March 23, 1971 L. G. SMITH 3,572,308

SPRING ACTUATED CENTRIFUGAL TYPE BALL THROWING DEVICE

Filed May 15, 1969 4 Sheets-Sheet 1

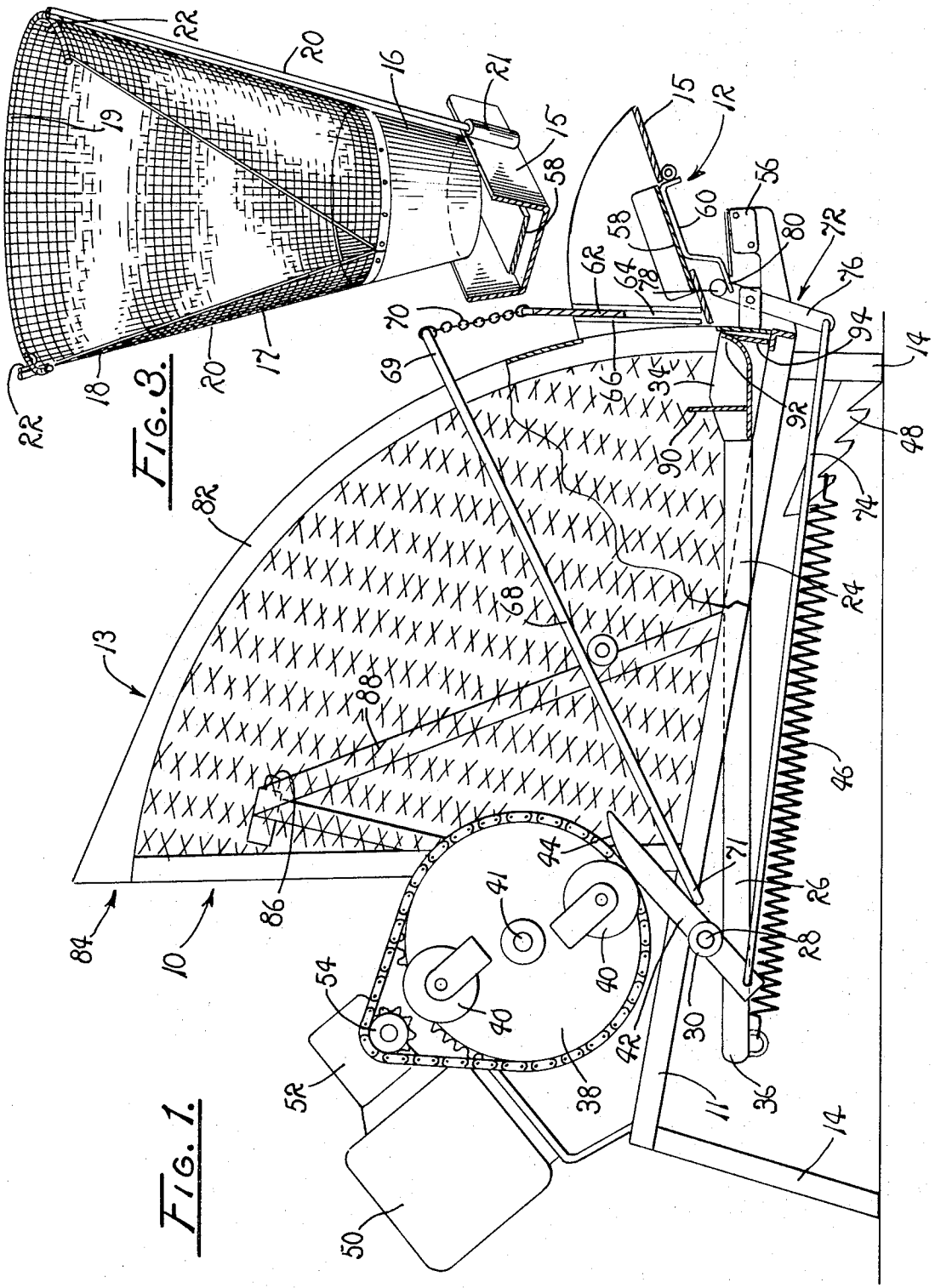


FIG. 3.

FIG. 1.

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SPRING ACTUATED CENTRIFUGAL TYPE BALL THROWING DEVICE

Filed May 15, 1969 4 Sheets-Sheet 2

FIG. 4.

