Feb. 24, 1953 N. J. STIVERS ET AL 2,629,202

TETHERED AERIAL TOP

Filed July 17, 1950

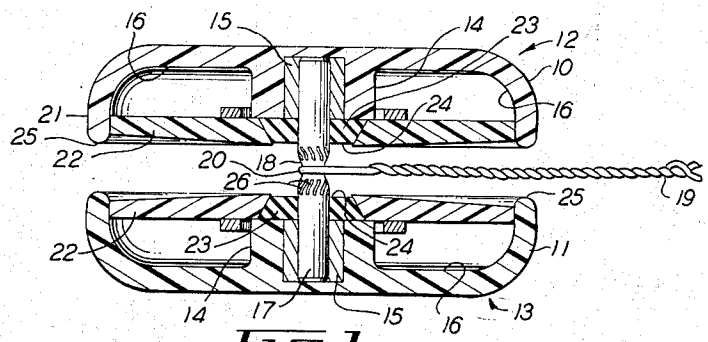

Fig. 1.

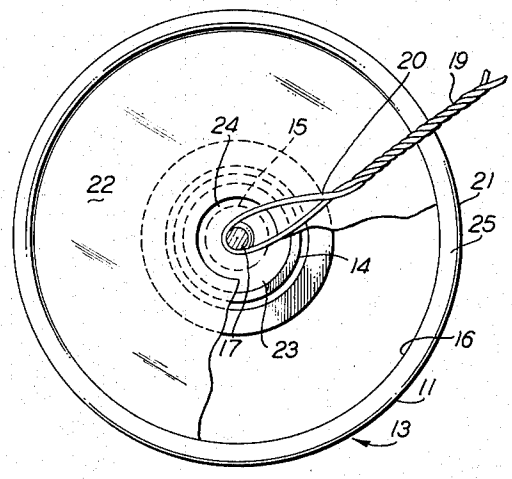

Fig. 2.

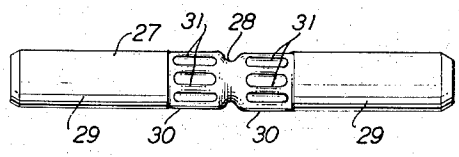

Fig. 4.

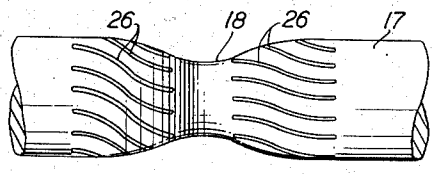

Fig. 3.

INVENTORS
NORMAN J. STIVERS
THOMAS H. ENNIS

BY Westall & Westall

ATTORNEYS

Patented Feb. 24, 1953

2,629,202

UNITED STATES PATENT OFFICE

2,629,202

TETHERED AERIAL TOP

Norman J. Stivers, Canoga Park, and Thomas H. Ennis, Burbank, Calif., assignors to Donald F. Duncan, Inc., Chicago, Ill., a corporation of Delaware

Application July 17, 1950, Serial No. 174,196

3 Claims. (Cl. 46—61)

1

This invention relates to toys and more specifically contemplates a top of the type adapted to be actuated by a string, cord or the like wound about the body of the device so as to impart a spin thereto, the string being rewound upon the body incident to the momentum thus produced.

Devices of the type to which our invention relates are usually composed of wood, and comprise, generally, a pair of half shells or disks spaced apart and connected by an axially-disposed shaft around which the string or cord is looped. After winding the string upon the shaft and securing the free end thereof to a finger of the user, a spin may be imparted to the top, by throwing the same. As the top reaches the end of its range of movement as determined by the length of the string, it will continue to spin freely within the string loop. A sudden relaxation of tension upon the string permits the loop to loosen and expand laterally upon the spinning shaft which doubles the loop about the shaft. Continued rotation of the top rewinds the string, returning the body of the top to the hand of the user.

The velocity of the top and the length of time it will continue to spin incident to momentum created during the initial throw, depends primarily upon the friction between the string and shaft and between the string and opposed walls of the body of the top. In accordance with conventional construction of such tops, the shaft must possess a certain degree of irregularity to assure engagement and rewinding of the string when tension is relieved. This irregularity limits the maximum velocity obtainable as well as the duration of the spin.

It is a principal object of the present invention to provide a top of the type referred to, comprising spaced body elements and an axial shaft extending therebetween for engagement by a string, an intermediate portion of said shaft being formed to normally center the string between the body element so as to minimize friction between the latter and the string during rotation of the top.

Another object hereof is the provision of a top comprising a shaft having an intermediate bearing section normally freely rotatable within a loop of an actuating string, but having associated therewith and disposed laterally of the bearing section, means rotatable with the shaft for positively engaging the string when the latter is shifted into contact therewith so as to compel a winding of the string about the shaft.

2

Another object is to provide an adhesive member or members disposed laterally of the centering means for the actuating string, to engage the loop of the latter upon expansion of the loop incident to relaxation of tension upon the string.

Another object is the provision of a shaft having a central polished bearing surface to minimize friction between the string and shaft, and a laterally-disposed irregular formation operable to positively engage and initiate rewinding of the string incident to lateral expansion of the string loop and the momentum of the top.

Still another object is to provide means carried by the shaft adjacent to the normal position of the string loop when the top is spinning freely, said means being adapted in response to relaxation of tension upon the string, to shift the loop laterally into positive engagement with a rewinding expedient associated with the shaft.

Still another object is to provide a body composed of oppositely-disposed hollow shells, each having associated therewith a weighted axial hub to concentrate the weight of the body of the top adjacent its axis of rotation to permit maximum acceleration.

Still another object is to provide a top comprising opposed body sections spaced apart by a shaft upon which a string is wound for impelling rotary motion of the top, the opposed walls of the respective sections having annular formations thereon operable to minimize friction between the string and body sections in the event that, due to the manner in which the top is actuated, an unbalanced or off-centered spinning results.

Numerous other objects and salient features, such for example, as improved mountings within the box section for the ends of a shaft of small cross-section, simplicity of construction, susceptibility to attractive design and perfect balance, and greater velocity in operation, will be apparent to those of skill in the art upon an examination of the following description read in the light of the accompanying drawings, in which:

Fig. 1 is a diametric sectional view of a top embodying my invention;

Fig. 2 is a transverse section through the shaft showing, in elevation, the inner face of one of the body elements;

Fig. 3 is an enlarged elevation of the shaft shown in Figs. 1 and 2; and

Fig. 4 is an enlarged elevation of a modified form of shaft.

Referring to the drawings more in detail, the numerals of which indicate similar parts throughout the several views, 10 and 11 designate identical opposed shells of body sections 12 and 13, respectively, of a top embodying the novel features hereof. Each shell 10 and 11 comprises a wall, generally calathiform, the contour of the outer surface of which is largely conventional and may be varied to meet specific design requirements. Formed integrally with the wall of each shell is an internal hollow hub 14, which is coaxially related therewith. The shells are preferably composed of a synthetic resinous material and may be transparent, if desired. Fitted non-rotatably into the bore of each hub 14 is bushing 15. The body sections 12 and 13 are secured in rigid coaxial relationship with the concavities 16 formed by the respective walls opposed to one another, by a shaft 17, the ends of which are tightly fitted into the respective bushings 15, whereby the sections are rigidly maintained in spaced relationship.

The shaft 17 is formed with an arcuately restricted central portion or groove 18 about which a string 19 is looped. The string is doubled to form the loop 20 and the ends (not shown) of the two reaches of the string 19 are tied together. The tied ends of the string are, in accordance with the operation of the top, held in the hand or engaged by a finger of the user and the two reaches of the string are twisted together. The loop 20 in the end of the doubled string thus provides a means for freely suspending the top while the latter is rotated, as will appear.

