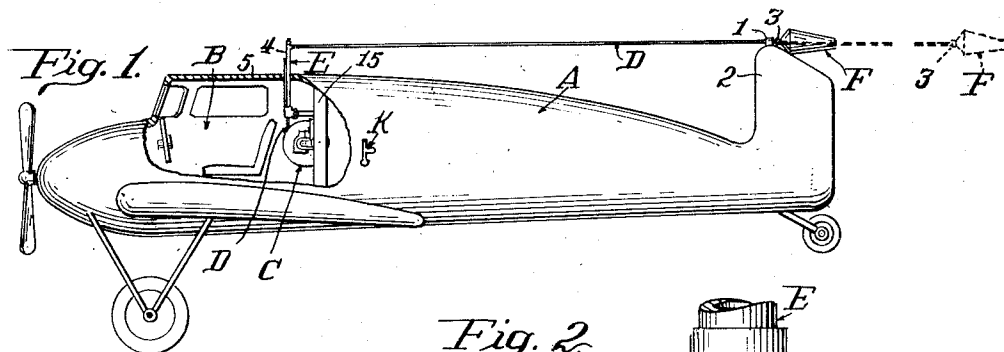
R. D. PAVLIK

2,251,418

AIRCRAFT ANTENNA

Filed July 3, 1939

3 Sheets-Sheet 1



Inventor
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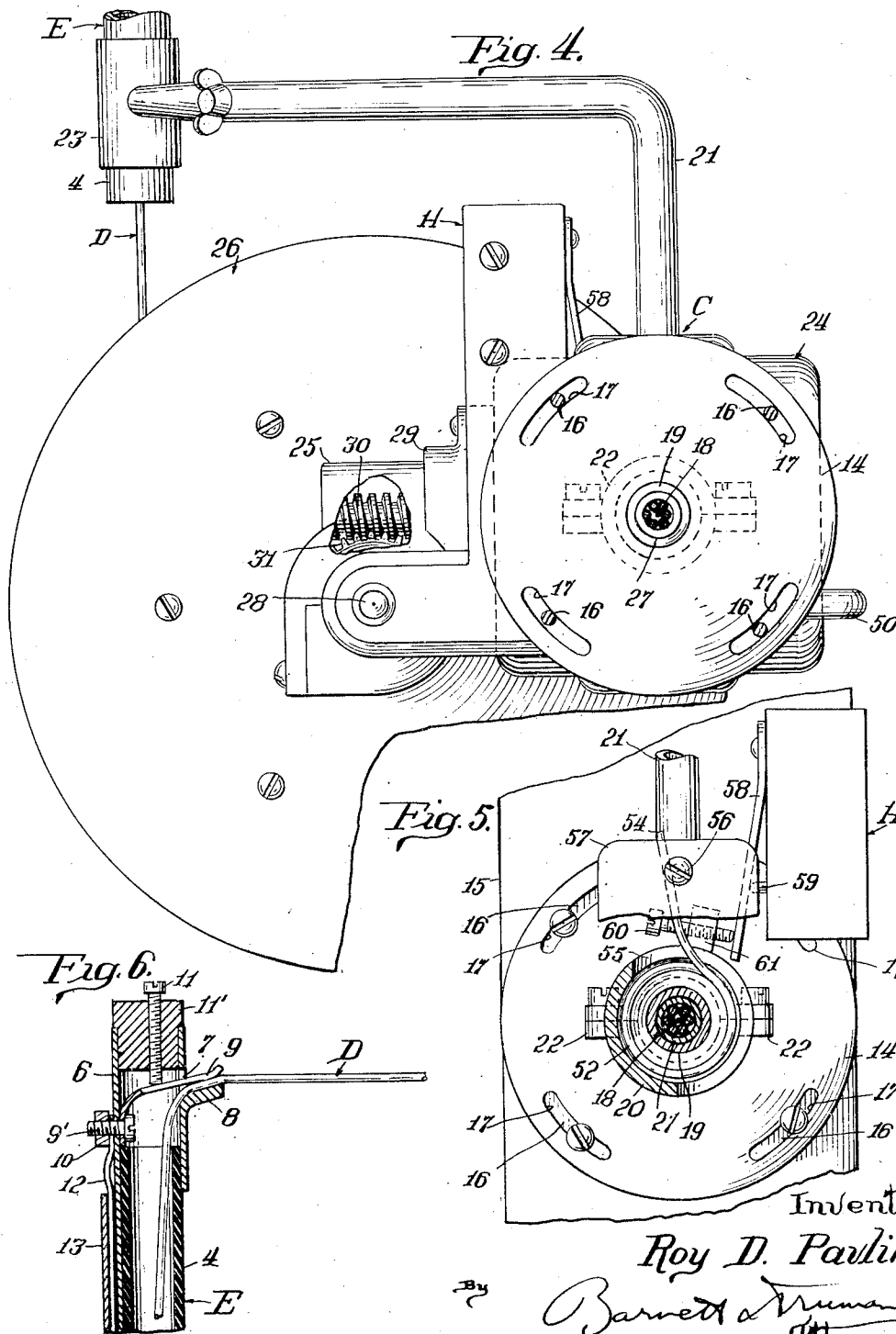
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AIRCRAFT ANTENNA

