United States Patent

[11] 3,628,285

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[45] Patented **Dec. 21, 1971**

[54] **GYROSCOPIC TOP DEVICE**
6 Claims, 20 Drawing Figs.

[52] **U.S. Cl.** **46/243,** 46/50, 46/67
[51] **Int. Cl.** **A63h 33/26,** A63h 1/06
[50] **Field of Search** 46/50, 67, 73, 243

[56] **References Cited**
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Primary Examiner—Louis G. Mancene
Assistant Examiner—Robert F. Cutting
Attorney—McGlew and Toren

ABSTRACT: An electrically operated gyroscopic top device which comprises a hollow body, an electric motor housed in said hollow body and having an output shaft extending in alignment with the central axis of said body, at least one end of said output shaft projecting outwardly of said body, and a flywheel fixedly mounted on the output shaft. The device can be used either independently or in combination with certain accessories.

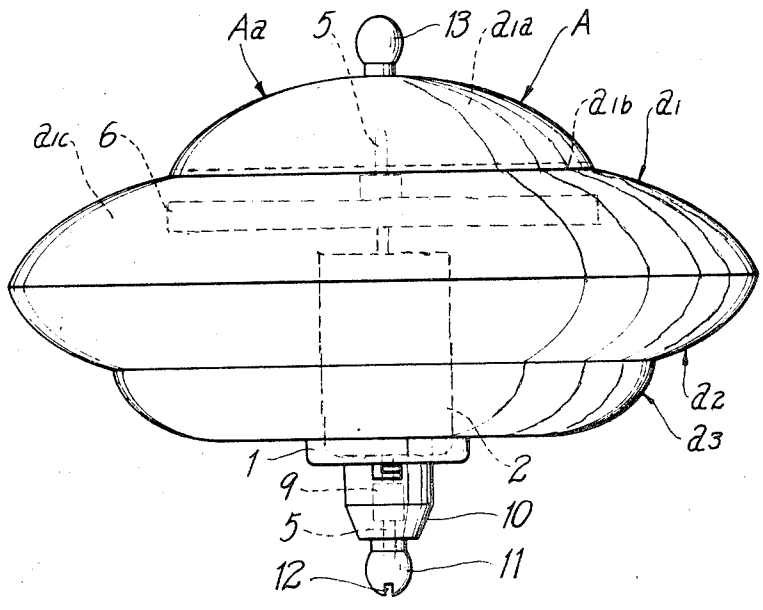


Fig-1

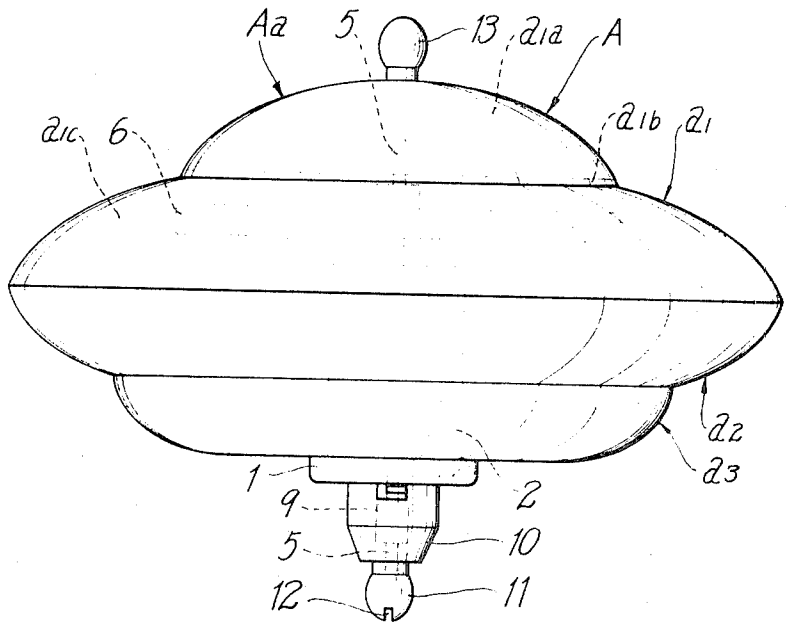
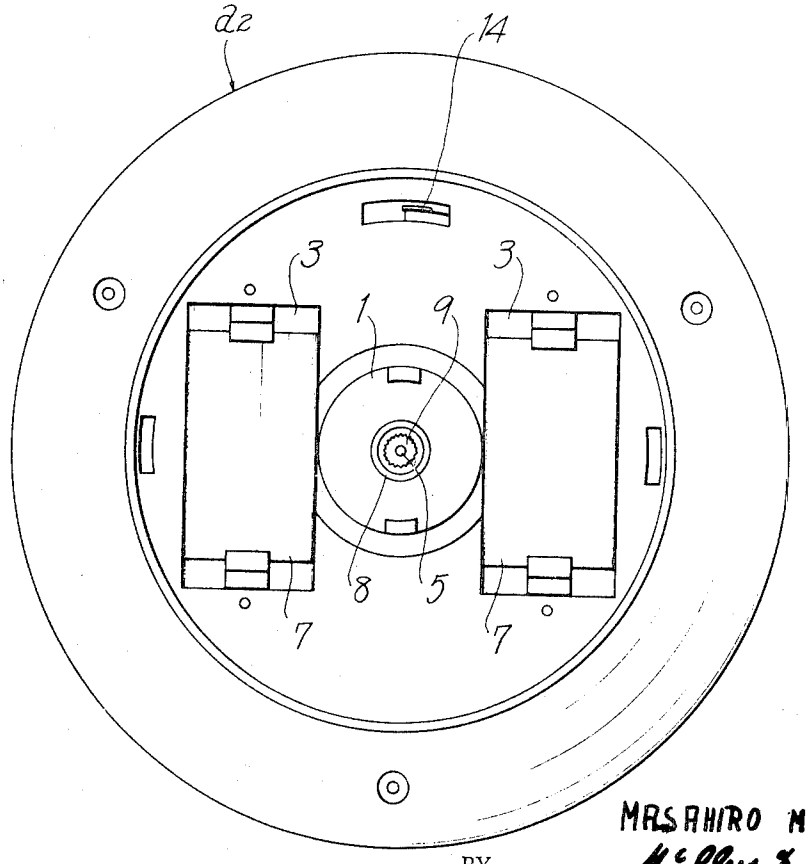


