

[54] **DEVICE HAVING TILTABLE AND ROTATABLE COACTING WHEELS FOR PROJECTING TENNIS BALLS**[76] Inventors: **Alfredo S. Yarur**, 2101 Yorkgate Drive; **Alfredo F. Yarur**, 4513 Edwards Mill Road; **Nicolas J. Yarur**, 2101 Yorkgate Drive, all of Raleigh, N.C.

3,724,437	4/1973	Halstead	124/1
3,766,901	10/1973	Cleary et al.	124/1
3,777,732	12/1973	Holloway et al.	124/51 R
3,785,358	1/1974	D'Angelo et al.	124/1

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Assistant Examiner—William R. Browne

Attorney, Agent, or Firm—B. B. Olive

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[58] Field of Search... 124/1, 51 A, 30 R, 49, 29, 50, 124/32, 51 R; 273/26 D; 222/16

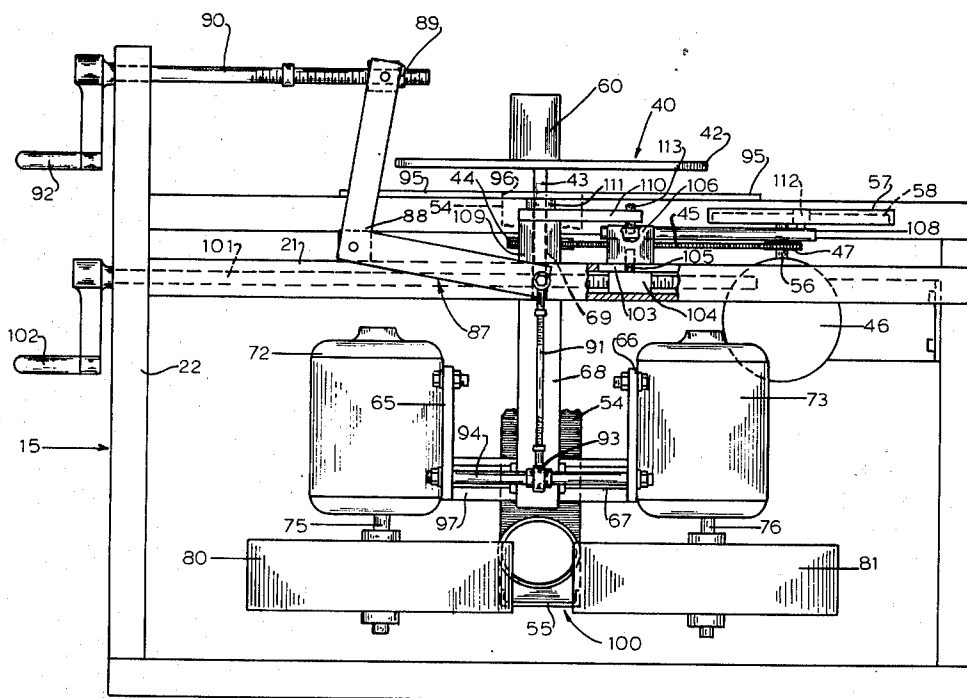
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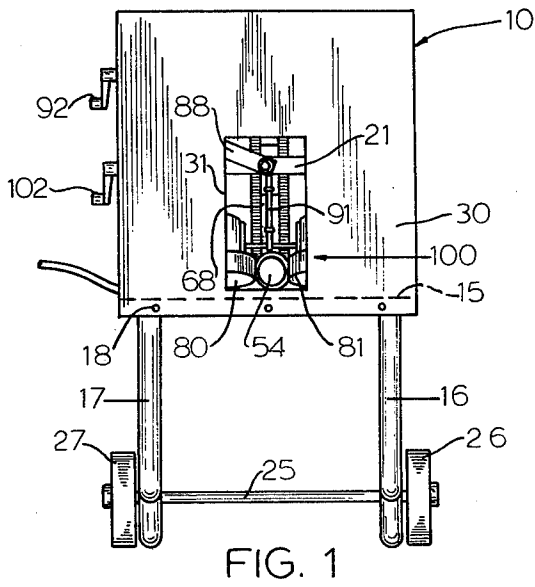
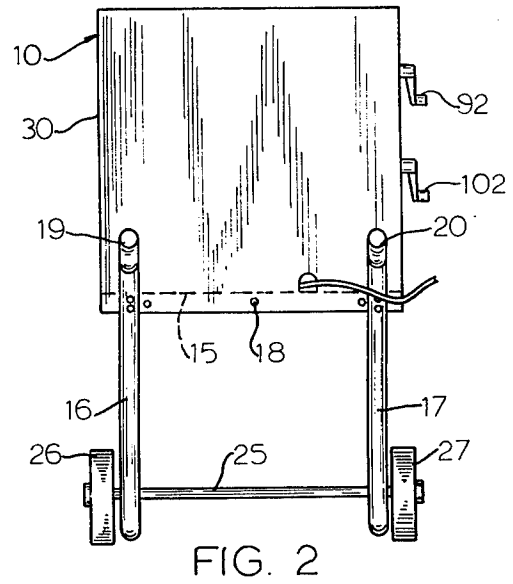
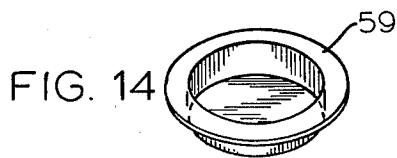
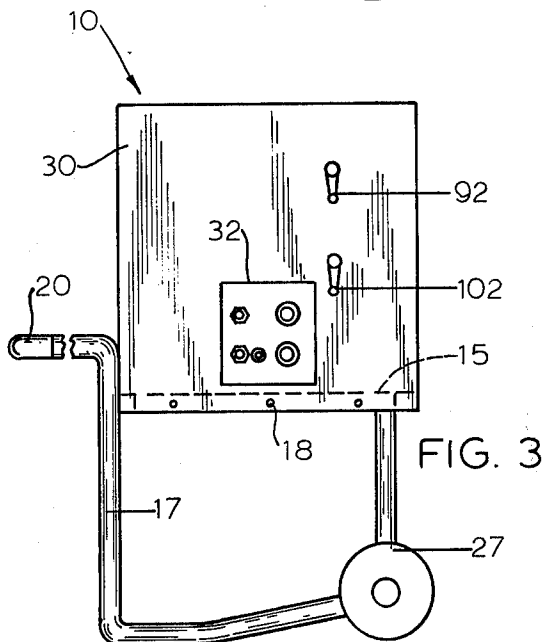
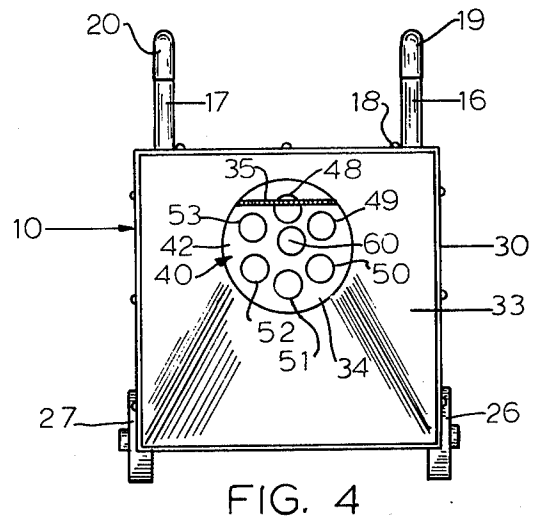
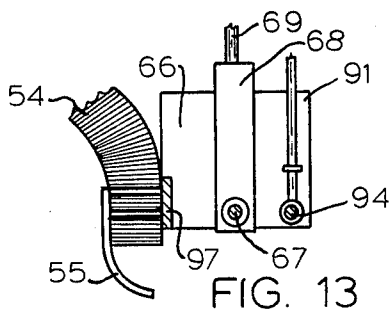
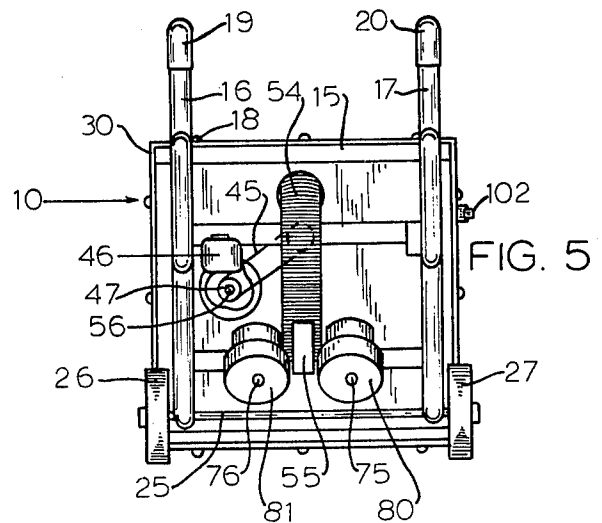
3,277,879	10/1966	Sayette.....	124/30 R X
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[57]

