US 20140109887A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2014/0109887 A1

(43) Pub. Date: Apr. 24, 2014

Edson

(54) TENNIS BALL THROWING MACHINE

(71) Applicant: **LUCK STONE CORPORATION**, Richmond, VA (US)

(72) Inventor: **Hurst H. Edson**, Lynchburg, VA (US)

(73) Assignee: **LUCK STONE CORPORATION**, Richmond, VA (US)

(21) Appl. No.: **13/658,898**

(22) Filed: **Oct. 24, 2012**

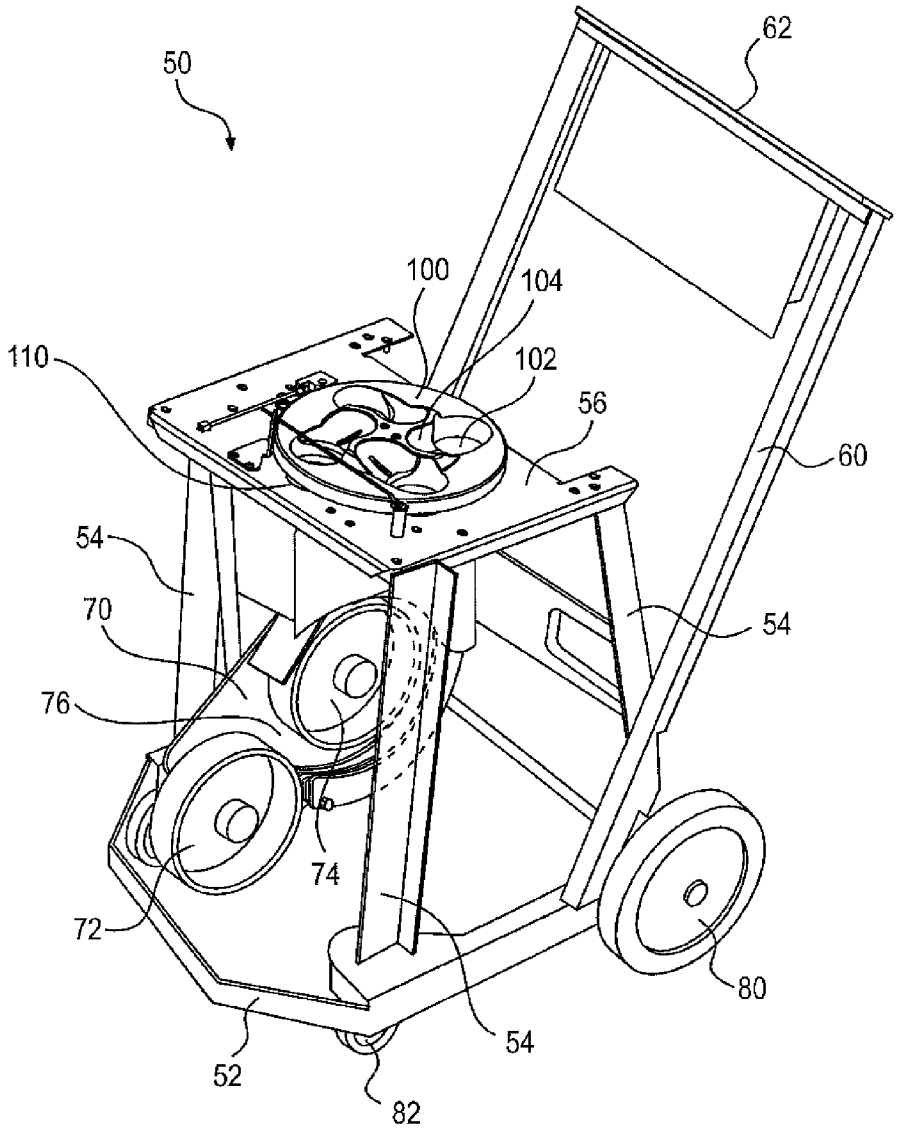
Publication Classification

(51) **Int. Cl.**
A63B 69/40 (2006.01)

(52) **U.S. Cl.**
USPC **124/78**

(57) **ABSTRACT**

A tennis ball throwing machine includes a support frame for carrying the machine, a pair of round pitching wheels, and a hopper mounted on the frame and above the pitching wheels. A ball chute connects the bottom of the hopper and a launch point that is proximate the point where the pitching wheels are closest together. The ball chute includes a plurality of guide rails that are spaced apart and open between them such that the guide rails are separated but are close enough together that they may support and carry a ball down the chute. The open rails allow for dirt and other debris to fall through the machine and away from the ball chute.