Fig-3



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Fig-2

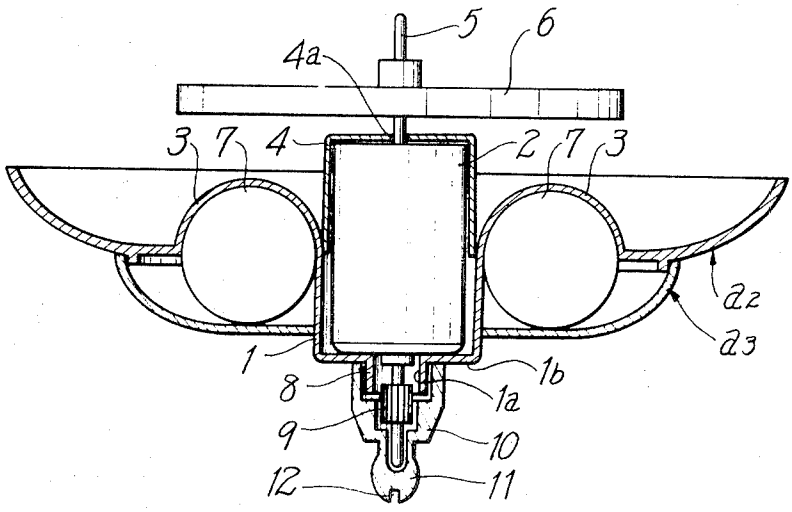
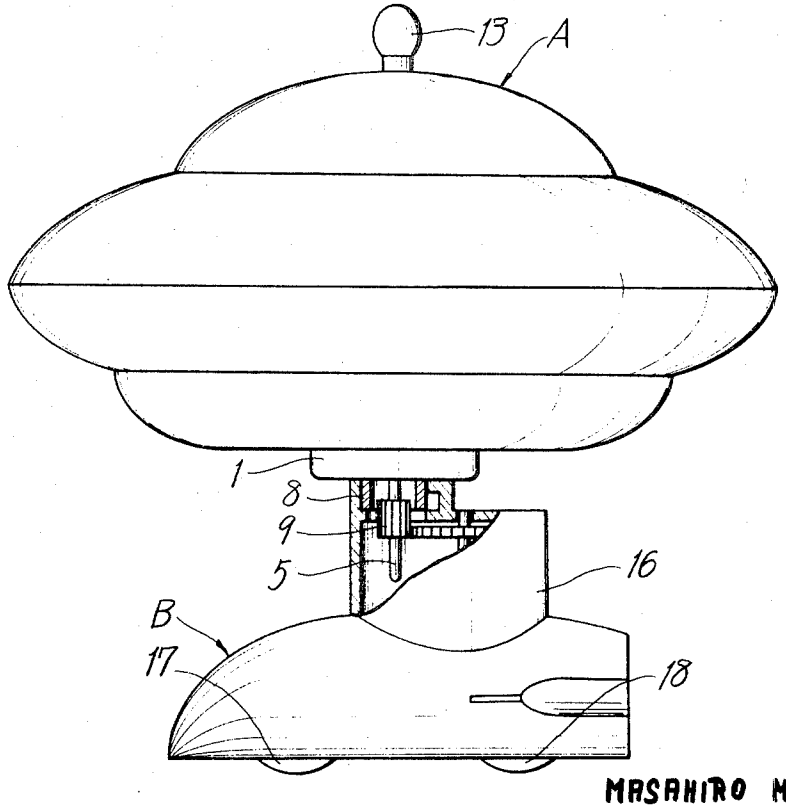


