

[54] AUTOMATIC BALL-THROWING MACHINE

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[56] References Cited

UNITED STATES PATENTS

2,923,286 2/1960 Draganti 124/13 A
3,018,769 1/1962 Parsonault 124/11

FOREIGN PATENTS OR APPLICATIONS

1,377,593 9/1964 France 124/11

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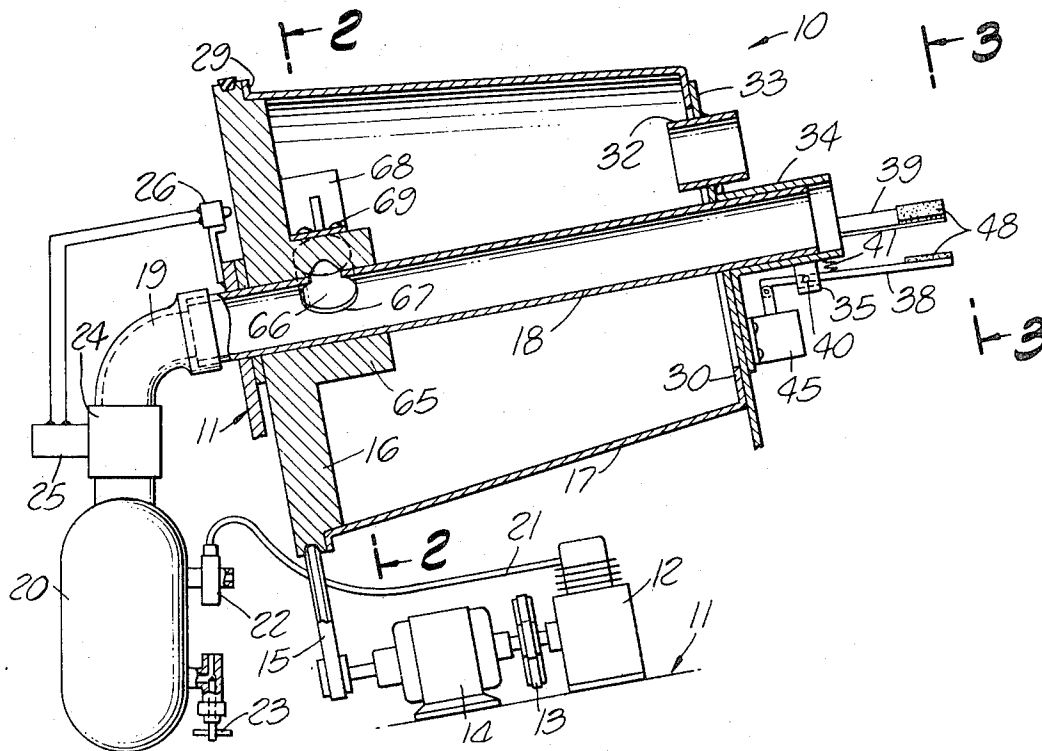
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ABSTRACT

A ball-throwing apparatus for throwing balls utilizing pressurized air and a fast-action valve. The barrel and breech are enclosed by a rotating cage containing a supply of the balls wherein a single ball is selected from the tumbling supply of balls by an L-shape leg member attached to the cage and leading to an opening in the barrel. The device includes randomly varied ball trajectory structure which is in the form of an adjustable bleeder valve venting air, to the atmosphere at different rates to vary the pressure which is discharging the ball and, or, movable fingers which randomly project into the path of a discharged ball to carom the ball into a different path. The varied trajectory structure can be manually controlled or prearranged by timer-driven cam discs.

5 Claims, 4 Drawing Figures



AUTOMATIC BALL-THROWING MACHINE

This application is a division of my application for U.S. Letters Patent Ser. No. 723,149 filed Apr. 22, 1968 entitled Automatic Ball-Throwing Machine and since abandoned.

This invention relates to ball-throwing machines and more particularly to an improved apparatus of this type having unique means for selecting a single ball to be thrown and means for directing successive balls along different trajectories selected in random order.

There are available in the prior art numerous machines for throwing balls but these are subject to numerous shortcomings and disadvantages sought to be eliminated by the present invention. Among the problems encountered in the use of these machines is the malfunctioning of the ball-loading means. It is desirable to provide an ample supply of reserve balls from which balls are selected in succession for ejection from the apparatus. Theoretically it would appear that any of the many prior proposals made for selecting and feeding balls into the ejection apparatus would be equally satisfactory and free from "hang-up" problems. Actually "hang-up" is one of the very frustrating and troublesome problems typical of this type of equipment. It may occur only once in 10 balls or once in 25 balls, but regardless of the intervals between hang-ups, the problem is not only irksome to those using the machine but can create a hazard owing to the fact that the hang-up may release unexpectedly and without warning followed by the forcible ejection of the ball from the apparatus against an unsuspecting player or a serviceman in its path. Accordingly, the possibility of a hang-up only once in 100 or 500 balls can create hazards and can render the machine unsafe and unsaleable.