The annular concavity 16 encircling the hub 14 of each body section within the rim 21 of the shell is enclosed by an annular plate 22 defining a flat cone and composed of a synthetic resinous material, each plate being cemented to the inner surface of the rim 21 below the plane of the outer edge of the latter, and to the hub 14 over which it partially extends. A disk 23, composed of rubber or other material having a slightly adhesive surface 24, encircles the shaft and overlies the bushing 15 and hub 14. The periphery of each disk 23 and the inner edge of the annular plate 22 are dove-tailed, whereby the plate partially overlies the edge of the disk and functions to maintain the latter in position. The disks 23 are of a thickness slightly less than that of the plates so as to inwardly offset the exposed surface of each disk from the corresponding surface of the adjacent marginal edge of the complementary plate 22.

It will be appreciated that with the shells 10 and 11 composed of a relatively light weight material, the bushings 15 and shaft 17 concentrate the bulk of the weight of each body section 12 and 13 adjacent the axis of rotation, thus permitting, as will appear, a more rapid acceleration.

In accordance with the utility and operation of the device, the string 19 is initially wound upon the shaft 17 and with the outer end of the string attached to the hand of the user, rotation of the shaft is initiated by throwing the top from the hand while retaining a hold upon the outer end of the string. Upon reaching the end of the string 19, the top continues to rotate, the shaft 17 turning freely within the loop 20. Due to the fact that the string is twisted, there is a tendency for the loop 20 to shift toward one end of the shaft 17 and accordingly, to rub upon the rotating adjacent surface of a correspondingly-disposed body section.

This tendency is offset by the circumferential restriction 18 at the middle of the shaft which functions to normally maintain the loop 20 in a position equispaced from the respective body sections 12 and 13. It will also be appreciated that in the event the loop is momentarily displaced from the restricted medial portion 18 of the shaft, while tension upon the string is maintained, contact of one or the other of the body sections with the string will be confined to the marginal inner edge of the annular plate 22 and similarly any imbalance of the spinning top, resulting from the manner in which the same is initially thrown, will not induce excessive friction of the body sections due to the projecting annular bead 25 defined by the edge of the rim, beyond the plane of the annular plate 22, it being understood that the outer edge 25 of the rim and the inner marginal edge of the plate 22 lie in substantially the same plane whereas the periphery of the flat plate 22 is offset inwardly with respect to the surface of the bead 25.

In order to utilize the momentum of the spinning top to rewind the string 19, tension upon the string is suddenly and momentarily relieved by lowering the hand quickly. The loop 20, relieved of the weight of the top, accordingly contracts longitudinally and expands laterally beyond the restricted area or groove 18 of the shaft 17 and into contact with the adhesive surface 24 of one or both of the disks 23 of the respective body sections. The slight momentary engagement of the released string loop initiates the rewinding process, the adhesiveness of the surface 24 of the disk so engaged by the string being effective to wind at least one convolution of the string upon shaft 17. Succeeding convolutions, tending to form during corresponding revolutions of the top, bind the string upon the shaft 17 so as to prevent slippage and assure the continued and complete rewinding of the entire string. It will be appreciated that as convolutions are added, the string is wound in contact with the rubber disks so that slippage is positively prevented down to the last convolution during the subsequent operation of unreeling and imparting a spin to the top.

A feature of the invention resides in the provision of a series of spiral grooves 26 formed in each portion of the shaft 17 intermediate the annular string-centering groove 18 and the respective disks 23. The grooves 26, as most clearly seen in Fig. 3, extend about the shaft in opposite directions whereby, regardless of the direction of rotation of the top one set of grooves 26, i. e., those on one side or the other of the central groove 18, will be operable to engage the shaft-encircling loop 20 upon relaxation of tension upon the string and functioning as a screw, tend to shift the engaged portion of the loop into contact with the surface of the complementary disk 23. It will also be appreciated that the grooves 26 per se, operate to initiate the rewinding process.

