A DEVICE FOR GENERATING A MEANDER MOTION

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The present invention relates to a device for generating a meander motion, as well as to a blank for producing a device for generating such a motion.

Moving or movable toys have always held a special fascination for homo ludens, Man the Playing, regardless of age, and the more complex the motions performed by the toy, the greater the fascination. Thus, the simple wheels of the platform pulled by a string and carrying a horse or a clown were replaced by eccentrics which made the horse appear to rock or the clown to sway and totter. Similar effects were attained by using non-circular, e.g., elliptical, wheels. However, wheels, whether circular, centric or eccentric, have become such an integral part of the daily experience of our technological society, that their respective actions are known and anticipated even by the young, and the effect of toys incorporating such elements appears to pall rapidly.

It is one of the objects of the present invention to provide a motion-producing device which is entirely novel, completely unexpected and even startling in its action and, in addition to the effects produced by the above-mentioned prior-art devices, also generates, when pushed or pulled along a zig-zagging or meandering motion.

This the invention achieves by providing a device for generating a meander motion, comprising at least two components, each constituted by at least a portion of at least the envelope of a double cone, including its respective apices, which components are connected to one another in such a way that the planes containing the geometrical bases of said double cones are intersecting, whereby, upon said device being made to roll along a surface, it will

perform a plane meander, a straight line common to both of said planes will perform a nutating motion and a point located on a normal to said straight line will describe a spatial meander.

While some of the more basic embodiments of the present invention, because of their very simplicity, cannot be utilized in the manner mentioned above, that is, by being applied to, and controlling the motion of, various objects such as animals and the like, these selfsame embodiments, by their unique aesthetic qualities, are eminently suitable to serve as toys in themselves, to be handled, moved about on the desk top and looked at in different positions, each of which offers a different view of their intriguing shape. As these embodiments can also be made of cardboard or similar flexible, bendable and foldable materials, the present invention also provides the blank as claimed in claim 10, wherein the outlines of said figures are marked on said material and wherein at least some of said figures are integrally preconnected at at least some of the edges constituting their outlines.

With specific reference now to the figures in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the

description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

In the drawings:

Fig. 1 is a perspective view of an embodiment of the device according to the invention;

Figs. 2 and 3 are perspective views of the two components constituting the embodiment of Fig. 1;

Figs. 4 and 5 are perspective views of the two components constituting an embodiment being a variant of the embodiment of Fig. 1;

Fig. 6 is a schematic representation of another embodiment of the device according to the invention;

Fig. 7 shows a perspective view of a physical realization of the geometries shown in Fig. 6;

Fig. 8 is a schematic representation of yet another embodiment of the device according to the invention;

Figs. 9 and 10 represent toy animals as mounted on embodiments of the invention based on Fig. 8;

Fig. 11 indicates the shape of a blank a plurality of which is required to produce the embodiment of Fig. 1;

Fig. 12 is an integral blank to produce the embodiment of Fig. 1, and

Fig. 13 is an integral blank to produce the embodiment of Fig. 2.

There is shown in Figs. 1,2 and 3 a basic embodiment of the present invention, which, although in reality possibly being also hollow or a one-piece, solid casting, may be thought of as consisting of two components in the shape of two identical double-cone halves, with apex angles of 90°, as seen to better advantage

in Figs. 2 and 3 in their proper relative orientation prior to being attached to one another with their respective planes of symmetry 1 and 1'. Each of these planes contains the cone axes 2 or 4, the apices 6, 8 or 12, 10 of their respective double-cone halves, as well as the diameters 14 or 16 of the imaginary bases (as given by the planes defined and delimited by the peripheries 18 and 20 respectively) of these cone halves. As can be seen, the planes containing these imaginary bases intersect at a right angle and the bases themselves touch one another with their diameters 14 and 16. The cones underlying the geometry of this embodiment being circular cones, the peripheries 18 and 20 of the two double-cone half-bases, each periphery produced by the intersection of the envelopes of its double-cone half, are semi-circular.

When the double-cone halves of Fig. 2 and Fig. 3 are joined in the above-described manner, the corners 22,24 of the periphery 18 in Fig. 2 will coincide with, and can, therefore, be said to constitute, the apices 10 and 12 of the double-cone half of Fig. 3, while the corners 26,28 of the periphery 20 of Fig. 3 will coincide with, and can, therefore, be said to constitute, the apices 6 and 8 of the double-cone half of Fig. 2.