Fig-4



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FIG-5

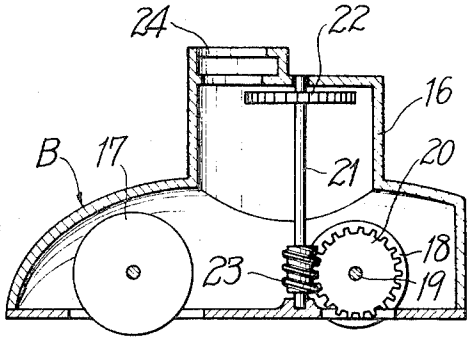


FIG-6

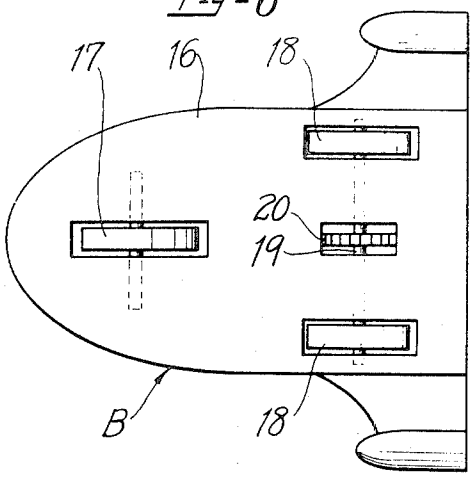
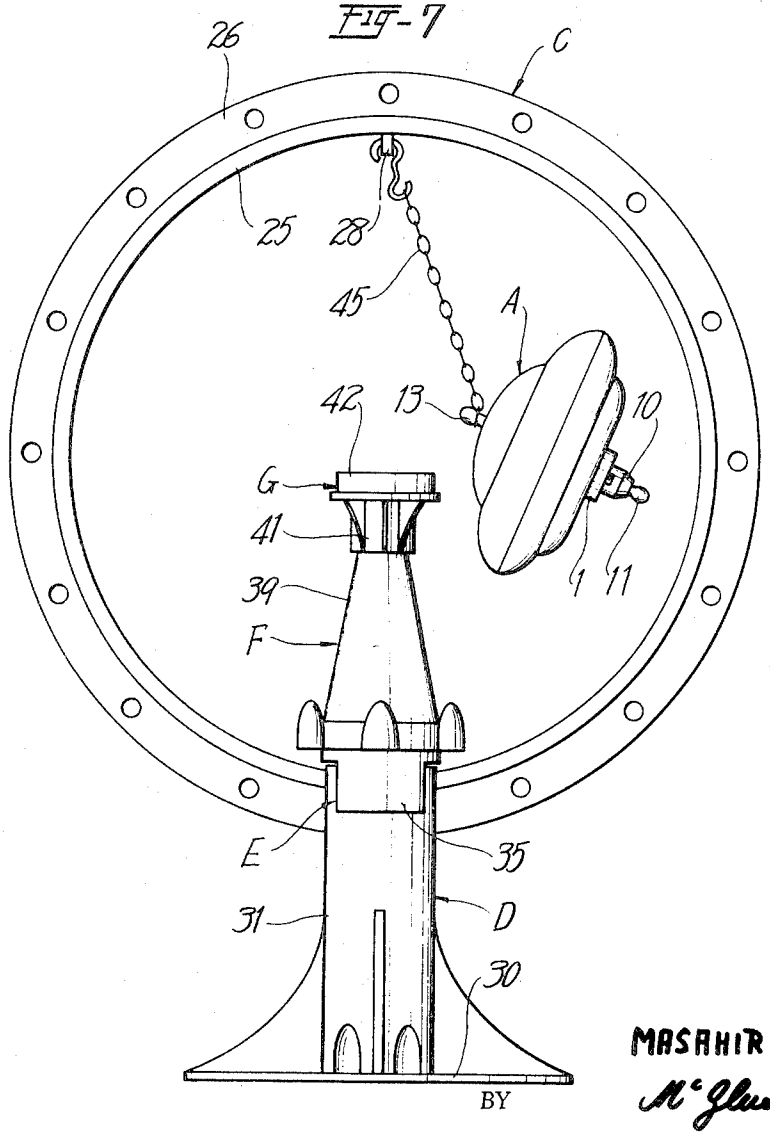