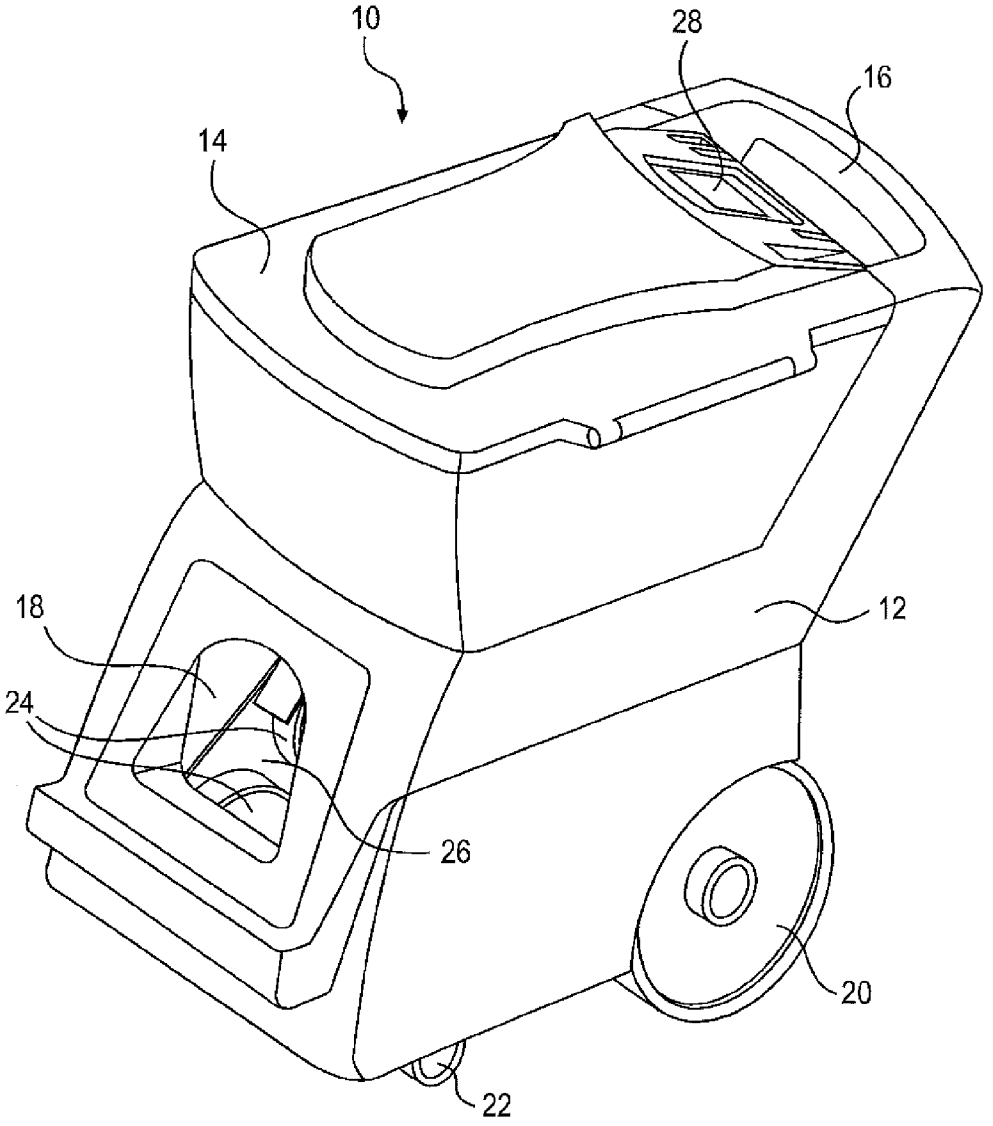


FIG. 1

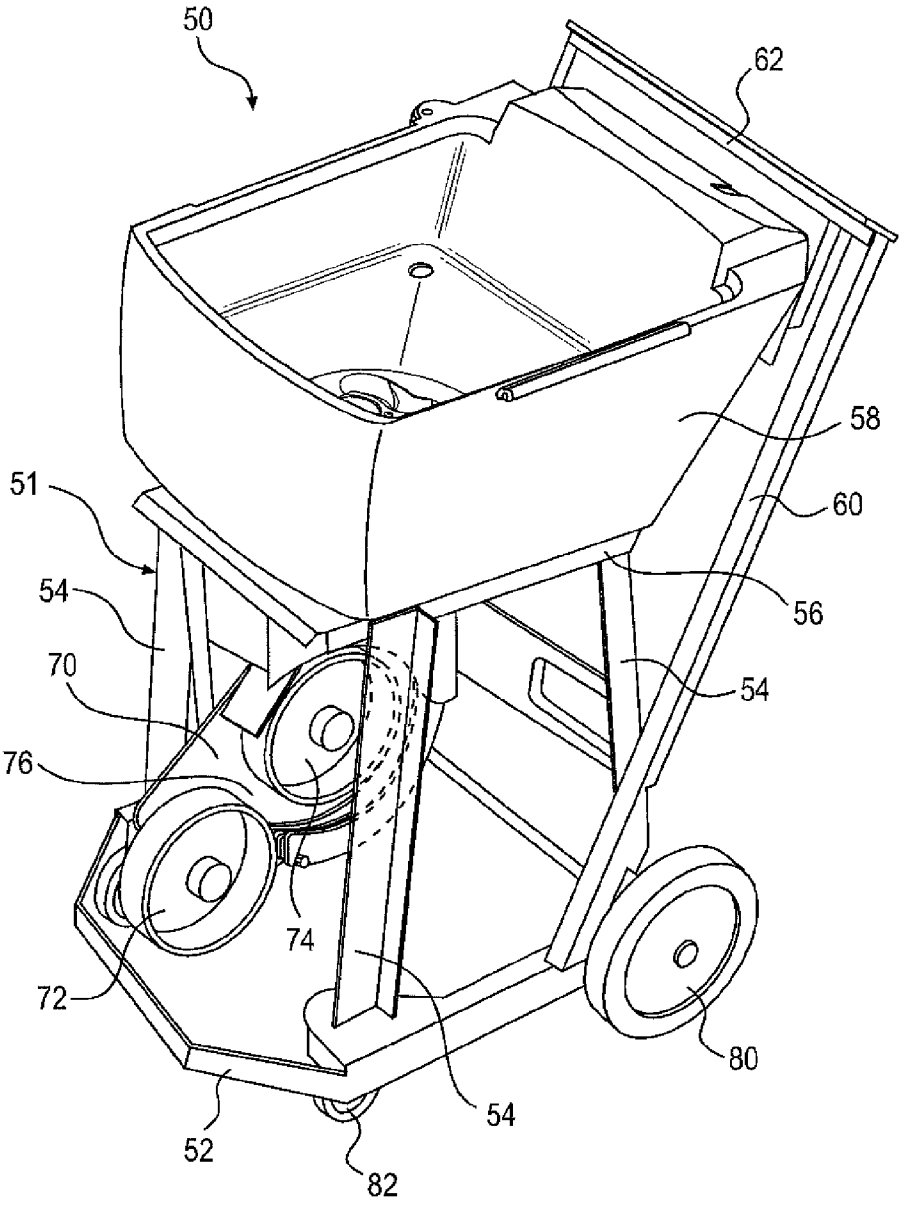


FIG. 2

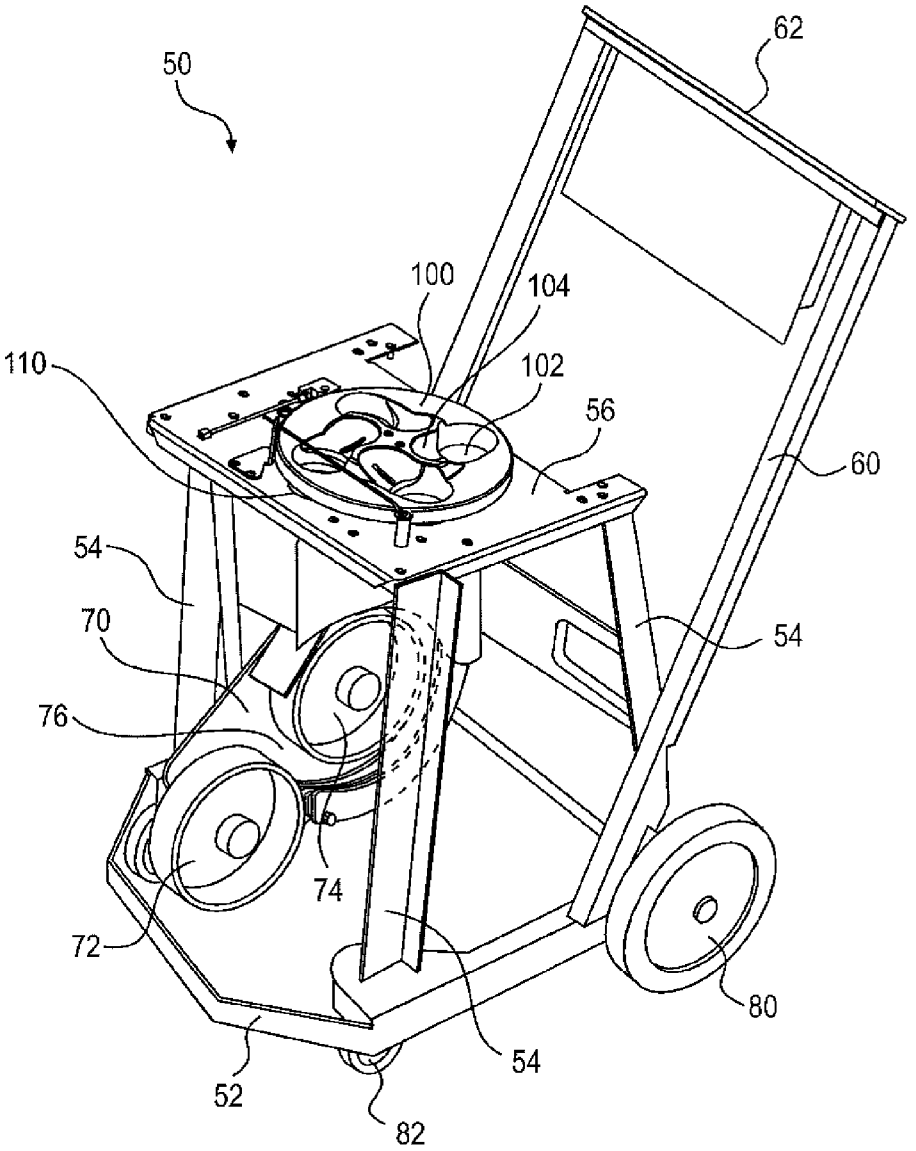


FIG. 3

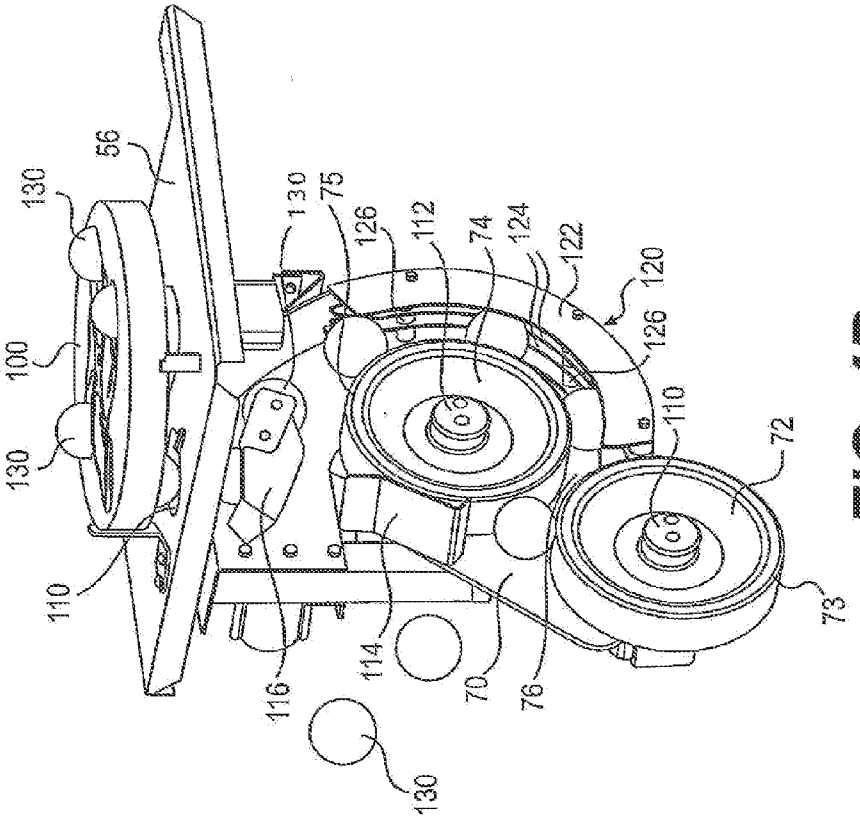

56
130
100
130
110
130
75
126
112
74
124
122
120
126
110
72
73
116
114
70
76
130

FIG. 4B

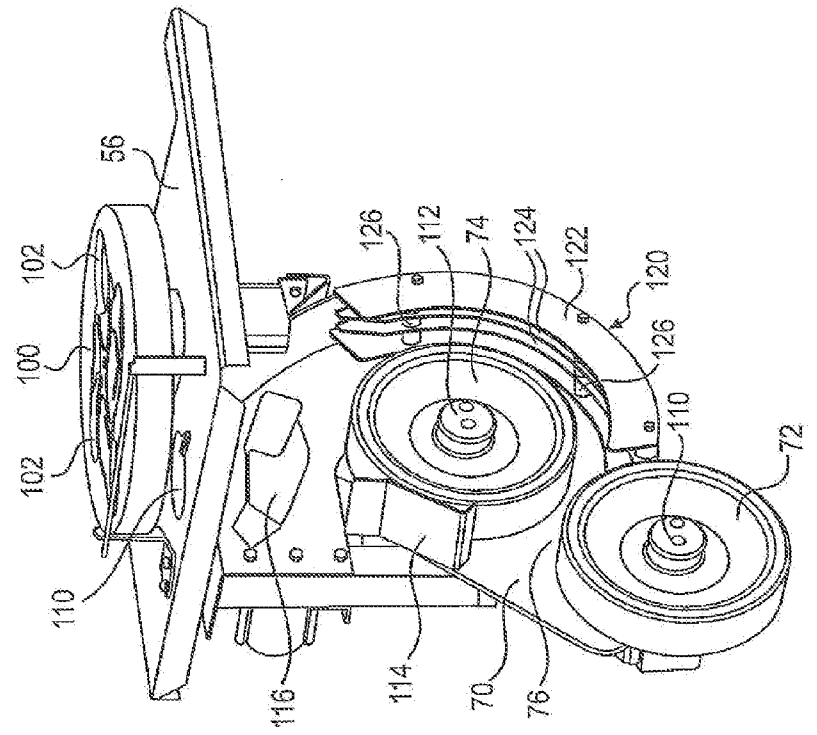

56
102
100
102
110
126
112
74
124
122
120
126
110
72
116
114
70
76

FIG. 4A

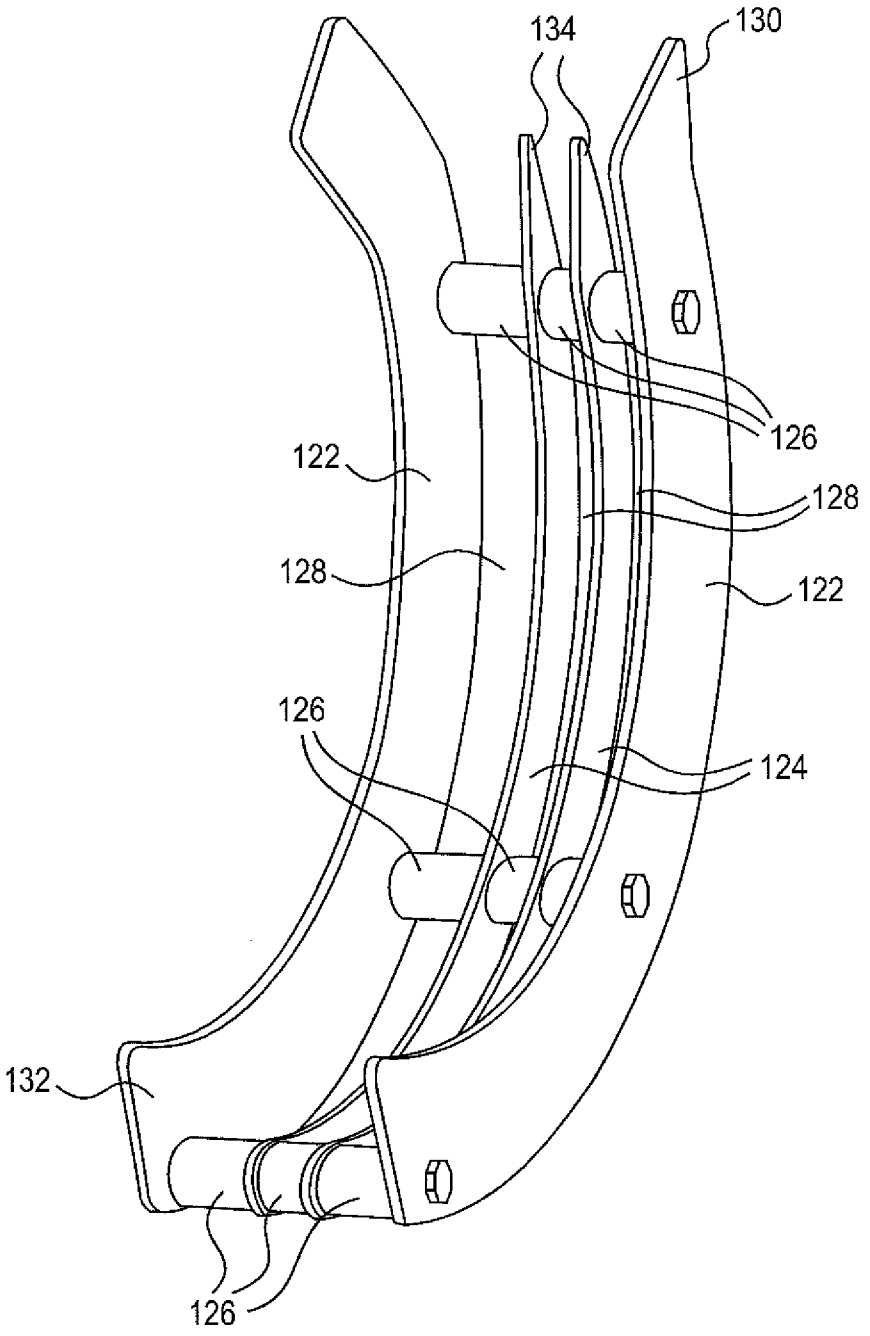


FIG. 5

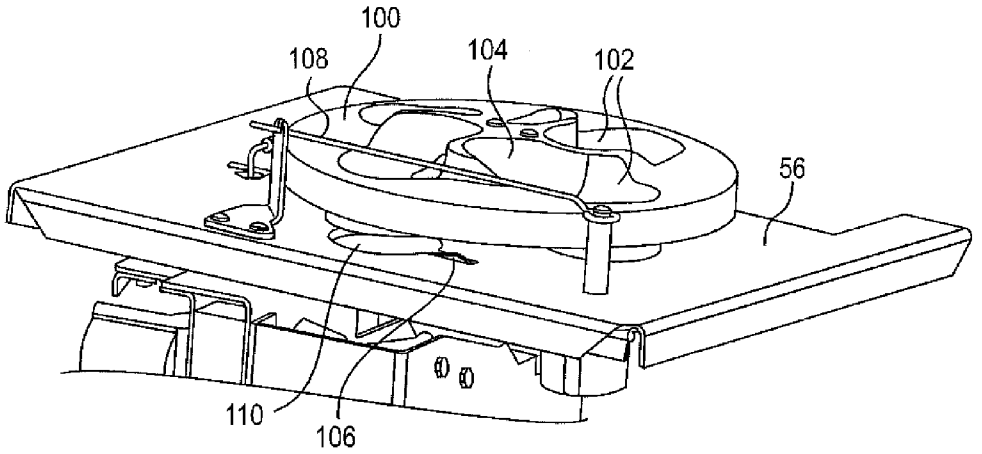


FIG. 6A

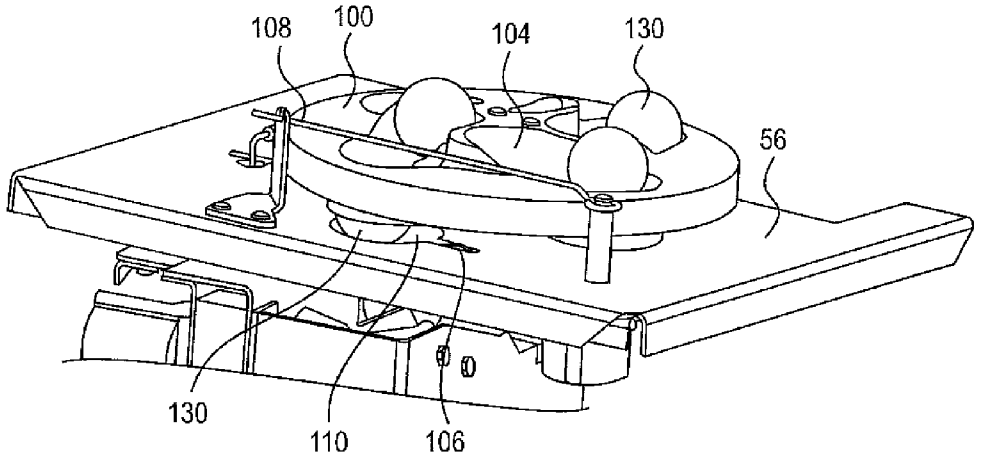


FIG. 6B

TENNIS BALL THROWING MACHINE

[0001] The present invention is directed to an improved tennis ball throwing machine. The improvements in the machine include a plurality of guide rails used in the ball chute that connects a ball hopper and the launch point of a ball throwing machine between two spinning wheels.

BACKGROUND

