United States Patent

[11] 3,601,111

[72] Inventor **James G. Embry**
409 Zephyr Drive, San Antonio, Tex. 78239

[21] Appl. No. **67,364**
[22] Filed **Aug. 27, 1970**
[45] Patented **Aug. 24, 1971**

[54] **TENNIS BALL-THROWING TRAINING DEVICE**
8 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **124/7,** 124/49, 124/36, 124/41
[51] **Int. Cl.** **F41b 15/00**
[50] **Field of Search** ..... 124/7, 1, 6, 36, 41, 49, 50, 16; 273/26 D; 272/83

[56] **References Cited**

UNITED STATES PATENTS

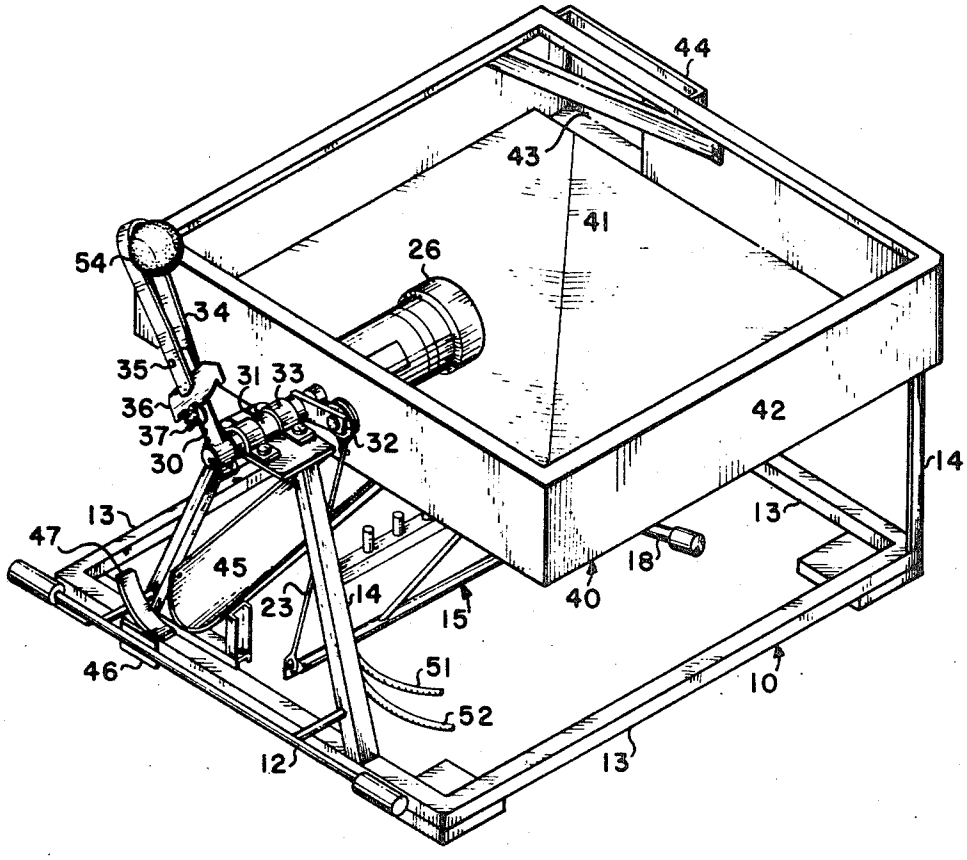
2,877,757	3/1959	Giovagnoli	124/7
3,207,147	9/1965	Giovagnoli	124/49
3,406,674	10/1968	Zone	124/7

FOREIGN PATENTS

165,921	11/1955	Australia	124/16

Primary Examiner—Richard C. Pinkham
Assistant Examiner—William R. Browne
Attorney—Willard J. Hodges, Jr.

ABSTRACT: An electric-powered tennis ball-throwing device having a feed hopper and ball chute for supplying individual tennis balls to a spring-propelled throwing arm, oscillating components mounted on resilient feet vibrate the entire machine to facilitate the ball feed function, the throwing arm incorporate adjusting means for varying the height of the ball trajectory and the speed of propulsion.