It is also desirable that a ball-throwing machine have the capability of varying the ball trajectory to add interest and to develop the skill of persons using the machine. Prior devices have been proposed equipped with adjustable means for altering the ball trajectory but these have the disadvantage of requiring an operator to change the adjustment each time it is desired to change the path of the ball.

It is the primary purpose of the present invention to provide a ball-throwing machine which is thoroughly reliable and trouble free as respects each of the aforementioned and other shortcomings of prior machines. To this end, the present apparatus features a gun barrel having simple unailing means for selecting a single ball from a tumbling mass of balls and delivering it into the barrel breech between ball-throwing cycles. This subassembly includes ball selecting and feeding means operating in synchronism with valve means controlling the charging port into the barrel breech. The apparatus also includes a plurality of separately controlled ball-directing means located opposite the barrel muzzle and selectively operable to carom the ball as it leaves the apparatus and, if desired, to also spin the ball as it is caromed. As herein disclosed by way of illustration, the ball-caroming means can loft the ball, or carom it to the right or to the left to simulate serving a tennis ball into the right or the left service court and these altering operations can be performed in any random order either in accordance with a prearranged automatically operating programming schedule, or manually under the control of an attendant for the apparatus. Another feature comprises simple adjustable means for varying the throwing range.

It is therefore a primary object of the present invention to provide an improved, highly versatile ball-throwing machine for throwing balls automatically in rapid succession.

Another object of the invention is the provision of an automatically cycling ball-throwing machine having improved means for loading a single ball at a time into a ball-ejecting barrel without risk of hang-up or malfunctioning.

Another object of the invention is the provision of an automatically cycling ball-throwing apparatus for tumbling a reserve supply of balls as a single one is selected for free-rolling discharge into the barrel breech.

Another object of the invention is the provision of an automatic ball-throwing machine having simple means for varying the throwing range of the machine.

Another object of the invention is the provision of a ball-throwing apparatus having trajectory altering means having both manual and automatic programming means optionally usable to vary the trajectory of successive balls.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated.

FIG. 1 is a fragmentary view of the essential features of the invention ball-throwing apparatus with portions of the apparatus shown in section;

FIG. 2 is a fragmentary cross-sectional view taken along line 2—2 on FIG. 1 as the ball is about to gravitate into the barrel breech;

FIG. 3 is a fragmentary view taken along line 3—3 on FIG. 1; and

FIG. 4 is a schematic of the electrical control for the ball trajectory control means.

Referring initially more particularly to FIG. 1, there is shown essential components of the invention ball-throwing apparatus and incorporating improvements on the same constructions disclosed in my copending applications for U.S. Letters Patent, Ser. No. 497,763, filed Oct. 19, 1965, entitled Automatic Ball-Throwing Machine for use by Sportsmen, now U.S. Pat. No. 3,400,703, and Ser. No. 537,909, filed Mar. 28, 1966, entitled Automatic Ball-Throwing Machine and since matured into U.S. Pat. No. 3,467,073. It will be understood that the apparatus may be mounted on a suitable main frame 11 only a portion of which is shown herein and preferably supported on carriage wheels for convenience in moving the apparatus from place to place.

Supported on frame 11 is an air compressor 12 driven through a speed reduction connection 13 by a motor 14. This motor is also connected by belting 15 to a large diameter drive pulley 16 closing one end of ball magazine 17 supported for rotation about the axis of gun barrel 18. This barrel is rigidly secured to main frame 11 at an appropriate angle to the horizontal and has a relatively large diameter direct tubular connection 19 with reservoir 20 for pressurized air. This reservoir is replenished with air from compressor 12 via conduit 21 equipped near its junction with the reservoir by a fail-safe pressure release valve 22. This valve operates in known manner to dump the contents of the reservoir whenever motor 14 is deenergized or upon a power failure. This avoids any possibility of the apparatus throwing a ball unexpectedly and after the apparatus has been deactivated.

The air reservoir is also provided with a manually adjustable needle valve 23 which operates to vent air to the atmosphere at a variable rate depending on the particular adjusted position thereof. As will be apparent, the setting determines the air pressure which can be developed in the reservoir during the time valve control switch 26 is closed and this pressure determines the pressure energy available to throw the ball at the instant valve 24 suddenly opens. The compressor operates at uniform speed but a variable amount of air is allowed to bleed to the atmosphere via bleed valve 23 before valve 24 opens for the next throwing cycle.

The release of air from reservoir 20 into the barrel is controlled by a fast-action pressure differential flow control valve 24 having a construction well known to persons skilled in the valve art and readily available in the marketplace. Valve 24 is normally closed and is opened abruptly by a solenoid 25 when the latter is energized by a normally open microswitch 26 as shown in FIG. 1 and adapted to be closed briefly by a cam 27 mounted on the exterior of pulley 16 (FIG. 2) and rotating therewith. Cam 27 is positioned to close switch 26 when ball magazine 17 has rotated approximately 90° from the position shown in FIG. 2. When open, valve 24 allows the high-pressure air from the reservoir to flow through conduit 19 into the breech end of barrel 18. At this time a single ball will be resting against the slightly reduced forward end of conduit 19.

Rotating magazine 17 for the reserve supply of balls may be formed of any light weight material with its flanged rim 29 secured to the rim of pulley 16. The smaller end of the magazine has a radially narrow intumed flange 30 terminating short of the ball-charging tube 32 mounted on a plate 33 demountable secured to the main frame of the apparatus. Barrel 18 passes through this plate and into a tubular member 34 secured to plate 33. Suitably mounted about the lower half of tube 34 are a plurality of brackets 35, each pivotally supporting a separate finger 37, 38 and 39 operable to alter the trajectory of the ball as it is propelled from the end of barrel 18. Each of the fingers is pivotally connected to brackets 35 by pivot pin 40 and is normally urged to a retracted position by a compression spring 41. The inner shorter end of the fingers is pivotally connected to the armature of a solenoid 44, 45, 46. The outer end of each finger may be provided with a pad 48 having a roughened surface effective to impart spin to the ball as the ball contacts this surface while being propelled from the apparatus.

Referring to FIG. 4, there is shown a schematic of the control circuit for fingers 37, 38 and 39. This circuit includes a timer motor 50 on the shaft of which is mounted separate cam discs 52, 53, 54 for opening and closing an associated one of switches 55, 56, 57 to control the supply of power to solenoids 44, 45, and 46, respectively. The rim of each of the cam discs is provided with notches or the like camming means for closing one of the switches for a short interval as the timer motor rotates. As shown in FIG. 4, switch 55 is closed and solenoid 44 is energized, whereas each of switches 56 and 57 controlling solenoids 45, 46 is open. It will be understood that the switches operate out of synchronism with one another so that only one switch is closed during any ball-throwing cycle.

The control schematic also includes a selector switch 60 normally closed to the right, or to the left, depending on whether it is desired to operate the trajectory control fingers automatically or manually. When switch 60 is positioned as shown in FIG. 4, the circuit operates automatically under the control of timer motor 50. However, if switch 60 is moved to its alternate position, then the solenoids are under the control of the associated manual switches 61, 62 and 63.

The ball selecting and loading means forming an important feature of the invention includes a valve 65 rotating with pulley 16 and provided with an outwardly flaring radial passage 66, the inner smaller end of which registers with the ball charging port 67 in barrel 18 momentarily during ball charging. Pulley 16 rotates clockwise as shown in FIGS. 1 and 2 and includes a ball selector 68 here shown as comprising an L-shaped member having one leg secured to pulley 16 by fasteners 69. Ball selector 68 is so positioned relative to the adjacent edge of passage 66 that a ball 70 resting thereon gravitates into passage 66 as the selector approaches a 12:00 o'clock position. Any other balls then present on selector 68 fall back into the main group of reserve balls since only a single ball can be accommodated in passage 66. Shortly thereafter this one ball gravitates through opening 67 into barrel 18 and rolls rearwardly therealong and into contact with the adjacent end of air tube 19. In the meantime the motor continues to rotate valve 65 to a position closing port 67. It will therefore be recognized that valve 65 serves the dual purpose of guiding a single ball into the barrel and as a close-fitting closure for port 67 during the ball-ejecting portion of the cycle. It will also be apparent that the continuously rotating magazine 17 is constantly tumbling the reserve supply of balls occupying its lower half. This aids very materially in keeping the balls in a loose, free-flowing group and assures that a new ball will be deposited on selector 68 as it is rotated through the tumbling mass.

