Jan. 18, 1966 H. K. BROSS 3,229,416

RACK-ACTUATED PROPELLER TOY

Filed March 20, 1964

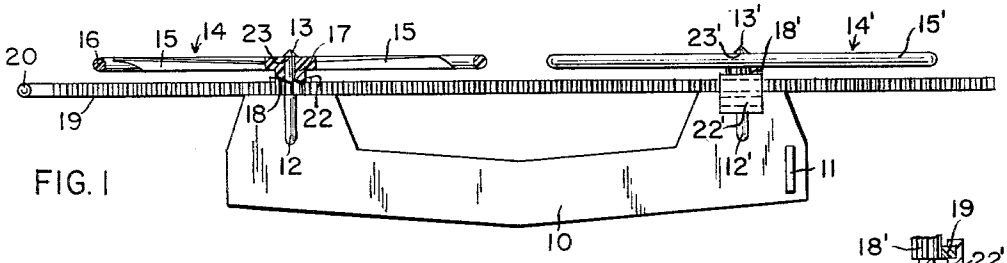


FIG. 1

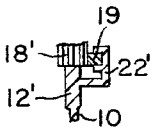
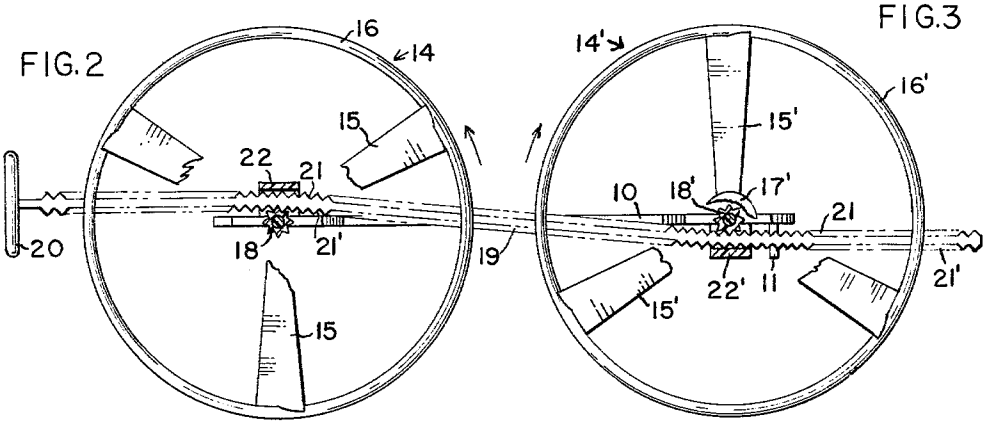


FIG. 3

FIG. 2



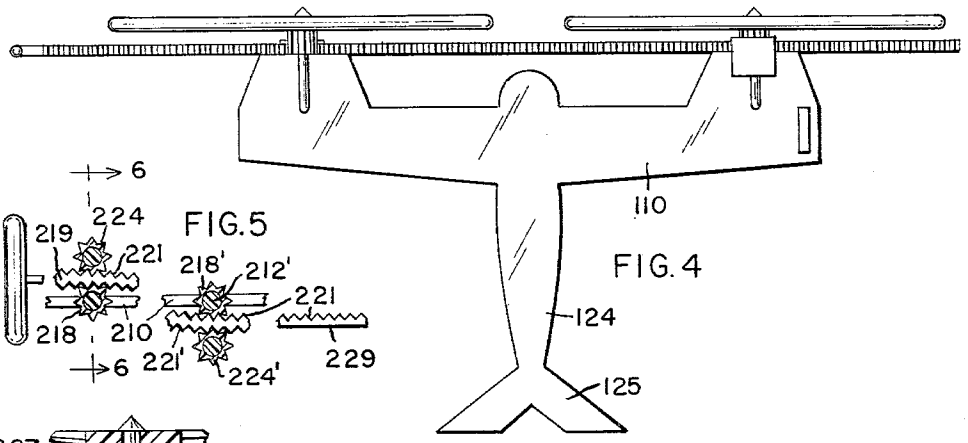


FIG. 4

FIG. 5

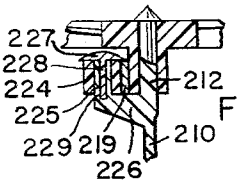


FIG. 6

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RACK-ACTUATED PROPELLER TOY

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7 Claims. (Cl. 46—75)

This invention relates to toys. Particularly, it relates to toys driven by rotating fans or propellers and pulling means for actuating said fans.

