United States Patent [19]

Sweeton

[11] **3,855,988**

[45] **Dec. 24, 1974**

[54] **BALL THROWING MACHINE**

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[22] Filed: **Apr. 13, 1973**

[21] Appl. No.: **350,696**

[52] **U.S. Cl.** ..... **124/11 R,** 124/30 R, 124/50, 124/51 R, 124/41

[51] **Int. Cl.** **F41f 1/04**

[58] **Field of Search** ..... 124/11 R, 13 A, 30 R, 41, 124/45, 48, 49, 50, 51 R

[56] **References Cited**

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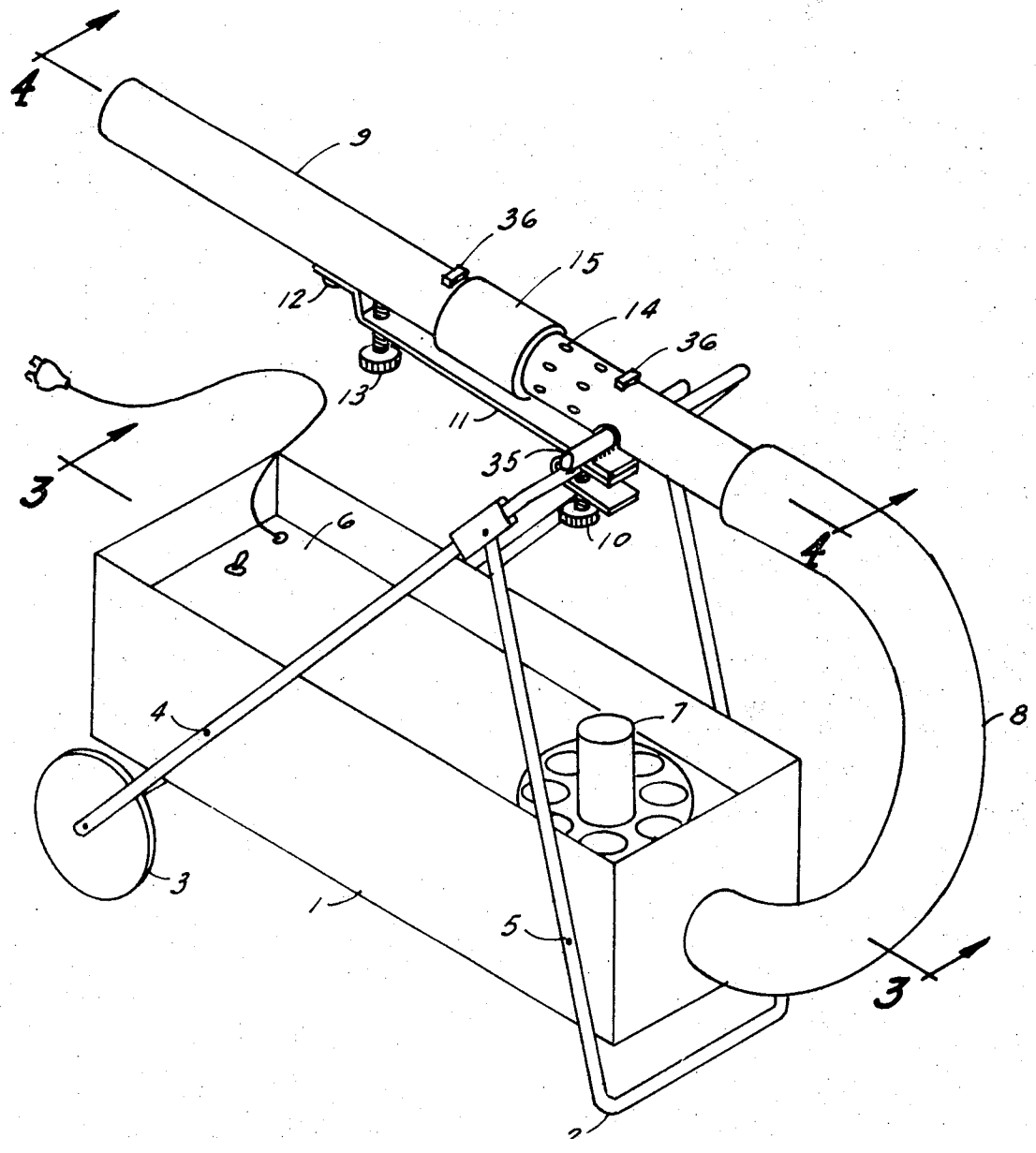
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Assistant Examiner—R. T. Stouffer
Attorney, Agent, or Firm—Sperry and Zoda

