June 10, 1958 F. SIEGFRIED 2,838,159

SPIRAL BALL CONVEYOR

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Fig. 1.

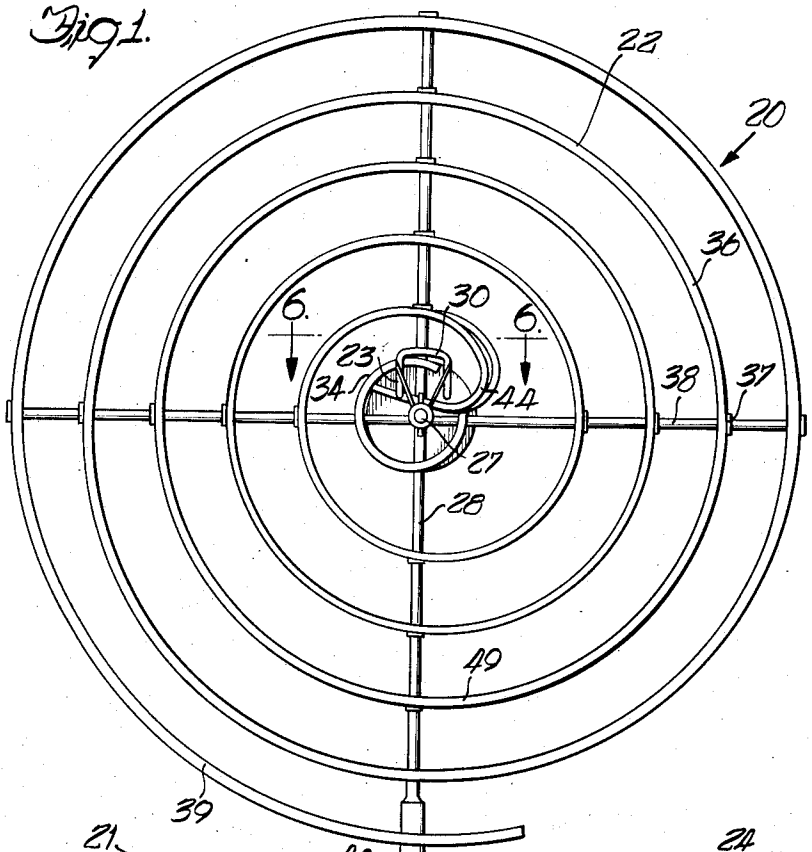
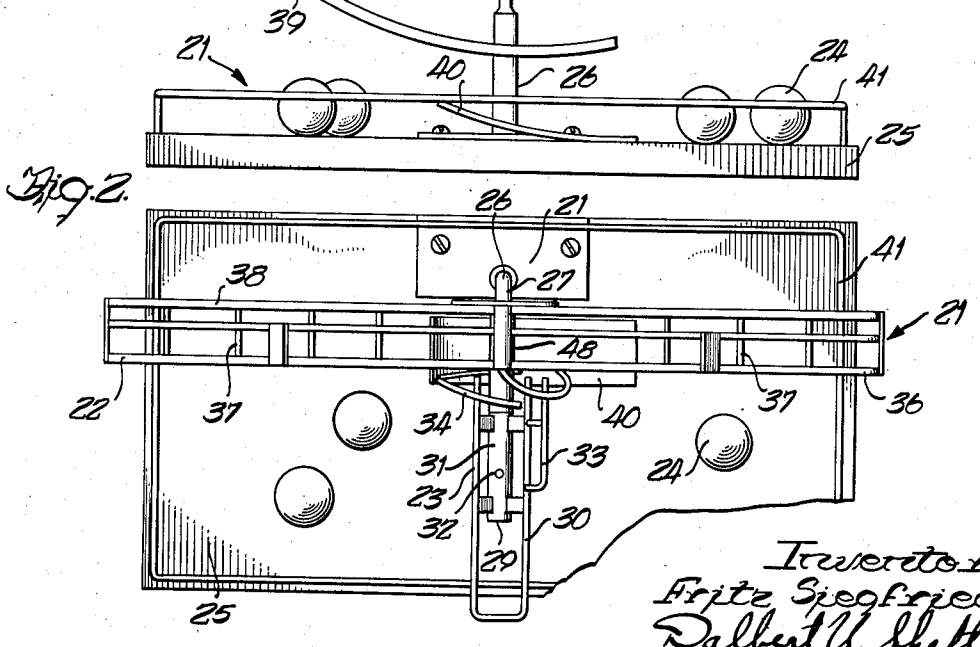