Referring now again to Fig. 1, a perspective view of the presently discussed embodiment, the latter is seen to rest on a surface (not shown), touching this surface along a straight line leading from the apex 10 of the double-cone half of Fig. 3 (which is also the corner 22 of the periphery 18 of Fig. 2) to the apex 8 of the double-cone half of Fig. 2(which is also the corner 28 of the periphery 20 of the double-cone half of Fig. 3). If now the device shown in Fig. 1 is given a slight push from somewhere behind and below the apex 12, it will start rolling forward, the apex 10 becoming a stationary pivot,

around which the periphery 20 and the envelope portion associated with it and with apex 10 will roll off, swerving to the left (as seen from the front), until the line connecting the apices 10 and 6 will make contact with the supporting surface, at which instant the apex 6 will become the pivot about which the periphery 18 and the envelope portion associated with it and with apex 6 will roll off, swerving to the right. The next apex to serve as pivot will be apex 12, producing a swerve to the left, to be followed by apex 8, producing a swerve to the right again. This completes a full cycle, the next cycle again beginning with apex 10 as pivot. If this embodiment of the device according to the invention was completely inked and made to roll off on a supporting surface, it would print out a meandering track the outlines of which would be very similar to the outlines of the blank shown in Fig. 12 as described hereinbelow.

Another embodiment of the device according to the invention is shown in its two components in Figs. 4 and 5. However, while the geometry of the previous embodiment was based on halves of right, circular double cones, the geometry of the two components of Figs. 4 and 5 is based on oblique, circular double-cone halves which, as was the case with the right, circular double-cone halves, are joined to one another at a mutual angular offset of 90°. As is obvious from Figs. 4 and 5, because of this obliqueness, the diameters 14 and 16 of the ~~geometrical~~ imaginary bases no longer touch one another, but merely face one another at a distance. These oblique double-cone halves being also circular, the peripheries 18 and 20 of the ~~geometrical~~ imaginary bases of the double-cone halves are semi-

circular and, as was the case with the embodiment of Figs. 3 and 4, the two corners of each of the two semi-circular peripheries constitute also the two apices of the double-cone half associated with the other periphery.

It should be understood that while the geometries of both of the embodiments described so far are based on circular double cones and, therefore, on peripheries which are at least parts of circles, other embodiments can be envisaged with geometries based on non-circular double cones, having peripheries which are at least parts of non-circular curves. Circular peripheries may also subtend angles that are other than 180°.

Another interesting feature of these two embodiments is the fact that part of the peripheries, including portions of the envelopes involved, could be cut away without substantially affecting the meandering motion of the device, as long as the projection of the center of gravity of the device is still within the instantaneous line of contact of the envelope with the supporting surface.

Another series of embodiments of the device according to the invention is based on the fact that a cone is fully defined by its base and by the position of its apex relative to this base. Translated into physical terms, a disc representing the base of a cone and a slender rod, mounted on the disc and the tip of which represents the apex of the cone, will roll off on a supporting surface in the same manner as a perfectcone will, although it has no envelope at all.

Fig. 6 is a schematic representation of an embodiment of the invention as based upon the above idea, which embodiment constitutes in fact a reduction to its essentials of the embodiment shown in Figs. 1,2 and 3. Here, the two components consist of the real bases 30 and 32 of the two halves of the right, circular double cones which are now imaginary. These bases 30 and 32 are semi-circular, their planes include with one another a right angle, and they touch one another with their diameters 14 and 16. The two corners 22, 24 and 26,28 of each of these semi-circular bases 30 and 32 constitute also the apices 10,12 and 6,8 of the other bases imaginary double-cone half.

An even more extreme reduction of the embodiment of Fig. 1 would be an embodiment consisting of two wires, bent to represent the two peripheries 18 and 20, and connected to one another at the correct angular offset of 90° by means of another, straight, piece of wire.

A physical realization of the geometries described in Fig. 6 is shown in Fig. 7. Here, a square board 11 constitutes the plane of symmetry of the device and includes the two lines 14 and 16 as its diagonals. The semi-circular ~~plane~~ real base 32 is fixed to one face of the square board 11, along the diagonal 16, and the semi-circular ~~plane~~ base 30 is fixed to the other face of the square board 11, along the diagonal 14. The corners of the square board 11 also constitute the four ends 22 and 24, and 26 and 28, respectively, of the peripheries 18 and 20.

Fig. 8 is a schematic representation of an embodiment of the invention and constitutes a reduction to its essentials of the embodiment of Figs. 4 and 5, based on oblique, circular double cones. As is realized when comparing this figure with

Fig. 6, the two embodiments are identical except for the following detail: the two lines 14 and 16 which here, too, also constitute the diameters of the ~~planes~~ bases 30 and 32 delimited by the peripheries 18 and 20, do not touch as in Fig. 6, but face one another across a distance bridged by a physical axis 34. When this embodiment is set rolling, this axis which is in fact a straight line common to both ~~planes~~ bases 30 and 32, will perform a nutating motion, that is, a motion resembling that of a double-bladed kayak paddle and a point located on a normal to this axis 34 will describe a spatial meander. It is because of this real, physical axis 34 that this embodiment is the basis of other, more elaborate embodiments which involve also the use of objects to which the meander motion is to be imparted.

Such an embodiment is the penguin-like object shown in Fig. 9. The penguin 36 is freely mounted on the axis (not shown) rigidly connecting the two semi-circular ~~planes~~ bases 30 and 32. The lower, substantially spherical body 38 of the penguin is either solid or filled with a heavy substance, bringing the center of gravity of the penguin below the axis itself. The penguin is, therefore, in a state of stable equilibrium to which it always tends to return. The toy is pulled by a string 40 and, when thus moved along a surface, offers an excellent imitation of the waddling gait of these animals.

Another application of the device in conjunction with an animal shape is shown in Fig. 10, being an imaginary, caterpillar-like insect. Here, two pairs of semi-circular ~~planes~~ bases 30 and 32 are used, each pair interconnected by an axis 34, which planes support the long, flexible body 42 either made of a corrugated rubber or plastic tube, or consisting of a plurality of articulated segments. Pulled along by a string 40, the toy will give a most creditable

performance of a goggle-eyed insect worming its way along. Obviously, more than two pairs of planes 30,32 may be used for longer bodies 42.

As stated hereinabove, the embodiments shown in Figs. 1 and 7, and the analogue of the former, as based on Figs. 4 and 5, while not suitable for being pulled along by a string, are nevertheless highly enjoyable as toys in themselves, to be handled, moved about on the table or desk top by pushing or even blowing, and to be observed in their intriguing motion and in different positions, each of which reveals a different aspect of their unusual shape.

As users would probably enjoy preparing these devices themselves, the present invention also provides blanks, comprising the developed shapes of any of the above-mentioned embodiments. These blanks can be printed on any suitable, flexible, bendable and foldable material such as cardboard or the like to be cut out, flexed and/or folded into shape, and glued at the appropriate joints.

Fig. 11 shows one such blank, four of which would be required to produce the shape of the embodiment of Fig. 1. The angle α should be about 127°, which would result in the required apex angle of 90°. However, a blank of this outline would entail much needless work in glueing together the pieces. A far better solution is shown in Fig. 12 in which the four developed cone portions of Fig. 11 are integrally preconnected, saving half of the glueing job. Glueing tabs 46, of which only some are indicated, are provided on one of each two joint partners AA, BB and CC. It would also be possible to provide the blank already precut, ready for glueing.

A blank for producing the embodiment shown in Fig. 7 is given in Fig. 13. Here, the parts are folded before glueing. Dash-dotted folding lines 50 means folding up, dashed lines 52 indicate folding down. After folding, the parts are stuck together on the rear side of the blank, there being no need for tabs in this embodiment.

Yet another embodiment based on Fig. 1 or its analogue according to Figs. 4 and 5 is at least partly hollow and includes, mounted in its inside, a source of motive power such as a spring motor or even a battery-powered electric motor. One way of transfering this power to the device would be to have such a motor drive an unbalanced mass which would always tend to assume a position in which its center of gravity would be as low as possible. By reaction it would, therefore, make its motor turn round. This reactive motion would, of course, be transmitted via the motor mounting to the device itself, making it roll along the supporting surface.

It goes without saying that a carefully chosen color scheme will greatly enhance the visual effect of the devices according to the invention.

While particular embodiments of the invention have been described, it will be evident to those skilled in the art that the present invention may be embodied in other specific forms without departing from the essential characteristics thereof. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.