FIG-7



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Fig-8

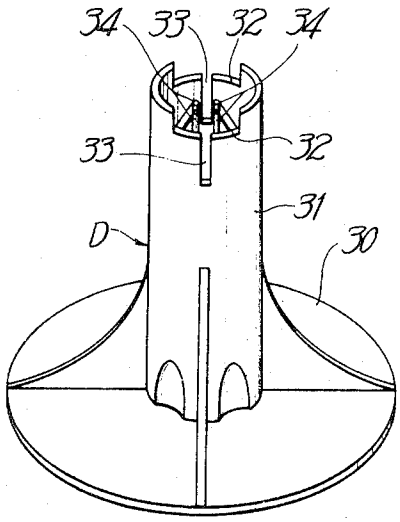


Fig-9

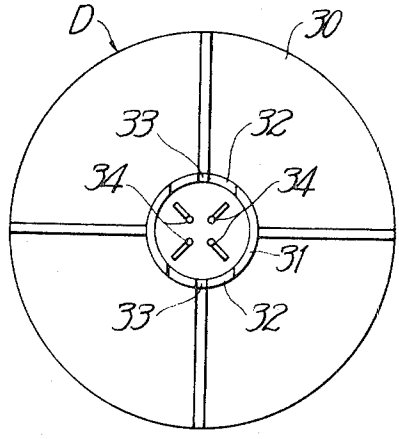


Fig-10

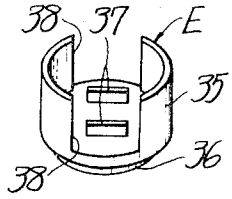


Fig-11

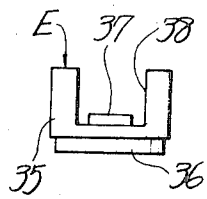


Fig-12

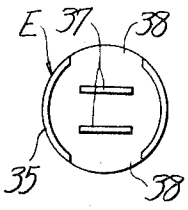


Fig-13

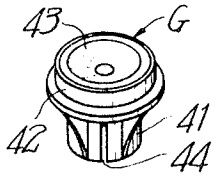


Fig-14

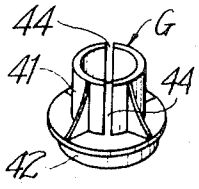
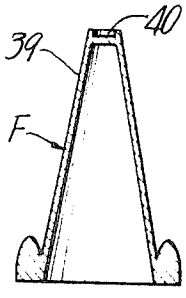