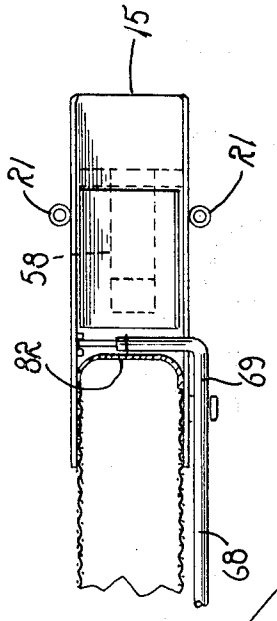


FIG. 2.

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SPRING ACTUATED CENTRIFUGAL TYPE BALL THROWING DEVICE

Filed May 15, 1969 4 Sheets-Sheet 3

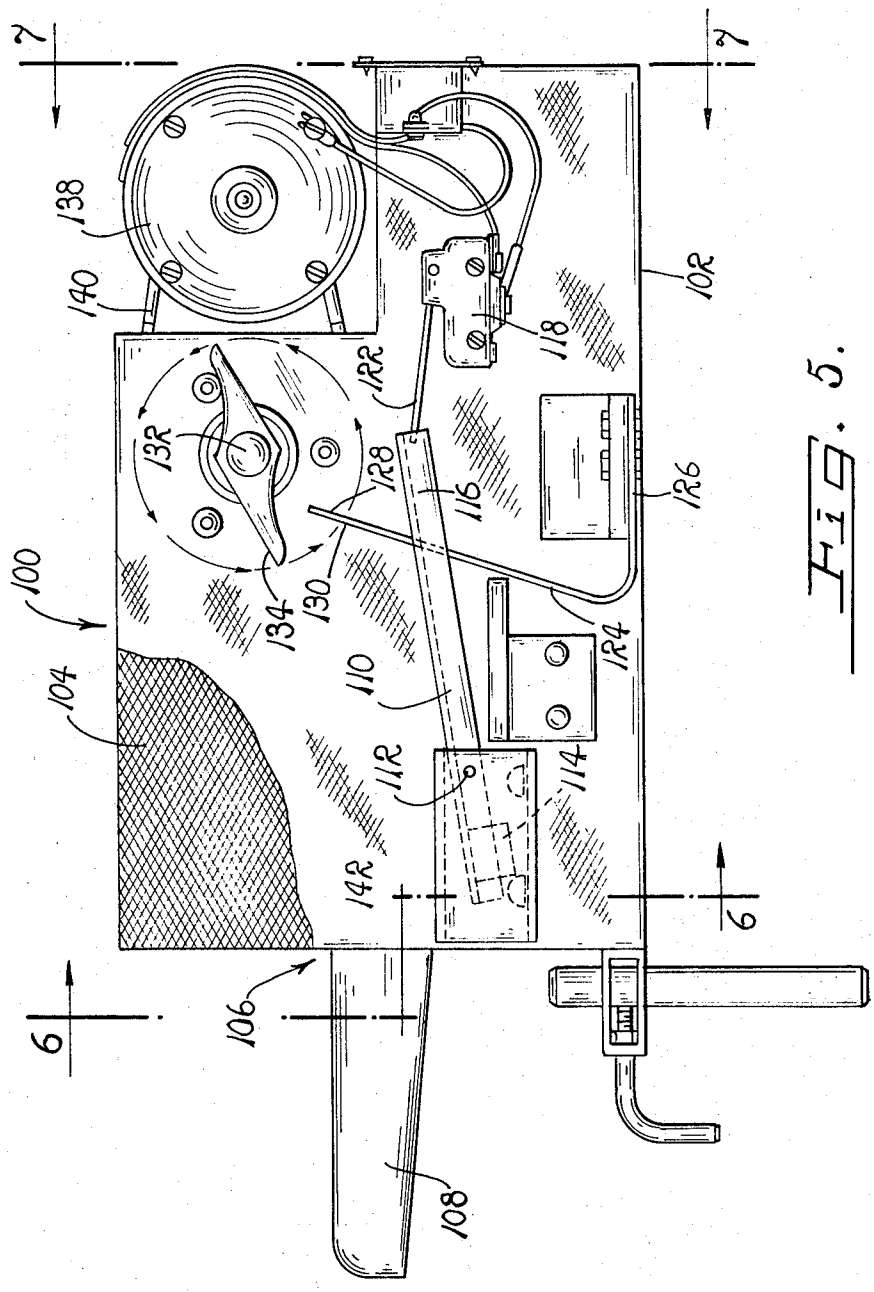


FIG. 5.