ABSTRACT

A tennis ball projecting machine for ejecting tennis balls in regular sequence and at a controlled velocity to simulate tennis service or return from an opponent during learning or practice sessions. The apparatus is directed to variation of the vertical and horizontal angles of ball ejection thereby providing game-like situations. The apparatus has two motor driven wheels mounted on the lower end of a vertical post member. To the upper end of the post member is attached members to rotate the motor mount and to elevate the wheels to vary the vertical trajectory of an object being projected.

5 Claims, 15 Drawing Figures



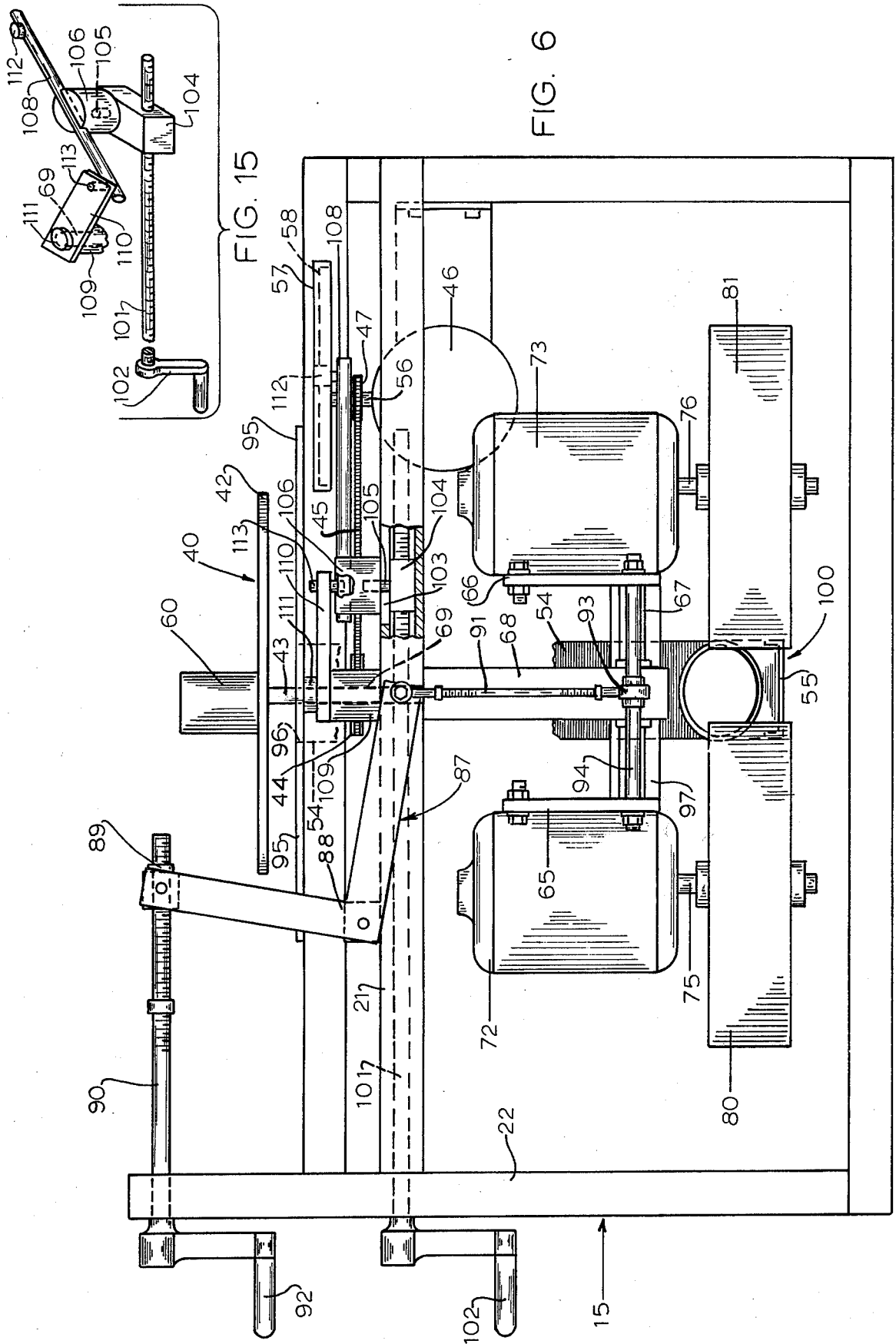
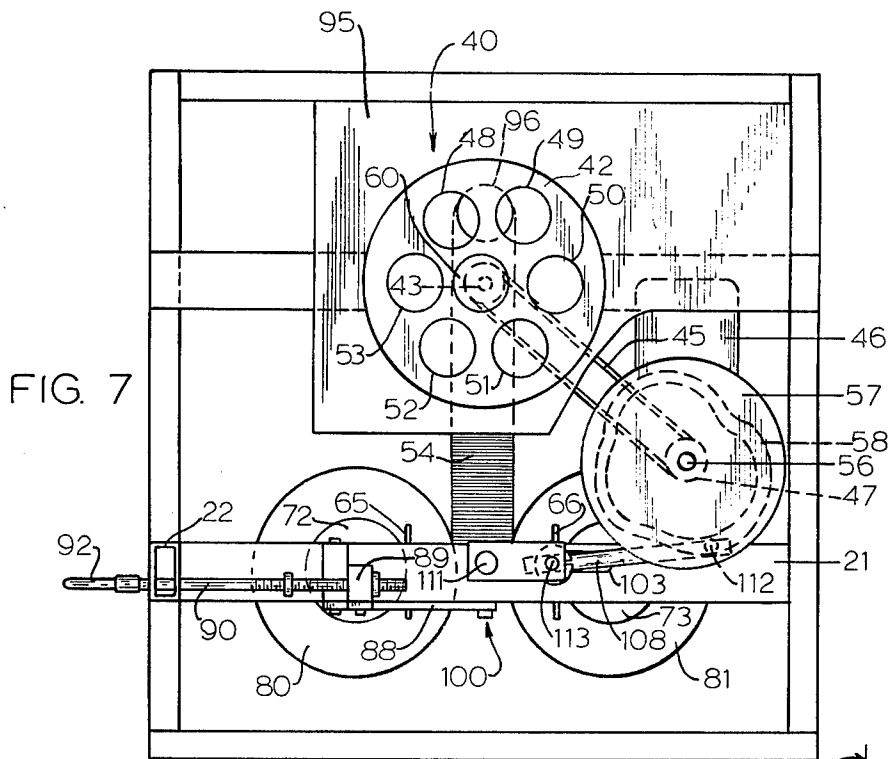
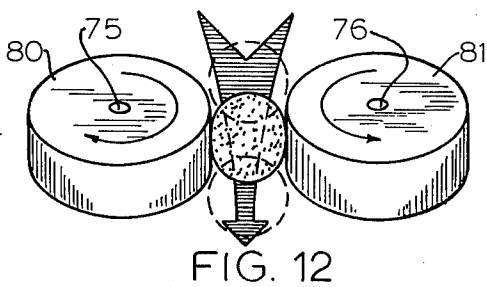
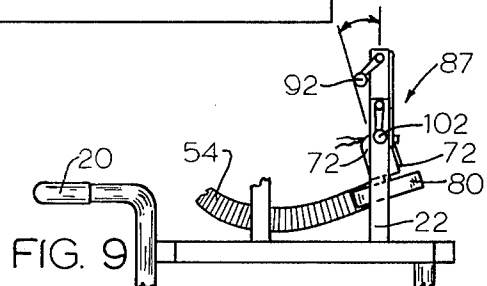
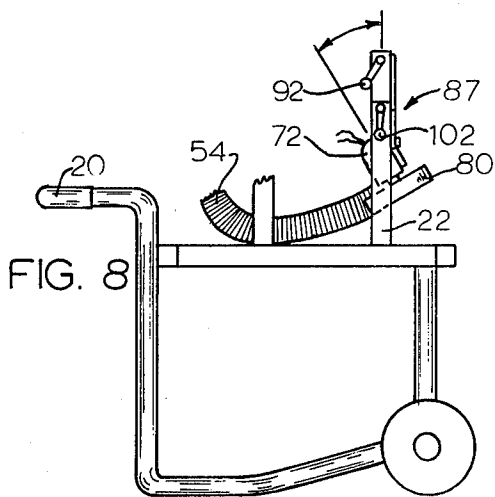
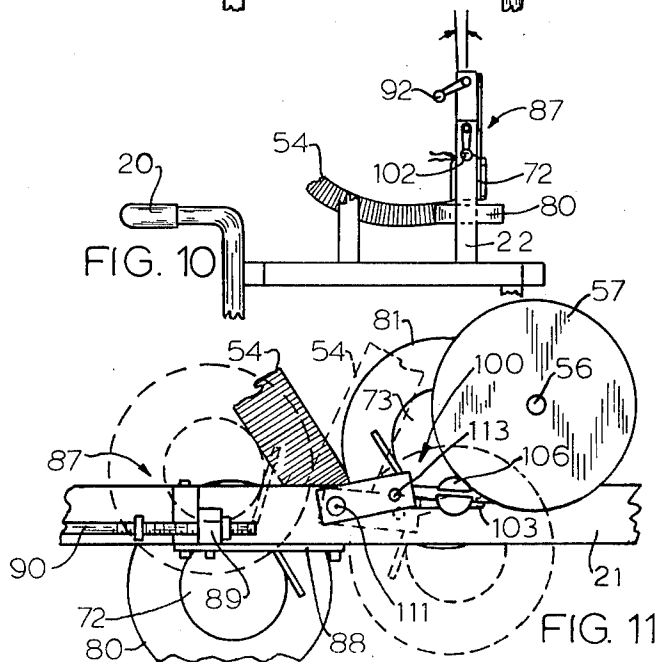