In my prior U.S. patent applications, Serial Nos. 257,432, filed February 11, 1963, and 276,754 filed April 30, 1963, I disclosed various toys operated by a child pulling a flexible rack which drove a pinion gear carried by the rotatable drive means, e.g. a propeller, of the toy. The present invention provides a further extension of the invention of said applications whereby a flexible rack can be used to operate two or more rotatable drive means which can be carried by a toy plane, helicopter, etc. The resulting toys are entertaining, relatively simple, easily operated, and they can be inexpensively formed and assembled.

The invention will be further understood by reference to the drawing and following description which includes a preferred embodiment of the invention and wherein:

FIGURE 1 is a side view, partly in section, of a toy helicopter having two propellers in driving engagement with an actuating rack.

FIGURE 2 is a top view, partly broken and in section, of the toy of FIGURE 1.

FIGURE 3 is a fragmentary view, partly in section, further illustrating the guide for the rack.

FIGURE 4 is a top view of a modification of the toy of FIGURES 1 to 3 showing how the toy can be made in the shape of an airplane.

FIGURE 5 is a top view, broken and partly in section, illustrating a modification of the embodiment of FIGURES 1 to 4.

FIGURE 6 is a cross-sectional view taken along the lines 6—6 of FIGURE 5.

In the embodiment of FIGURES 1 to 3, the helicopter toy has the flat banana-shaped body or fuselage **10**, integrally defining the outwardly extending hand grip **11** and the two upwardly extending axle stubs **12** and **12'** whose outer ends terminate in cones **13** and **13'**. Propellers **14** and **14'** having propeller blades **15** and **15'** extending between the outer rims **16** and **16'** and the hubs **17** and **17'**, are mounted on axle stubs **12** and **12'** for free rotation. The lower portions of hubs **17** and **17'** define the pinion gears **18** and **18'**. A flexible plastic pulling rack **19**, having pulling handle **20**, is formed with the two series of teeth **21** and **21'** on opposed faces of the rack. Rack guiding and supporting members **22** and **22'**, defining channels which support the rack on three sides, extend outwardly from opposite sides of body **10** and guide rack **19** into meshing toothed engagement with pinion gears **18** and **18'**.

To operate, the rack **19** is threaded into engagement with gears **18** and **18'** as shown in the drawings. The child then grasps handle **20** in one hand, while holding body **10** with the other hand at hand grip **11**. The child then rapidly pulls handle **20** away from the helicopter body which will cause propellers **14** and **14'** to spin in opposite directions (as noted by the arrows in FIGURE 3) as rack **19** is pulled completely through the guide members **22** and **22'**.

Once the removable rack **19** is completely free of engagement with the helicopter, the helicopter can be released by the child whereupon it will rise into flight and

fly until the momentum stored in the propellers is substantially lost.

By the arrangement shown, both propellers can be simultaneously spun in opposite directions whereby said propellers will tend to balance each other to reduce the tendency for the body **10** to also spin in flight about its vertical axis. By forming helicopter body **10** thin and flat, a light weight is achieved, while the broad area of body **10** encounters wind resistance to turning about its vertical axis.

The toy, including the rack, can be inexpensively molded of plastic, such as polyethylene, or similar slightly resilient plastic. In this way, the rack **19** will have sufficient flexibility for it to bend sufficiently to be threaded through both guides **22** and **22'**. Yet, once pulled through the toy, the rack **19** will resume a substantially straight-line form.