[0002] Tennis ball throwing machines have been manufactured and used widely for many years. They are effective tools to let individuals of all skill levels practice their tennis shots. As a result of this broad usage, there are some challenging issues that have been recognized with respect to these throwing machines, but have not yet been solved.

[0003] One important issue with tennis ball throwing machines is dirt and debris. Specifically, excessive tennis ball fuzz, pollen, clay, dust, and other dirt may collect on tennis balls. This dirt and sticks, twigs, and leaves can easily and often does come off a ball and builds up inside a tennis ball throwing machine and especially in the chute that feeds balls to the pitching wheels. If there is excessive dirt and debris build up, then it may affect the consistency and, if bad enough, the actual operation of the throwing machine. This dirt build up may, especially for heavily used machines, require frequent service for cleaning of the machine.

[0004] Another issue with tennis ball throwing machines generally is the consistent, regular feed of tennis balls from a tennis ball hopper to the pitching wheels. If there is a ball jam issue in the hopper, then time is wasted, practice is interrupted, and the user can be frustrated with the machine. Ball jams present a safety risk as well, since inexperienced users may try to resolve a jam while standing in front of and/or reaching inside of the machine.

SUMMARY

[0005] Accordingly, it is an object of the present invention to overcome the foregoing short comings with existing tennis ball throwing machines.

[0006] In one example, a tennis ball throwing machine throws balls of a selected substantially uniform compressible type. The machine comprises a support frame for carrying a pair of pitching wheels and drive motors. The pair of pitching wheels are round with their axes of rotation being substantially parallel, rotatable mounted on the support frame wherein the wheels each comprise a ball engaging peripheral surface. The respective peripheral surfaces are adjacent on another and laterally spaced such that a ball is slightly compressed when passing between the surfaces. The pair of drive motors is mounted on the support frame and connected one each to the pitching wheels to cause those wheels to rotate in opposite directions at variable speeds. A hopper is mounted on the support frame and above the pitching wheels. A ball chute is positioned in a path from the bottom of the hopper and a launch point that is proximate the point where the peripheral surfaces of the pitching wheels are closest together. The ball chute comprises a plurality of guide rails that are spaced apart and open between with the guide rails being separated at a distance apart to support and direct a ball that is carried by the rails. As a result, debris is free to fall out of and away from the ball chute.