FIG. 6



DEVICE HAVING TILTABLE AND ROTATABLE COACTING WHEELS FOR PROJECTING TENNIS BALLS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates generally to pitching machines used for projecting balls of various types during practice or learning sessions. More specifically, the invention relates to machines adapted to project tennis balls in simulated ball service or return.

2. Description of the Prior Art

The general history of the prior art illustrates that the sport of tennis has gained in popularity throughout the past decade as an individual as well as a team sport. Where tennis is being taught, whether in schools, athletic clubs, or other institutions, there is frequently a need for a type of ball throwing machine which can be used during learning or practice sessions to simulate game-like situations for the benefit of the individual, whether novice or professional. Most machines which have been devised to date for throwing tennis balls have largely been adaptations of baseball pitching machines. Though these machines have been effective in propelling tennis balls, they have imparted considerable objectionable spin to the ball, caused a significant amount of wear on the covers of the balls, and have led to frequent jamming. In addition, most machines have required an attendant to manually operate the controls and refill the ball magazine. Horizontal and vertical positioning apparatus has usually been limited to a few fixed positions and has not been available for incremental positioning over a wide range of positions and swings, vertically and horizontally. U.S. Pat. No. 3,399,660 teaches the concept of utilizing high speed rotating cones or discs, obliquely situated, to propel tennis balls. The user is faced with the same practice shot repeated time after time unless he makes frequent trips to the machine to alter the adjustments and even then he cannot substantially alter the type of throw he will receive. Vertical and horizontal control of the pitch remains a problem.

In addition to the foregoing, reference should be made to U.S. Pat. No. 3,604,409; 3,089,476; 1,989,452; 3,640,263; 2,716,973; 3,538,900; 3,308,802, 3,459,168; 2,112,611 and 3,568,653 which are directed to other pitching or projecting machines which might be of general interest.