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3 Sheets-Sheet 2

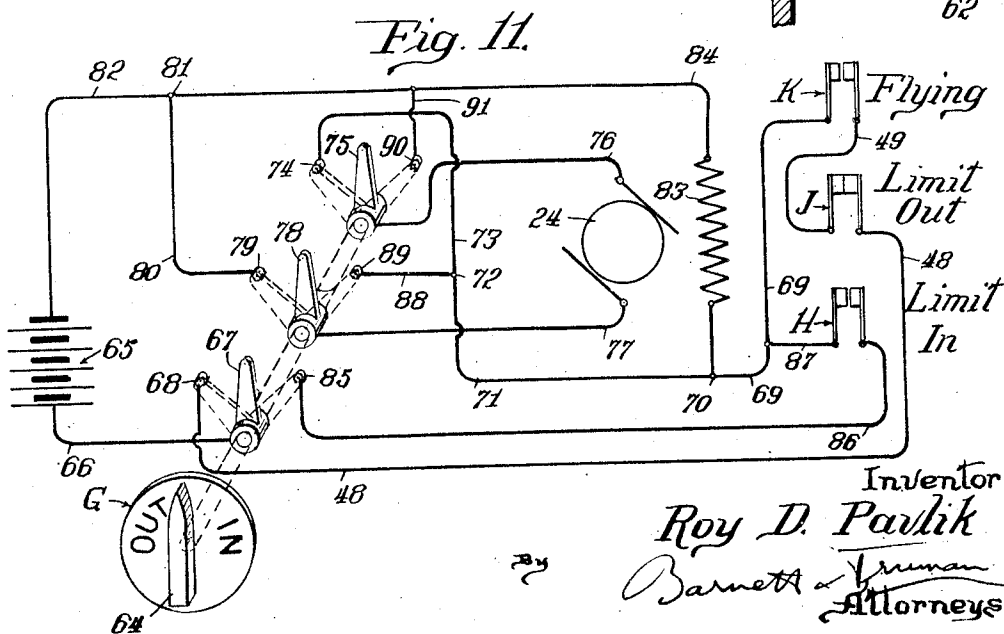
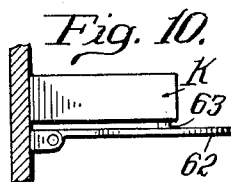
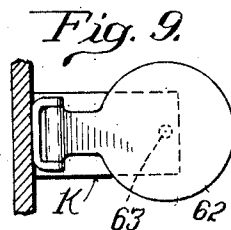
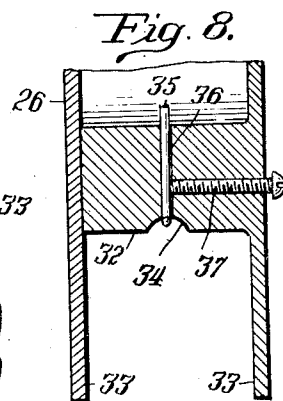
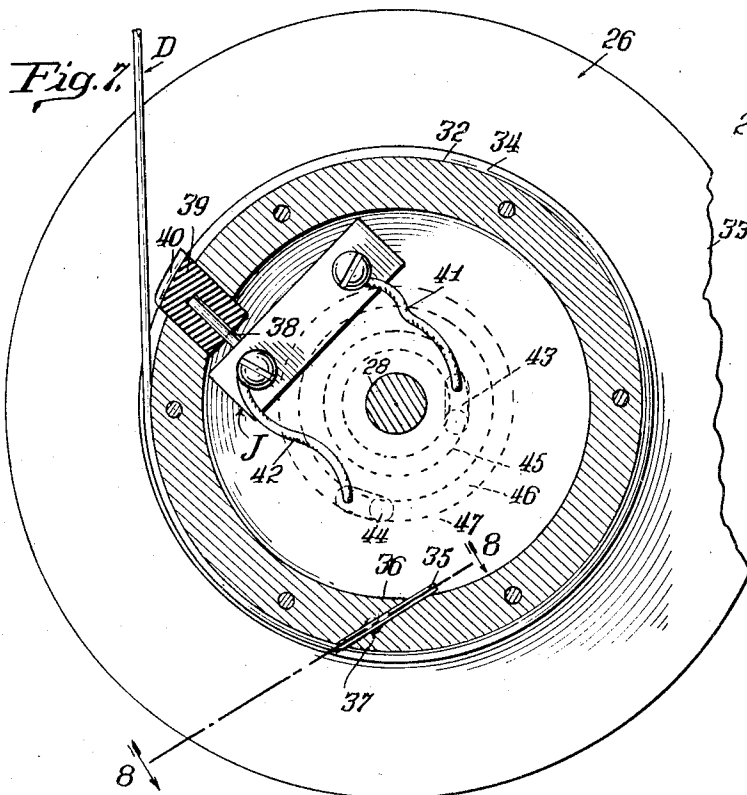