Fig. 2.



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Fig. 3.

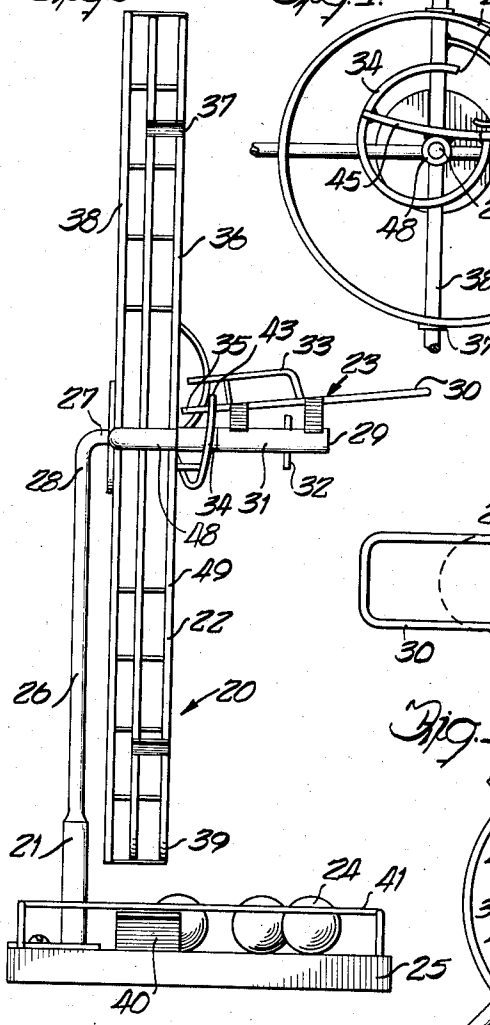


Fig. 4.

Fig. 5.

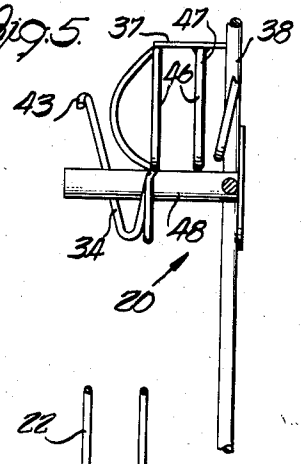


Fig. 6.

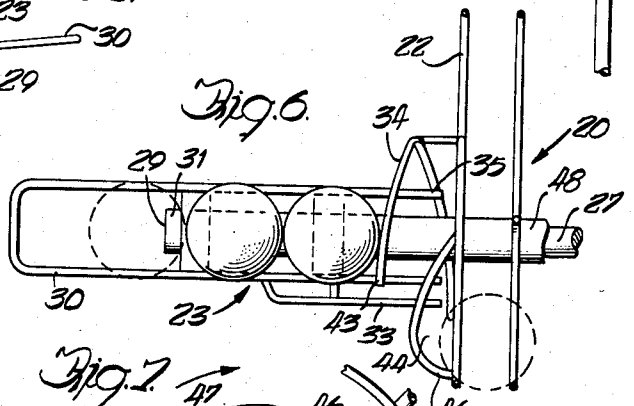


Fig. 7.

