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ANTENNA WINCH FOR AIRCRAFT

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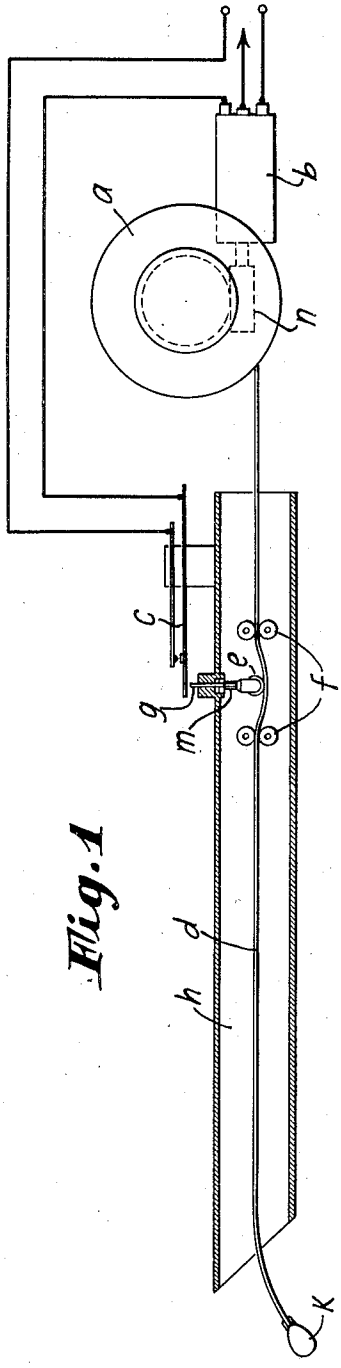

Fig. 1

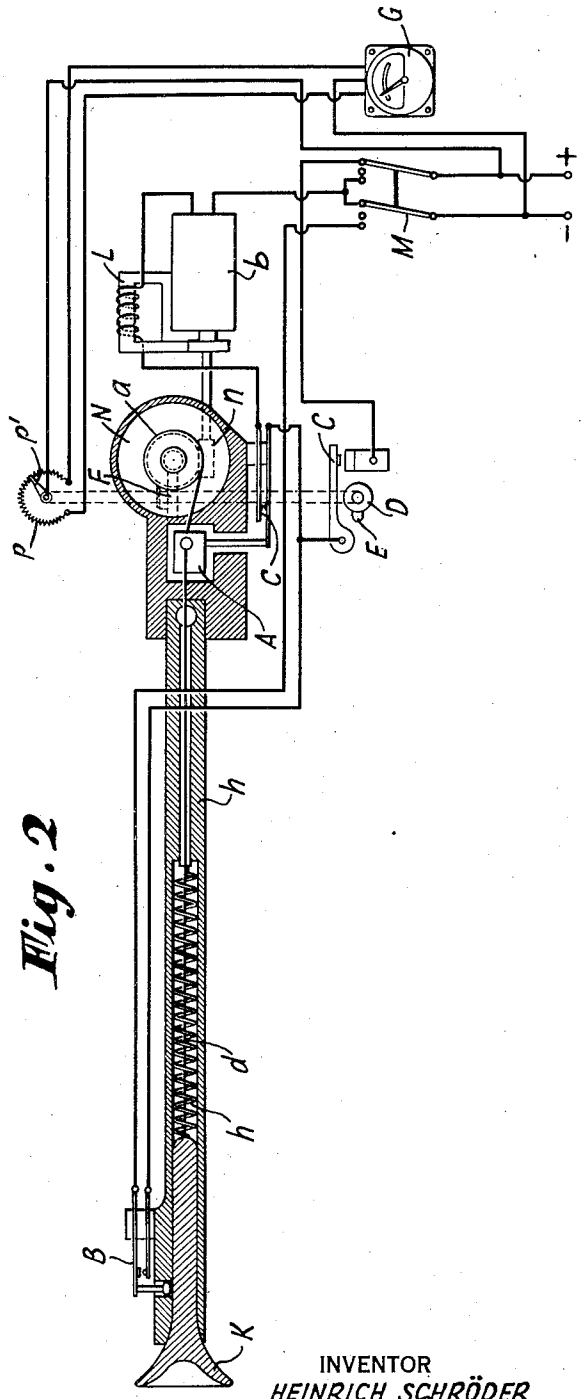

Fig. 2

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ANTENNA WINCH FOR AIRCRAFT

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7 Claims. (Cl. 250—33)

This invention relates to a new and novel construction of a remote controlled electrically driven antenna which comprising a readily reversible and replaceable motor with means for recording the number of feet of cable paid out, circuit cut-out contacts, a mechanical length check-up, braking means for a motor, a safety device to insure against kinking or tangling of antenna cable, ejection means for the end of the aerial, a spiral spring, and means for accommodation of the aerial in outer tail end of airplane.

This invention is a continuation in part to my copending United States application Serial No. 197,338, filed March 22, 1938.

The use of so-called trailing antennae is well known in the operation of aircraft. In order that the aerial may always be taut or tensioned, a wind bag or a weight is generally attached at the end of the antenna. It frequently happens that the antenna cable or strand may get into the motor driving mechanism as it is being paid out by means of a driving motor from the antenna winch. As a result, mechanical damage may be caused. In other words, the operating safety of trailing antennae of the kind heretofore used leaves much to be desired.

Now, the present invention discloses novel ways and means whereby the drive mechanism for the antenna which is rendered inoperative whenever the tension or tautness of the antenna cable becomes too slack.

In one exemplified embodiment of the invention shown in Fig. 1, a leaf spring switch *c* is included in the circuits of an electric motor *b* for driving the antenna winch *a*, said switch being subject to a control action of a swivel mounted roller *e* running on the stretched antenna cable *d*. To be more precise, roller *e* runs on a portion of the antenna cable which is held and guided by two guide rollers *f*, and it is furnished with a push-rod *g* designed to control and operate the switch *c*. The roller *e*, together with push-rod *g*, is accommodated inside the antenna stack or shaft *h* in which is placed also the antenna cable *d*. When the tension of the antenna cable *d* which is fitted at its end with a wind bag or a counterpoise *k* diminishes, then also the portion of the antenna cable held between the guide rolls *f* will relax or slacken, and as a consequence, a light expansion spring *m* will depress the pivoted roller *e*. As a result, the circuit of the driving motor *b* which was closed by way of the switch *c* will be opened and the motor thus will be disconnected. In fact, the switch *c* will be closed only when the antenna wire becomes tensioned so that the pivoted roller *e* is thus forced upwards against the pressure of spring *m*. The motor *b* being then connected in the circuit drives, through the worm *n*, the worm wheel and thus antenna winch *a* so that the antenna cable *d* is tensioned by action of the traction produced by the wind bag or weight *k*.

It is also possible to make the entire switch mechanism operate in a mechanical manner by having the pivoted roller *e* running on the tensioned antenna cable may be in rigid mechanical connection with a slip clutch associated with the drive mechanism. Most suited for the purpose will be found a friction clutch which is rendered operative only when the antenna strand or cable *d* is taut and under tension. As the tension of the antenna cable is relaxed, the clutch for the antenna winch is also disconnected. This action may be combined with a mechanical brake action of the winch. It is also possible to adopt a positively acting mechanical clutch or coupling means which will be engaged or disengaged as a function of the tension of the antenna cable.

Fig. 2 shows the fundamentals of a complete system associated with a trailing antenna of this kind. Similar reference letters denote the same details and parts as in Fig. 1. The safety device above described is designed to prevent tangling of the antenna cable or wire and is illustrated in this figure merely diagrammatically at A. A further development of the idea underlying the invention is that the antenna, both when retracted and when paid out is furnished with end cutout contacts B and C. The cutout contact C is subject to control from a cam disk D and its tappet E. This cam disk D, for instance, may be driven by way of the worm wheel F from the antenna winch *a* in a way to insure positive action and operation of this control device. In order that terminal cutout contact of the paid out antenna may provide for different lengths of the wire, it is advisable to make the cam or disk D adjustable.

The arrangement shown in Fig. 2 also comprises a potentiometer P in conjunction with a differential instrument G. Instrument G serves to indicate the length of paid out antenna, and may be calibrated to read directly in terms of feet or meters. The variable contact P' of the potentiometer P is also in positive coupling association with the antenna winch *a*, and could be seated upon the same spindle on which is mounted the cam disk controlling the end cutout contact.

The end cutout contact B serves for the in-

terruption and opening of the motor circuit when the antenna has been retracted and drawn in. According to the invention this cutout device is so designed that contact B by means of the soft rubber air cup K with its connected stem, is controlled by way of rollers or balls. The coasting of the motor, when contact B is disconnected, is used for the purpose of tensioning a spring H provided in the interior of the antenna shaft *h*. The energy which is thus stored up in spring H is used for ejecting the air cup or scoop K when paying out the aerial *d* until it is seized by the wind. An arrangement of this kind is necessary in order to keep the antitangling contact *c* closed. For the electric motor there is provided a magnetic brake device L which will be released only when the circuit of the electric motor is closed. For the payout and the withdrawal or retraction of the antenna is provided a two-pole reversing switch M; if of the tumbler type it can be readily changed from neutral into either position. In this manner convenient tuning of the antena to $\lambda/4$ is readily feasible by intermittent switching.

The winch motor *b* working with a permanent field may be of the cartridge type so that, after loosening one screw, it is readily replaceable. For the sake of prevention of jamming or seizing of the antenna wire, the outer edges or rims of the winch drum may be drawn inwardly in such a way that the drum circumferentially present only a small gap similarly as the shuttle of a sewing machine, and through this opening the antenna wire may be readily paid out and retracted. The winch drum itself is placed inside a casing N of insulation material in order to provide additional safety against drop of the antenna strand.

In the position of the switch M as shown in Fig. 2, the circuit of the electric motor for the paying out of the trailing aerial is closed through the end cutout contact C, the antitangling contact *c*, the brake device L so that payout of the antenna is feasible.

The length of antenna that has been paid out at any given time is automatically indicated by the position of the variable tap H of the potentiometer P and is read by the pointer of the instrument G. As soon as the adjustable cam E of the cam disk D strikes the movable lever of the switch C disconnection of the electric motor is effected simultaneously with the starting or tripping of the brake mechanism L. In the same manner, by reversing of the switch M into the left-hand end position retraction or drawing in of the antenna may be effected. The circuit of the electric motor is then made through the end cutout contact B, the anti-tangling contact *c* and the brake device L.

The stern antenna could also be in the form of a vertical antenna. In this instance, the downwardly projecting end would be furnished with a stream-lined casing. The air cup K in this case would be replaced by a rubber ball provided with a suitable rubber stick.

What is claimed is:

1. An automatic antenna cable winch comprising an electric motor arranged for rotation of said winch, guide means for said cable, an electrical circuit having a reversing switch connected thereto for reversing the direction of rotation of said motor, contact means for said motor, said contact means being located adjacent said guide means, a roller in frictional engagement with said cable, means secured to said roller to render said winch inoperative when tension on said antenna cable is lacking, and means to control the rotation of said winch by said motor when tension is present on said cable.

2. An automatic antenna cable winch comprising an electric motor arranged for rotation of said winch, guide means for said cable, an electrical circuit with contact means for said motor, said contact means being located adjacent said guide means, a roller in frictional engagement with said cable, said roller being pivoted to run on a portion of said cable, means secured to said roller to render said winch inoperative when tension on said antenna cable is lacking, and means to control the rotation of said winch by said motor including a mechanical clutch coupled to said motor and arranged to be released upon drop of tension on said antenna cable.

3. An automatic antenna cable winch comprising an electric motor arranged for rotation of said winch comprising a soft rubber tube having located therein a stem-like extension, an electrical circuit with contact means for said motor, said contact means being located on said tube, means cooperating with said stem-like extension to render said winch inoperative when tension on said antenna cable is lacking, and means to control the rotation of said winch by said motor when tension is present on said cable.

4. An automatic antenna cable winch as claimed in claim 3 with the characteristic feature that inside said rubber tube is mounted a tensioning spring which is tensioned during the coasting period of said motor by means of a windbag which is attached to said stem-like extension, an electrical circuit with contact means for said motor, said contact means being located on said tube, means cooperating with said stem-like extension to render the winch inoperative when tension on said antenna cable is lacking, and means to control the rotation of said winch by said motor when tension is present on said cable.

5. An automatic cable winch as claimed in claim 3 with the characteristic feature that a magnetic brake is coupled to said motor and opened only when the motor circuit is closed.

6. An automatic antenna winch comprising an electric motor for rotation of said winch, guide means for said cable, an electrical circuit having contact means for said motor located adjacent said guide means, engaging means with said cable to render said winch inoperative when tension on said antenna cable is lacking, means to control the rotation of said winch by said motor when tension is present on said cable, and a potentiometer connected in circuit with a measuring instrument to indicate the position of the cable on said winch.

7. An automatic antenna winch comprising an electric motor for rotation of said winch, guide means for said cable, an electrical circuit having contact means for said motor located adjacent said guide means, engaging means with said cable to render said winch inoperative when tension on said antenna cable is lacking, means to control the rotation of said winch by said motor when tension is present on said cable, and contact means to indicate the paid out and the retracted state of said cable.

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