Sept. 7, 1954 B. NAGLER 2,688,206

TOY HELICOPTER

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FIG. 1

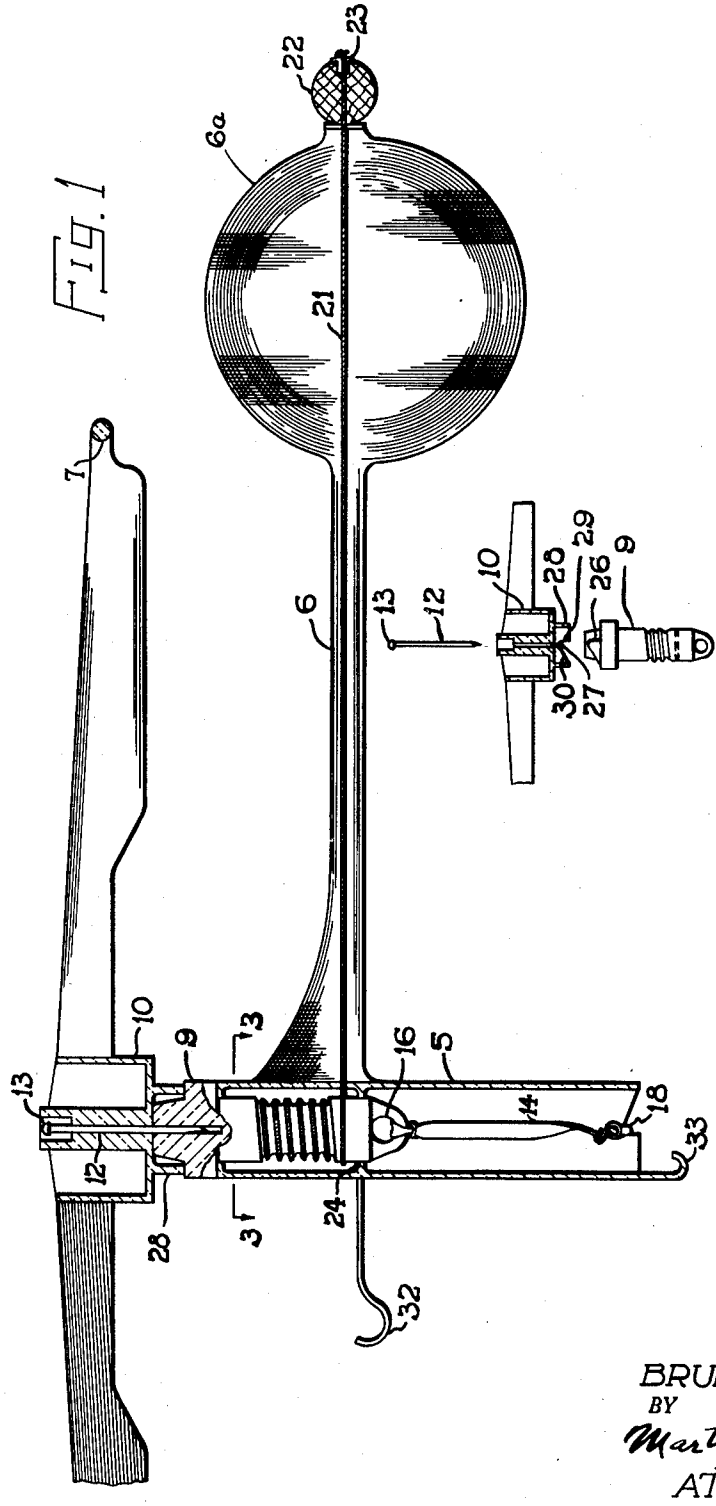



FIG. 2

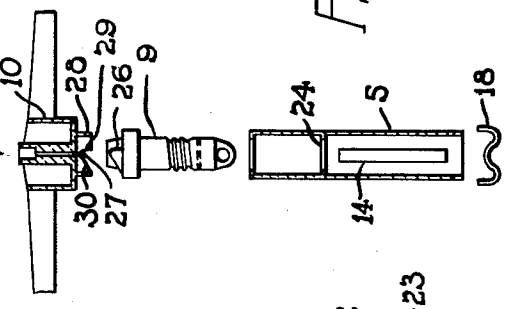
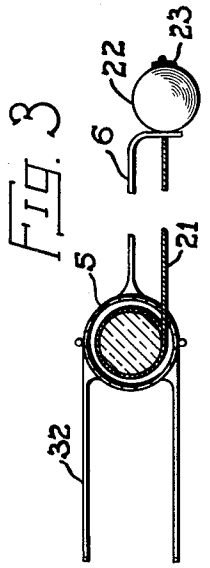