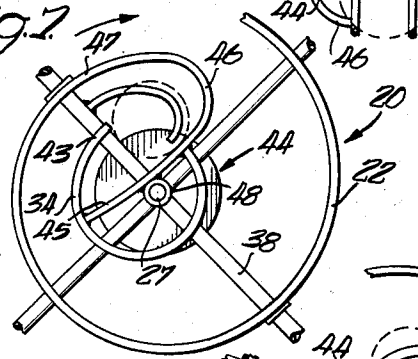


Fig. 8.

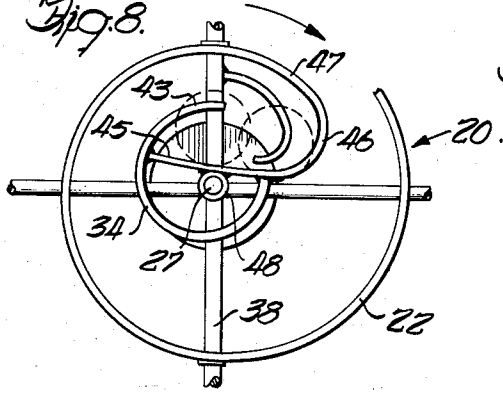
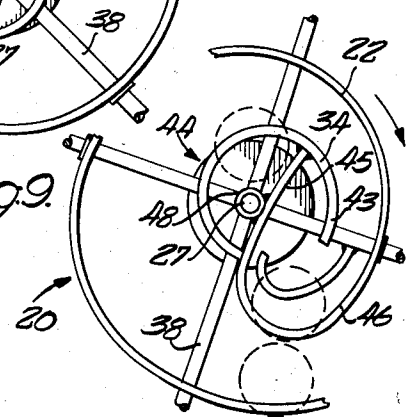


Fig. 9.



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SPIRAL BALL CONVEYOR

Fritz Siegfried, Chicago, Ill.

Application April 17, 1957, Serial No. 653,373

3 Claims. (Cl. 198—26)

This invention relates to a spiral ball conveyor, and more particularly to a rotating spiral track on which rolling balls are conveyed.

The present invention utilizes a new and improved spiral track construction that is mounted for rotation in a vertical plane. Balls or other rollable objects are introduced near the center of the spiral track by a unique ball feed means and roll downwardly in a vertical line as the spiral rotates. The balls then drop from the bottom at the periphery of the spiral.

This invention is adaptable to many uses such as a child's toy, a conveyor for rolling objects such as where it is desirable to transfer rolling objects from one level to another or to mix the contents of a rolling container. The structure is also adaptable as a power generating means to rotate a spiral or the shaft to which it is attached.

The principal object of this invention is to provide a new and improved spiral ball conveyor.

Another object of the present invention is to provide a spiral track rotatable in a vertical plane and upon which balls are freely rollable.

A further object of the present invention is to provide a spiral ball conveyor as described above wherein the rolling balls act as the drive means for rotating the spiral track.

Still another object of the present invention is to provide a spiral ball conveyor as described above having means to introduce balls singly into the spiral track.

A still further object of the present invention is to provide a spiral conveyor as described above having a ball receiving portion on which the balls roll to provide an initial torque impetus for rotation of the spiral track.

Other and further objects and advantages of the present invention will be apparent from the following description and drawings in which:

Fig. 1 is a front elevational view of a spiral ball conveyor illustrating one embodiment of the present invention;

Fig. 2 is a top plan view of the device of Fig. 1;

Fig. 3 is a side elevational view of the device of Fig. 1;

Fig. 4 is an enlarged front elevational view of a portion of the device of Fig. 1;

Fig. 5 is a side elevation of the structure illustrated in Fig. 4;

Fig. 6 is an enlarged horizontal sectional of a portion of the device of Fig. 1 taken along lines 6—6 of Fig. 1;

Fig. 7 is a view similar to Fig. 4 illustrating the position of a ball and the spiral track before introduction of the ball onto the spiral track;

Fig. 8 is a view similar to Fig. 7 showing a ball on the spiral track and the track advanced from the position of Fig. 7; and

Fig. 9 is a view similar to Fig. 7 showing two balls on the spiral track and the track advanced from the position of Fig. 8.