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SPRING ACTUATED CENTRIFUGAL TYPE BALL THROWING DEVICE

Filed May 15, 1969 4 Sheets-Sheet 4

Fig. 7.

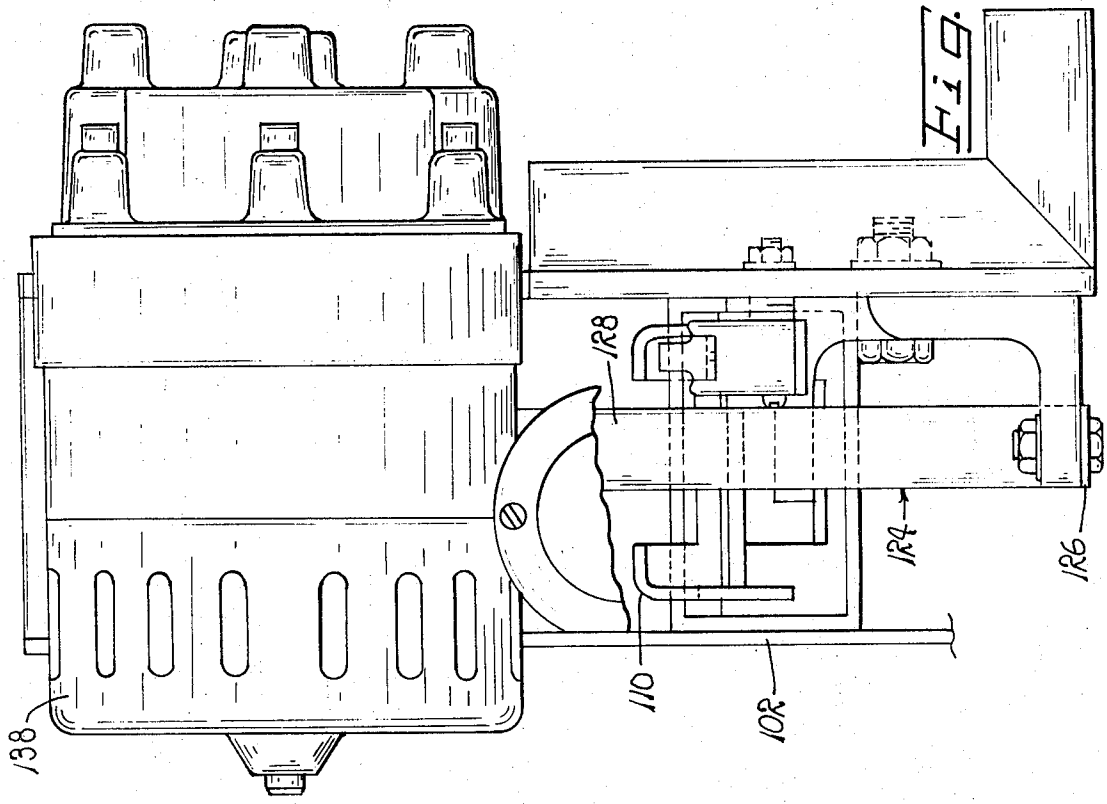
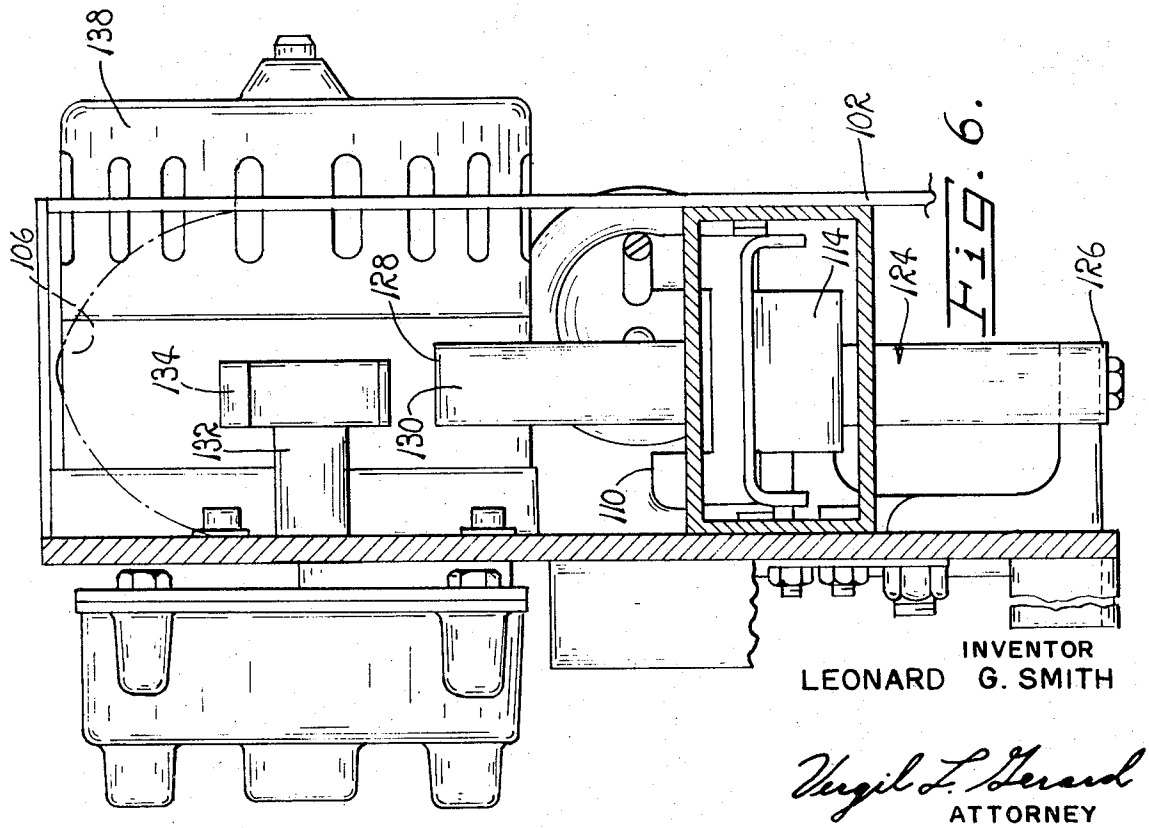