In Fig. 4, we have illustrated a modified form of shaft adapted for incorporation in a top comprising body sections of the type illustrated in the embodiment first above described and illustrated in Figs. 1–3, inclusive. The shaft 27 is formed with a central string-engaging groove 28 and end portions 29 adapted to be mounted in the respective bushings 15 of the body sections 12 and 13. The sections 30 of the shaft intervening between the end portions 29 and the centering groove 28 are each formed with a series

of radially-disposed vanes or teeth 31, which are operable to engage the loop 20 of a string engaged therewith upon relaxation of tension upon the string, and thereby to compel the initial convolution. Continued rotation of the top piles additional convolutions upon the engaged loop so as to bind the string to the shaft for the completion of a rewinding process.

It will thus be seen that we have provided a top comprising a body adapted for permanent association with a string for initiating rotation and for suspending the rotating top in mid-air, and upon which the body of the top may be rewound incident to continued rotation of the top, wherein a polished bearing surface is provided for free spinning of the top so as to assure maximum velocity, in combination with auxiliary means operable to positively engage the string to accomplish the rewinding of the latter upon the body, friction of the body sections upon the string being minimized.

While we have shown and described but two embodiments of our invention, it will be understood that numerous changes in size, design, shape, number and proportion of the various parts may be made, that the radial distribution of weight in the body sections of the top may be varied by substituting rings of various diameters, and that the exposed adhesive surfaces of the disks may be offset with respect to the plane of the innermost marginal edge of the plates in either direction or that such varying planes may be coincident, if desired, that while the bushings permit the utilization of a small diameter axle, an axle of larger diameter may be substituted with or without the bushings, and that the distance between body sections may be altered to meet specific requirements—without departing from the spirit of our invention as defined by the appended claims.

What we claim and desire to secure by Letters Patent is:

1. In a top, a shaft, a body comprising a pair of generally disc-shaped sections rigidly mounted on opposite ends of said shaft in spaced relationship, said shaft being formed to define in its central zone, midway between said body sections, a smoothly polished zone of slightly reduced diameter having arcuate extremities blending smoothly into the main portion of said shaft, and a flexible line loosely looped over said shaft and normally adapted to ride in said polished zone, said shaft being provided also with a plurality of oppositely directed shallow spiral grooves on the shaft surface adjacent both sides of said polished zone, said spiral grooves being adapted to urge the line toward one of said body members and away from said polished zone.

2. In a top, a shaft, a body comprising a pair of generally disc-shaped sections rigidly mounted on opposite ends of said shaft in spaced relationship, said shaft being provided, midway between said body members, with a smooth polished zone of reduced diameter, said zone having arcuate extremities blending gently into the main portion of said shaft, said shaft being also provided with a plurality of shallow spiral grooves on both sides of said polished zone, and a flexible line looped around said shaft and adapted normally to ride in said polished zone, each of said body members being provided with a friction disc rigidly mounted on said shaft in coaxial relation therewith and presenting a friction surface adapted to engage and hold said line when said line is moved axially into contact therewith.

3. In a top, a shaft, a body comprising a pair of generally disc-shaped sections rigidly mounted on opposite ends of said shaft in spaced relationship, and a flexible line loosely looped over said shaft, each of said body sections being provided with a friction disc rigidly mounted relative to said body section and to said shaft and being coaxially disposed around said shaft, said friction discs being recessed slightly in said body members relative to the opposed surfaces of said body members to provide slightly greater axial separation between said discs than between said opposed faces, said friction discs being adapted to engage and hold said line when said line is moved axially along said shaft into contact with one of said friction discs.

NORMAN J. STIVERS.
THOMAS H. ENNIS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
901,037	Philippart	Oct. 13, 1908
1,866,697	Blackburn	July 12, 1932
2,015,649	Amell	Oct. 1, 1935

FOREIGN PATENTS

Number	Country	Date
392,002	Great Britain	May 11, 1933