While this device is susceptible of embodiments in

many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, the spiral ball conveyor, generally indicated as **20** broadly consists of a supporting structure **21** on which a spiral track **22** is mounted for rotation thereon. In the embodiment of Fig. 1 the rotation would normally be clockwise. The supporting structure **21** includes ball feed means **23** which feed balls **24** into the center of the spiral track for simultaneous rotation of the track and rolling of the balls thereby progressing the balls in a vertical line down the track for eventual discharge at the bottom thereof.

The supporting structure **21** consists of a base **25** to which is attached a vertical support **26**. A horizontal shaft **27** extends from the upper end **28** of the vertical support **26** for the mounting of the spiral track **22** thereon. Attached to the outer end **29** of the shaft **27** is a ball feed trough **30** which is shaped to hold a plurality of balls, and declines toward the center of the spiral track to feed balls into the track. In the embodiment shown, the ball feed trough **30** is formed from a U-shaped rod which is supported above the hub **31** which is mounted on the shaft **27** and fixed thereto by a locking pin **32** extending through the hub and shaft. To prevent balls from falling off the ball feed trough when contacted by the ball stop **34**, which will be described below, a guard **33** is provided along the righthand side **35** of the trough.

The spiral track in the embodiment lilustrated comprises a pair of spirally curved lengths **36** having a plurality of loops **49**. The lengths are secured in a fixed spaced relationship by cross pieces **37** to provide a track upon which balls may roll. The loops **49** are secured to radial supports **38** extending from a central bearing **48** rotatably mounted on the shaft **27**. Because of the spiral shape, the lowest point of each loop of the spiral is horizontally spaced from the vertical plane of the shaft **27** so that when a ball is on the track it tends to roll to the lowest point of the particular loop. When the ball is in this lowest point, a torque is produced determined by the weight of the ball and a moment arm measured by the distance from the lowest point of the loop to the vertical plane of the shaft. This torque imparts a rotation to the track setting up a condition wherein the balls are rolling around the spiral counterclockwise relative to the spiral, and the spiral is rotating clockwise relative to the supporting structure with the result that the balls move in a downward vertical path until the last loop **39** of the spiral passes the ball and the ball drops off the track onto the base **25**.

Any type of base **25** can be utilized depending on the use of the device, whether for a game or for any other purpose. In the embodiment illustrated, the base has a curved metal plate **40** mounted directly below the spiral track **22** so that balls dropping from the track strike the curved metal plate **40** and roll from the plate onto the base **25**. A retaining rail **41** is attached to the plate to prevent balls from rolling off the plate so that they may be easily recovered and collected.

This invention includes a unique ball feed means **23** which in addition to the ball feed trough **30** includes an outwardly spiralling ball stop **34** secured to the track **22** and rotatable therewith. The end **43** of the stop **34** is spaced from the track sufficiently to enter between the first and second balls adjacent the track to prevent more than one ball from dropping into the track. During each

rotation thereof the stop 34 spirally advances into the plane of the track 22 so that the second ball is permitted to advance to the position previously occupied by the first ball during one rotation of the track. Thus, on the next rotation of the track, the stop 34 will once again enter between adjacent balls and prevent more than one ball from dropping onto the track. The operation of the ball feed means is aptly illustrated in Figs. 4–9.

A unique ball receiving section 44 is formed in the spiral track 22 for receipt of balls as they roll from the trough 30 in a manner controlled by the ball engaging length 42. This ball receiving section is provided with an inner portion 45 adjacent the center of the spiral track which extends outwardly from the center and declines to the righthand side of the track, as illustrated in Figs. 1 and 4, when the track is in the ball receiving position so that as a ball is fed onto the inner portion 45, it rolls outwardly to a position where a relatively large torque is provided to give the initial impetus to the rotation of the spiral track. At the outer end of the inner portion 45, a sharply curved portion 46 is provided which is curved upwardly to merge with the inner end 47 of the spiral track to guide the balls from the ball receiving section onto the spiral track for movement thereon. To prevent balls from falling out of the ball receiving section, a curved arm 50 is mounted adjacent the sharply curved portion 46.