Fig. 6.



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SPRING ACTUATED CENTRIFUGAL TYPE BALL THROWING DEVICE

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Filed May 15, 1969, Ser. No. 825,008
Int. Cl. F41b 3/02
U.S. Cl. 124—7 7 Claims

ABSTRACT OF THE DISCLOSURE

A device for throwing a ball mechanically to an animal or person. The preferred embodiments of the invention include a throwing arm resiliently mounted in a housing. The housing has an inlet door and an outlet door. An electric drive motor is provided to cock the throwing arm against a spring to a position where the ball is received from the housing inlet. The housing inlet also has a weight actuated switch which senses the presence of the ball in the inlet and starts the electric motor to cock the throwing arm. After the throwing arm is cocked, it is released to the urging of the spring which rapidly drives it to an uncocked position, propelling the ball out of the housing outlet.

BACKGROUND OF THE INVENTION

This invention relates generally to projectile propelling devices and particularly to power driven, automatically actuated devices for throwing a ball.

Many dog owners train their animals to chase and retrieve a thrown ball only to find themselves constantly begged to play this game. Likewise, children can often be constructively entertained for long periods, throwing and catching a ball. The problem is that both of these activities require a second participant, who is not always available.

While it is true that various ball throwing and ball return devices have been heretofore developed, none has met the need for a simple, relatively inexpensive, power driven, automatic ball propeller. Previously known ball propellers include nets spring mounted within a frame, which are quite simple, and expensive automated pitching machines for use in professional sports, which are highly complex. Devices of the nature of the first described require that the ball be thrown accurately into the device with sufficient momentum to power its return, and, therefore are not suitable for use by animals or small children. The complex devices are too expensive and complicated to be feasible for individual use.

It is, therefore, a major object of my invention to provide a ball throwing device which is relatively inexpensive to construct and extremely simple to use.

It is another object of my invention to provide a ball throwing device which is independently powered and automatically actuated.

It is a further object of my invention to provide a ball throwing device of the type described which is actuated by placement of the ball in a receiving passage and thereafter automatically proceeding to throw the ball.

These and other objects and advantages of my invention will become more readily apparent from the following specification and drawings in which:

FIG. 1 is a side elevational view of a first preferred embodiment of my invention with the mechanism in an activated position;

FIG. 2 is a side elevational view of the preferred embodiment of my invention shown in FIG. 1, with the mechanism in a passive condition;

FIG. 3 is a perspective view of the ball receiving portion of the embodiment in FIG. 1;

FIG. 4 is a fragmentary plan view of the ball receiving portion of the embodiment in FIG. 1;

FIG. 5 is a side elevational view of an alternate preferred embodiment of my invention, with portions of the housing cut away;

FIG. 6 is a sectional view taken on the 6—6 line in FIG. 5; and

FIG. 7 is a sectional view taken on the 7—7 line in FIG. 5.