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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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AIRCRAFT ANTENNA

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Application July 3, 1939, Serial No. 282,753

12 Claims. (Cl. 250—33)

This invention relates to certain new and useful improvements in aircraft antenna, and more particularly to an extensible and retractible antenna or aerial supported above and behind the fuselage of the air-plane and adapted for both receiving and transmitting radio messages at all times.

It has heretofore been the usual practice to utilize a fixed antenna stretched between masts or towers projecting above the fuselage near either end thereof (the rear stabilizer is conveniently used for one of these towers), and a relatively short antenna of this type is suitable for receiving messages, and also for transmitting at short range, for example, when the air-plane is nearing the air-port or coming in for landing. A longer antenna is required for long range transmission. For this purpose an auxiliary antenna has been used, usually weighted at its free end and let out through an opening in the lower portion of the fuselage, this antenna trailing below and behind the ship when in place. Such an antenna may extend as much as sixty feet from the ship. This antenna must be completely reeled in when the ship is flying low or is to be landed, to prevent the antenna from becoming entangled in trees, telephone wires or other objects. When this longer antenna is reeled in, the radio connections are transferred to the shorter antenna permanently mounted above the fuselage.

When landing the ship, the pilot's time is rather fully occupied with other details of landing, and the winding of a hand-operated reel to bring in the trailing antenna constitutes an additional hazard. Even though a motor-operated reel is provided, an antenna hanging below the fuselage is more apt to cause trouble than one mounted above the ship or extending more or less horizontally behind the ship.

According to the present invention, a single antenna is used which, when reeled in to its minimum effective length, will still have a portion stretched taut between spaced towers projecting above the fuselage so as to serve the function of the shorter antenna heretofore used. A "wind-sock" or other suitable drag or float is attached to the rear or free end of the antenna so that when the antenna is reeled out the extended portion of the antenna will be supported in an approximately horizontal position behind the ship. The antenna reeling mechanism is operated by a reversible electric motor through irreversible driving mechanism so that the antenna can only be let out or pulled in by rotation of the motor and will be held in any intermediate position by

the irreversible driving mechanism when the motor is stopped. The rotation of the motor, in either direction, is controlled by a single hand-operated switch positioned convenient to the pilot. The control circuits also comprise automatically operating limit switches for stopping the motor when the antenna is let out to its maximum length or reeled into its minimum length, and the antenna will be kept taut at all times. Means is also provided for preventing the unreeling of the antenna (in response to movement of the hand-operated switch) when the air-plane is not in flight. When the ship is in flight, the antenna can be reeled out to any desired extent (between its minimum and maximum limits), and can also be reeled in or withdrawn to any extent and from any position by the simple manipulation of the hand-switch.

The principal object of this invention is to provide an improved antenna assembly for aircraft, of the type briefly described hereinabove and disclosed more in detail in the specifications which follow.

Another object is to provide an improved motor-operated reeling mechanism for letting out or pulling in the antenna.

Another object is to provide improved electrical control mechanism for the reeling apparatus.

Another object is to provide improved means for keeping the antenna taut when reeled in to its minimum length.

Another object is to provide means for rendering the reeling-out apparatus, or other electrically operated mechanism on the ship, inoperative when the ship is not in flight.

Another object is to provide improved limit-switch mechanism for the reeling apparatus.

Other objects and advantages of this invention will be more apparent from the following detailed description of one approved form of apparatus constructed and operating according to the principles of this invention.

In the accompanying drawings:

Fig. 1 is a side elevation of an air-plane in flight, the antenna being shown in retracted or reeled-in position in solid lines, and in extended or reeled-out position in dotted lines. It will be understood that when reeled out the antenna will extend much further behind the ship than is indicated in Fig. 1, an intermediate portion of the wire being broken away.