In operation, balls are loaded on the trough 30 and the spiral track 22 is given an initial clockwise rotation as by hand so that it will rotate sufficiently to permit the first ball to be conveyed onto the ball receiving section 44. The ball then rolls downwardly on the declining inner portion 45 giving the track the necessary impetus to continue rotation. The ball then is guided by the sharply curved portion 46 onto the spiral track and rolls at the bottom of the loop, which as described above, is spaced from the center line of the spiral track to maintain a moment arm thereby producing a torque on the track for continuous rotation thereon. As the torque is measured by the moment arm and the weight of the balls, it is obvious that the rate of rotation can be controlled by the weight of the balls, thus the balls must be of sufficient weight to overcome the rolling friction of the track and ball. Subsequent balls are fed onto the track upon each rotation of the track.

Naturally, the structure and the balls can be constructed of any desirable material such as metal or any of various plastic materials depending on the strength and cost desired.

Thus, the above described invention provides a new and unique structure for conveying balls from the center of a spiral to the bottom thereof and has adaptability for any situation where it is desired to roll objects, to convey them from one point to a lower point, or to provide simple power for rotation of a shaft.

One special adaptation of the present invention is for use as a toy wherein the spiral can be brightly colored to give a pleasant effect as the balls roll thereon. Further, it can be adapted as a game by using any desired method of scoring such as incorporating holes in the base 25 in which the balls may come to rest as they roll off the spiral. Also, the rotation of the spiral could be linked to a shaft to provide power for the operation of other toys.

I claim as my invention:

1. A spiral ball conveyor, comprising: a supporting structure; a horizontal shaft secured to and extending from said supporting structure; a spiral track mounted on said shaft for rotation in a substantially vertical plane; balls freely rollable on said spiral track in a manner so as to descend in a substantially vertical line from the interior to the periphery of said track as the track rotates; and means for feeding balls onto the interior of the spiral track including a ball feed trough in which a plurality of balls may be mounted and a ball engaging member secured to said spiral track for rotation therewith, said ball engaging member passing between adjacent balls on said trough to permit the feeding of a single ball onto said track during each complete rotation of the track.

2. A spiral ball conveyor, comprising: a supporting structure; a horizontal shaft secured to and extending from said supporting structure; a spiral track mounted on said shaft for rotation in a substantially vertical plane; a ball freely rollable on said spiral track in a manner so as to descend in a substantially vertical line from the interior to the periphery of said track as the track rotates; means for feeding the ball onto the interior of the spiral track; and a ball receiving portion on said track at the interior thereof having an inner end adjacent said means, an inner length of track leading away from said means cooperating with the means to direct a ball fed by the means away from the vertical plane of said shaft to impart an initial torque to the track causing rotation, and a sharply curved length of track on which the ball rolls from said inner length to the rest of the spiral track.

3. A spiral ball conveyor, comprising: a supporting structure; a horizontal shaft secured to and extending from said supporting structure; a spiral track mounted on said shaft for rotation in a substantially vertical plane; balls freely rollable on said spiral track in a manner so as to descend in a substantially vertical line from the interior to the periphery of said track as the track rotates; means for feeding balls onto the interior of the spiral track including a ball feed trough in which a plurality of balls may be mounted and a ball engaging member secured to said spiral track for rotation therewith, said ball engaging member passing between adjacent balls on said trough to permit feeding of a single ball onto said track during each complete rotation of the track; and a ball receiving portion on said track at the interior thereof, said portion being adjacent the means for feeding balls on the track and leading away therefrom so that as a ball is fed onto said portion it rolls to a position away from the vertical plane of the shaft thereby imparting a torque to the track which causes rotation, said portion merging with the rest of the track to feed the balls thereonto.

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