Fig-15



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Fig-16

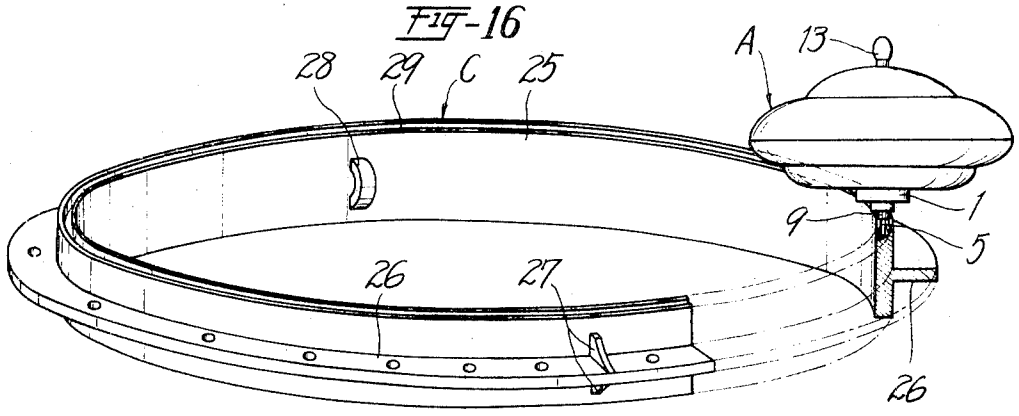


Fig-17

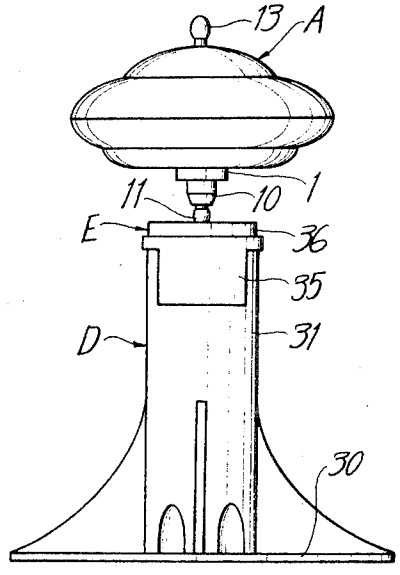


Fig-18

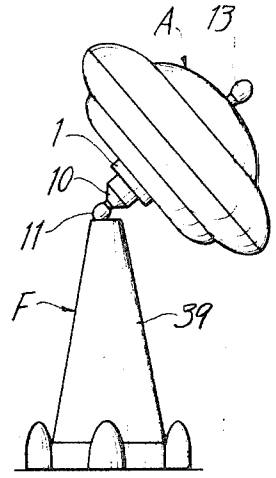


Fig-19

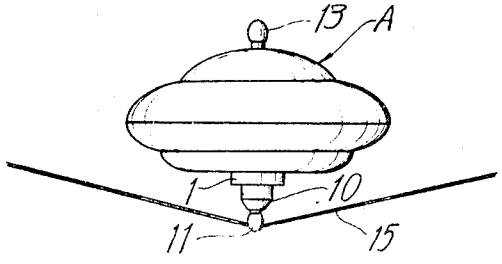
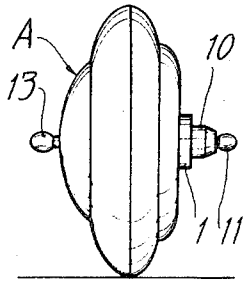


Fig-20



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GYROSCOPIC TOP DEVICE

SUMMARY OF THE INVENTION

The present invention relates to a top, and more particularly to a gyroscopic top device arranged to be operated by a self-contained power source and to be combinable with certain accessories so that it can be used either independently or in combination with such accessories.

It is, therefore, one object of the present invention to provide entertainment and amusement for children by providing a new and useful gyroscopic top device arranged to be automatically operated by a driving mechanism contained therein and which can be used in combination with certain accessories prepared therefor.

It is another object of the present invention to provide a new and useful gyroscopic top device of the kind described above which is provided with power takeoff means for driving a certain accessory unit such, for example, as a toy vehicle.

It is a further object of the present invention to provide a gyroscopic top device of the character described above which can be coupled with certain track means so that it can travel along a track while spinning.

It is still another object of the present invention to provide a toy of the type described which is simple in construction and operation, attractive in appearance and which can be manufactured and sold at a reasonable cost.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which like reference numerals or characters refer to like portions or elements.

In the drawings:

FIG. 1 is an elevational side view of a gyroscopic top device embodying the present invention;

FIG. 2 is a vertical cross-sectional view of the top device shown in FIG. 1 from which an upper casing has been removed, showing the internal structure thereof;

FIG. 3 is a bottom plan view of the same from which a lower casing has been removed;

FIG. 4 is a side view, partly in cross section, of a combination of a top device and a toy vehicle of the present invention;

FIG. 5 is a vertical cross-sectional view of the toy vehicle shown in FIG. 4;

FIG. 6 is a bottom plan view of the same;

FIG. 7 is a side view, showing an example of use of the gyroscopic top device in combination with accessories of the present invention;

FIG. 8 is a perspective view of the supporting column shown in FIG. 7;

FIG. 9 is a top plan view of the same;

FIG. 10 is a perspective view of the holding member shown in FIG. 7;

FIG. 11 is a side view of the holding member;

FIG. 12 is a plan view of the same;

FIG. 13 is a perspective view of the receiving platform shown in FIG. 7;

FIG. 14 is a perspective view of the platform in its upside-down state;

FIG. 15 is a vertical cross-sectional view of another supporting column shown in FIG. 7;

FIG. 16 is a perspective view, partly in cross section, showing another example of use of the top device in combination with an accessory of the present invention; and

FIGS. 17 to 20 are side views, showing other examples of use of the gyroscopic top device in accordance with the present invention.

Referring now to the drawings in FIGS. 1 to 3, there is shown a gyroscopic top device A as a presently preferred embodiment of the present invention. The top device A is provided with a hollow body A*a* which comprises three bowl-shaped casings, an upper casing *a*1, a middle casing 22, and a lower casing *a*3 which are formed to have symmetrical configurations about a common vertical axis. The upper casing *a*1 is fixed to the middle casing *a*2 at their peripheral edges by means of screws, not shown. The lower casing *a*3 is detachably fixed to the middle casing *a*2 for the reason which will be described later.