Fig. 2 is a rear elevation of the reeling mechanism.

Fig. 3 is a partial vertical section showing the

commutator, this view being taken substantially on the line 3—3 of Fig. 2.

Fig. 4 is a side elevation of the reeling mechanism, partially broken away, the view being taken looking from the left at Fig. 2, or in the same direction as this apparatus is seen in Fig. 1.

Fig. 5 is a partial vertical section, taken substantially on the line 5—5 of Fig. 2.

Fig. 6 is a vertical section through the upper end of the forward mast or tower.

Fig. 7 is a vertical section through the reel, taken substantially on the line 7—7 of Fig. 2.

Fig. 8 is a detail sectional view taken substantially on the line 8—8 of Fig. 7.

Figs. 9 and 10 are an elevation and a plan, respectively, of the wind-operated safety switch.

Fig. 11 is a wiring diagram showing the electrical connections for controlling the motor.

Referring first to Fig. 1, at A is diagrammatically indicated an air-plane comprising the forward pilot's compartment B, at the rear of which is positioned the antenna-reeling mechanism C, from which antenna D extends upwardly through mast or tower E and then rearwardly above the fuselage to the wind-cone or equivalent drag device F. This wind-cone (commonly known as a "wind-sock") is of well known type, consisting of a fabric cone open at both ends and provided with means for attaching its larger open end to the rear end of the antenna wire D. When drawn through the air, the wind passing through the cone will hold the device back like a kite or drag so as to hold wire D in a substantially horizontal position behind the frame. Obviously, any equivalent form of drag device could be used.

The antenna wire D is preferably in the form of an exposed braided bronze wire, or it may be made of other suitable metal having sufficient strength and flexibility. The rear or free end of this wire extends slidably through an insulated eyelet or guide I, conveniently mounted at the top of the stabilizer 2 of the plane, and is attached to a stop button 3 where connection is made with the wind-sock F. When the antenna is reeled in to its minimum effective length, button 3 will engage the guide I and limit further movement of the antenna in a forward direction.

The antenna wire extends forwardly above the fuselage to the top of mast or tower E and thence downwardly through this mast to the winding mechanism C. This mast E (the upper portion of which is shown in detail in Fig. 6) is preferably in the form of a tube 4 of insulating material which extends intermediately through the roof 5 of the plane and is suitably mounted therein. A metallic head 6 (for example, bronze or brass) is mounted at the upper end of insulating tube 4, and is provided with an opening 7 in one side below which is a curved grooved lip 8, over which the antenna wire D slidably moves, the wire then extending downwardly through tube 4 to the winding mechanism C within the ship. The sliding engagement of wire D with lip 8 tends to polish the engaging surfaces and maintain a good electrical connection. A brush in the form of a metallic spring 9 is secured at one end within head 6 by means of screw-bolt 9' provided with nut 10. The free end of spring-brush 9 yieldably engages the upper surface of antenna wire D and holds it firmly within the lip 8. The adjusting screw 11 mounted in plug 11' which closes the upper end of the mast engages the upper side of spring 9 to regulate the pressure exerted on the antenna wire. The cir-

cuit wire 12 which extends to the radio equipment (not here shown, but located within the fuselage) is connected at one end with the metallic head 6 and brush 9 and may be encased in a small separate insulating tube 13. This wire 12 may be secured to the head by the screw and nut 9' and 10 which hold brush 9 in place. It will thus be seen that the effective portion of the aerial or antenna extends rearwardly from the top of the mast E.

The motor-driven reeling mechanism C is controlled by means of a hand-switch G (Fig. 11) which is positioned on the instrument board in a position convenient to the pilot. The motor-operating circuits are also automatically controlled by certain switches H, J and K, which will be hereinafter described.

The reeling assembly C is carried by a supporting plate 14 fixed mounted on some fixed member 15 of the fuselage structure (see Figs. 1 and 5). As here shown, the supporting plate 14 is fixed in place by screws 15 extending through arcuate slots 17 in the plate so that the assembly C may be properly adjusted about the horizontal axis 18 around which the reel swings, as hereinafter described. A hollow cylindrical bearing 19 extends laterally from supporting plate 14 and terminates in the spring-housing 20. A bracket arm 21 is clamped at 22 around bearing 19 and extends upwardly and laterally, terminating in a clamp 23 which engages the lower end portion of the insulated tube 4 through which antenna D extends.