[0007] The hopper may comprise a generally solid base but for a generally ball-sized aperture therein. The ball chute is connected proximate to the hopper at and around the aperture. The hopper may further comprise a rotating turntable mounted on the base of the hopper with the turntable have a ball-sized opening therein. The turntable opening intersects the hopper aperture with each revolution of the turntable on the base. The delivery of balls to the chute is controlled by the speed of rotation of the turntable. The turntable may comprise multiple openings that intersect with the aperture with each rotation of the turntable on the base. In another example, the base of the hopper may further comprise a trigger latch proximate the side of the aperture where the balls may be fed into the aperture. The trigger latch is adapted to detect the presence or absence of a ball in the turntable opening aligning with the aperture during the rotation of the turntable on the base. An electronic processor may be mounted on the support frame and connected to the drive motors and connected to the drive motors and to the hopper turntable motor with the processor adapted to allow a user to control the speed and position of each of the motors. The ball chute defines a passageway for a tennis ball in the path from the hopper to the launch point. A portion of the passageway may be defined by one of the pitching wheels and the diameter of the passageway in this portion is slightly less than the diameter of the tennis ball. The axes of rotation of the pitching wheels are movable with respect to one another where by the trajectory of a ball thrown by the machine may be changed. The guide rails in the ball chute may comprise generally parallel, spaced apart, metal blades. Alternatively, the guide rails may comprise generally parallel, spaced apart, metal wires.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a perspective view of a tennis ball throwing machine.

[0009] FIG. **2** is perspective view of the tennis ball machine shown in FIG. **1** with the lower, plastic shell housing portion and the top lid removed.

[0010] FIG. **3** is a perspective view of the tennis ball machine with the entire plastic shell housing portion removed and the top lid removed.

[0011] FIGS. **4**A and **4**B are perspective views of a tennis ball path from the turntable in the bottom of the hopper at the top through the throwing mechanism underneath. FIG. **4**A is shown without any tennis balls, while FIG. **4**B shows tennis balls along the path of travel.

[0012] FIG. **5** is a perspective view of one example of guide rails in accordance with the present invention.

[0013] FIGS. **6**A and **6**B are side views of a turntable positioned at the bottom of a hopper and adapted to deliver tennis balls into the ball chute. FIG. **6**A shows this view without any tennis balls, while FIG. **6**B shows sample tennis balls in the hopper and being dropped through the aperture.

DETAILED DESCRIPTION

[0014] The tennis ball throwing machine described herein solves, or at least greatly reduces the problems arising from, the issue of debris and dirt build-up in the machine. As will be described, the operating components of the machine are substantially protected from the sun and the environmental elements such as rain and precipitation. However, the bottom of the machine is open to the surface under the throwing machine. Moreover, at least a portion of the ball pathway and chute in the mechanism are open so that debris that may otherwise collect on along ball pathway or otherwise in the machine is free to fall to the surface under the machine.

[0015] As shown in FIG. **1**, a tennis ball throwing machine **10** includes a plastic shell **12** that covers the exterior of the machine. A top lid **14** is hingedly connected as the top of the tennis ball throwing machine **10** to protect the machine from rain and other precipitation. The machine **10** is easily moved around by a user using the handle **16** and rolling the machine on the large rear wheels **20** together with the smaller-diameter caster wheels **22** on the front of the machine. The machine **10** includes an open front window **18** where the balls that are thrown by the machine will exit the machine. In FIG. **1**, the window **18** reveals the pitching wheels **24** together with the launch point **26** which is generally the closest point between the two pitching wheels. In the vicinity of the top and the back of the machine **10**, there is shown an interface touchpad **28** that is used to select the tennis ball drills and conduct other communications between the user and the machine.

[0016] Turning now to FIG. **2**, there is shown a stripped-down ball machine **50** that is similar to the ball machine **10** shown in FIG. **1**, except that the ball machine **50** has had the top lid and outer shell removed to show the inside of the machine. The tennis ball machine **50** includes a support frame **51** that is made up of a wheel frame **52**, four vertical support members **54**, and a support plate **56**. The vertical support members **54** are secured on their bottom ends to the wheel frame **52**. The vertical support members **54** are secured on their top end to the support plate **56**. The plate **56** carries the ball throwing mechanism **70** and the ball hopper **58**. The support frame **51** further comprises vertical handle support **60** and a horizontal handle **62**.

[0017] The wheel frame **52** has large rear wheels **80** connected to the rear portion of that frame and caster wheels **82** connected to the front side of the frame. The large wheels **80** allow a user to more simply maneuver the machine **50**. The support plate **56** has the pitching assembly **70** connected to the underside thereof and the ball hopper walls **58** connected to the topside thereof. The hopper walls **58**, and especially its outside sidewalls, may form a segment of the outer shell of the machine such as shown in FIG. **1**. Alternatively, the hopper walls **58** may form a complete ball container that is removable from and replaceable into the machine **50** and would have an outer shell around it.

[0018] The pitching mechanism **70** includes the lower pitching wheel **72** and upper pitching wheel **74**. Each pitching wheel **72** and **74** has a ball engaging peripheral surface **73** and **75** respectively on its outside perimeter. The surfaces **73** and **75** may be rubber or some other suitable material. The surfaces **73** and **75** may also be slightly concave in profile to conform to a tennis ball diameter. The spot that is generally the closest spot between the lower and upper pitching wheels **72** and **74** is referred to as the launch point **76**. This is generally the location where a ball is thrown from the machine **50**.

[0019] As is readily evident from FIG. **2** as well as FIG. **3**, the machine **50** does not contain any wall or base that encloses the bottom of the machine. Instead, the bottom of the machine is open under and between the wheel frame **52**. In this way, any dirt or debris that may enter the machine **50** or the pitching mechanism **70** will fall through the machine and on to the surface underneath the machine.