Issued U.S. Pat. No. 3,777,732 has contributed tremendously to this field. U.S. Pat. No. 3,777,732 teaches a tennis ball ejecting machine comprised of a frame and housing which mounts a ball discharge mechanism, a ball feed mechanism, remote and machine located control means, and appropriate handles and wheel for portability. A plurality of balls can be placed into a feed hopper and are individually selected by a rotating gate and fed into a flexible tube. Upon reaching the end of the tube, each ball enters a propelling mechanism which consists of two narrowly spaced cylindrical drums which are synchronously rotated about parallel axes by electric motors. The moving tennis ball, after entering the propelling mechanism is engaged between the two drums by friction, momentarily compressed, and discharged outwardly at a velocity approximating the circumferential speed of the rotating drums. A pivotal portion of a frame member supports the discharge mechanism and enables the vertical angle

of ball discharge to be varied. The horizontal angle of discharge is controlled either by a movable deflecting baffle situated outward of the rotating drums or by oscillating a subframe which supports the discharge mechanism.

SUMMARY OF THE INVENTION

The apparatus of the present invention as disclosed herein comprises a support frame and housing. The support frame mounts a tennis ball receiving hopper, a tennis ball frame mechanism, a tennis ball ejecting mechanism, control means on the machine, and appropriate handles and wheels to render the machine portable. A plurality of tennis balls are placed into a ball receiving hopper and are individually selected by a rotating aperture disc and fed into a flexible feed tube. Upon reaching the end of the tube, each ball individually enters an ejecting mechanism which consists of two narrowly spaced cylindrical wheels which are individually but synchronously rotated about parallel axes by individual electric motors. A moving tennis ball, having entered the ejecting mechanism, is engaged between the two wheels by friction, momentarily compressed, and ejected outwardly at a velocity approximating the circumferential speed of the synchronized rotating wheels. The invention apparatus is directed to use of an improved pivotal linkage which is connected to the ejecting mechanism and enables the vertical angle of ball ejection to be varied by vertically tilting the motor mounts with respect to a vertical post. The tilting may be accomplished incrementally, thus providing a wide range of tilted positions. The horizontal angle of ball ejection is controlled by a screw type linkage and a cam and follower mechanism which rotates the same post around its vertical axis for horizontal control. This also may be done incrementally and with a wide range of horizontal swings. The use of such a single post structure for both vertical and horizontal control thus eliminates the use of a tiltable frame and further eliminates the need for a baffle deflector.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of a machine built in accordance with the invention, showing an aperture in the housing to permit the ejection of tennis balls.

FIG. 2 is a rear view of the complete machine.

FIG. 3 is a side view of the machine showing the controls, vertical and horizontal angle controls and the handle and wheel structure.

FIG. 4 is a top view of the machine revealing the tennis ball receiving hopper, rotating apertured disc and an anti-jamming spring guide.

FIG. 5 is a view of the underside of the machine showing the flexible feed tube, ball ejecting wheels and the cam and follower mechanism.

FIG. 6 is an enlarged view showing only the mechanism portion of the machine with the handle and wheel structure removed.

FIG. 7 is a reduced scale plan view of the mechanism of FIG. 6.

FIG. 8 is a partial side view illustrating the vertical adjustment feature of the machine.

FIG. 9 is a partial side view similar to FIG. 8 but showing the vertical adjusting mechanism in a different position.

FIG. 10 is a view similar to FIGS. 8 and 9 but showing a vertical adjustment which will eject the tennis ball almost directly at the player.

FIG. 11 is a partial plan view of the ejecting wheels and horizontal angle adjustment mechanism and in dashed lines another position obtainable.

FIG. 12 shows in a somewhat schematic view a tennis ball being engaged between the rotating ejecting wheels.

FIG. 13 is a fragmentary elevation section view of a portion of the ball ejecting mechanism.

FIG. 14 is a perspective view of a cup member which can be placed in the aperture disc to prevent passage of a ball.

FIG. 15 is a perspective view illustrating some of the linkage involved in regulating the horizontal swing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 through 5, in a preferred embodiment the projecting machine of the invention, generally identified by 10, comprises a frame 15 composed of tubular aluminum segments joined by welding, or the like, into a rectangular base supporting vertical and horizontal structural members. Two U-shaped leg members 16, 17 are adapted to provide upright support and are secured to said frame member and fitted with respective hand grip portions 19, 20, axle 25, and wheels 26, 27. A removable housing member 30 formed of sheet aluminum includes four sidewalls, and in the front wall a ball ejecting aperture 31 which permits the exit of ejecting tennis balls. A control access aperture 32 is located on the sidewall which permits access to the manual controls. The complete housing assembly is open at the bottom. The housing is assembled to frame 15 at appropriate screw attachment points 18. Housing 30, immediately below its open upper end, is fitted with a metal ball hopper 33 formed with a depressed area at the top of the housing adapted to hold a plurality of tennis balls. A bottom aperture 34 permits the entry of balls into machine 10 from hopper 33. Ball hopper 33 is provided with an anti-jamming spring 35. It is contemplated that the entire housing assembly may be of unitary construction and fabricated of formed aluminum sheeting.