The swinging portion of the reel-assembly comprises the motor 24, driving mechanism 25 and reel 26, together with some associated elements. This swinging assembly is carried by a tubular shaft 27 journaled in the fixed bearing 19. The reel 26 is carried by shaft 28 journaled in housing 29 which completely encloses the motor and driving mechanism 25 so as to eliminate any danger from sparking. The motor 24 is of the reversible type and rotates the worm 30 meshing with worm wheel 31 on the reel-shaft 28. The worm 30 has a small pitch-angle so that the gearing is of the irreversible type, that is the rotating worm can drive the worm wheel in either direction, but the worm wheel will be unable to rotate the worm. Consequently when the motor is stopped, the worm 30 will lock the reel against rotation in either direction.

The reel 26 comprises the central annular hub portion 32 secured between the similar circular side plates or discs 33 of considerably greater diameter. The central portion of hub 32 is grooved at 34 to take the first few turns of the antenna wire D. The end 35 of the antenna is inserted through a diagonally extending hole 36 formed in the hub (see Figs. 7 and 8) and clamped in place by the adjustable screw 37. The end of the antenna will remain locked in place in the reel under any normal conditions, but screw 37 may be so adjusted that the wire will pull out when subjected to an excessive tension so as to prevent injury to the reeling mechanism. As an additional precaution the wire antenna will preferably be weakened at some point intermediate its length (for example, by severing a few strands of the braided wire), so that the antenna will break at this point before causing any damage to the associated mechanism. Obviously the antenna wire will be left at sufficient strength to resist any normal tension.

The safety limit-switch J is mounted within the hollow hub 32. This is a highly sensitive

snap-switch of the normally open type, that is, the switch will remain open to break the circuit therethrough unless a small inward pressure is applied to plunger 38 operated by the plug 39 projecting outwardly through a passage in the hub 32. This plug 39 is grooved at 40, corresponding to the groove 34 in the hub, and the plug projects slightly beyond the peripheral face of the hub when the switch is open. However, when the first turn of wire D is wrapped in groove 34, the plug 39 will be pushed in slightly so as to close switch J. Wires 41 and 42 extending from the terminals of switch J lead to spring brushes 43 and 44 which bear respectively against rings 45 and 46 of a fixed commutator head 47 (see Figs. 2, 3 and 7). Circuit wires 48 and 49 lead out from rings 45 and 46 through the tubular arm 50 which also serves to hold commutator head 47 against rotation. Head 47 is journaled on stem 51 extending out from one side of reel 26. Limit switch J is connected in the reeling-out circuit of motor 24 (as will be hereinafter explained in connection with Fig. 11). When the antenna D has been reeled out to its maximum length, and the last turn of wire leaves the reel, plug 39 will be released and switch J will automatically open, thus breaking the actuating circuit and stopping the motor 24. Reel 26 will immediately cease rotating and will be locked in this position by the now stationary worm 30.

It will be apparent from Fig. 4 that the swinging portion of the reel assembly is pivoted eccentrically about the axis 18 so that this assembly tends to swing downwardly and exerts its weight against the pull of antenna D. As an additional means for resisting the pull of the antenna, a torsion spring 52 is mounted within the fixed spring-cup 20, one end of this spring being anchored at 53 within the cup. The other upwardly projecting end portion 54 of this spring extends through a slot or notched portion 55 of the cup and the spring, when so installed, is twisted so as to have a pre-loaded tension. The upper end portion 54 of this spring bears against a lug or abutment 56, for example, the end of a screw mounted in the end plate 57 of the swinging assembly. It will now be seen that the upward or outward pull of antenna wire D always tends to pull the reel and motor assembly in a clockwise direction (Fig. 4), or in a counter-clockwise direction, as seen in Fig. 5, but this pull is resisted by the weight of the swinging parts as well as the tension of the pre-loaded spring 52. The tension of this spring is sufficient to resist the pull of the antenna when the antenna is wholly or partially extended, but when the antenna is reeled in to its minimum effective length and stop 3 engages the fixed guide or eyelet 1 (Fig. 1) the resulting increased tension in the antenna will be sufficient to lift the swinging assembly and swing it about axis 18 against the resistance of spring 52.