[0020] Turning now to FIG. **3**, the machine **50** is the same machine as shown in FIG. **2** except that the hopper walls **58** have been removed. As is more clearly seen, the support plate **56** has a turntable **100** mounted thereon. The turntable **100** is open to the inside of the hopper walls (not shown). The turntable **100** has four openings **102** in it together with funnel portions **104** with each opening that encourages the movement of a tennis ball into the openings. An aperture **110** in the support plate **56** is the outlet where tennis balls from the hopper are fed down and into the pitching assembly **70**. The openings **102** align with the aperture **110** to drop the balls into the pitching assembly **70**. Although not shown, an electric motor operates the rotation of the turntable **100**. In this example, the support plate **56** is the bottom of a hopper. The turntable **100** rotates around inside the hopper to capture and feed the balls to the aperture **110**. In alternative embodiments, a hopper may be a single unitary piece having only an aperture in the bottom thereof. A turntable can be rotatably mounted inside the hopper to selectively feed tennis balls through the aperture of a hopper.

[0021] FIGS. **4**A and **4**B demonstrate the path of tennis ball within a machine like machine **10** or **50**. Tennis balls are collected inside a hopper (not shown). At the bottom of the hopper is a turntable **100** having openings **102** therein. In this example, there are four openings in the turntable **100**. There may be one or more openings depending on the operation and engineering of a given ball throwing machine. The opening **102** has a funnel component (not shown) that helps guide tennis balls into the opening. Below the turntable **100** is the bottom of the hopper which is also the support plate **56**. The support plate **56** has an aperture **110** therein that is oriented above the throwing mechanism **70**. When an opening **102** in the turntable **100** that has a ball therein is aligned with the aperture **110**, the ball will drop through the aperture by way of gravity. The ball is deflected back by the deflector **16**. The tennis ball is then in the chute of the ball machine. The chute passageway is defined on one side by the peripheral surface **75** of the upper pitching wheel **74**. On the other side of the passageway there is the chute **120**. The chute **120** is shown as being made up of four rails or blades **122** and **124**. These blades **122** and **124** are aligned so that they are substantially parallel. Spacers **126** separate the rail blades **122** and **124**. The blades **122** are on the outside of the chute **120**. They contain a tennis ball within the passageway. The blades **124** are set deeper to form a passageway, together with the peripheral surface **75**, that is slightly smaller in diameter than a tennis ball. In this way, the spinning of the upper pitching wheel **74** rolls the tennis ball **130** through the passageway along the chute **120** to the launch point **76**. At the launch point **76**, the tennis ball **130** is engaged by both upper and lower pitching wheels **74** and **72** respectively. The rotation of the upper and lower pitching wheels **72** and **74** throws the tennis ball **130** from the machine.

[0022] An additional benefit from the rail ball chute delivery system is the notable tracking consistency of the ball to the pitching wheel launch position. The inner two rails **124** guide the ball to the center of the pitching wheels **72** and **74** each time by steering the ball as it rolls between the upper pitching wheel **74** and the inner two rails. Two rails **124** are used in this example as the rolling surface and the ball is located side to side and guided initially by the outer two ball chute guide rails **122**. The increase in consistent launch location tends to add consistent to the pitching spin and trajectory.

[0023] The upper and lower pitching wheels **72** and **74** respectively spin around axes **112** and **110** respectively. The axes **110** and **112** are substantially parallel to each other to guide a tennis ball that is pitched from those wheels generally straight in front of the machine. The pitching mechanism **70** is mounted so that the pitching wheels **72** and **74** may be positioned relative to each other to change the trajectory and

rotational spin of balls thrown by the machine. For instance, if the lower pitching wheel **72** is generally rotated downwardly, relative to the upper pitching wheel **74**, then a ball that is thrown by the pitching machine will have an arc that is more flat to the ground. In addition, by varying the pitching wheel speeds in relation to one another to cause top or backwards spin on the ball, the ball flight characteristics and ground impact deflection characteristics may be changed. In the drawings of FIG. **4**, the pitching wheels **72** and **74** are generally oriented so a ball will be thrown upwardly. In the rotation of the throwing mechanism **70**, the chute **120** will also rotate with the overall mechanism so that the chute will accurately deliver a tennis ball proximate the launch point **76**. Also shown in FIGS. **4**A and **4**B is a second deflector plate **114** which prevents tennis balls from accidentally shooting upwardly and inside a ball machine where a fast moving ball could possibly damage the parts of the machine inside the outer shell.

[0024] FIGS. **4**A and **4**B are essentially identical except that tennis balls **130** are shown all along the ball path through the machine in FIG. **4**B.

[0025] FIG. **5** is a drawing of the chute **120** as removed from the ball throwing machine **10** or **50**. As is evident from FIG. **5**, the chute **120** includes two outside rails **122**. These rails are relatively thin sheets of metal that form curved blades. The two interior rails **124** are less wide than the outside rails **122**. The inside rails **124** will carry and a support a tennis ball. The outside rails **122** will contain a tennis ball within the chute **120**. Spacers **126** keep the respective rails **122** and **124** spaced apart. This spacing allows for open areas **128** between the rails **122** and **124**. These open spaces **125** allow for dirt and debris to fall out of the passageway that is defined in part by the chute **120**. As explained earlier, there is no bottom wall of the machine **10**. Accordingly, the debris may fall through the chute **120** and out underneath the machine onto the ground or tennis court surface.

[0026] The rails **122** and **124** may be comprised of aluminum, stainless steel, or other acceptable materials including plastic. Preferably, the metal is not able to rust. If the rails **122** and **124** were to rust, then it could roughen the passageway and affect the delivery of tennis balls to the launch point in the machine.