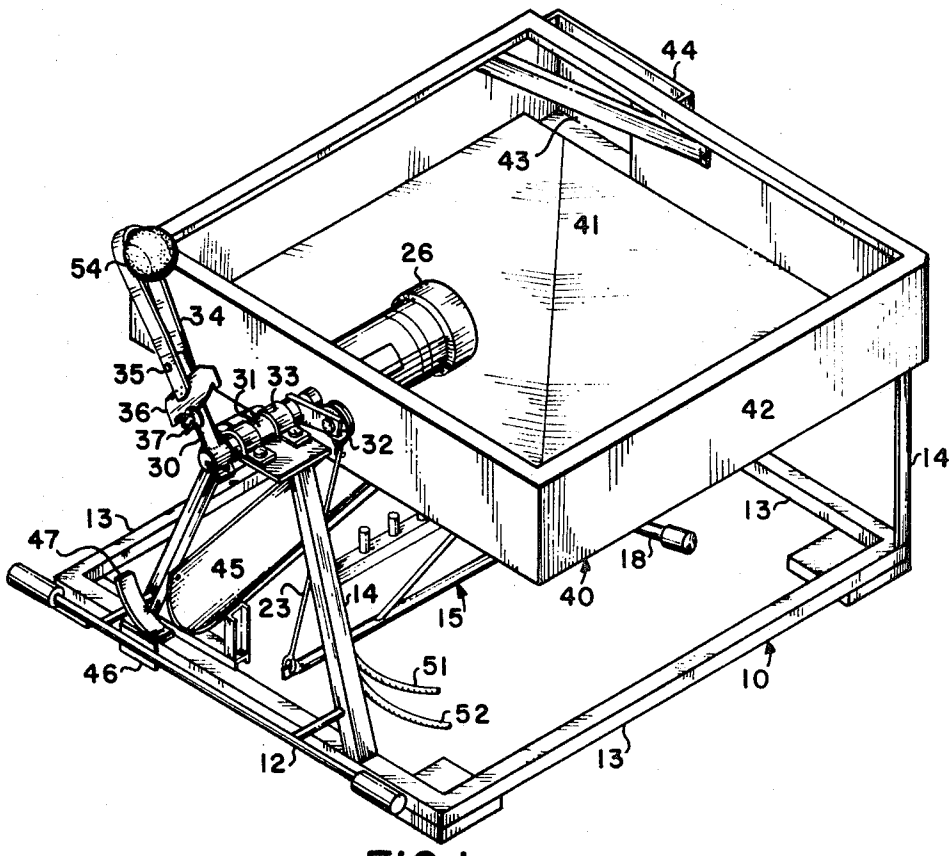


FIG. 1

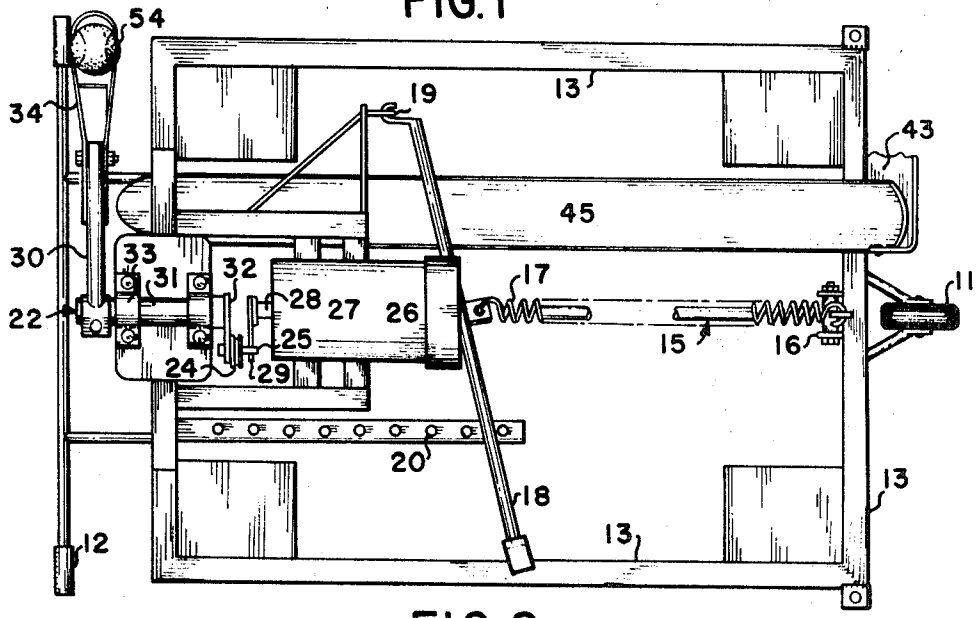


FIG. 2

INVENTOR

JAMES G. EMBRY

BY Willard Hodges Jr.