The sensitive limit switch H is fixedly mounted on the swinging assembly. It is a switch of essentially the same type as the limit switch J previously described, except for the fact that switch H is normally closed, but will be opened, when the flexible leaf spring 58 is pressed in toward the switch so as to operate the projecting plunger 59. The adjustable screw 60 mounted in lug 61 projecting from one side of spring-cup 20 constitutes a fixed abutment to be engaged by the switch-operating leaf-spring 58. When switch H is rotated in a counter-clockwise direction (Fig. 5) along with the swinging assembly, the leaf-

spring 58 will engage the stop screw 60 and cause snap-switch H to open. The switch H is connected in the reeling-in circuit of motor 24 so that when switch H is opened the motor circuit will be broken and the motor and reel will cease rotating, the reel being locked in this position by worm 30. It will now be apparent that when the antenna is reeled in to its minimum length, the added tension in the antenna will lift the swinging reel assembly and stop the motor by opening switch H. At the same time the pre-loaded tension of spring 52 will be added to the normal pull on antenna D so that the antenna will be held taut between the towers 2 and E above the fuselage. It will now be seen that no fixed length of wire or number of turns must be wound upon the reel 26, the stopping of the mechanism depending entirely upon the final tension developed in the antenna. In this way any stretch in the antenna wire is automatically compensated for, and it is not essential that the antenna shall wind on the reel in any predetermined arrangement or number of laps.

When the ship is at the air-port or grounded, no material tension can be developed by the wind-sock F to pull out the antenna. If the hand-operated switch G should be then turned to cause the motor to unreel the antenna, the wire would simply unwind and entangle itself within or above the ship. In order to avoid this possibility, a third safety switch K is used (see Figs. 9, 10 and 11). This is a self-opening snap switch connected in the reeling-out circuit. This switch is so positioned that when the ship is in motion, some consequent air-pressure variation, such as the wind pressure exerted against a small swinging vane 62 will operate the plunger 63 to close switch K and complete the reeling-out circuit at this point.

Alternatively, this switch K might be operated by the tension differential exerted by wind-sock F when the ship is in motion. Obviously, when the ship is in flight an increased pull is exerted on the antenna by the wind-sock F, and this increased pull could be utilized to operate the safety switch K.

Referring now to Fig. 11, one suitable example of the electrical operating circuits will be described. The manual control switch G (which as already noted will be located in a position convenient to the pilot), comprises a knob or lever 64 which can be partially rotated from the neutral position shown in the drawings, either counter-clockwise to the "out" position, or clockwise to the "in" position. This movement of lever 64 will simultaneously operate three separate switches, each comprising a swinging contact arm adapted to engage alternatively with either of two fixed contacts. Assuming first that the ship is grounded and the antenna reeled in to its minimum effective length, limit switch H and safety switch K will be open, and limit switch J will be closed. At this time operation of switch G in either direction will not close any operating circuit, since the reeling-in circuit is broken at switch H, and the reeling-out circuit is broken at switch K. Assuming now that the ship takes off and is in flight, the safety switch K will automatically close. If the pilot now turns switch handle 64 to the "out" position, a reeling-out circuit for the reversible motor will now be completed as follows: From battery 65, through wire 66 to movable switch contact 67, fixed contact 68, wire 48 to closed switch J, wire 49 to closed switch K, wire 59, terminal 70, wire 71, terminal 72, wire

73, fixed contact 74, movable switch arm 75, wire 76 to the armature of motor 24 wire 77, movable switch arm 78, fixed contact 79, wire 80, terminal 81 and wire 82 back to the battery. At the same time a shunt circuit will be completed from terminal 70 through motor field 83, and wire 84 to terminal 81. If the switch handle 64 is left in the "out" position, the motor will continue to run in this direction until the antenna has been let out to its maximum length, whereupon limit switch J will automatically open, as hereinabove described, and stop the motor. However, at any time while the antenna is being reeled off, the motor may be stopped by manually turning handle 64 to the upright or neutral position.

It will be noted that as soon as the reeling-out process has started and the excess tension on antenna D has been relieved, the spring 52 will swing down the movable portion of the reeling assembly so as to permit limit switch H to close. Now at any time, with the antenna either partially or completely reeled out, if switch handle 64 is swung to the "in" position, the following reeling-in circuit will be completed: From battery 65 through wire 66, movable switch contact 67, fixed contact 85, wire 86, closed switch H, wires 87 and 89, terminal 70, wire 71, terminal 72, wire 88, fixed contact 89, movable switch contact 78, wire 77, motor armature 24, wire 73, movable switch contact 75, fixed contact 80, and wires 91, 84 and 82, back to the battery. At the same time a shunt circuit will be completed as before, through motor field 83. The motor will now rotate in a reverse direction and if switch G is left in the "in" position, the reeling-in process will continue until the wind-sock F has been completely drawn in, antenna D has been stopped at the fixed eyelet 1, the swinging assembly of the reeling mechanism has been lifted against the tension of spring 52 and switch H has been opened, thus stopping the motor. However, at any intermediate point this reeling-in process can be stopped by swinging hand switch 64 back to the neutral position.