The middle casing *a*2 is provided with a downwardly projecting hollow cylindrical portion 1 which is formed concentrically with the common vertical axis. An electric motor 2 is received in the cylindrical housing 1. The middle casing *a*2 is provided also with a pair of semicylindrical housings 3 and 3 on opposite sides of the cylindrical housing 1 relative to the vertical axis of said casing. The upper portion of the motor 2 which extends upwardly outwardly of the cylindrical housing 1 is covered with a cylindrical cap 4. The lower peripheral edge of this cylindrical cap 4 is inserted in and secured to the cylindrical housing 1 to thereby securely fix the motor 2 to the middle casing *a*2.

One end of the output shaft 5 of the motor 2 extends upwardly into the upper chamber *a*1*a* of the upper casing *a*1 through the central opening 4*a* of the cylindrical cap 4 and through a bearing, not shown, formed in the center of a partition wall *a*1*b* which divides the internal space of the upper casing *a*1 into the upper chamber *a*1*a* and the lower chamber *a*1*c*. A flywheel 6 is fixed to a portion of the output shaft 5 within the lower chamber *a*1*c* of said upper casing. In the semicylindrical housings 3 and 3, there are housed dry batteries 7 and 7, one in each housing, so that these batteries are held between the middle casing *a*2 and the lower casing *a*3. These dry batteries are in circuit with the electric motor 2.

The cylindrical housing 1 is provided with a cylindrical projection 8 having a diameter smaller than that of the cylindrical housing 1, said cylindrical projection 8 extending downwardly from the central opening 1*a* formed in the bottom wall 1*b* of the cylindrical housing 1. The lower end of the output shaft 5 of the motor 2 extends downwardly through this cylindrical projection 8. A toothed wheel 9 is fixed to an intermediate portion of the length of the downwardly projecting portion of the output shaft 5 for the purposes which will be described later. A substantially nipplelike cap 10 is detachably mounted on the cylindrical projection 8 so as to cover both the lower end of the output shaft 5 and the toothed wheel 9. This cap 10 is provided, at its lower end, with a spherical portion 11 which is formed integrally with the cap 10 and which is formed with a rift 12 at the lower end thereof.

The upper casing *a*1 is provided with a spherical projection 13 which projects upwardly from the center of the external face of the casing *a*1. The lower casing *a*3 is provided with a switch 14 which is in circuit with the dry cell batteries 7 and the motor 2 so that the motor circuit can be opened and closed by manipulation of the switch 14.

In operation, when the switch 14 is turned on and the motor 2 is actuated and then the gyroscopic top device is placed on a floor or a platform in such a way that the toy stands on the spherical portion 11 of the nipplelike cap 10, the output shaft 5 of the motor 2 is rotated about a vertical axis within the body A*a* of the gyroscopic top device and the flywheel 6 is rotated together with the output shaft 5.

In case the output shaft provided with a flywheel which is a mass article is rotated, the output shaft will be subjected to a great amount of moment of inertia which is afforded by the flywheel, and accordingly, it will be retained in its vertical position while rotating. As a result, the body A*a* of the top device can be retained stationary in its vertical position by the self-sustaining action of the output shaft 5. If, for example, the lower cap 10 is removed and if the output shaft 5 is supported directly on the surface of the floor and the like, the same state or effect as described above will be obtained, with only the exception that the frictional force produced between said surface and the surface-contacting portion of the output shaft will impart a load to rotation of the output shaft and that, accordingly, the rotational efficiency of the output shaft will be somewhat reduced.

With the foregoing structure, the top can be held also stationary in its vertical position during the rotation of the motor even when the upper spherical projection **13** of the upper casing *a*1 is supported on the surface of the floor and the like. Furthermore, the gyroscopic top of the present invention can be used by having a desired portion of the outer peripheral edge of the body A*a* of the top supported on the surface in the manner shown in FIG. **20**. In this instance, the top can be held also stationary in its position of lying on its side. Also, the gyroscopic top device may be used by mounting the rift **12** of the lower cap **10** onto a string **15** or a wire to have the body A*a* supported on the string or the like.