[57] **ABSTRACT**

A ball throwing device is provided with a base having an air box therein. A barrel is movable to various selected positions with respect to the base and connected to the air box by a flexible duct through which balls pass to the barrel. The balls to be thrown are introduced successively from a rotary ball feed assembly into the air box and barrel and are held within the barrel by a ball-stop detent until sufficient air pressure has built up behind the ball to move it past the ball-stop detent and out of the barrel in a desired trajectory and at a desired speed.

8 Claims, 5 Drawing Figures



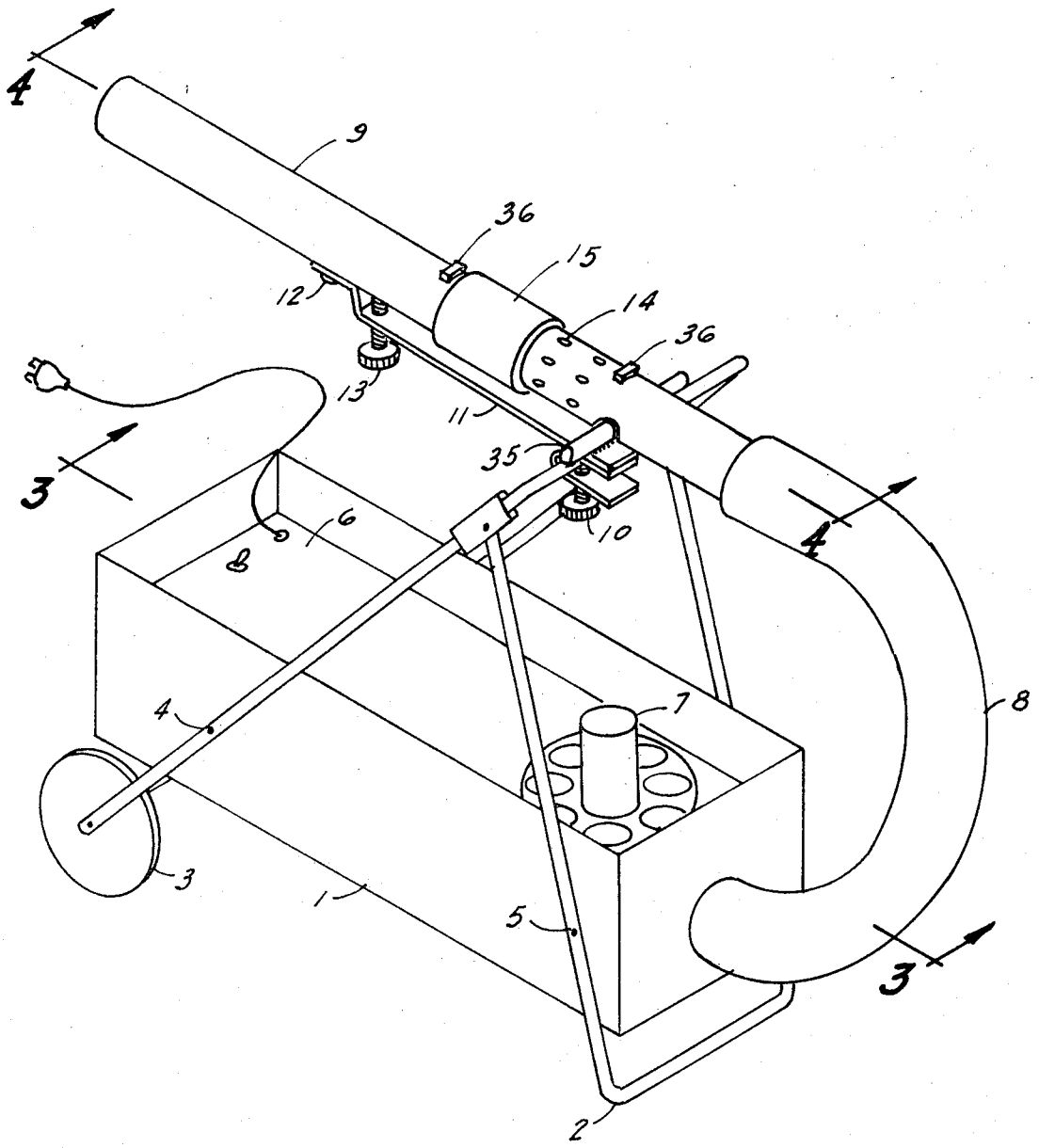


Fig 1

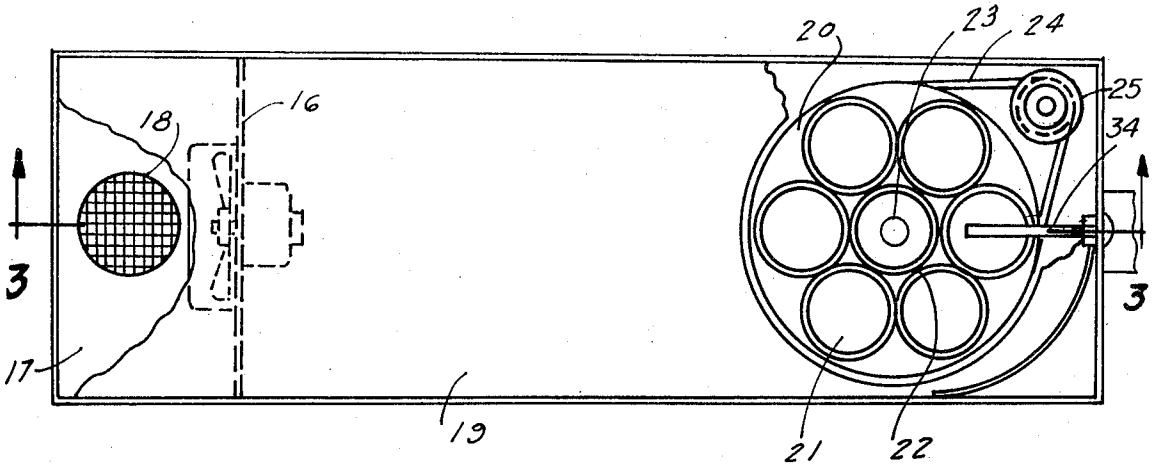

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Fig 2

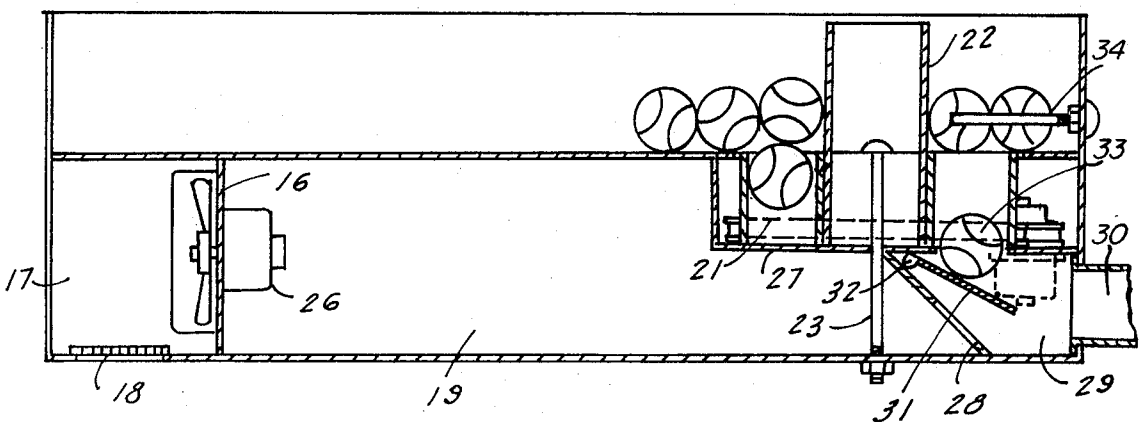

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Fig 3

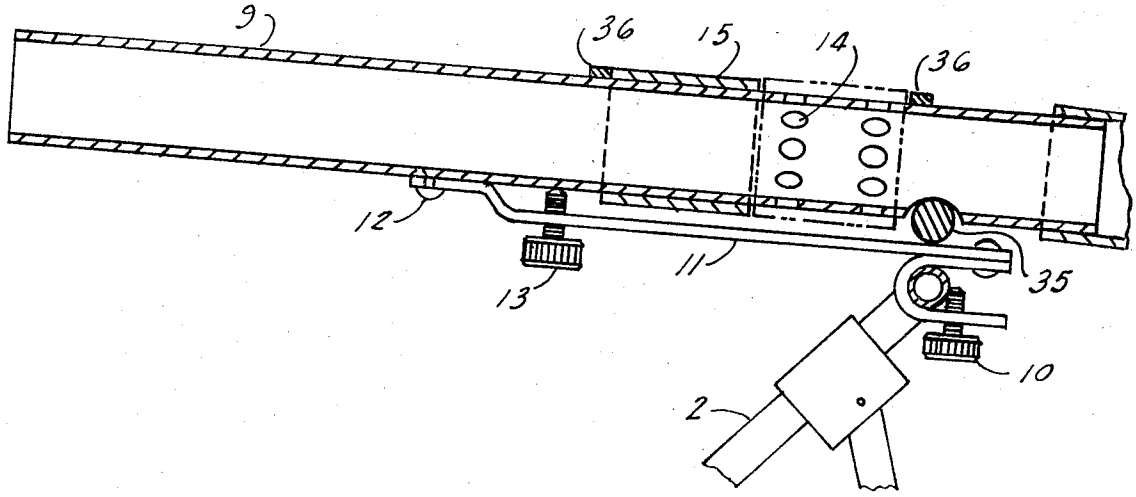


Fig 4

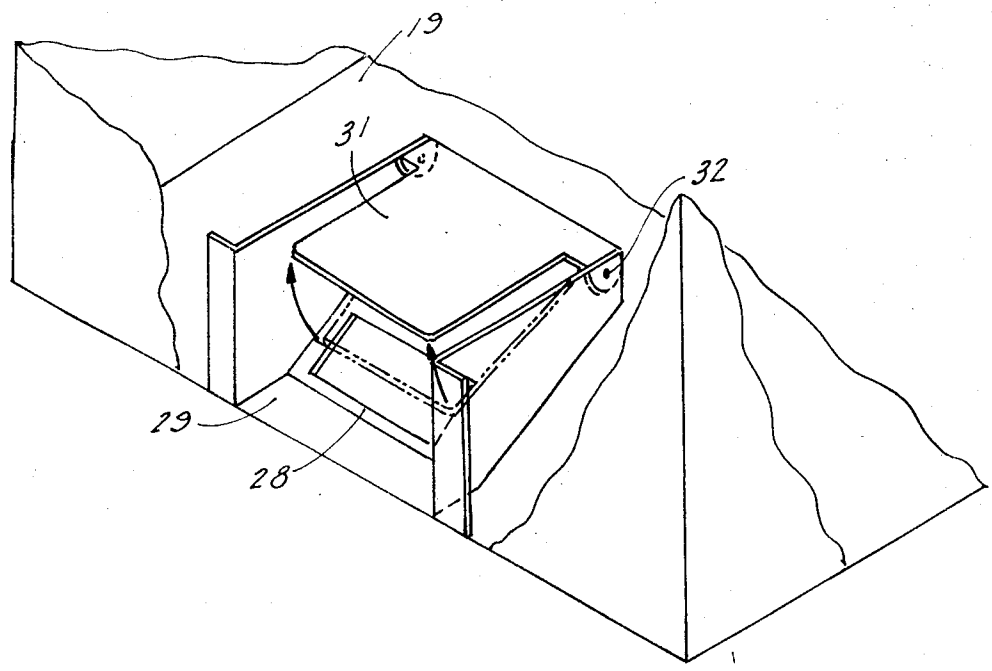


Fig 5

BALL THROWING MACHINE

This application is a continuation of applicant's copending application Ser. No. 66,447 filed Aug. 24, 1970 now abandoned.