FIG. 3



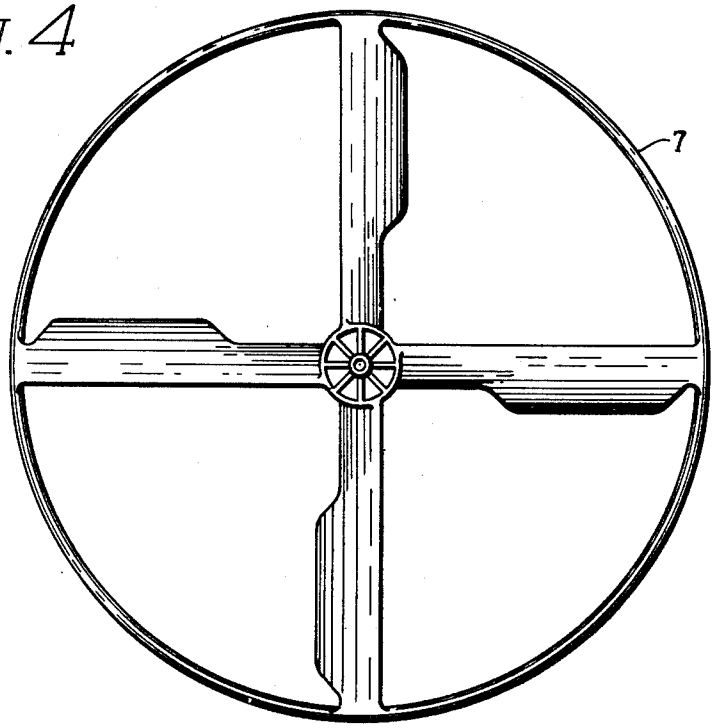

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Fig. 4



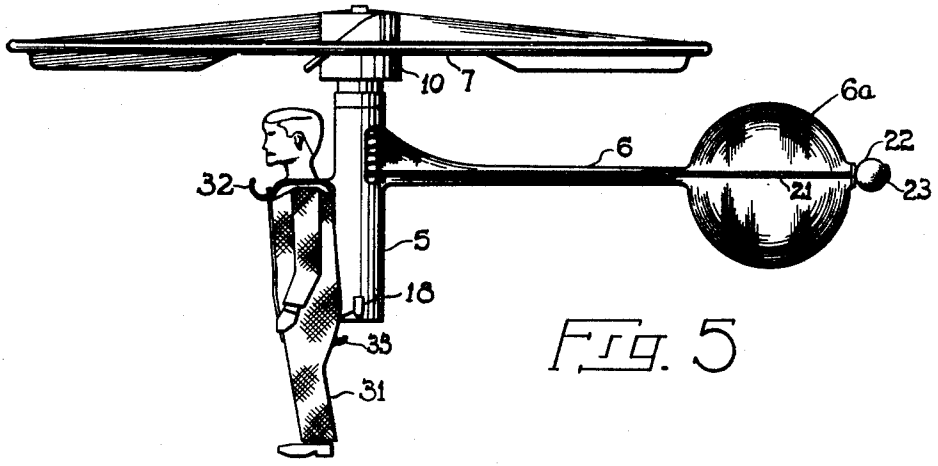




Fig. 5

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FIG. 8

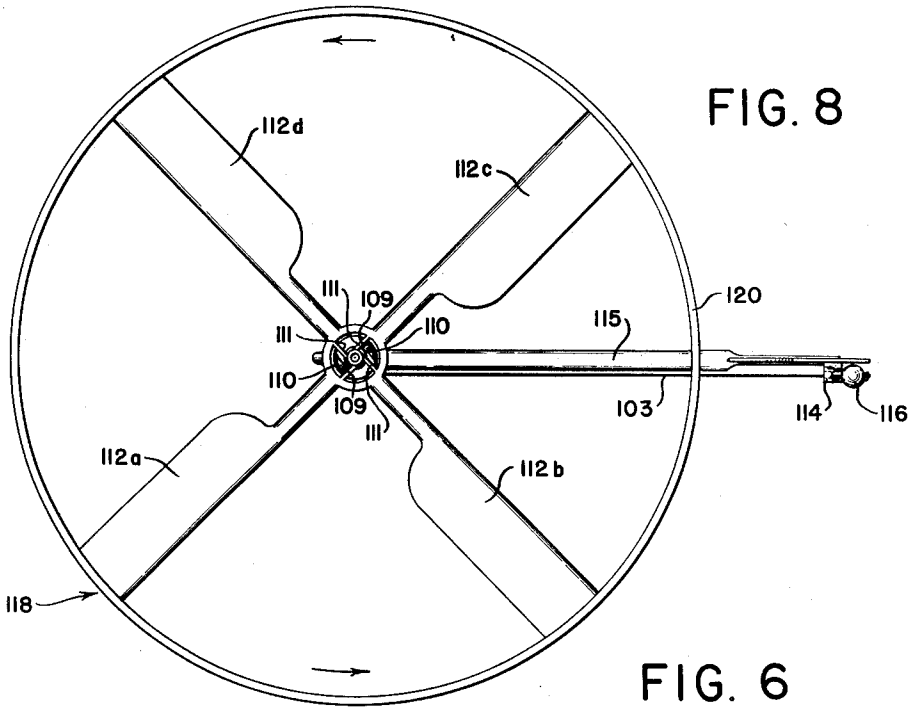
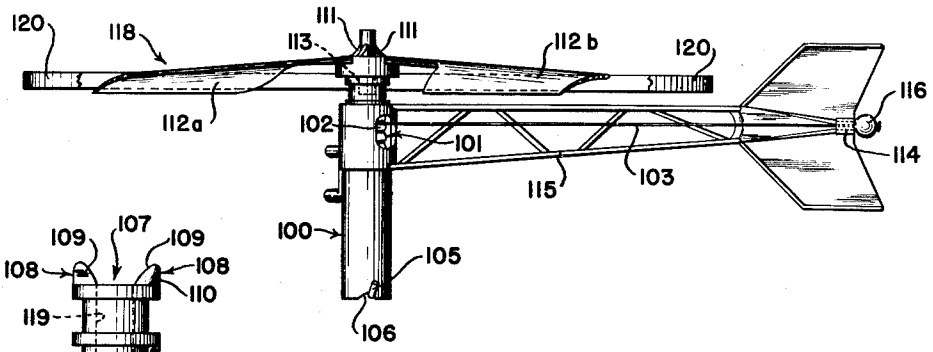



FIG. 6



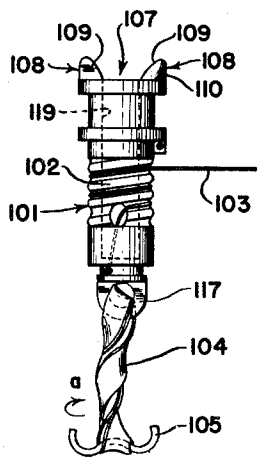




FIG. 7

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## TOY HELICOPTER

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Application July 13, 1953, Serial No. 367,552

5 Claims. (Cl. 46—75)

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This invention relates to mechanical toys, and more particularly, to mechanical toys involving parts in which energy may be stored, then released to produce vertical ascent.

Attempts have been made in the past to design mechanical toys that simulate helicopters and autogyros in flight. Examples of such toys are disclosed in U. S. Patents Nos. 696,990; 1,260,957; 1,914,076; 2,012,600; 2,051,151; 2,382,347; 2,439,-143; and 2,640,296. The toys which have been known heretofore have proven unsatisfactory as the rotating members which form the lifting means for said devices have been made of hard or relatively rigid substances which have sharp edges and consequently when spinning at high speeds are potentially dangerous to the children that might operate them. In addition, such hard or rigid rotors are apt to mar, scratch or break furniture and fixtures with which they come in contact. They are thus not well suited to indoor operation.

My present invention comprises modifications of the aforementioned patents characterized by features which improve the safety and flyability of the mechanisms therein described, and, in particular, by a rotating member made of a pliant substance, preferably polyethylene.

My invention provides a mechanical toy which simulates a helicopter in flight which has improved flying characteristics and is completely safe, non-destructive, and unbreakable. Broadly my invention contemplates a toy helicopter having a vertical housing within which a spool is rotatably mounted and a cord wound around said spool which is adapted to rotate said spool when the cord is unwound. A rotatable blade structure or rotor is used, made of a pliant substance. I have found that polyethylene is a particularly advantageous substance of which to make the rotor, as it has the desired amount of pliability and is easily molded. The rotor has a central hub, an outer ring concentric with said hub and a plurality of uniformly spaced blades extending radially from said hub to said outer ring. Affixed to one end of the spool is a clutch means having driving faces adapted to engage the hub of the rotor and having cam surfaces oppositely disposed to said driving faces adapted positively to disengage the rotor from the clutch means when the spool stops unwinding. A rewinding means is incorporated into the mechanism for rewinding the cord on to the spool.

