July 26, 1949. H. L. RODERICK 2,477,421

MODEL AIRPLANE MOTOR

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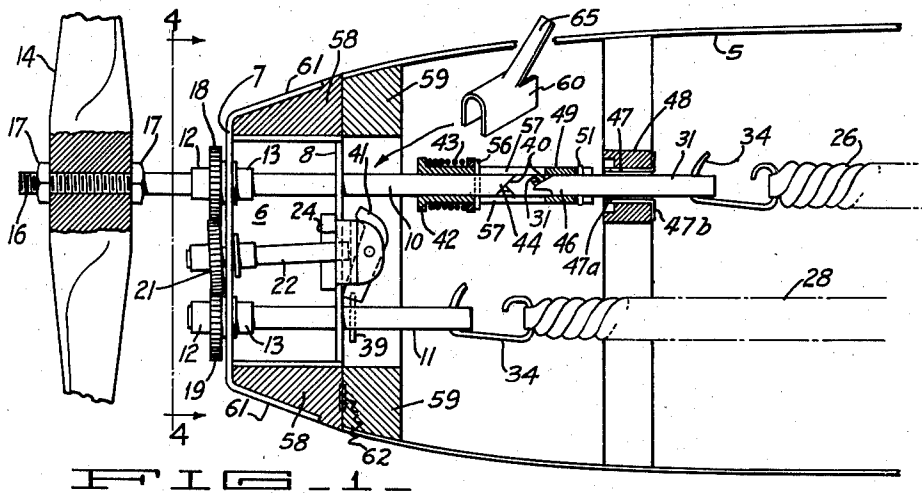


FIG. 1.

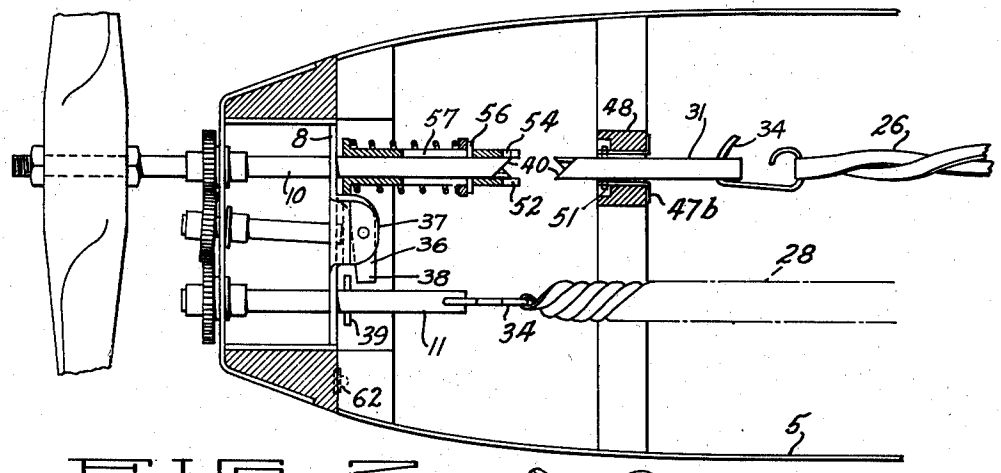


FIG. 2.

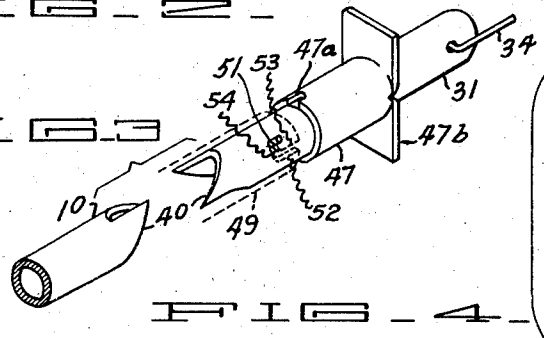


FIG. 3.

FIG. 4.

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MODEL AIRPLANE MOTOR

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3 Claims. (Cl. 185—37)

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The invention relates to motors for model airplanes and the like, and relates more particularly to a motor and motor mounting of the general nature disclosed in my United States Patent No. 1,936,072, issued November 21, 1933.