[0027] Also, the rails **122** and **124** are shown in the form of flat sheets or blades of metal. These rails may also be made from wire or bars or other round supports. The round wire pieces may be spaced similar to the blades shown in FIG. **5** so that outside rails are set up higher than inside rails that will primarily carry the tennis ball. It is possible that the wires would be stainless steel wire welded together at a proper spacing or they could have spacers there between. The rails could even be plastic as long as a firm and durable plastic was used. Alternatively, combinations of wire and blade types of rails may be used.

[0028] As shown in FIG. **5**, the openings **128** comprise approximately more than eighty percent of the width of the chute **120** defined as the distance between the outside blades/rails **122**. In alternative embodiments, the space between the outside rails may make up more than sixty percent of the width, or further alternatively, more than thirty percent of the width of the chute. Still further alternatively, a chute may include a surface that is perforated or has slots therein to allow debris to fall through it. This chute is expected to have greater that seventy-five percent open space, or alternatively, greater that fifty percent, or still further alternatively, greater than thirty percent open space to allow debris to fall through.

[0029] The chute **120** includes a top end **130** and a bottom end **132**. The top end **130** of the chute **120** is near the hopper and the aperture **110** in the bottom of the hopper that allows a ball to feed into the passageway defined by the chute **120**. The top end **134** of the inside rails **124** are tapered and pointed to allow for a funnel effect to guide the balls into the passageway.

[0030] FIGS. **6**A and **6**B demonstrate the operation of the trigger latch **106** in conjunction with the turntable **100**. As is evident from the drawings, there is a trigger latch **106** that is biased upwardly from the surface of the support plate **56**. In operation, as a tennis ball **130** rotates around in an opening **102** as the turntable **100** turns in the clockwise direction, a ball will roll over the latch **106** and press it downwardly. In order to prevent the ball from merely riding up on the trigger latch **106**, there is the restraining wire **108** that will force the ball to push down on the trigger latch. The restraining wire **108** also restricts balls in the hopper from entering the open position in the turntable when ne drops into the aperture. When a ball pushes down on the trigger latch **106**, the ball throwing machine knows there is a tennis ball in the ready position adjacent the aperture **110**. During operation, the balls in a hopper may become jammed, or alternatively the hopper may be almost empty. As a result, the openings **102** do not always have tennis balls **130** in them as the turntable **100** rotates during operation. The trigger latch **106** is electrically connected to the processor that operates the tennis ball machine. When pressed down, the turntable **100** will actuate at the predetermined time to rotate and drop a ball **130** into the aperture **110** so that the ball will be fed into the throwing mechanism. Alternatively, if an opening **102** is empty and does not contain a tennis ball **130**, then the trigger latch **106** will remain in its upward position. This signals to the machine processor that there is no ball in the ready position. Accordingly, the processor will rotate the turntable **100** another quarter turn (in this example) to seek a tennis ball that would be in the next opening **102**. The turntable **100** will rotate until a tennis ball does arrive and press down the trigger latch **106**. In this way, the ball machine can operate consistently and without interruption.

[0031] Other embodiments of the present invention will be apparent to those skilled in the art from consideration of the specification. It is intended that the specification and Figures be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

That which is claimed is:

1. A tennis ball throwing machine for throwing balls of a selected substantially uniform compressible type comprising:

a support frame for carrying a pair of pitching wheels and drive motors;

the pair of pitching wheels being round and with their axes of rotation being substantially parallel, rotatably mounted on the support frame wherein the wheels each comprise a ball engaging peripheral surface and those respective surfaces are adjacent one another and laterally spaced such that a ball is at least slightly compressed when passing between the surfaces;

the pair of drive motors mounted on the support frame and connected one each to the pitching wheels to cause those wheels to rotate in opposite directions at variable speeds;

a hopper mounted on the support frame and above the pitching wheels;

a ball chute positioned in a path from a bottom of the hopper and a launch point that is proximate the point where the peripheral surfaces of the pitching wheels are closest together, wherein the ball chute comprises a plurality of guide rails that are spaced apart and open between them, and the guide rails are separated at a distance apart to support and direct a ball that maybe carried by the rails, whereby debris is free to fall out of and away from the ball chute.

2. A tennis ball throwing machine as described in claim **1** wherein the hopper comprises a generally solid base but for a generally ball-sized aperture therein, and the ball chute is connected proximate to the hopper at and around the aperture, and

wherein the hopper further comprises a rotating turntable mounted on the base of the hopper, and the turntable has a ball-sized opening therein with the opening intersecting the aperture with each revolution of the turntable on the base, whereby the delivery of balls to the chute is controlled by the speed of rotation of the turntable.

3. A tennis ball throwing machine as described in claim **2**, wherein the turntable comprises multiple openings that intersect with the aperture with each rotation of the turntable on the base.

4. A tennis ball throwing machine as described in claim **2**, wherein the base of the hopper further comprises a trigger latch proximate the side of the aperture where balls may be fed into the aperture, the trigger latch adapted to detect the presence or absence of a ball in the turntable opening aligning with the aperture during the rotation of the turntable on the base.

5. A tennis ball throwing machine as described in claim **2**, further comprising an electronic processor mounted on the support frame and connected to the drive motors and to the hopper turntable motor, the processor adapted to allow a user to control the speed and position of each of the motors.

6. A tennis ball throwing machine as described in claim **1**, wherein the ball chute defines a passageway for a tennis ball in the path from the hopper to the launch point, and further wherein a portion of the passageway is defined by one of the pitching wheels and the diameter of the passageway in this portion is slightly less than the diameter of a tennis ball.

7. A tennis ball throwing machine as described in claim **1**, wherein the axes of rotation of the pitching wheels are moveable respective to one another whereby the trajectory of a ball thrown by the machine may be changed.

8. A tennis ball throwing machine as described in claim **1**, wherein the guide rails comprise generally parallel, spaced apart, metal blades.

9. A tennis ball throwing machine as described in claim **1**, wherein the guide rails comprise generally parallel, spaced apart, metal wires.

* * * * *