Reference is now made to the accompanying drawings which illustrate specific embodiments of my invention, wherein:

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Fig. 1 is a view, in longitudinal section, of a device embodying the invention;

Fig. 2 is an exploded view of the parts forming the central assembly of the device of Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 1;

Fig. 4 is a plan view, on a reduced scale, of the blade assembly of the device of Fig. 1;

Fig. 5 is an elevation view of the device of Fig. 1;

Fig. 6 is an elevation view of another specific embodiment of the invention;

Fig. 7 is an exploded view of the parts forming the central assembly of the device of Fig. 6; and

Fig. 8 is a plan view of the device of Fig. 6.

Reference is now made to the drawings in more detail. In Figs. 1–5, numeral 5 designates a vertically disposed hollow body having a horizontal extension 6 terminating in a vertical anti-torque fin 6a, and carrying a pliant blade structure resembling that of a helicopter flying machine; the blades having their tips terminating in a circular outer ring 7. The blades are substantially wider at their outer ends where they are connected to the ring 7 than at their inner ends where they are connected to the hub and are curved downwardly in the direction of their trailing edges. Hence, when the rotor is rotated, and the velocity of rotation increases, an upward force is exerted against the lower surface of the pliant blades tending to lift their outer portions and the ring relative to the hub to a naturally more stable configuration. The body 5 carries a centrally disposed operating assembly including a driving spool 9, a driven rotor 10 having blades extending radially therefrom, a spindle or bearing pin 12 whose lower end is frictionally held within spool 9, said spindle having a head 13 to serve as an upper limiting element to limit upward motion of the rotor 10, and a looped flexible elastic band 14 suspended at its upper end on an eye 16 in which the spool 9 terminates; the elastic band 14 being detachably connected at its lower end to the body 5 by suitable means such as the pin 18. By detaching the pin 18 from the lower end of the housing and rotating it to twist the elastic band 14, the elastic band may be pretensioned to the desired extent. The rotor 10 may be advantageously made of a pliant substance such as polyethylene to improve the flying characteristics of the toy and make it safe for children to play with. Polyethylene has the added advantage of having a density less than water so that it will float if it comes to rest in the water and not sink and be lost.

A cord 21 is secured at one end to the spool 9, is wound about the spool for the desired number of turns, and then passed along the horizontal extension 6 to emerge through the rear orifice in the spherical tail 22, where it is retained by a suitable knob or clasp 23; being held taut by the initial tensioning of the elastic band 14. A bearing element 24 secured to the body 5 supports the central assembly and permits its rotation in relation thereto.

The spool 9 carries a pin 26 adapted to co-act with a slot 27 cut in the skirt portion 28 of the blade rotor 10; the slot 27 having a driving face 29 and an overrunning cam surface 30.

A mannikin 31, simulating an aviator, is "strapped" or suspended upon hooks 32 and 33 on the body 5. This figure 31 may be integrally cast with the body 5, if desired.

To operate, the operator unwinds the cord 21 by pulling it outwardly, then releases it. Outward movement of the cord twists the looped elastic band 14 to store therein the energy to cause the rapid retraction (and rewinding) of the cord as soon as the operator releases it. During unwinding of the cord the spool 9 and rotor 10 rotate in unison; the rotor 10 being driven by the engagement of pin 26 against face 29 of slot 27. Upon release of the cord, the rotor continues to rotate and since its speed of rotation then becomes greater than the speed of rotation of the spool, the cam faces 30 will override the cam surface of the pin 26 and thereby be lifted and disengaged from the spool. Also the sudden reversal of the direction of rotation of the spool 9 produces a camming action, as between pin 26 and face 30 of the slot, which accelerates the disengagement of the rotor from the spool. As the rotor is disengaged from the spool, it climbs upon spindle 12 toward the stop-head 13, and continues to spin in the same (clockwise) direction, under the momentum of the energy stored in it, enhanced by the provision of the outer ring 7 serving as a flywheel. The band 14 simultaneously causes spool 9 to re-wind the cord by rotating said spool in a counter-clockwise direction, with the pin 26 now passing under the lower surface of the skirt 28, which remains lifted thereabove. Because of this spinning of the blades there is created an upwardly directed air current (due to the aero-dynamic contour and pitch of the blades) which carries the toy upward in a vertical path, in the same manner as in the operation of an actual helicopter. When the energy stored in the rotor has been dissipated, the toy glides back to the ground or other surface from which it ascended—again, after the manner of an actual helicopter. If desired the pin 12 may be removed from the mechanism so the rotor 10 will ascend alone separate from the remaining part of the toy which then becomes a launching mechanism rather than an integral flying part of the toy.