Referring now to FIGS. **4**, **5** and **6**, there is shown an example of a toy vehicle B which is one of the accessories of the present invention and which can be used in combination with the gyroscopic top device previously described. The toy vehicle B comprises a vehicle body **16**, a front-wheel assembly **17** supported by the body for rotation, rear wheels **18** and **18** mounted on the rear axle **19** rotatably supported by the body, a toothed wheel **20** mounted on the rear axle **19**, a vertical shaft **21** which is supported rotatably within the vehicle body **16**, a toothed wheel **22** and a worm gear **23** which are provided vertically spacedly on the vertical shaft **21**, said worm gear **23** being meshed with the toothed wheel **20** mounted on the rear axle **19**, and an opening **24** formed in the upper portion of the vehicle body **16**. In order to combine the gyroscopic top device of the present invention with said toy vehicle, the lower cap **10** of the former is removed and the cylindrical projection **8** exposed thereby is inserted into the opening **24** of the vehicle so that the pinion **9** mounted on the lower end of the output shaft **5** of the motor **2** is meshed with the toothed wheel **22** which is mounted on the vertical shaft **21**, as shown in FIG. **4**. Then, as the motor **2** is actuated after so combining these two bodies, the rotation of the motor **2** will be transmitted to the rear driving wheels **18** and **18** by the gear arrangements, thus causing the vehicle B to travel on a supporting surface.

FIG. **16** shows another example of use of the gyroscopic top device in combination with an accessory of the present invention. In this example, the top can be run along an annular rail C. The annular rail C is provided with a horizontally projecting wall or flange **26** which is formed around the external face of the vertical annular wall **25**. Protrusions **27** may be formed locally on the flange **26**, as shown in FIG. **16**. A suspending member **28** is provided at one site of the inner peripheral face of the vertical annular wall **25**. This vertical annular wall **25** has its top surface formed with an annular groove **29**. The bottom face of the groove **29** is inclined inwardly throughout the entire groove. In order to operate the top on this track, the lower cap **10** is removed, and the lower end of the output shaft **5** of the motor **2** is inserted in the groove **29**. Then, the output shaft **5** will tend to slide to the inner side of the groove **29** owing to the inwardly inclined bottom surface of said groove, causing the lowermost contacting surface of the output shaft **29** to be brought into contact at one edge thereof with said inclined surface. With this contact, the top A is permitted to travel along the track C while being guided by the groove **29**. During this travel, the top will be retained in its upright position owing to its gyroscopic action which has been described previously.

FIG. **17** shows another example of use of the gyroscopic top. In this case the top is used jointly with a supporting column D and a holding member E. As shown in FIGS. **8** and **9**, this supporting column D comprises a baseplate **30**, a cylindrical post **31** extending upright from said baseplate **30**, said cylindrical post **31** being provided with cutouts **32** and **32** and also with slits **33** and **33** in the upper open end of said post. Also, four protruding members **34** are provided inside the upper open end of said cylindrical post. On the other hand, the holding member E (see FIGS. **10** through **12**) comprises a cylindrical member **35**, a stepped seat **36** formed on the outer face of the bottom wall of said cylindrical member **35** integrally therewith. Projecting ridges **37** and **37** are formed on the inner face of the bottom wall. The open end of the cylindrical member **35** is provided with cutouts **38** and **38**. In order to combine this holding member E with the supporting column D, the cutouts **38** and **38** of the cylindrical member **35** are interlocked with the cutouts **32** and **32** of the cylindrical post **31** together. After these two elements have been combined together, the top A is placed on the seat **36** of the holding member E and the motor **2** is actuated. Thereby, the actuated top will be retained in its upright position on the seat **36**, as illustrated in FIG. **17**.

FIG. **18** shows still another example of use of the gyroscopic toy. In this instance, the toy is placed on top of a pillar F. This pillar F (see FIG. **15**) comprises a substantially frustoconical cylindrical body **39** having at its top end a recessed seat **40**. The top is placed on this recessed seat **40** without removing the lower cap **10**. Whereupon, as the motor **2** is actuated, the toy will be held in its upright position on said recessed seat. If and when a small amount of force is applied to the spherical projection **13** of the toy body, to incline the body, the top will make a conical movement while being held in an inclined position as shown in FIG. **18**.

FIG. **7** shows yet another example of use of the gyroscopic top device. In this instance, the device is used together with the supporting column D, holding member E, pillar F, annular track C plus a receiving platform G. This receiving platform G (see FIGS. **13** and **14**) is of the structure which comprises a cylindrical portion **41** having a cylindrical seat **42** which is provided with a conical recess **43**. The cylindrical stem **41** is provided with vertical slits **44** and **44**. In actual use, the vertical wall **25** of the annular track C is inserted in the cutouts **32** and **32** of the supporting column D, and the flange **26** of said track C is inserted in the slits **33** and **33** while being nipped between the protruding members **34** and **34**. After the foregoing assemblage has been made, the cutouts **38** and **38** of the holding member E are interlocked with the vertical wall **25** of the annular rail C, while inserting the holding member E in the cylindrical post **31** of the supporting column D. After these elements have been assembled together, the lower open end of the frustoconical cylindrical body **39** of the supporting pillar F is mounted onto the stepped seat **36** of the holding member E to be held thereby. Finally, the cylindrical portion **41** of the receiving platform G is mounted onto the recessed seat **40** of the supporting pillar F to be retained thereby. After the framework assemblage has thus been completed, one end of a chain **45** is connected to the suspending means **28** of the annular rail C with a hook. Then, the spherical projection **13** of the gyroscopic toy is connected with the other end of the chain **45**. By actuating the motor while manually holding the top in a position outwardly of the vertical of the chain **45**, the top will make conical movement in its inclined position as shown in FIG. **7**. Also, the top device of the present invention can be used in such a way that it is placed on the conical recess **43** of the seat **42** of the receiving platform G. In this instance also, the top can be caused to make conical movement by applying an external force thereto.