ATTORNEY

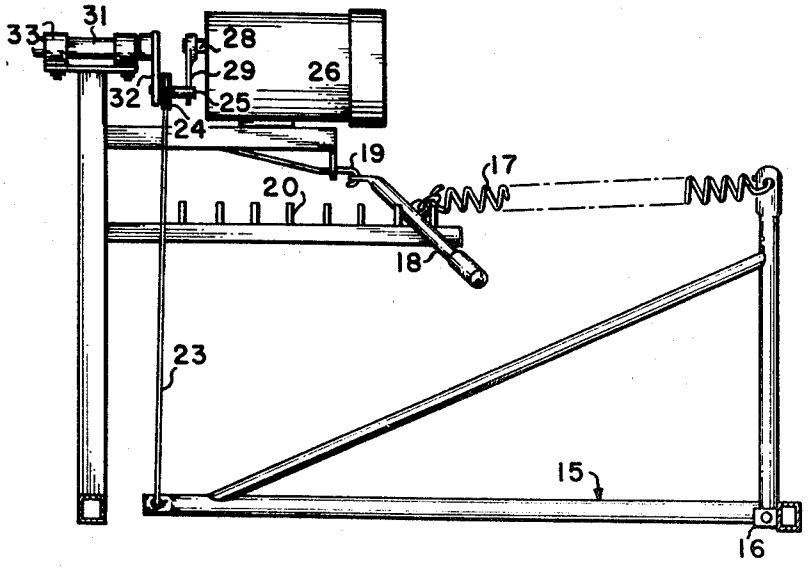


FIG. 3



FIG. 4



FIG. 5

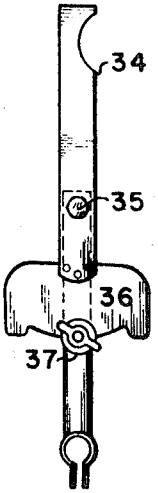


FIG. 7

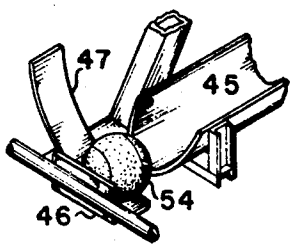


FIG. 6

INVENTOR

JAMES G. EMBRY

BY

ATTORNEY

TENNIS BALL-THROWING TRAINING DEVICE

Several designs for ball-propelling devices are known to the prior art. The vast majority of these devices utilizing a throwing arm are particularly designed with the view to propelling baseballs. Most devices pertaining to the art of propelling tennis balls have utilized a device to strike the tennis ball. The variation in weight between a baseball and a tennis ball create substantial problems in positive feed means and hopper design as well as problems in propelling the tennis ball. The desire to solve the problems of feeding the tennis ball in the throwing device as well as propelling the tennis ball in consistent manner prompted your inventor to conceive and develop the device of this invention. Various objects were accomplished in the design and development of the invention constituting the subject matter of this patent application.

One object was to accomplish an effective feed means to supply the light tennis balls individually to the throwing arm.

Another object was to provide a relatively inexpensive portable device which could serve as a training device for tennis instruction.

Another object was to provide a device capable of delivering tennis ball at preselected angles of trajectory and rate of propulsion.

Other objects accomplished and advantages of the device will become apparent from a study of the construction and operation of the device of this invention.

In brief, the device of this invention comprises a resilient or flexible base which may rest on the ground or surface of the tennis court. Supported above the base is a feed hopper and ball feed chute which supplies the individual tennis balls to a throwing arm. The throwing arm is connected by means of a crank and pivot to a drive cable which engages a tensioned triangle which is adjustably spring loaded permitting variation in the rate of propulsion of the individually thrown tennis balls. The tensioned triangle provides propulsion force to the crank of the throwing arm to propel tennis ball as well as contributing to the oscillation of the device on the flexible or resilient feet to facilitate the feed function. An electric drive motor activates the device through a reduction gear transmission which activates the throwing arm by means of a pivot lever. The tensioning of the triangle-tensioning spring is accomplished by the pivot lever lifting the throwing arm crank and rotating the throwing arm to such a position as to cause the throwing hand to engage a tennis ball adjacent the feed chute. At the moment the ball is engaged by the throwing hand, the lifting action of the pivot lever on the throwing crank passes over top dead center and the triangle tension spring drives the throwing crank carrying the throwing arm sharply downward propelling the tennis ball.