Referring now to Figs. 6–8, a vertical housing 100 has a spool 101 rotatably mounted within said housing 100. The spool 101 has helical threads 102 adapted to guide the cord 103 so that it will wind on and off the spool 101 uniformly and without entangling. At one end of the spool 101 is an attaching means 117 for connecting an elastic band 104 to a double hook 105 adapted to engage the recesses 106 on the bottom of the housing 100. Said double hook 105 can be rotated as a ratchet in direction *a* to wind up the elastic band 104 and create a tension on said band 104 against which the spool 101 will unwind



and which will rewind the cord 103 after it is unwound. A clutch means 107 is positioned at the other end of said spool 101 which has two projections 108 extending axially of the spool 101. Each of the projections 108 has a driving face 109 and a cam surface 110. The projections 108 are adapted to engage the hub 111 of the rotor 118 to which the blades 112*a*, *b*, *c*, *d* are mounted uniformly spaced radial to said hub 111. The hub 111 has a cylindrical extension 113 which extends downwardly into a cylindrical recess 119 in the clutch means 107 so that the rotor 118 will stay centered on the clutch means 107 when the clutch means 107 and the rotor 118 are being rotated. The outer tips of the blades 112 are affixed to an outer circular ring 120 which completes the rotor 118.

The cord 103 passes through a guide 114 affixed to the end of a horizontal member 115. A bead 116 is tied to the end of the cord 103 to limit the amount of cord 103 that will wind on to the spool 101.

In operation, the operator places the rotor 118 on the clutch means 107 so that the projections 108 are in engagement with the hub 111 and pulls the cord 103 which causes the cord 103 to overcome the tension of the elastic band 104 and unwind from the spool 101 thereby causing said spool 101 and the clutch means 107 to rotate. The driving faces 109 of the projections 108 drive the blade assembly in a rotary motion until the length of cord 103 on the spool 101 is exhausted so the rotation of the spool 101 and the clutch means 107 stops. The rotor 118 continues to rotate and overruns the cam surfaces 110 of the projections 108 which positively disengages the hub 111 from the clutch means 107. The spinning rotor 118 rises through the air simulating the flight of an actual helicopter raised by the rotating blades 112 until the energy imparted to it has been dissipated and glides back down to the ground.

I claim:

1. In a mechanical toy: a vertical housing, a spool rotatably mounted concentrically within said housing; a cord wound around said spool and adapted to rotate said spool when unwound therefrom; a pliant rotor having a central hub, an outer ring concentric with said hub and a plurality of uniformly spaced pliant blades extending radially from said hub to said outer ring; clutch means on one end of said spool having driving faces adapted to engage the hub of the blade assembly and cam surfaces oppositely disposed to said driving faces adapted positively to disengage said blade assembly from the clutch means when the unwinding ceases; means to rotate said spool to rewind said cord thereon, an elastic torsioning member connected at one end to said spool, and means so detachably connecting the other end of said torsioning member to said housing as to permit adjustably pretensioning of the elastic torsion member.

2. A mechanical toy comprising means mounting a spool for rotation, means for rotating said spool, clutch means on one end of said spool having driving faces, a rotor having a central hub provided with clutch means to be engaged by the driving faces on the spool, one of said clutch means having cam surfaces constructed and arranged positively to disengage said hub from said spool when the speed of rotation of the rotor exceeds the speed of rotation of the spool, said rotor also including a ring spaced

from said hub, and a plurality of spaced blades connected at their inner ends to said hub and at their outer ends to said ring, said blades being pliant, substantially wider at their outer ends than at their inner ends and curved downwardly in the direction of their trailing edges when rotated, so that as the velocity of rotation of the rotor increases an upward force is exerted against the pliant blades tending to lift them and said ring relative to the hub.

3. A mechanical toy as set forth in claim 2 in which the rotor is made of polyethylene.

4. A mechanical toy as set forth in claim 2 in which the means for rotating the spool includes a cord wound around the spool and adapted to rotate the spool when unwound therefrom.

5. A mechanical toy as set forth in claim 2 in which a bearing pin extends from the hub of the rotor and the spool has an opening to receive said bearing pin.



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