A tennis ball feed mechanism 40 is suitably secured to frame 15 and is situated immediately beneath bottom aperture 34 to receive tennis balls one by one. A rotatable aperture disc 42 is adapted to rotate with shaft 43 which is fitted with a gear 44 and a drive chain 45 for being driven by a variable speed, drive motor 46 through gear 47, as best shown in FIG. 6. Control of disc 42 is, of course, obtained by control of motor 46 with respect to being on or off and speed. Aperture disc 42 has six apertures 48, 49, 50, 51, 52, 53, each of which is adapted to temporarily contain no more than one tennis ball and through which each ball passes from disc 42 to flexible tube 54. A plate 95 below disc 42 provides a temporary ball support surface for the balls. Vertical cylinder 60 is offset from the center of disc 42 with which it turns and acts to stir the balls. Flexible feed tube 54 is secured to plate 95 by any suitable clamping or fastening means, not shown, and mates with an aperture 96 in plate 95. Thus, as disc 42 rotates at a selected speed and as the apertures in disc 42 each containing a tennis ball pass over aperture 96 of plate 95 each respective ball will be permitted to exit hopper

33 and fall freely through its respective aperture 48, 49, 50, 51, 52 or 53, through aperture 96 and into flexible feed tube 54.

The opposite end of feed tube 54 is connected by suitable clamping means to an adjacent ball ejecting mechanism 100 (see FIG. 13). Final guidance is provided by metal guide 55 having a discharge end positioned to guide the balls to ejecting wheels 80, 81 as shown in FIGS. 5 and 6.

As will be more fully appreciated from later disclosure, flexible and extensible tube 54 provides a unique advantage to the overall invention. In particular, the flexibility allows the discharge end of tube 54 which mounts metal guide 55 to be moved to different angles for variation in loft of the ball as later described. However, irrespective of any such angular position, the ball is given a positive, low friction path of guidance through tube 54. Various helically-reinforced, flexible tubes, such as used in vacuum systems and clothes dryers, are of course readily available for such purposes.

The ball discharge mechanism 100 includes two variable speed electric ejecting motors 72, 73 having drive shafts 75, 76. Motors 72, 73 are respectively secured to plates 65, 66 and are oriented such that shafts 75, 76 of motors 72, 73 rotate about parallel axes. Motor mounting plates 65, 66 are secured to and supported by a shaft 67 which extends through a vertical post 68 and enables plates 65, 66 and thus motors 72, 73 to pivot around the axis of shaft 67 for vertical ball control as later explained. Two cylindrical wheels 80, 81 are rotatably secured to drive shafts 75, 76 and reside in the same plane in opposed positions. These wheels, best shown in FIG. 6, may be of hollow aluminum or magnesium casting or solid construction and have their circumferential edges fitted with a soft compressible material, i.e., rubber, vinyl, or the like, so as to be adapted to conform said edges to the outside diameter, texture, and hardness of a given ball. As shown diagrammatically in FIG. 12, wheels 80, 81 are adapted to be synchronously rotated in opposite directions outwardly, represented by the solid arrow, such that a ball upon reaching the end of flexible tube 54 will be introduced into, temporarily engaged between, and instantaneously discharged from wheels 80, 81 at a velocity approximating their circumferential speed.

The description thus far has dealt primarily with the prior art construction over which the present invention offers an improvement. There is next described the vertical and horizontal ball direction control mechanism with which the invention is primarily concerned.

A height adjustment mechanism 87, best shown in FIGS. 6, 8, 9, 10, and 11, is mounted on frame 15 and enables the vertical angle of ball ejection to be manually varied. Mechanism 87 comprises an L-shaped or bell crank arm 88 which is pivotally secured at one end to threaded and movable block member 89 which rides on a threaded shaft 90 and at an opposite end arm 88 is pivotally secured to a vertical rod 91. A handle 92 is mounted on the outer end of shaft 90. Turning of handle 92 in one direction or the other is thus adapted to effect the rotation of the shaft 90 to cause threaded block 89 to move in or out and to correspondingly cause L-shaped arm 88 to pivot in an up and down manner. The lower end of rod 91 is secured by means of a universal connection 93 to a horizontal shaft 94. Shaft 94 is integrally secured to motor support plates 65, 66. Plates 65, 66, as previously mentioned, are se-

cured to horizontal shaft 67 which passes through and rotates in vertical post 68. Thus, as shaft 90 is turned by handle 92, rod 91 moves up or down, depending on the direction of rotation of shaft 90, and thereby causes motors 72, 73 to pivot vertically for purposes of vertical control of ball direction. A connecting plate 97 extends between and is secured to support plates 65, 66 and provides a mounting surface for metal guide 55 and flexible tube 54 (see FIG. 13). Guide 55 is integrally secured in a predetermined position to plate 97 so that the tennis balls are always in perfect alignment when fed into ejecting wheels 80, 81.

The previously mentioned shaft member 67 extends between support plates 65, 66 and is made integral thereto. The vertical post member 68 pivotally mounts and supports shaft 67 and extends upward therefrom. Post member 68 has secured at its upper end a vertical shaft member 69 which supports the lower portion of post 68. Shaft 69 extends through frame cross member 21 of frame 15, through and rotates in a fixed sleeve 109 and is secured to an arm 110. A nut 111 is secured to the end of shaft 69. As later explained, pivoting of arm 110 acts to pivot post 68 around its vertical axis which provides horizontal direction control for the ball.