For more detailed description of the construction and operation of the device, reference is made to the attached several views and the following detailed description wherein identical reference characters are utilized to designate similar or equivalent components throughout the various views and the following detailed description.

In FIG. 1 is a perspective side view of the device viewed from slightly above.

FIG. 2 is a top view of the device with the feed hopper removed.

FIG. 3 is a fragmented elevation view particularly illustrating the tensioned triangle which provides adjustable throwing force and contributes to the oscillation of the device.

FIG. 4 is a fragmented side elevation of a resilient foot incorporating a resilient pad.

FIG. 5 is a fragmented side elevation of a resilient foot incorporating a resilient spring.

FIG. 6 is a fragmented perspective view of the ball feed chute, ball stop and ball support.

FIG. 7 is a side fragmented elevation view of the throwing arm disclosing details of the components permitting ball trajectory adjustments.

With particular reference to FIGS. 1 and 2, the tennis ball-throwing machine of this invention is constructed on a frame 10 which may for ease of maneuver include a wheel 11 and a maneuvering handle 12. The frame 10 of the device is of conventional construction utilizing stringers 13 as the base for the device. All components above the base are supported by vertical supports 14. For description of the components utilized in propelling the tennis ball, reference is particularly made to FIGS. 2 and 3. An important feature of this construction is the tensioned triangle 15 which is pivotally secured to frame 10 by triangle pivot point 16. The tensioned triangle is driven and maintained in an operating condition by triangle tension spring 17. The spring 17 is attached to spring adjusting arm 18 which is pivotally secured to a portion of the frame by adjusting arm pivot 19. The degree of tension applied to triangle 15 is accomplished by applying more or less tension to the spring 17 by moving the adjusting arm 18 to a selected adjusting stop 20. Pivotally secured to the opposite end of triangle 15 from pivot point 16 is drive cable 23 which interconnects triangle 15 and drive cable pivot point 24. Projecting outward and through cable drive pivot point 24 is a pivot pin 25. The activating force for the machine is electric drive motor 26 which propels the device through the transmission 27 and transmission drive shaft 28 which rotates pivot lever 29. The details of the construction of the electric motor and transmission will not be described in that the device is well known to the art and available on the commercial market as the geared motor for driving conveyor belts. Secured to the upper extremities of suitable vertical support members 14 is a throwing arm 30 which is secured to the outer end of the throwing arm shaft 31. Secured to the opposite end of shaft 31 is throwing arm crank 32. Shaft 31 is mounted in suitable shaft-bearing means 33. With particular reference to FIG. 1 and FIG. 7, adjustably mounted on the end of the throwing arm 30 is throwing hand 34. Throwing hand 34 is pivotally attached to throwing arm 30 by a height pivot 35 permitting tilting of throwing hand 34 in relation to throwing arm 30. The height fan 36 is secured in the desired position by throwing hand adjusting clamp 37. Positioned on the upper end of the vertical supports 14 is feed hopper 40. In the preferred embodiment this feed hopper 40 was constructed of sheet metal having a bottom 41 with side frames 42. In the side frame 42 at the end corner of the device opposite the drive motor 26 is a ball door 43. Leading from a ball door 43 is a short ball door chute 44 which feeds into the elongated ball feed chute 45. In the preferred embodiment, this ball feed chute 45 was constructed of a "U" section of sheet metal. Ball feed chute 45 is rigidly secured to frame 10. Constructed adjacent to end of ball feed chute 45 is ball stop 46 and an arcuate ball support 47, as particularly illustrated in FIG. 6. The entire mechanism is resiliently supported above the ground or the surface of the tennis court on a multiplicity of resilient feet which may be constructed in two configurations. One method is to utilize spongelike resilient feet 49 of plastic materials as illustrated in FIG. 4. Another method of construction would utilize resilient springs 50 as illustrated in FIG. 5. The device may be connected to an external source of electrical energy by means of power cable 51. Attached to drive motor 26 is also the motor control cable 52 which permits the operator to control the motor 26 by means of motor control switch. Construction of the motor control switch is not illustrated in that it may be a conventional pushbutton on-off switch readily available on the commercial market.

In the preferred embodiment, frame 10, stringers 13 and vertical supports 14 utilize angle iron or strap metal which was secured by welding. Other conventional methods of securing the various members in an integral structure might be utilized.