The operation of the described apparatus will be readily apparent from the foregoing detailed description of its components and their functions. To place the apparatus in use, a quantity of balls is charged into the magazine through charging tube 32. This having been done motor 14 is started to operate compressor 12 and charge reservoir 20 with compressed air.

As the reservoir pressure reaches a predetermined pressure governed by the setting of the pressure control bleed valve 23, cam 27 closes switch 26 and momentarily energizes solenoid 25 thereby abruptly opening the fast action valve 24. A large volume of high-pressure air then flows from the reservoir through tube 19 and ejects a ball from the apparatus. No one of the trajectory control switches may then be closed and, in this event, the ball is propelled directly forwardly from the apparatus.

As ball magazine 17 continues to rotate, ball selector 68 will select another ball from the main supply of balls and elevate the selected ball into passage 66 as this passage rotates into registry with charging port 67. While this is occurring compressor 12 restores the air pressure in reservoir 20. By the time the air pressure has increased sufficiently to again operate switch 26, valve 65 will have rotated to a position closing port 67. As this switch operates to open valve 24 for the second ball throwing cycle, one of switches 55, 56 and 57 may be in closed position. In this case, as the ball is thrown one of the trajectory control fingers 36, 37 or 39 will be positioned to engage the ball as it is propelled out of the barrel thereby caroming it from a straight path depending upon which one of the fingers has been activated. As shown in FIG. 4, switch 55 is closed to energize solenoid 44. Accordingly the finger on the left side of the barrel as viewed from FIG. 3 will have been activated thereby causing the ball to be lobbed or to carom to the right. If pad 48 on the finger has been roughened or is of a texture or nature effective to spin the ball, then the ball will be spun as it is deflected. If the middle one of the three fingers is energized and elevated then the ball will be lofted or caromed through an upwardly arched path.

The apparatus continues to operate automatically to project balls in substantially equally spaced time periods with the trajectory of successive balls under the control of the caroming mechanism. Thus it will be understood that the balls may exit in a normal unaltered trajectory, or may be deflected or caromed to either side or upwardly depending on which one of the fingers has been activated by an associated solenoid. Preferably, successive balls are projected in different paths and in a random order controlled either by the timer-driven cam discs 52, 53, 54 or by the manual switches 61, 62, 63.

It will therefore be recognized that the described ball-throwing apparatus is fully automatic and operates to throw balls in any desired randomly selected straight or caromed path. The apparatus is particularly suitable for simulating a tennis player and can be adjusted and arranged to throw balls to any part of the court.

While the particular automatic ball-throwing machine herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A ball-throwing apparatus having a barrel the breech end of which is equipped with normally closed fast-action valve means controlling the flow of pressurized air to eject a ball from said barrel and comprising a member movable between a position closing said charging opening and a second position clear of said opening, said breech end having a ball-charging opening in the wall thereof, valve means closing said opening during ejection of a ball from said barrel, and means operatively associated with said valve means for moving the same to open position and for simultaneously selecting a single ball only from a group of balls and then discharging the same through the opening as said valve means reaches open position and for closing said valve means prior to abruptly opening said fast-action valve means, said ball-selecting means being rotatable about said barrel and cooperable with the exterior thereof to select a ball and elevate the same about one exterior side of said barrel until the selected ball can fall by gravity through said charging opening into the barrel breech.

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2. A ball-throwing apparatus as defined in claim 1 characterized in the provision of cage means rotatable about the axis of said barrel and operating to tumble a supply of balls in the path of said ball selecting means.

3. A ball-throwing apparatus as defined in claim 2 characterized in the provision of common means for operating said cage means and said ball-selecting means in unison.

4. A ball-throwing machine having a barrel equipped with means for ejecting balls therefrom automatically in succession utilizing a charge of pressurized air, fast-action valve means for dumping a ball-projecting charge of air abruptly behind a ball in the barrel breech to project the same from the barrel and including switch means for controlling the actuation of said fast-action valve means, means for feeding a ball into the breech of said barrel and including means to operate said

switch to actuate said fast-action valve means after a ball has been deposited in the breech of said barrel, and adjustable bleeder valve means for venting air to the atmosphere at different rates to vary the pressure in the charge of air released into the barrel breech thereby to vary the trajectory of the ball and the distance traveled by the ball.

5. A ball-throwing machine as defined in claim 4 characterized in the provision of power-driven compressor means normally operating at a uniform rate to supply pressurized air, means for storing the pressurized air between ball-throwing periods, and said adjustable bleeder means being positioned to vent air from the stored supply thereof between ball-throwing periods to limit the quantity and pressure of air available for each ball-throwing operation.

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