For many years a variety of automatic ball throwing machines have been found useful by instructors, pupils, and professional players of ball games such as tennis, and the use of such machines offers a number of advantages to the player over the use of a real-life playing partner. A machine gives the player a greater freedom of choice as to time and place, and for practice purposes it is able to provide a continuous series of consistent shots. This is helpful to the player who wishes to practice one particular stroke.

The machines which have been built and marketed are for the most part motor driven mechanical devices of some complexity. They are expensive to build and to maintain, difficult to service, and prone to mechanical derangement. Air operated machines which have been built and offered for this application are in general dependent on a supply of high pressure air supplied from an external air compressor. The higher air pressure requires that the machine be of heavy and expensive construction. Moreover, the barrels through which the balls are projected in prior art devices have not been movable independently of the ball supply means so that it has been necessary to tilt or move the major active elements of the assembly as a unit in order to vary the trajectory of the balls discharged.

It is an object of this invention to provide a ball throwing machine for the uses above set forth which will avoid the difficulties and objections to the machines which are currently available for these uses. The machine which is hereafter described in this specification is inexpensively constructed of light-weight materials, and is extremely simple to operate and maintain. Parts of the machine may be easily replaced by the user when they become worn or defective. The number of moving parts is kept to what is nearly an irreducible minimum. The correction of almost any malfunction of the machine may be achieved by the non-technical user without resort to outside assistance. Moreover, the barrel of the machine is adjustable to vary the trajectory and speed of the balls projected therefrom without shifting the whole device about.

The accomplishment of the above described object of this invention is effected by the use of a unique means of feeding and propelling the ball. This unique means is the use of a supply of compressed air at minimum pressure and of sufficient volume for the purpose required. It is this relationship between the pressure and volume of air supplied which permits the use of light-weight construction and inexpensive components thruout, and is the key to the simplicity of the machine.

The construction and operation of the ball throwing machine which is the subject of this invention can best be described by reference to the drawings which accompany this specification.

FIG. 1 shows the external appearance of a typical form of machine, embodying the present invention.

FIG. 2 shows a top view of the machine illustrated in FIG. 1 with the projection barrel assembly and air duct removed, and with portions of the ball hopper tray cut away to show certain of the working parts below this tray.

FIG. 3 shows a sectional side view of that form of the invention shown in FIG. 1 outlining a preferred arrangement of the interior working parts.

FIG. 4 shows the arrangement of FIG. 1 including details of the mechanisms provided for adjusting the position of the barrel and for control of the speed of the ball by the operator.

FIG. 5 shows in detail the construction of the air valve which provides for the introduction of the ball into the air duct.