The ball hopper 40 which was of sheet metal construction was secured to the vertical supports 14 by means of bolts or screws. Other methods of securing, however, would be acceptable. In placing the device in operation a group of tennis balls may be indiscriminately deposited in the hopper 40 and power cable 51 attached to external source of electric power. An activation of the motor control switch (not illustrated)

places the device in operation which continues repetitively throwing tennis balls until the device is deactivated. As previously stated, the tension triangle **15** through triangle tension spring **17** places drive cable **23** under the desired degree of tension. This is best illustrated in FIG. **3**. The motor **26** through transmission **27** rotates transmission drive shaft **28** moving or rotating pivot lever **29**. Pivot lever **29** contacts and rotates pivot pin **25** carrying throwing arm crank **32**; as crank **32** is rotated and lifted additional tension is placed on spring **17** through triangle **15** by means of drive cable **23**. The rotation of crank **32** rotates shaft **31** carrying throwing arm **30** and throwing hand **34**. Throwing arm **30** is so positioned on shaft **31** as to arrive at the end of ball feed chute **45**, ball stop **46**, ball support **47** at just an instant before pivot lever **29** has lifted the throwing crank **32** to top dead center. As tennis ball **54** is grasped by hand **34**, crank **32** passes over top dead center. From this point the tension of spring **17** through triangle **15** and drive cable **23** rapidly pulls crank **32** downward which thrusts throwing arm **30** upward through its throwing arc propelling the tennis ball forward. If motor **26** is left in operation the cycle is repeated. Particular reference to FIG. **7**; the angle at which the ball **54** is propelled may be adjusted by height fan **36**. In FIG. **7** if throwing hand **34** were tilted to the right, a low trajectory would be accomplished. As a maximum tilt to the left the machine would throw a high ball or lob the ball.

Having described in some detail the construction and operation of the device what is desired to be claimed is all embodiments and adaptations of the device not departing from the scope of the appended claims or their equivalents.

1. A tennis ball-throwing machine comprising:

a. a frame structure having a top portion and a bottom portion,

b. a feed hopper mounted on the top portion of said frame structure,

c. throwing arm means constructed on an elongated axis rotatably mounted on said frame structure and adapted to receive and propel a tennis ball,

d. a ball feed means interconnecting said feed hopper and said throwing arm means,

e. a tensioned triangle pivotally mounted on said frame and attached to said frame structure,

f. a means interconnecting said tensioned triangle and said throwing arm, and said frame being constructed and arranged to retain said tensioned triangle under spring-loaded tension,

g. motor means operably engaging said throwing arm means for imparting rotary motion force to said throwing arm means,

h. a throwing hand constructed on an elongated axis secured to said throwing arm means, said hand adapted to receive a tennis ball, and

i. a spring-adjusting arm pivotally attached at one end thereof to said frame structure, said arm having means attached thereto for varying the spring-loaded tension applied to the throwing arm for throwing a projectile, and

j. a means on said frame having a multiplicity of adjusting arm stops for receiving and retaining a free end of said spring-adjusting arm.

2. The invention of claim **1** including:

a. a throwing hand constructed on an elongated axis secured to said throwing arm means said hand adapted to receive a tennis ball, and

b. means for pivotally adjusting the elongated axis of said throwing hand relative to the elongated axis of said throwing arm means.

3. The invention of claim **1** including:

a. resilient feet secured to the bottom portion of said frame structure constructed and arranged to support said frame structure above a substantially flat surface.

4. The invention of claim **3** wherein said resilient feet comprise plastic resilient pads.

5. The invention of claim **3** wherein said resilient feet comprise resilient springs.

6. The invention of claim **1** wherein said motor means comprises:

a. an electric motor operably connected through a reduction gear transmission to a transmission drive shaft upon which is mounted

b. a pivot lever which contacts and drives in rotation said throwing arm means.

7. The invention of claim **1** wherein said ball feed means comprises:

a. a ball feed chute having a feed end and a discharge end,

b. a ball stop secured to said frames and adapted to stop and retain a tennis ball adjacent the discharge end of said ball feed chute, and

c. a ball support means secured to said frame and adapted to support a tennis ball adjacent the discharge end of said ball feed chute.

8. The invention of claim **1** wherein said throwing arm means comprises:

a. a shaft rotatably mounted on said frame,

b. a throwing arm secured to one end of said shaft, and

c. a crank secured to the end of said shaft opposite said throwing arm and operatively connected to said motor means.