Frame cross member 21 is preferably of hollow aluminum construction. A threaded shaft 101 is mounted at one end in a frame upright member 22 and passes through upright member 22 into the hollow portion of cross member 21. A handle 102 is secured to the outer end of shaft 101. Frame cross member 21 has a slot 103 (FIGS. 6 and 11) extending lengthwise in the top portion thereof. Shaft 101 has threadably mounted thereon a block 104. Block 104 is designed to travel back and forth on shaft 101 when shaft 101 is rotated by turning handle 102. Block 104 has a vertical stud 105 integrally secured in the top thereof. Stud 105 passes through and extends above slot 103 and mounts a cylindrical block 106 into which stud 105 partially extends and about which block 106 may rotate. Block 106 has a slot 107 in which a rod 108 is slidably received.

The previously mentioned sleeve 109 is rigidly secured to the top of frame cross member 21 and receives the mentioned vertical shaft member 69 for rotation. Shaft 69, at its uppermost end, is secured to a rectangular arm 110. Nut 111 mounts on the exposed threaded end of shaft 69 and retains arm 110 secured. The outer end of arm 110 receives a rotatable stud 113 which extends through arm 110 and is rotatably secured to one end of rod 108. As handle 102 is rotated, threaded block 104 moves either inward or outward on threaded shaft 101 which in turn moves block 106 on rod 108. Block 106 thus provides an adjustable pivot point for rod 108 as later explained and as generally illustrated in FIG. 15.

Rod 108 has a rotatable cam follower 112. The previously referred to variable speed drive motor 46 has a shaft 56 which drives gear 47 mounted thereon. Shaft 56 extends upward through gear 47 and has a track cam 57 mounted on the end thereof. Cam 57 has a grooved track 58 formed in its bottom side which receives cam follower 112.

As best seen in FIGS. 6 through 13 and FIG. 15, horizontal displacement of the ejected tennis balls is controlled by cam 57 and follower 112. In turn, the angle of ball displacement can be varied to suit the desired spread for ball ejection. As threaded block 104 is

moved inward or outward, the amount that the ejection mechanism rotates horizontally is controlled by the distance that the center of vertical stud 105 integral with block 104 is located from vertical stud 113. The center of stud 105 might be called the fulcrum point of the horizontal ball displacement mechanism. This fulcrum point can be changed by turning handle 102 which in turn causes shaft 101 to rotate and makes block 104 move. See in particular FIGS. 6 and 15. When block 104 is moved back so that the center of stud 105 coincides vertically with the axis of stud 113 as in FIGS. 6 and 7, the machine ejects balls straight out or to the center position only, since arm 110 will remain still since stud 105 or fulcrum point and the axis of stud 113 coincide. However, whenever block 104 is moved out so that the centers of stud 105 and stud 113 do not coincide as in FIGS. 11 and 15, block 106 turns on stud 105 and provides a pivot for rod 108 which causes the motor to oscillate back and forth according to the shape of cam track 58 and the ball is thus projected from side to side.

Turning now to a description of the machine in operation, according to the invention's preferred embodiment, operation of the machine 10 proceeds in the following manner. A plurality of tennis balls are placed into hopper 33 and machine 10 is wheeled to a playing surface and positioned to eject tennis balls across a net in the direction of the player. Prior to assuming the playing position, a player connects the machine to a suitable source of power, energizes the controls, and manually pre-sets the desired speed of ball discharge, height of ball trajectory by adjusting handle 92, the desired rate of ball feed, and whether or not the horizontal angle mechanism is to be utilized by adjusting handle 102. At this time, ejecting motors 72, 73 are rotating; however, ball feed motor 46 has not yet been energized. Next the player energizes the ball feed motor 46 and assumes his position at the other side of the court ready for play. Individual balls are not being selected from the ball hopper 33 by rotating aperture disc 42 and are being permitted to fall one at a time through apertures 48 to 53 down through aperture 96 in plate 95 and then into tube 54 whereupon a ball travels to the opposite end of tube 54 over guide 55, FIGS. 8 and 13, and becomes introduced into ball discharge mechanism 100. The ball is then drawn into and momentarily engaged between the two outwardly rotating wheels 80, 81 and is propelled outwardly at a fast rate of speed which can be varied from a low to a very high speed. If the horizontal angle mechanism has been energized, there is provided a series of simulated tennis "returns" falling at different locations on the playing surface. Alternately, if the horizontal angle mechanism has not been energized, the machine will provide a series of precisely controlled simulated tennis "serves." Play may be terminated or resumed at will by the manual controls. While not shown, it is recognized that remote controls may be employed as more fully described in U.S. Pat. No. 3,777,732, previously mentioned.

To summarize the control features, it can be seen that the frequency of ball ejection, the vertical angle of ejection, the horizontal angle of ejection, and the speed of ejecting are all subject to control and variation to present a great variety of play experiences. Frequency of ball ejection is controlled by varying the speed of variable speed motor 46 which rotates aperture disc 42 whose speed thus determines how often a ball is ejected

toward the player. The vertical angle of ejection is controlled manually by handle 92. The horizontal angle of ejection in a swinging movement is controlled by handle 102 which in turn controls the mechanism which controls cam 57 and follower 112. The speed of ejecting or velocity imparted to the ball is controlled by simultaneously varying the speed of the variable speed ejecting motors 72, 73 which in turn control the speed of the ejecting wheels 80, 81. Another feature of the present machine is that cups 59 (see FIG. 14) can be placed in selected ones of apertures 48 through 53 to block the passage for the tennis balls. By placing cups 59 in the proper apertures, the machine can be set up to eject balls at the two side positions and miss the center ejecting position. Utilizing this feature, two players could receive practice by a single machine.