Referring now to the drawings and particularly to FIGS. 1 through 4 thereof, the numeral **10** designates generally a first preferred embodiment of my ball throwing device. The ball throwing device **10** includes a mounting frame **11**, a ball receiving section **12** and a ball propelling section **13**.

The ball receiving section **12** and the ball propelling section **13** are interconnected and are supported on the mounting frame **11**. The mounting frame **11** has depending legs **14** which support the mounting frame **11** a desired distance off the ground.

The ball receiving section **12** has a ball receiving trough **15** which opens upwardly and is disposed to receive a funnel **16** which is attached to the lower portion of a semi-funnel shaped net **17**. The net **17** is supported at its upper portion **18** by a semi-circular resilient band **19** which passes through a seam in the upper end of the net and holds the net suitably taut to provide a ball restricting surface. The net **17** and funnel **16** are mounted on support rods **20** which extend upwardly from sockets **21** in the outer surface of the ball receiving trough **15**, and have support hooks **22** which engage the net band **19**. The ball receiving trough **15** is connected to the propelling section **13** to direct balls received by it into the ball propelling section.

The ball propelling section **13** has a throwing arm **24** which is pivotally mounted near its proximal end **26** to the mounting frame **11** at pivot point **28** by a pivot shaft **30**. At its distal end **32** the throwing arm **24** has a ball cup **34**. The proximal end **26** of the throwing arm **24** extends past the pivot point **28** to form a throwing arm lever **36**.

A cam plate **38** is rotatably mounted on the frame **11** adjacent the pivot point **28** at the proximal end of the throwing arm **24**. A pair of cam rollers **40** are mounted on the cam plate **38**, disposed oppositely, and outwardly from the cam hub **41**. A cam arm **42** is affixed to the pivot shaft **30** on the end adjacent the cam plate **38** and has a cam surface **44** on one end disposed for engagement by said cam rollers **40** upon rotation of the cam plate. The cam rollers **40** drive the upper end of the cam arm **42** rearward as they engage the cam surface **44**, rotating the pivot shaft **30** and the throwing arm **24** mounted thereon.

The throwing arm **24** is normally positioned substantially upright with respect to the frame **11** and is held in this position by a drive spring **46** which is connected between the throwing arm lever **36** and a spring hook **48** mounted on the rear portion of frame **11**. The spring hook **48** is so disposed with respect to the throwing arm lever **36** on the proximal end **32** of the throwing arm **24**, that pivoting of the throwing arm by the cam arm **42**, as described above, increases tension in the spring **46**. When the throwing arm **24** is disposed in its lowermost position (see FIG. 3) the spring is at its maximum tension. The spring lock **48** has several attachment positions to permit variation in the maximum spring tension.

To drive the cam plate **38**, a drive motor **50** is mounted on a frame **11** and connected to the cam plate **38** through a reduction gear **52** and a chain and sprocket **54**. The drive motor **50** is electrically powered from a 110 volt A.C. power source.

To actuate the drive motor **50**, a start switch **56** is provided in the ball receiving section **12**. The start switch **56** is mounted below the ball receiving trough **15** and is actuated by a weight sensing plate **58** disposed on the bottom of the ball receiving trough and connected by linkage **60** to the start switch **56**. The linkage **60** is pivotally mounted to the bottom of the ball receiving trough **15** rearwardly of the weight sensing plate **58** and is connected to the weight sensing plate through an opening **62** in the bottom of the trough. The pivotal mounting of the linkage **60** is spring loaded so that the linkage normally holds the weight sensing plate **58** upward from the bottom of the ball receiving trough but pivots downwardly when a ball is positioned on the plate.

To control the delivery of balls from the ball receiving section **12** to the ball propelling section **13**, a gate **62** is provided in an entrance to the ball propelling section. The gate **62** is so positioned that a ball placed in the ball receiving section **12** is prevented from passing to the ball propelling section **13** through the entrance **64** until the gate is opened. The gate **62** is vertically slidable in tracks **66**, and closes the entrance **64** when in its lower position and opens it in its upper position. Movement of the gate **62** is achieved by a gate lever **68** which is centrally pivoted to the frame **11** and has a rearward end **69** connected to the top of the gate by a chain **70** and a forward end **71** disposed for engagement by the cam arm **42**. The forward end of the gate lever is so positioned with respect to the cam arm **42** that the gate is fully opened just after the cam arm reaches its position of maximum pivoting by the cam rollers **40** and, therefore, just after the throwing arm reaches its position of maximum pivoting. The ball cup **34** on the distal end **32** of the throwing arm is, therefore, properly located adjacent the entrance **64** to receive a ball from the ball receiving trough **15** when the gate **62** opens sufficiently to pass a ball.