In that form of the invention chosen for purposes of illustration in the drawings the device embodies an air box 1 which may be formed of sheet metal or the like and is provided with a frame assembly pivotally connected to the air box 4 and 5. One number of the frame assembly has a ground engaging portion 2 whereas wheels 3 are provided on another member of the frame assembly to permit ready movement of the device from place to place or to vary the position of the device in use. The members of the frame assembly may be made collapsible or they may be readily disassembled when the device is to be transported from one location to another. However during use the air box will remain stationary on the ground or wherever it is placed.

The upper surface of the air box 1 is formed to serve as a ball hopper tray 6 for receiving a substantial number of balls such as tennis balls. The tray 6 is designed to slant downward toward a ball supply or feed device 7 when in use so that the balls will move toward the feed device by gravity and may thereafter be successively introduced into the air box near one end thereof for delivery through a flexible connection, such as the flexible air duct 8, to a barrel 9 for discharge from the device.

The barrel 9 preferably is located above and spaced from the tray 6 and air box 1 so as to extend from the lower end of the air box toward the opposite end thereof whereby the all-over length of the device is limited. The barrel is movably supported on the frame assembly so as to be selectively tilted to various positions as desired to alter the trajectory of the balls discharged from the device. As shown the barrel 9 is secured in that position to which it is moved by means of a clamping screw 10 engagable with a tubular member of the frame assembly.

The flexible air duct 8 has an internal diameter sufficient to permit passage of a ball therethrough and is connected at one end to the breach of barrel 9, whereas the opposite end of the air duct 8 is connected to the air box 1 near that end of the air box adjacent the ball supply device 7. The flexibility of the duct 8 between the air box and barrel 9 renders it possible to tilt the barrel to a desired elevation without moving the air box or remainder of the device to alter the trajectory of the balls being discharged.

FIGS. 2 and 3 show in detail a preferred construction of the air box and the means provided for the supply of compressed air, as well as the device for feeding the balls, both of which are incorporated into the construction of said box. Referring to FIG. 2, which is a top view of the box with a portion of the ball hopper tray cut away, the interior of the box is divided into two main compartments by a partition (16). The small compartment is the air intake chamber (17) which is open to the atmosphere thru an air intake (18). The larger compartment is the accumulator chamber (19) which extends from the partition (16) under the ball feed

rotor (20) of ball supply means 7. The ball feed rotor consists of an assembly of six ball feed pockets affixed to a central cylinder (22), the entire assembly being rotatably mounted on a vertical shaft (23). The ball feed rotor assembly is turned at a slow speed of about two revolutions per minute by a belt (24) driven by a small gear motor.

Referring to FIG. 3 of the drawings, this shows a sectional side elevation of the air box showing the interior arrangement in detail. An electrically operated motor-blower unit is mounted on the partition (16) between the intake chamber (17) and the accumulator chamber (19). This unit serves to maintain air pressure in the accumulator chamber and to supply the necessary volume of air under low pressure to this chamber. The ball feed rotor assembly rests on a ball feed rotor tray (27) which is positioned at a level about two inches below the hopper tray, and comprises an upper surface of the extended pressure chamber (19).

At the rear of the extended pressure chamber (19) is installed an inclined baffle plate (28), said plate being pierced by an air passage leading into the air valve chamber (29). The lower end of the flexible air duct 8 is attached to a connection 30 at the rear of the air valve chamber whereas the opposite end of the air duct is connected to the breech of the projection barrel (9). A circular ball feed port (33) is cut in the ball feed rotor tray (27). This port is so positioned as to provide communication to the air valve chamber (29) from the ball feed rotor pockets (21) which come successively into position over said port as the ball feed rotor assembly is rotated by the driving motor (25).