The toy is preferably injection molded of only four pieces, namely the helicopter body **10** including: integral axle stubs **12** and **12'** and guides **22** and **22'**; the two propellers **14** and **14'**; and the rack **19**. Assembly of the toy is simple and is carried out by simply pressing the propeller hubs **17** and **17'**, over cones **13** and **13'** respectively, until the hub is retained between the bottom **23** and **23'** of said cones and the body **10**. Bottoms **23** and **23'** are slightly larger in diameter than the base of the hubs **17** and **17**; however, due to the elastic nature of said hubs, said hubs will expand outwardly enough to allow passage of said cones through said hubs during assembly and will then resume their normal shape whereby said hubs are retained on their axle stubs about which they are freely rotatable. This assembly can be carried out by the consumer, thus allowing the toy unit to be packaged unassembled and flat, thereby reducing the bulk of the toy for storage and shipment.

FIGURE 4 represents a modification of the embodiment of FIGURES 1 to 3 in that as the body **110** is in the form of an airplane having fuselage **124** and tail **125**, the other parts being the same as in FIGURES 1 to 3.

FIGURES 5 and 6 represent another modification of the embodiments of FIGURES 1 to 4, which modification permits spinning both propellers at about the same speed. In this manner, the oppositely spinning propellers completely balance each other. This is particularly desirable to achieve a straightline flight, e.g. as is desirable with the airplane of FIGURE 4. Otherwise, if one airplane propeller spins faster, or for a longer length of time, than the other propeller while in free flight, the airplane will fly in circles.

Specifically in FIGURES 5 and 6, axle stubs **212** and **212'**, integral with flat body **210**, support pinion drive gears **218** and **218'** which are opposite the toothed guide idler gears **224** and **224'**. The mounting of these idler gears is illustrated in FIGURE 6, where idler gear **224** is freely rotatable on the shaft **225** molded integrally with rib **226** projecting transversely from body **210**. A pin, having the head **227**, has the shank **228** which is held fixed by frictional engagement within a blind bore **229** in shaft **225**. The circular head **227** overlaps shaft **225** so that the edge of head **227** acts as a guide for rack **219** (as shown in FIGURE 6). The rack **219** is formed with a row of teeth **221** over its entire length and with a row of teeth **221'** over only part of its length. The section **229** is bare of teeth, and has a length corresponding to the distance between pinion drive gears **218** and **218'**.

To operate, rack **219** is inserted between the idler and drive gears as shown in FIGURES 5 and 6, and is then rapidly pulled outwardly through said gears. Because of the bare section **229** of the rack, both pinion drive gears **218** and **218'** will be rotated an equal number of times while in meshing driving engagement with said

rack **219**. Thus, the propellers attached to said drive gears will be spinning in opposite directions but at about the same speed so as to balance the torque of each other.

The rack and the meshing pinion drive gear can take forms other than those specifically illustrated herein. For example, forms such as those illustrated in FIGURES 26 to 31 of my copending U.S. patent application Serial No. 276,754 filed April 30, 1963, which figures and accompanying description are hereby incorporated by reference.

I claim:

1. A toy comprising a body, a pair of propellers in substantially the same plane and spaced from each other carried by said body for rotation thereon, said propellers including hubs defining pinion drive gears, a flexible plastic rack defining a first and second series of teeth on different faces of said track and having a pulling handle at one end, said rack being engageable with said pinion gears, and a pair of rack supporting and guide means defined by said body on opposite sides of said body and proximate said gears for supporting and guiding said rack into meshing engagement with said gears upon insertion of said rack between said pinion drive gears and said guide means, whereupon rapid pulling of said rack by means of said handle through said guide means will spin said pinion gears and their propellers in opposite directions.

2. A toy according to claim **1**, wherein said rack supporting and guide members are fixed members integral with said body and said rack is slidingly engageable with said members.

3. A toy according to claim **1**, wherein said rack supporting and guide members include idler gears having teeth which are meshingly engageable with the teeth of said rack.

4. A toy according to claim **3**, wherein said second series of teeth is shorter than said first series of teeth by a distance about equal to the distance between said pinion drive gears.

5. A toy according to claim **1**, wherein said body is in the form of a banana-shaped helicopter.

6. A toy according to claim **1**, wherein said body is in the form of an airplane including a fuselage and wings, wherein said propellers are mounted on said wings on opposite sides of said fuselage.

7. A toy according to claim **1**, wherein said body is flat and has axle stubs molded integrally with said body, said stubs extending past an edge of said body and adapted for rotatably supporting said propeller hubs.

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