To maintain drive power after a ball has passed off of the weight sensing plate **58** and through the entrance **64** into the ball cup **34**, a switch lock linkage **72** is provided adjacent the start switch **56**, which is connected by a control rod **74** to the lower end of cam arm **42**. The switch lock linkage **72** has a pivot arm **76** which is pivotally mounted on a rearward portion of the frame **11** adjacent the start switch linkage **60** and has a lock bar **78** on its upper end, while its lower end is connected to the rearward end of control rod **74**. The start switch linkage **60** has a lock lever **80** which projects forwardly adjacent the switch lock linkage **72** and is engageable by the lock bar **78** on the upper end of the pivot arm **76** when the linkage **60** is in its downward pivotal position. Since the control rod **74** is connected to the lower end of the cam arm **42** it is drawn forwardly when the upper end of cam arm **42** is driven rearwardly by engagement of the rollers **40** with the cam surface **44**. As the control rod **74** is drawn rearwardly, it pivots the pivot arm **76** to move the lock bar **78** on its upper end rearwardly into its position of engagement with the lock lever **80** of the start switch linkage. If the start switch linkage is in its downwardly pivoted position so that engagement occurs between the lock bar **78** and the lock lever **80**, the start switch linkage is held in its downward position even though the ball has passed off of the weight sensing plate **58**, and the start switch **56** remains closed.

To eliminate the risk of any interference with the throwing arm **24** during its movement, a housing **82** is provided on frame **11** which covers the area of travel of the throwing arm. The housing **82** has a throat opening **84** which is aligned with the cup **34** on the upper end of the throwing arm **24** when the throwing arm upper end is pivoted forwardly, so that a ball may pass from the cup out the opening. To limit the forward movement of the upper end of the throwing arm **24** a stop block **86** is mounted on the frame **11** by means of a bracket **88**. The stop block **86** is formed of hard rubber and is positioned by the bracket **88** to engage the upper end of throwing arm **24** just below the cup **34** and stop its forward movement at a point where the throwing arm is nearly vertical and the cup **34** is aligned with the throat opening **84**.

To prevent a ball contained in the cup **34** from falling from the cup when the throwing arm approaches its near vertical position, a tongue **90** is provided which projects outwardly from and substantially normal to the upper end of the throwing arm **24** just below the cup **34**. Also, a positioning flange **92** and stop leg **94** are provided which assure proper positioning of the cup **34** to receive a ball from the ball receiving section **12** when the throwing arm is pivoted rearwardly to its ball receiving position (see FIG. 1). The flange **92** is mounted on the frame **11** just below the entrance **64** of the ball receiving section and the stop leg **94** projects from the uppermost portion of the cup **34** in a position to engage the flange when the cup is properly located to receive a ball.

The operation of my first preferred embodiment, just described, is as follows. After the drive motor **50** is connected to a 110 volt AC power source, a ball is thrown against the receiving net **17**. The net **17** directs the ball downward through the funnel **16** and into the ball receiving trough **15** of the ball receiving section **12**. When the ball reaches the ball receiving trough **15** it passes on to the weight sensing plate **58** where its weight causes the weight sensing plate **58** and its attached start switch linkage **60** to pivot downwardly and close the start switch **56**.

Closing the start switch **56** activates the drive motor **50** which, through the reduction gear **52** and chain and sprocket **54**, rotates the cam plate **38**. As the cam plate **38** rotates it carries one of the rollers **40** into engagement with the cam surface **44** on cam arm **42** and drives the upper end of cam arm **42** rearwardly. As the cam arm **42** pivots rearwardly it rotates the pivot shaft **30**, carrying the upper end of the throwing arm **24** rearwardly against the tension of drive spring **46**. At the same time, the upper end of cam arm **42** engages the forward end **71** of gate lever **68** pivoting the rearward end **69** of this gate lever upwardly to lift the gate **62** in the tracks **66** through the chain **70** and open the entrance **64**. The gate lever **68** is so positioned with respect to the cam arm **42** that the entrance **64** is not opened a sufficient amount to pass the ball in the ball receiving trough **15** until the cup **34** on the upper end of the throwing arm reaches a location where it is positioned to receive the ball. Also, the stop leg **94** protects against slight variations in this sequence by blocking forward movement of the ball until the cup is properly positioned.