As may be seen from the foregoing, the gyroscopic top device according to the present invention comprises a hollow body in which a motor is mounted and a flywheel directly fixed to the motor, so that the flywheel is caused to spin by the motor power and produces a required moment of inertia for driving the top, thus making it possible to provide unique amusement and entertainment for children. Also, the toy of the present invention can display, to the highest extent, its value as a dynamic toy for use in intellectual training. Furthermore, as described in connection with the example of use, the top device can be used in combination with various other accessories and it can afford a high commercial value as well as a high play value as a toy.

Preferably, the body A*a* of the gyroscopic toy device of the present invention is formed with, for example, an opaque synthetic resin so that the interior of the body A*a* is rendered invisible. It is to be understood, however, that the body A*a* may be formed with a transparent material, such as a transparent synthetic resin. In the embodiment described, the out-

put shaft of the motor is arranged so that one end thereof extends outwardly from one side of the body A*a* of the top. However, this output shaft may extend outwardly from both sides of the body A*a*. Furthermore, the flywheel—which is a mass article—preferably is made with a metal having suitable weight, such as a thick iron plate. In the embodiment described, the flywheel is attached to one end of the output shaft. However, it can be fixed to each of the opposite ends of the output shaft.

What I claim is:

1. A toy comprising in combination a gyroscopic top device and an accessory in which said top device is engageable, said top comprising a hollow body symmetrically shaped about a central axis, an electric motor positioned within said hollow body, an output shaft extending from said electric motor on the central axis of said hollow body, one end of said output shaft projecting outwardly from said hollow body, a flywheel positioned on said output shaft within said hollow body for rotation therewith, dry cell batteries symmetrically positioned within said hollow body about its central axis, a power takeoff mounted on the end of said output shaft projecting outwardly from said hollow body, and said accessory being arranged to receive the one end of said output shaft projecting outwardly from said hollow body.

2. A toy, as set forth in claim 1, characterized in that said accessory being a vehicle, said vehicle comprising a vehicle body, means positioned within said vehicle body for driving said vehicle and comprising an elongated shaft located within said vehicle body, means attached to said shaft and engageable with said power takeoff means on said output shaft for driving said shaft in said vehicle, gear means on said shaft for imparting driving motion to said vehicle, said vehicle body having an opening therethrough for receiving the end of said shaft projecting from said hollow body so that said power takeoff means on said output shaft can engage said means on said shaft in said vehicle body.

3. A toy, as set forth in claim 2, characterized in that said power takeoff means of said top comprising a pinion, and said means on said shaft in said vehicle body comprising a gearwheel for transmitting the motion from said output shaft to said shaft in said vehicle body.

4. A toy, as set forth in claim 1, characterized in that a hollow cap being detachably engaged on the one end of said output shaft projecting outwardly from said hollow body, said hollow cap having a spherical portion at its end remote from said hollow body, said spherical portion having a slot therein passing through the central axis of said output shaft, and said slot being engageable with a tensioned stringlike member for supporting said top during its gyroscopic action.

5. A toy, as set forth in claim 1, characterized in that said accessory comprising an annular vertically extending support member having an annular groove in its upper surface forming an endless track, said groove having an inwardly inclined bottom surface, and the one end of said output shaft projecting outwardly from said hollow body being supportable on said inclined bottom surface of said annular groove so that as said output shaft rotates said top travels along the endless track formed by said annular groove.

6. A toy, as set forth in claim 4, characterized in that said accessory comprising a supporting column, a concavely shaped surface formed in the upper end of said column forming a seat for said hollow cap so that said top is supportable in the seat on said supporting column during its gyroscopic action.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,628,285 Dated December 21, 1971

Inventor(s) MASAHIRO MURAKAMI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent the following is to be inserted:

--[32] Priority November 22, 1968
[33] Japan
[31] 43 102357--

Signed and sealed this 13th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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