Of particular significance is that the vertical post arrangement utilizing post 68 eliminates the need to rotate any frame or sub-frame as such and eliminates the need to employ deflecting baffles as with the prior apparatus. Furthermore, the positive cam tracking and pivoting arrangement utilizing cam 57 and pivotal rod 108 provides positive horizontal pitch directions suited to the inexperienced as well as experienced players.

What is claimed is:

1. A ball projecting machine for ejecting tennis balls, and the like, of a selected substantially uniform compressible type comprising, in combination:

- a. a machine supporting frame;
- b. a vertical post means having an upper end rotatably supported by said frame for rotative swinging about a fixed vertical axis;
- c. a pair of motor mounts mounted on said post means at the lower end thereof and on opposite sides thereof, said post means providing means to enable said mounts to swing together about the vertical axis of the post means and to pivot on said post means about a horizontal axis passing through the lower end thereof;
- d. a pair of electrical drive motors each being mounted on a respective said motor mount and having driven shafts extending therefrom and rotating in opposite directions at a predetermined speed with the respective axes thereof positioned parallel, laterally spaced, without lateral tilt and with a predetermined rearward tilt, said motors having in association therewith control means for controlling the energization and speed thereof;
- e. a pair of cylindrical-shaped rotatable ball ejecting wheels mounted on respective shafts of said motors and being swingable and pivotable with the motor mounts therefor about said respective vertical and horizontal axes, said wheels having ball engaging peripheral surfaces with a common central plane perpendicular to the axes of the wheels and of sufficient rigidity such that the outer surface of a ball may be at least slightly compressed when passing between said ball engaging surfaces;
- f. a ball feed structure including a ball receiving hopper supported on said frame above said wheels and having a ball entry aperture in the bottom thereof, an electrically driven apertured disc mounted on said frame below said ball entry aperture and having a predetermined number of apertures to sequentially receive and pass successive balls one at a time and at a predetermined rate, and having in association therewith control means for

controlling the energization and speed of said apertured disc, a plate member fixed below and parallel to said disc and containing a ball aperture therein, a flexible elongated hollow feed tube mounted with a ball receiving end fixedly positioned below said apertured disc and aligned with said plate ball aperture to receive each said ball passed by said apertured disc and plate aperture in succession and with the opposite discharge end of said tube being directed between said wheels whereby to guide said balls through said tube to said wheels in the peripheral direction of said ball engaging surfaces whereby each ball when received, is at least slightly compressed between and is ejected from and free of said ball engaging surfaces at some predetermined speed, said feed tube being flexible so as to permit changes in the angle of rearward tilt of said wheel axes and with the discharge end thereof being secured to said motor mounts in a manner enabling said tube discharge end to swing and pivot therewith; and

g. operator means mounted on said frame and operatively connected to swing and tilt said motor mounts about the respective said vertical and horizontal axes, said operator means including a first operator means connected to said motor mounts and adapted to pivot said motor mounts on said post means about said horizontal axis to adjust rearward tilting of said motor shaft and wheel axes and the vertical angle of ejecting a ball received between said wheels while causing said tube member to be appropriately flexed and its discharge end to be repositioned according to the amount of such adjustment and including a second operator means mounted on said frame arranged to swing said motor mounts about said post means vertical axis to adjust the horizontal positioning of said motor shaft and wheel axes and the horizontal trajectory of successive such balls, said second operator means includes a tracking type cam rotatably driven in coordination with said apertured disc, a lever having one end connected to follow the track of said cam, having an opposite end pivotally connected to a crank arm secured to said post means to swing said post means about its vertical axis and having a pivotal support block slidably and pivotally mounting said lever between said lever ends, said pivotal support block being positionable on said frame between said lever ends to control the amount said lever opposite end swings said crank arm and post means about said vertical axis as said lever one end tracks said cam.

2. A machine as claimed in claim 1 wherein said ball apertured disc comprises a circular, horizontally positioned plate member having a plurality of peripherally spaced holes to pass balls received thereon and includes a vertical cylindrical-shaped post member fixed on top of said plate in a position axially offset from the center of the disc and operative to engage and stir balls in said hopper to effect free circulation of such balls through said apertured disc.

3. A machine as claimed in claim 1 wherein said second operator means further includes manually rotatable operator means arranged to support and position said pivotal support block.

4. A machine as claimed in claim 1 in which for a minimum swinging effect position said movable sup-

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port block is arranged to move to a position proximate the end of said crank arm to which said lever opposite end is connected to provide no swinging effect.

5. A machine as claimed in claim 1, further comprising an adjustable pivotal support which is movable be-

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tween a position providing a maximum swinging effect of said post means and a position providing a minimum swinging effect of said post means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,913,552 Dated October 21, 1975

Inventor(s) Alfredo S. Yarur; Alfredo F. Yarur; Nicolas J. Yarur

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 2, line 11, "frame" should be --feed--.

Col. 4, line 63, "and" should be --or--.

Col. 6, line 19, "motor" should be --motors--.

Col. 6, line 39, "not" should be --now--.

Signed and Sealed this

twenty-third Day of March 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks