May 31, 1966 R. D. CALDERON 3,253,365

SELF-PROPELLED TOP

Filed July 12, 1963

FIG. 1

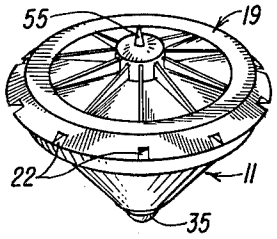


FIG. 2

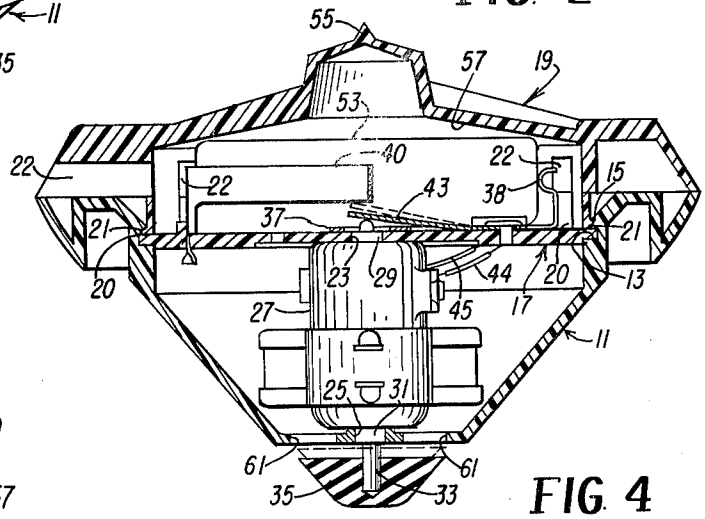


FIG. 3

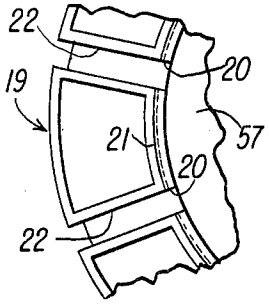


FIG. 4

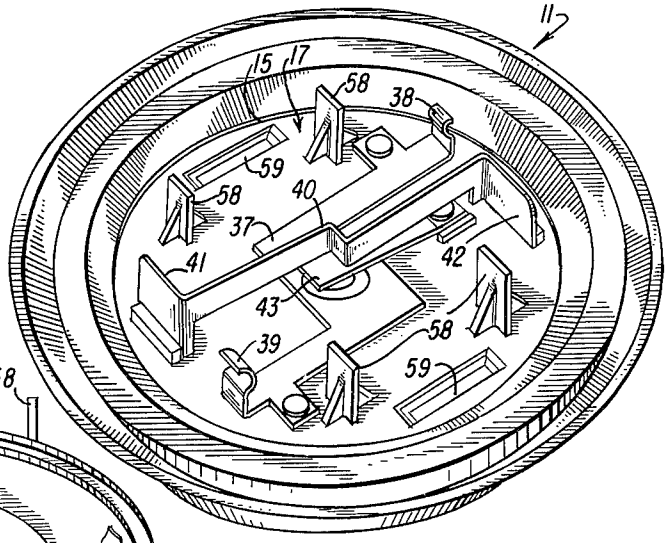
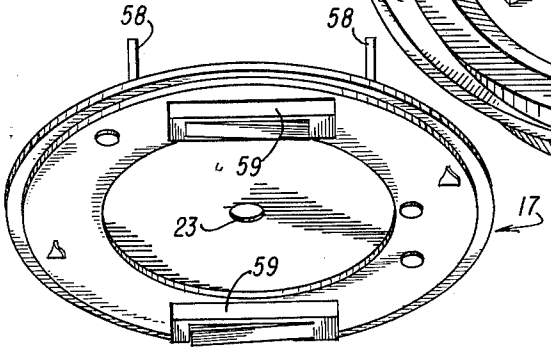


FIG. 5



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3,253,365

SELF-PROPELLED TOP

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This invention relates to toy tops and more particularly to a self-propelled and self contained top.

Although numerous types of self-propelled toys have been proposed, a toy top having such attributes has heretofore remained impractical. One reason for this is that to place a driving motor and a source of energy for the motor within a reasonably small enclosure has presented numerous balancing and packaging problems. In addition, such a self-propelled top may be difficult to start and even more difficult to stop, especially if accidentally upset.

Accordingly, it is an object of this invention to provide a wholly self contained, self-propelled top of practical construction.

Another object of the invention is to provide a self contained, self-propelled top which is simple to start and stop.

Another object of the invention is to provide a self contained top wherein balancing is easily achieved without resorting to maintaining close tolerances.

A feature of the invention is the provision, in a self-propelled top, of a direct current motor drivingly connected to the top body and having a spindle co-axial with the axis of symmetry of the top such that the motor and top are driven about the spindle.

Another feature of the invention is the provision, in a self contained, self-propelled top, of a motor having an axially displaceable spindle, and of a switch connecting energizing batteries to the motor and operable by displacement of the spindle.

Still another feature of the invention is the provision, in a self-propelled, self contained top, of an enclosure and electrical contacts formed to balance a pair of batteries about the axis of symmetry of the top.

In the drawings:

FIG. 1 is a perspective view of a top constructed in accordance with the invention;

FIG. 2 is a half-sectional view of the top of FIG. 1;

FIG. 3 is a plan view of a portion of the underside of the cover cap;

FIG. 4 is a perspective view of the top with the cover cap removed; and

FIG. 5 is a perspective view of the underside of the mounting disk of the top.

In accordance with the invention, the self-propelled top includes an enclosure having a substantially conical lower portion. A cap portion is removably secured to the lower portion of the enclosure and a mounting disk is placed on the lower portion at the juncture thereof with the cap portion. The enclosure is symmetrical about an axis, and the lower portion and the mounting disk contain openings at this axis of symmetry.

A direct current motor is mounted in the lower portion and is drivingly secured to the lower portion and to the mounting disk. The motor has an axially displaceable spindle which has a lower end protruding through the opening in the lower portion to receive a mounting cone thereon. The upper portion of the spindle protrudes through the opening in the mounting disk and engages a switch on the upper side of the mounting disk to operate the switch to a closed position when the top is balanced on the cone. The mounting disk also serves to carry a pair of batteries which are connected to the motor through the switch. The disk includes posts and a battery retainer thereon which cooperate to insure balanced positioning of the batteries.

Referring now to FIGS. 1 and 2, the top includes an enclosure having a lower portion **11** of substantially conical configuration. Lower portion **11** has a shoulder **13** formed on the inner walls thereof and an overhanging lip **15** extends around the interior wall above shoulder **13**. A mounting disk **17** rests upon shoulder **13**, and a cap portion **19** is secured to lower portion **11** by a ridge **21** which surrounds the inside of cap portion **19** and snaps between lip **15** and disk **17** to wedge disk **17** against shoulder **13**. Ridge **21** may include a plurality of openings **20** to permit inward displacement to clear lip **15** during assembly. As may be seen from FIG. 3, cap portion **19** is formed with a plurality of passages **22** therein which permit air flow to the outside as will be explained.

As may be seen, the double chambered enclosure comprised of lower portion **11**, cap portion **19** and disk **17** is symmetrical about a central axis. Disk **17** is provided with an opening **23** at the axis of symmetry, and lower portion **11** is provided with an opening **25**, also at the axis of symmetry. A motor **27** is mounted within the enclosure by means of bushing **29**, which extends in opening **23**, and bushing **31** which extends in opening **25**. The bushings are force-fit in their respective openings and hence, a driving connection is made between motor **27** and disk **17** and lower portion **11**.

Motor **27** includes a spindle **33**, the lower end of which protrudes through opening **25** and the upper end protrudes through opening **23**. A rubber support cone **35** is attached to the lower end of spindle **33** for supporting the top during rotation.

The battery retainer includes a dog-leg strip **37** secured flush against the surface of disk **17** and having two integral resilient contacts **38** and **39** at respective ends. A second dog-leg strip **40** is mounted in the vertical plane above strip **37** and out of contact therewith. Strip **40** is supported at its respective ends on disk **17** by two integral contacts **41** and **42**. A resilient leaf **43** is mounted to disk **17** and is movable into contact with the center of strip **40**. With batteries in place facing in opposite directions, the battery retainer will connect them in parallel with contacts **38** and **39** engaging poles of one polarity and contacts **41** and **42** engaging poles of the other polarity. Leaf **43** is connected to one side of motor **27** through wire **44**, and strip **37** is connected to the other side of motor **27** through wire **45**. Contact of leaf **43** with strip **40** will therefore energize the motor. Because the batteries are mounted in opposite directions, the fact that the center of gravity of many batteries is not in their geometric center will not affect the balance of the top.

Spindle **33** is axially displaceable and is biased downwardly by resilient leaf **43**. When the top is balanced on cone **35**, however, the weight of the top is sufficient to displace spindle **33** upwardly against the resilience of leaf **43** to cause leaf **43** to engage strip **40** as shown in phantom in FIG. 2. Accordingly, the motor **27** is energized by the batteries **51** and **53**. Motor **27** will rotate about spindle **33** with cone **35** frictionally gripping the support surface for the top so that the spindle is substantially prevented from rotation. As a result, the enclosure and the elements mounted thereon rotate about the spindle and cone. In order to facilitate starting, a pointed projection **55** extends upwardly from top portion **19** and a finger may be placed thereon to hold the top in an upright position on cone **35** until a sufficient angular velocity is attained. Upon attainment of a sufficient angular velocity, the gyroscopic effect, due to the conservation of angular momentum of the enclosure and its associated elements will cause the top to remain in an upright position without further manual support.

Since the frictional engagement of the simple battery clips **37** and **39** may be insufficient to maintain the bat-

teries in precise balanced relation with the axis of symmetry when high are attained, provision must be made to prevent the outward displacement of the batteries due to centrifugal force. Provision should also be made to prevent upward displacement of the batteries due to handling movement, etc. As may be seen from FIG. 2, the inner surface **57** of top portion **19** is slanted and is so formed that it will engage batteries **51** and **53** to prevent their upward displacement. Outward displacement of the batteries is prevented by four posts **58** rising from the upper side of disk **17**. Tolerances for the dimensions of the top portion **19** and the posts **58** on disk **17** may be easily maintained by molding the respective parts as integral units. By insuring balanced placement of the batteries in this manner, a stable top may be easily mass produced.

Referring now to FIG. 4, disk **17** has two reed devices **59** mounted on its underside. These devices may be of the type which produce an audible humming when the air passing through them attains a sufficiently high velocity. Lower portion **11** is vented at **61** to supply air to the reed devices **59**. Air flow is upward through reed devices **59** because of the effect of the passages **22** in cap **19**, which force the air out of the top. When the top reaches sufficient speed, air flow will be sufficient to cause the reed devices **59** to hum. Other devices operated by air or centrifugal force might be attached to the top as a further attraction to users of the device.

It may therefore be seen that the invention provides an entirely self contained top which is self driving and self starting and is simple of construction and operation. In the event that the top is accidentally upset, the motor will be de-energized due to the resilience of leaf **43** opening switch **45**. The enclosure may be constructed out of light durable plastic and the storage batteries may be any type of penlight battery. Although any size of top is well within the scope of the invention, successfully operating devices have been constructed with an over-all diameter of less than 4 inches.

I claim:

1. A self-propelled top including in combination, an enclosure symmetrical about an axis and having an opening at the bottom thereof at the axis, a direct current motor having a spindle axially displaceable between first and second positions, said motor being mounted in said enclosure and being drivingly connected thereto with said spindle coaxial with the axis of symmetry of said enclosure, a friction support for said top secured to said spindle outwardly of said opening in said enclosure, means for mounting an electrical energy source within said enclosure, and switch means for connecting the energy source to said motor and being closable by support of said top on said friction support to cause axial displacement of said shaft from said first position to said second position, whereby said motor is energized to drive said enclosure in rotation about said spindle to maintain said enclosure and said motor upright on said spindle.

2. A self-propelled top including in combination, an enclosure symmetrical about an axis and having an opening in the bottom thereof at the axis, a direct current motor having a spindle axially displaceable between first and second positions, said motor being mounted in said enclosure and drivingly connected thereto with said spindle being coaxial with the axis of symmetry of said enclosure and having a portion extending through said opening in said enclosure, a friction support for said top secured to said spindle outwardly of said opening, means for mounting a pair of batteries within said enclosure, electrical contact means for engaging the batteries, switch means connecting said electrical contact means to said motor and being closable by axial displacement of said spindle from said first position to said second position by the weight of said top, whereby said motor is energized to drive said enclosure in rotation about said spindle to maintain said enclosure and said motor upright on said spindle, said enclosure having means therein to symmetrically limit outward displacement of said batteries due to centrifugal force.

3. A self-propelled top including in combination, an enclosure symmetrical about an axis and having a substantially conical lower portion having an opening in the bottom thereof at the axis, and further having a removable cap portion secured thereto, a mounting disk supported on said lower portion of said enclosure proximate the juncture thereof with said cap portion and having a central opening therein, a direct current motor having a spindle axially displaceable between first and second positions, said motor being mounted in said lower portion of said enclosure and being drivingly connected to said lower portion and said mounting disk, said spindle being coaxial with the axis of symmetry of said enclosure and having a lower portion extending through said opening in said enclosure and an upper portion extending through said central opening in said disk, battery retaining means secured within said enclosure on said mounting disk, a switch mounted on said mounting disk and engageable by said upper portion of said spindle to be closable thereby upon axial displacement thereof from said first position to said second position and support means fixed to said lower end of said spindle and permitting axial displacement of said spindle from said first position to said second position upon placement of said top in an upright position on said support means, said switch connecting said battery retaining means to said motor to energize the same when closed to cause said motor to rotate about said spindle and drive said enclosure to maintain said enclosure and said motor upright on said support means upon the attainment of a gyroscopically stable angular velocity, said cap portion having a projection thereon to permit manual maintenance of said top in an upright position during starting.

4. A self-propelled top including in combination, an enclosure symmetrical about an axis thereof and having an opening in the bottom, said axis passing through the center of said opening, an electric motor having a central spindle and a motor body, means joining the body of said motor and said enclosure for mounting said motor with said spindle coaxial with the axis of said enclosure, a support for said top secured to said spindle outwardly of said opening and having a portion thereof to be disposed on a supporting surface for said top and to prevent rotation of said spindle, means for mounting energizing batteries within said enclosure, circuit means including a switch for electrically connecting the batteries to said motor, said enclosure including means to prevent physical displacement of said batteries upon spinning of said enclosure, and means for manually retaining said top in an upright position on a supporting surface while said enclosure, said motor body, and the energizing batteries are rotatable about said spindle during starting of said top.

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