In motor driven devices of the character described, as set forth in my patent aforesaid, a plurality of driving units may be used to drive a single driven member such as a propeller or the like, and an appropriate change-over mechanism is used to connect the driven member to one source of energy until such source is substantially exhausted, and then to connect the driven member with a second source of energy.

Heretofore in such change-over mechanisms, some difficulty has been experienced in effecting a proper disconnection of the driven member from the first source of energy and a proper connection of the driven member with the second source of energy; in that, just prior to the change-over, a part of the energy of the first set of rubber bands or similar source of energy will be frictionally dissipated in actuating the change-over mechanism. This decreases the power output of the first energy source and may prevent the change-over mechanism from properly operating. Under such conditions, in any event, a certain amount of chattering of the elements of the detachable connection, used in the change-over mechanism, may occur, accompanied by wear and tear on the operating mechanism.

In accordance with the present invention and as a principal object thereof, I provide a change-over mechanism in a motor of the character described, which will provide for a quick, positive and clean release and separation of the first source of energy from the driven member and which will not dissipate any energy of the first source of power in actuating such change-over mechanism.

The invention has other objects and advantages, some of which, with the foregoing, will be set forth in the following description of a preferred form of my invention which is illustrated in the drawing accompanying and forming a part of the specification. It is to be understood, however, that I do not limit myself to the specific embodiment shown in the said drawing and description, as I may adopt variations of this preferred form within the scope of my invention, as set forth in the claims hereof.

Referring to said drawing:

Figure 1 is a vertical sectional view of a model airplane constructed in accordance with the present invention;

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Figure 2 is a vertical cross-section view similar to Figure 1 but showing certain of the operating parts in a different position;

Figure 3 is a perspective view in detail of the detachable connecting means between one of the motor units and the propeller of the airplane; and

Figure 4 is a front elevation, partly in section, of the motor unit taken substantially on the plane on line 4—4 of Figure 1.

The model airplane of the present invention, and as illustrated in the accompanying drawing, comprises a supporting frame 5 which supports the motor units and is preferably of a shape suitable to act as the frame of the fuselage of a model airplane, to which the wings, tail structure and the like may be fastened.

Secured to the forward end of the frame is a drive unit supporting plate 6, which is provided with a forward flange 7 and a rear flange 8 apertured to support a pair of longitudinally extending shafts 10 and 11 which are journalled in aligned bearing openings in the flanges 7 and 8 and are held against longitudinal movement by paired collars 12 and 13 fixed to each of the shafts 10 and 11 at opposite sides of flange 7.

In accordance with my preferred arrangement, the shaft 10 is disposed in vertically spaced relation above the shaft 11 and forms a main motor shaft, or driven member, of the mechanism, extending forwardly of the flange 7 to support a propeller 14 at its front end. The propeller, as here shown, is fastened to a threaded end portion 16 of the shaft 10 between a pair of nuts 17. The shaft 11 constitutes a second motor shaft, and when operated by its associated source of energy, is arranged to drive the shaft 10 after energy from the directly connected source of energy for shaft 10 is substantially exhausted. The driving connection between the shafts 10 and 11, as shown, includes gears 18 and 19 mounted on the outer collars 12 on these shafts, and adapted to be entrained upon rotation of the gear 19 by means of an intermediate idler pinion 21. The latter is carried on the forward end of a shaft 22 which is mounted in an inclined slot 23 in the flange 7 and is rockably journalled at its opposite end in a bearing 24 formed in the flange 8 so as to permit reciprocatory movement of the outer end of the shaft in the slot 23. As will be seen from Figure 4, the angle of slot 23 is such that when shaft 11 is stationary, the gear 21 will gravitate to a position supported on and in mesh with the gear

19, but out of mesh with gear 18, and on rotation of the gear 19 in a counter-clockwise direction, with reference to Figure 4, the gear 21 will be advanced into mesh with the gear 18 to provide a driving connection between the shafts 11 and 10.

The motive power for the shafts 10 and 11 is here derived from resilient sources of energy such as rubber bands 26 and 28, which extend longitudinally of the frame 5 and are fastened at their rear ends to fixed hooks or the like supported in the frame. At its forward end band 26 is releasably connected by a hook 34 to the rear end of an auxiliary clutch shaft 31, while band 28 is releasably connected by a similar hook 34 to the rear end of the shaft 11.

Each band may be tensioned by releasing its front end in a manner hereinafter described, twisting the band, and re-securing the released end. After the winding of the bands in this manner, the pin 51 in shaft 31 may be seated in a recess 47a of a sleeve 47 having a rectangular flange 47b secured to the frame, and the pin 39 in shaft 11 may be engaged by a dog 36, as hereinafter described, to prevent unwinding of the bands by rotation of these shafts.

In accordance with the present invention, the resilient means 26 provides the initial energy for driving the propeller and is connected to the main driving shaft 10 by a detachable connection which is automatically operative in response to the discharge of energy from the band 26 to effect a disconnection of the band from the shaft 10. This disconnection is of substantial importance, as will be understood, in order to prevent re-winding of the band 26 by energy derived from the second resilient means 28, which would materially shorten the effective operating period of the second spring motor, as well as for other purposes hereinafter referred to.

In effecting this disconnection of the band 26 and the shaft 10, advantage is taken of the lengthening of the band, during the discharge of stored energy therein, to operate at a predetermined length of the band a trigger mechanism for quickly and positively severing the driving connection between the band 26 and shaft 10.

As shown in the accompanying drawing this severable driving connection comprises a sleeve 42 keyed to the shaft 10 by means of a pin 56 fixed in the shaft and extending through opposite longitudinal slots 57 in said sleeve. A spring 43 compressed between a flange on the leftmost end of sleeve 42 and a washer abutting pin 56 tends to maintain sleeve 42 in the position in which it is shown in Figure 2 but the sleeve 42 may, on compression of the spring 43, be extended beyond the rightmost end 44 of shaft 10 and brought into surrounding relation with the forward end 46 of a clutch shaft 31 as shown in Figure 1, which shaft 31 is supported in alignment with the shaft 10 in a bearing sleeve 47 carried by a transverse frame member 48, so as to be capable of both rotational and longitudinal movement.

The right end 49 of the sleeve 42 is adapted to be secured to the shaft 31 against longitudinal displacement and against rotational displacement in one direction relative thereto by means of a bayonet type connection including the pin 51 carried by the forward end portion of the shaft 31 which extends radially from opposite sides thereof for engagement in diametrically opposed bayonet slots 52 formed in the end 49 of the sleeve. These slots, as will be seen from Figure 3, include longitudinal portions 53 which extend from the right end of the sleeve to right angular portions 54, and the clutch connection is made by entering the pin 51 in the longitudinal portions 53 and moving the same longitudinally and rotationally into the slot portions 54.

Upon unwinding of the band 26 and resultant lengthening of said band, it will be seen that the expansion of spring 43 will move sleeve 42 leftwardly and the attached shaft 31 will thus be drawn towards the right end 44 of the shaft 10. In accordance with the present invention, camming means are provided upon the adjacent ends 44 and 46 of the shafts 10 and 31 to effect relative rotation of these shafts as an incident to the engagement thereof which ensues when band 26 has lengthened sufficiently. Such means are here provided in the form of cam faces 49 on the contiguous ends of the shafts 10 and 31 which, upon a forced longitudinal engagement will cause a relative rotational displacement between the shafts. The sleeve 42, while slidable on the shaft 10, is keyed for rotation therewith as has been described, so that the rotational displacement of the shafts 10 and 31 is translated into a rotational displacement between the sleeve 42 and the shaft 31 to effect a disconnection of the pin 51 and bayonet slots. The pin 51 is thus moved in the bayonet slot 52 to an aligned position with the longitudinal portion 53 of the slot, and the sleeve 42 is withdrawn from the shaft 31 by further expansion of spring 43 to sever the driving connection between the shafts 31 and 10.

The shaft 11 is held against rotation until substantial exhaustion of the energy stored in the band 26 by a dog 36 which is pivoted to a lip 37 struck out of the flange 8 at a position intermediate to the shafts 10 and 11. The lower end 38 of the dog may be swung towards the flange 8 into the path of a transversely extending pin 39 on the shaft 11 to hold the latter against turning. Release of the shaft 11 is effected by a displacement of the upper end 41 of the dog towards the plate 8 so as to withdraw the lower end 38 of the dog away from the pin 39. This displacement of the dog and release of the shaft 11 is accomplished by the sleeve 42, the leftward movement of which, described above, brings it into contact with the upper end 41 of the dog. In order to insure release of the dog 36 from pin 39, which presses quite strongly against the dog, the upper end 41 of the dog 36 is shaped to present a cam surface to the end of sleeve 42.

Upon release of the shaft 31 by the sleeve 42, the former will withdraw under the remaining tension in the band 26 to a position engaging the pin 51 against the bearing sleeve 47 and the latter, as has been mentioned, is provided with opposed notches 47a in which the pin will engage to hold the shaft against further rotation and thereby prevent complete unwinding of the band 26, and possible entanglement thereof with band 28.

It will thus be clear that while the driving connection between the resilient driving means 26 and the driven member 10 is absolutely positive during the operating period of the energy source 26, it will be quickly and cleanly severed upon the substantial exhaustion of energy from the source 26, without chattering of the several parts, and also that the second drive means including the source of energy 28 and the shaft 11 will be quickly and cleanly released for rotation without any danger of a simultaneous connection of the two driving sources with the single driven member. It will be further noted in con-

nection with the driving connection between the shafts 11 and 10 including the gears 19, 21 and 18, that the intermediate idler gear 21 is normally held out of engagement with the gear 18 on the main shaft by gravity and that after a substantial exhaustion of energy from the source 28 the gear 21 will drop out of mesh with the propeller gear 18, should the propeller, due to favorable flying conditions, tend to rotate faster than the driving connection. Upon disengagement of the idler gear with the propeller gear, it will be clear that the propeller will be absolutely free to rotate and the plane may operate as a glider to substantially increase the period and length of flight.

A holding member 60 which, as illustrated in Figure 1, is formed to engage over the shaft 10 between the flange 8 and the left end of the sleeve 42 so as to hold the sleeve in the position in which it is shown in Figure 1, against the action of spring 43 permitting lock 36 to hold shaft 11 against rotation after band 28 is wound and during the winding of band 26 prior to the time the shaft 31 is advanced against the resilience of the band 26 into engagement with the end of the sleeve, as above described. Preferably the member 60 is provided with a raised handle portion 65 to facilitate its positioning on and withdrawal from the shaft 10.

According to my invention the frontal portion of the ship supporting the propeller and its drive unit is detachably secured to the frame 5 so that the frontal portion may be removed with its attendant shafts and gears to draw shafts 10 and 11 and band 28 outwardly of the fuselage, to wind the bands and move the sleeve 42.

For this purpose I provide a separable connection between the frontal assembly and the body of the airplane, by securing ears 61 of plate 6 to a separable nose piece 58 and mounting the latter on supporting members 59 adjacent the front of the frame 5 by detachable snap fastener means 62. The latter, in the present construction, are simple ball and spring socket fasteners of the conventional glove fastener type and are preferably positioned at the portion of the abutting members 58 and 59 below the band 28.

I claim:

1. In a device of the character described, a driven member, a source of energy for driving said member, detachable clutch sections having bayonet locking means for holding said sections against separation, resilient means urging the separation of said sections, and means operative in response to a substantial release of energy from such source to unlock said bayonet means to effect a disconnection by said resilient means.

2. In a device of the character described, a driven shaft, resilient means for driving said shaft and changing in length with the potential energy stored therein, means slidably carried by said shaft and having a bayonet type connection with said first means, a spring urging the separation of said first and second means, and cam means controlled by a predetermined change in length of said driving means, caused by a substantial release of energy and the co-action of the spring, to effect a relative rotative displacement of said first and second means to disconnect said bayonet connection.

3. In a device of the character described, a driven shaft, a source of energy, a shaft driven by said source in endwise alignment with said first shaft, means adapted to be yieldingly extended from said first shaft, detachable means securing said means to said second shaft against endwise movement thereon, and means operative in response to a substantial release of energy from said source to detach said second means to permit a rapid resilient withdrawal of said first means.

HARRY L. RODERICK.

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