It will now be seen that the reeling mechanism will act automatically to stop the motor at either extreme limit of motion of the antenna, but the antenna can be halted and held at any intermediate length by proper manipulation of hand switch G. For example, if the pilot has started to reel out the antenna and for any reason it should be desirable to immediately reel in the same, he need only throw the switch G to the "in" position and immediately the motor will be reversed and the antenna will be reeled in. Also, the antenna can be stopped at any intermediate length and from this position adjusted either in or out, if such adjustment of the antenna length should be desirable for any reason. In any event, and at any time, all that the pilot needs to do to retract the antenna is to throw switch G to the "in" position, and the antenna will be automatically pulled in and held taut at its minimum effective length above the ship.

In case the antenna should be completely reeled out and the pilot should fail to throw switch G to reel in the antenna prior to landing, or there should be any failure in the reeling mechanism, the antenna wire D will pull out at its connection 37 with the reel in the event that the antenna becomes entangled in any obstructions. If the antenna should be partly wound on the reel at this time, so that the attachment 37 might fail to release the antenna, the wire will break at the

partially severed intermediate point before causing damage to the ship or reeling mechanism.

It will be apparent that the flexible antenna wire is entirely free of any knobs or other projections intermediate its ends so that it can pass freely through the various guides and fittings, and any stretch or elongation of the wire has no effect on the proper operation of the limit stop mechanisms. The wire will always be held taut, and there is no possibility of releasing the tension on this antenna wire when withdrawn to its minimum effective length above the fuselage. Only that portion of the wire between the brush mechanism at the top of mast E and the wind-sock F is utilized for receiving or transmitting messages, the remainder of the antenna wire extending down to and reeled upon reel 26 being utilized simply for changing the length of the antenna and holding same taut under all conditions.

I claim:

1. An antenna assembly for airplanes comprising an antenna wire, a reel to which one end of the wire is connected, a drag-device at the free end of the wire, guiding means for the wire mounted on the fuselage of the ship at positions spaced apart substantially horizontally the minimum effective length of the antenna, and means for rotating the reel to either reel out or reel in the wire between its minimum and maximum effective lengths, said means comprising a reversible motor, irreversible driving means through which the motor turns the reel selectively in either direction, alternative circuits for the motor for causing the motor to rotate in either direction, a manually operable control switch for selectively closing or opening either circuit whereby the antenna may be adjusted to and held at any desired length between its maximum and minimum effective lengths, and a normally open switch in the reeling-out circuit, said switch being positioned within the reel and held closed by the first turn of wire on the reel.

2. An antenna assembly for airplanes comprising an antenna wire, a reel to which one end of the wire is connected, a drag device at the free end of the wire, guiding means for the wire mounted on the fuselage of the ship at positions spaced apart substantially horizontally the minimum effective length of the antenna, one of these guiding means stopping the drag-device when completely reeled in, and means for rotating the reel to either reel out or reel in the wire between its minimum and maximum effective lengths, said means comprising a reversible motor, irreversible driving means through which the motor turns the reel selectively in either direction, alternative circuits for the motor for causing the motor to rotate in either direction, a manually operable control switch for selectively closing or opening either circuit whereby the antenna may be adjusted to and held at any desired length between its maximum and minimum effective lengths, a normally closed switch in the reeling-in circuit, and means actuated by the increased tension in the antenna when the drag is stopped at its innermost position for opening said switch.

3. An antenna assembly for airplanes comprising an antenna wire, a reel to which one end of the wire is connected, a drag device at the free end of the wire, guiding means for the wire mounted on the fuselage of the ship at positions spaced apart substantially horizontally the minimum effective length of the antenna, and means for rotating the reel to either reel out or reel in the wire between its minimum and maximum

effective lengths, said means comprising a reversible motor, irreversible driving means through which the motor turns the reel selectively in either direction, alternative circuits for the motor for causing the motor to rotate in either direction, a manually operable control switch for selectively closing or opening either circuit whereby the antenna may be adjusted to and held at any desired length between its maximum and minimum effective lengths, a normally open switch in the reeling-out circuit, and wind-pressure operated means independent of the antenna for closing said switch when the ship is in flight.

4. In combination with an antenna for an airplane adapted to be extended or retracted between a minimum and a maximum effective length, a winding mechanism for reeling-in the antenna, cooperating devices for stopping the movement of the antenna when it has been reeled in to its minimum length, said devices comprising a fixed guide on the ship through which the antenna is movable and an abutment member carried at the free end of the antenna for engaging said guide, said winding mechanism comprising a reel to which the other end of the antenna is attached, a motor, irreversible driving means through which said motor rotates the reel, and a circuit for actuating the motor to reel in the antenna, a normally closed limit switch in this circuit, a fixed support on which the winding mechanism is bodily movable, yieldable means for normally moving the winding mechanism in a direction opposed to the reeling out pull of the antenna, the added tension in the antenna when its movement is stopped at its minimum length serving to move the winding mechanism in opposition to the yieldable means, and means actuated by this latter movement of the winding mechanism for opening the limit switch to stop the motor.

5. In combination with an antenna for an airplane adapted to be extended or retracted between a minimum and a maximum effective length, a winding mechanism for reeling-in the antenna, cooperating devices for stopping the movement of the antenna when it has been reeled in to its minimum length, said devices comprising a fixed guide on the ship through which the antenna is movable and an abutment member carried at the free end of the antenna for engaging said guide, said winding mechanism comprising a reel to which the other end of the antenna is attached, a motor, irreversible driving means through which said motor rotates the reel, and a circuit for actuating the motor to reel in the antenna, a normally closed limit switch in this circuit, a fixed support on which the winding mechanism is pivoted eccentrically to normally swing down in a direction opposed to the reeling out pull of the antenna, the added tension in the antenna when its movement is stopped at its minimum length serving to lift the winding mechanism, and means actuated by this latter movement of the winding mechanism for opening the limit switch to stop the motor.

6. In combination with an antenna for an airplane adapted to be extended or retracted between a minimum and a maximum effective length, a winding mechanism for reeling-in the antenna, cooperating devices for stopping the movement of the antenna when it has been reeled in to its minimum length, said devices comprising a fixed guide on the ship through which the antenna is movable and an abutment member

carried at the free end of the antenna for engaging said guide, said winding mechanism comprising a reel to which the other end of the antenna is attached, a motor, irreversible driving means through which said motor rotates the reel, and a circuit for actuating the motor to reel in the antenna, a normally closed limit switch in this circuit, a fixed support on which the winding mechanism is pivoted eccentrically to normally swing down in a direction opposed to the reeling out pull of the antenna, a spring connected under stress between the winding mechanism and stationary support and swinging the winding mechanism downwardly against the normal pull of the antenna, the added tension in the antenna when its movement is stopped at its minimum length serving to lift the winding mechanism in opposition to the spring thus holding the antenna taut, and means actuated by this latter movement of the winding mechanism for opening the limit switch to stop the motor.

7. In combination with an antenna for an airplane, means for supporting the antenna from the airplane, means for reeling in or out this antenna and holding it at minimum, maximum or intermediate effective lengths comprising a reversible motor, and alternative reeling in and reeling out circuits for energizing the motor, means for automatically opening the reeling out circuit when the antenna is extended to its maximum length, means for automatically opening the reeling in circuit when the antenna is drawn in to its minimum effective length, means for automatically opening the reeling out circuit when the airplane is not in motion, and a manually operable switch effective to alternatively open or close either circuit at any time except when said circuit is broken by one of said automatic means.

8. In combination with an antenna for airplanes, a grooved reel to which one end of the antenna is attached and on which the antenna may be partially wound, a motor-mechanism for rotating the reel, a circuit for actuating the motor-mechanism to reel-out the antenna, a self-opening switch mounted within the reel and connected in said circuit, and a switch-closing plunger projecting through the grooved surface of the reel so as to be operated by the pressure of the innermost turn of the antenna.

9. In combination with an antenna for airplanes, a reel on which a portion of the antenna may be wound and from which the antenna may be reeled out when the ship is in flight, a motor-mechanism for rotating the reel, a circuit for actuating the motor-mechanism to reel-out the antenna, a manually operable switch for closing this circuit, a self-opening switch in this circuit, and air-pressure operated means independent of the antenna for automatically closing this latter switch when the ship is in flight.

10. In combination with electrically actuated antenna-operating equipment on an airplane, including an actuating circuit, a manually operable control switch for said circuit, a self-opening switch in said circuit, and wind-pressure operated means independent of the antenna for automatically closing this latter switch when the ship is in flight.

11. In combination with electrically actuated antenna-operating equipment on an airplane, means for controlling said equipment while the airplane is in flight, a switch movable normally to a position which renders said equipment inoperative by said control means, and air-pressure operated means independent of the antenna for

moving said switch, when the airplane is in flight, to render said equipment operative by said control means.

12. In combination with a flexible member, a grooved reel to which one end of the member is attached and on which the member may be partially wound, a motor-mechanism for rotating the reel, a circuit for actuating the motor-mech-

anism to reel out the member, a self-opening switch mounted within the reel and connected in said circuit, and a switch-closing plunger projecting through the grooved surface of the reel so as to be operated by the pressure of the innermost turn of the member.

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