An air valve comprising a vane (31) and an horizontal pivot (32) is positioned under said ball feed port (23) in such a manner that when the vane of said valve is in the horizontal position the air under pressure in the air valve chamber is prevented from escaping upward through said port. The mounting of the valve is such that the force of gravity tends to open said valve when the machine is turned off, but the valve is maintained in the closed horizontal position by air pressure when the machine is energized. A ball feed ward (34) comprising an horizontal rod installed directly over the ball feed port (33) serves to prevent more than one ball at a time from dropping through said port.

FIG. 4 shows in greater detail the mounting of the projection barrel and the arrangement of the control devices fitted to the barrel. The barrel is provided with a ball-stop detent spring (11) in the form of a leaf spring fitted to the under side of the barrel and secured thereto by bolt (12). The barrel is supported by the detent spring which in turn is adjustably secured to a transverse section of the tubular frame (2) by clamping screw (10). The ball-stop detent (35) is a short horizontal tubular section secured to the detent spring. The detent projects a short distance into and through the inside surface of the barrel. For this purpose an horizontal cut in the lower section of the barrel is shaped to fit the detent. Also shown in detail in FIG. 4 are the pressure relief airholes (14) and the adjustable sleeve (15) which can be manually positioned to expose a variable number of holes. By this means the air pressure acting on the ball as it passes through the barrel may be wholly or partially relieved, and the speed of the ball may be varied. The movement of the sleeve (15) is limited by two stops (36).

FIG. 5 shows in detail the construction of the air valve and air valve chamber. The identification of the parts designated and their respective functions is previously described.

The operation of the machine is as follows: The device is moved into place with the barrel of the device aimed in a desired direction after which the barrel is tilted to the proper angle to assure discharge of the ball in a desired trajectory. The clamping screw 10 is then tightened to hold the barrel in place. Current is then supplied to the motor-blower unit, bringing it up to normal speed. A number of balls are placed in the hopper tray. The ball feed motor (25) is not activated. Air enters thru the air intake (18) and air pressure builds up in the accumulator chamber (19). Air pressure flows thru the baffle plate (28) and closes the air valve vane (31), maintaining same in a closed position. Air flows out thru the flexible duct (8) and thru the muzzle of the projection barrel (9).

The ball feed motor (25) is now activated and the ball feed rotor (2) begins to turn. Balls in the hopper tray drop into the ball feed pockets (21) and are carried successively over the ball feed port (33) and air valve vane (31). The valve vane is maintained in its closed horizontal position by air pressure from below. However, the weight of the ball resting on the vane is sufficient to cause the valve to drop open and admit the ball into the air valve chamber (29). As soon as the ball is free of the valve the air pressure in the valve chamber causes the valve to reassume its closed position.

The ball is carried by a stream of air through the flexible duct (8) and into the barrel to the point where its free passage is interrupted by the ball-stop detent (35). At this point the ball rests against the detent and blocks the escape of air from the accumulator chamber and the duct. The pressure of the confined air then begins to rise. Its rise continues until it reaches the point where the air pressure behind the ball is sufficient to overcome the pressure of the detent spring. This pressure having been reached, the ball-stop detent is depressed by the pressure of the ball thereon, the ball passes the detent point, and the expansion of air compressed in and confined to the duct and the accumulator chamber serves to accelerate the ball and to cause its ejection from the barrel at a high rate of speed.

The volume and pressure of available air are greater than necessary to provide the ball speed desired. Since the air supply is not always readily adjustable, other means are provided to reduce the volume and pressure and thus control the speed and trajectory of the ball. The detent spring pressure may be adjusted by the screw (13), thus controlling the pressure which must be built up in duct (8) behind the ball to cause the release of the detent (35). The volume of air acting on the ball may also be partially reduced by changing the position of the sleeve (15). The positioning of this sleeve exposes a variable number of the pressure relief airholes (14), thereby effecting a reduction in the speed at which the ball is ejected from the muzzle of the barrel.