The pivotal movement of the cam arm **42** also draws the control arm **74** forwardly, and through the switch lock linkage **72** locks the start switch linkage **60** down to keep the start switch **56** closed.

When the throwing arm **24** has been pivoted far enough to engage the stop leg **94** with the flange **92** the ball passes from the ball receiving trough **15** of the ball receiving section into the cup **34** in the ball propelling section **13**. Since the start switch **56** is locked closed, the drive motor **50** continues to rotate the cam plate **38** until the roller **40** passes free of the cam surface **44** on cam arm **42**, at which point the drive spring **46** recoils driving the upper end of throwing arm **24** upwardly until it strikes the stop block **86**. The ball is there propelled from the cup **34** out the throat opening **84** and for a considerable distance therebeyond.

The forward pivottng of the throwing arm **24** also rotates the pivot shaft **30** back to its original positioning, carrying with it the cam arm **42**. This releases the switch lock linkage **72** and permits the start switch linkage **60** to pivot upwardly and open the start switch **56**. It also releases the gate lever **68** and permits the gate **62** to fall in the tracks **66** and close the entrance **64**. The mechanism is thus prepared for another cycle and when a ball

is again thrown into the net **17** the operation, just described, is repeated.

Referring now to FIGS. 5 through 7, the numeral **100** designates generally an alternate preferred embodiment of my invention. The alternate embodiment has a frame **102** and a housing **104** with a ball port **106**. A ball funnel **108** is mounted on the frame **102** at the bottom of the ball port **106** and extends both inwardly and outwardly of the housing **104**. Just inwardly of the ball funnel **108** is a ball contact arm **110** which is pivotally mounted on a frame **102** by pivot pin **112**. The ball contact arm **110** is weighted at its outward end by a movable weight **114** which is regulated to cause the arm to pivot with its inward end **116** upwardly when no ball is resting in contact with the inward end. Contact with the ball passing down the funnel **108** and engaging the inward end **116** of the ball contact arm **112** causes the inward end of the contact arm to pivot downwardly. A start switch **118** is mounted on a frame **102** and is connected by an actuating linkage **122** to the inward end **116** of the ball contact arm **110** is a propelling spring **124** which is secured to the frame **112** at a proximal end **126** and has a distal end **128** extending upwardly therefrom to provide a flat ball engaging surface **130**.

A drive shaft **132** is mounted on a frame **112** and carries a cam arm **134** on its inner end and a reduction gear and drive pulley **136** on its outer end. The cam arm **134** is disposed to contact the flat ball engaging surface **130** on the distal end **128** of the propelling spring **124** when the drive shaft is rotated and urge the distal end rearwardly against its normal resilience. An electric motor **138** is mounted on a frame **112** and connected to the reduction gear and pulley **136** by a drive belt **140**. The motor **138** is powered from a 110 volt AC power source and the start switch **118** is connected in the power circuit to switch the motor on and off.

To interconnect the ball funnel **108** and the ball contact arm **110** a ball support **142** is mounted on the housing **112** just rearward of the ball funnel and has a slight slope rearwardly. Just rearward of the ball support **142** is a ball contact arm stop **144** which limits the downward pivoting of the inner end of the ball contact arm **110**.

This second embodiment of my invention operates as follows:

The ball is either set in the inwardly declining ball funnel **108** or directed into this funnel by means of a catch net similar to that described in the first embodiment but here mounted on the front of the housing **104**. The slight inward decline of the ball funnel **108** causes the ball to pass inwardly onto the ball support **142** and finally onto the ball contact arm **110**, pivoting the upwardly extending inner end of the arm downwardly. This actuates the start switch **118** by means of the actuating linkage **122**. The start switch **118**, upon activation, closes the electric circuit to the motor **138** and through the reduction gear and pulley **136** drives the drive shaft **132**. Rotation of the drive shaft **132** carries the cam lever **134** into contact with the ball engaging surface **130** of the distal end **128** of propelling spring **124**, driving the distal end of the spring rearwardly against its natural resilience. As the spring is driven rearwardly, the ball remains against the ball engaging surface **130**, following the spring rearwardly along the declining ball contact arm.

As the drive shaft **132** continues its rotation, the cam arm **134** reaches a point where it slips free of its contact with the distal end **128** of the propelling spring **124**, permitting the spring to snap forwardly. This propels the ball back up the ball contact arm, across the ball support **142** and out through the ball funnel **108** for a considerable distance therebeyond. As soon as the ball is propelled out of the ball funnel, the ball contact arm drops back to its original position with its inner end extending upwardly by reason of the movable weight **114**, and deenergizes the start switch **118** to the electric motor **138** through the actuating linkage **122**. The apparatus is then ready to recycle through the same operation.

From this description of preferred embodiments of my invention it will be understood that I have provided an automatically actuated, power driven, ball propelling device which is simple to use and relatively inexpensive to construct. Many structural variations are possible, of course, without deviating from the essential elements of the invention.

I claim:

1. A ball propelling device comprising:

a frame;

a propelling arm operatively associated with said frame, and movable with respect thereto;

resilient means operatively associated with said propelling arm and frame and disposed to resiliently bias said arm toward a static position with respect to said frame;

arming means operatively associated with said arm and frame and disposed to move said arm against the bias of said resilient means away from said static position to an armed position and thereafter release said arm for return to said static position;

drive means operatively associated with said frame and arming means and disposed to drive said arming means; and

ball receiving means operatively associated with said frame and said propelling arm and disposed to sequentially receive and position a ball in engagement with said propelling arm when said arm is in said armed position, said ball receiving means having a trough mounted on said frame and disposed to deliver a ball received therein to said propelling arm when said arm is in said armed position, a weight sensing platform mounted in said trough and disposed for activating movement by a ball received in said trough, switch means electrically interconnected with said drive means to energize said drive means, and switch activating means interconnected between said switch means and said weight sensing platform and disposed to actuate said switch means upon said activating movement of said weight sensing platform.

2. A ball propelling device as described in claim **1** in which:

said propelling arm has a proximal end mounted on said frame and a distal end disposed to engage a ball received by said ball receiving means when said arm is disposed in said armed position.

3. A ball propelling device as described in claim **1** in which:

said propelling arm is pivotally mounted to said frame adjacent a proximal end thereof and has a ball engaging surface adjacent its distal end;

said resilient means includes a tension spring interconnected between said frame and the proximal end of said propelling arm; and

said arming means includes a cam arm rotatably mounted on said frame and drivingly interconnected with said drive means, said cam arm having a cam surface disposed to engage said propelling arm and drive it away from said static position against the resilient biasing of said resilient means to said armed position and upon further rotation to release said propelling arm for free return to said static position under resilient urging of said resilient means.

4. A ball propelling device as described in claim **3** in which:

said trough is mounted on said frame and sloped downwardly toward said propelling arm when said arm is in said armed position, said weight sensing platform is pivotally mounted with respect to said trough to normally pivot in one direction but upon engagement by a ball to pivot in another direction, said switch actuating means is mechanically interconnected with said trough and platform and actuatable

by said platform upon its pivoting in said other direction, said switch means is disposed to energize said drive means when said switch actuating means is actuated by pivoting of said platform, and said ball receiving means further includes a lock-in mechanism operatively associated with said switch actuating means and said propelling arm and disposed to lock said switch actuating means and switch means in said drive means energizing position until said propelling arm has completed its cycle from static position to armed position and back again.

5. A ball propelling device as described in claim **1** in which:

said trough is mounted on said frame and sloped downwardly toward said propelling arm when said arm is in said armed position, said weight sensing platform is pivotally mounted with respect to said trough to normally pivot in one direction but upon engagement by a ball to pivot in another direction, said switch actuating means is mechanically interconnected with said trough and platform and actuatable by said platform upon its pivoting in said other direction, said switch means is disposed to energize said drive means when said switch actuating means is actuated by pivoting of said platform, and said ball receiving means further includes a lock-in mechanism operatively associated with said switch actuating means and said propelling arm and disposed to lock said switch actuating means and switch means in said drive means energizing position until said propelling arm has completed its cycle from static position to armed position and back again.

6. A ball propelling device as described in claim **5** in which:

said ball receiving means further includes a ball collector net having an upper end disposed above said ball receiving means to form an easy target for thrown balls and a lower end connected to a ball funnel disposed to deliver balls, one at a time, to said trough and weight sensing platform.

7. A ball propelling device as described in claim **1** in which:

said ball receiving means further includes a ball collector disposed to form an easy target for thrown balls.

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U.S. Cl. X.R.

124—32, 36, 50