I claim:

1. A ball throwing device comprising a base embodying a stationary air box with an exterior open top portion defining a ball receiving tray, said tray having an inclined ball receiving floor with upstanding side and end walls circumscribing and extending above said floor, a support frame including a portion extending

above said tray, a ball projection barrel supported on said frame, said barrel having an outer end through which the balls are projected and an inner end connected to one end of a flexible conduit with the other end of said flexible conduit being connected to said air box, a ball feed assembly including a plurality of cylindrical containers arranged in an annular side-by-side pattern each having an open top at the level of the floor of said tray for receiving a ball from said tray, wall means at the bottom of said cylindrical containers for supporting the balls in said containers except in an area adjacent the connection of said air box to said flexible conduit, a horizontal panel pivotally located below said area and being displaceable downwardly by the weight of a ball thereabove and being urged upwardly by the pressure of air in the air box to close the bottom of said cylindrical containers, said panel being releasable downwardly when a ball is in the cylindrical container to deposit each ball in succession into the air box directly adjacent the connection to said flexible conduit, means for rotating said ball feed assembly to feed balls in succession from said tray into said air box, fan means for pressurizing said air box, said conduit and said barrel to feed balls from said air box through said conduit to said barrel, and releasable detent means in said barrel for blocking the movement of the ball through said barrel until a predetermined air pressure is built up behind said ball to release the ball for projection out of said barrel.

2. A ball throwing device as described in claim **1** wherein a means is provided for operator control of the pressure of air in said duct which shall cause the release of said detent.

3. A ball throwing device as described in claim **2** wherein said means provided for operator control of the pressure in said duct shall be a spring attached to and exerting pressure upon said detent, the tension of said spring being manually adjustable by the operator of said machine.

4. A ball throwing device as described in claim **1** wherein a means is provided for operator control of the volume of air the expansion of which in said barrel shall cause said ball to be accelerated within and ejected from the muzzle of said barrel.

5. A ball throwing device as described in claim **4** wherein said means provided for operator control of said volume of air shall be a plurality of perforations in said barrel, said perforations being exposed by the manual positioning of a cylindrical sleeve fitted to the outside of said barrel, the exposure of said perforations thereby permitting the escape from said barrel of a portion of the air compressed in and confined to said barrel, the expansion of which in said barrel shall cause said ball to be accelerated within and ejected from the muzzle of said barrel.

6. A ball throwing device as described in claim **1** wherein said means for the supply of air under pressure to said chamber shall be an electric motor driven blower.

7. A ball throwing device as described in claim **1** wherein said barrel is movably mounted on said frame.

8. A ball throwing device comprising a base embodying a stationary air box with an exterior open top portion defining a ball receiving tray, said tray having an inclined ball receiving floor with upstanding side and end walls circumscribing and extending above said floor, a ball projection barrel movably supported above said tray, said barrel having an outer end through which the balls are projected and an inner end connected to one end of a flexible conduit with the other end of said flexible conduit being connected to said air box, a ball feed assembly including a plurality of cylindrical containers arranged in an annular side-by-side pattern each having an open top at the level of the floor of said tray for receiving a ball from said tray, walls means at the bottom of said cylindrical containers for supporting the balls in said containers except in an area adjacent the connection of said air box to said flexible conduit, a horizontal panel pivotally located below said area and being displaceable downwardly by the weight of a ball thereabove and being urged upwardly by the pressure of air in the air box to close the bottom of said cylindrical containers, said panel being releasable downwardly when a ball is in the cylindrical container to deposit each ball in succession into the air box directly adjacent the connection to said flexible conduit, means for rotating said ball feed assembly to feed balls in succession from said tray into said air box, fan means for pressurizing said air box, said conduit and said barrel to feed balls from said air box through said conduit to said barrel, and releasable detent means in said barrel for blocking the movement of the ball through said barrel until a predetermined air pressure is built up behind said ball to release the ball for projection out of said barrel.

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