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Staples

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[54] BALL PROJECTING DEVICE

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[52] **U.S. Cl.** .....**124/1,** 124/51, 124/49, 124/30 R

[51] **Int. Cl.**.....**F41b 15/00**

[58] **Field of Search**.....124/1, 41, 49, 50, 124/48, 30 R; 273/26 D

[56] **References Cited**

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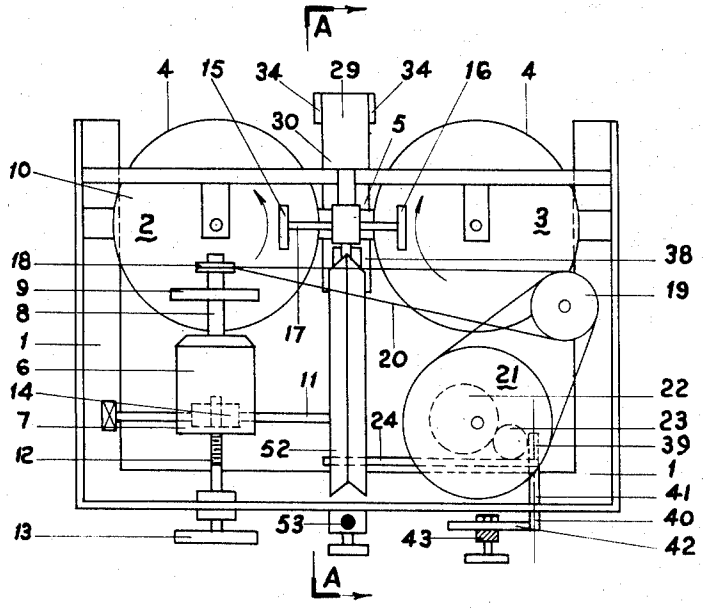
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Assistant Examiner—William R. Browne
Attorney—Luke A. Mattare et al.

[57] **ABSTRACT**

The invention relates to a ball projecting arrangement wherein the balls may be projected from between the adjacent portions of the peripheries of a pair of wheels located in the same plane and driven to rotate in opposite directions. The adjacent portions of the peripheries of the wheels are spaced apart less than the diameter of a ball to be projected and the arrangement includes a variable speed ball feed supply mechanism and a variably positioned and movable deflector plate located between and in front of the wheels relative to the direction in which the wheels are adapted to rotate. The positioning of the deflector plate is controlled by a set of rotating cams.

7 Claims, 3 Drawing Figures



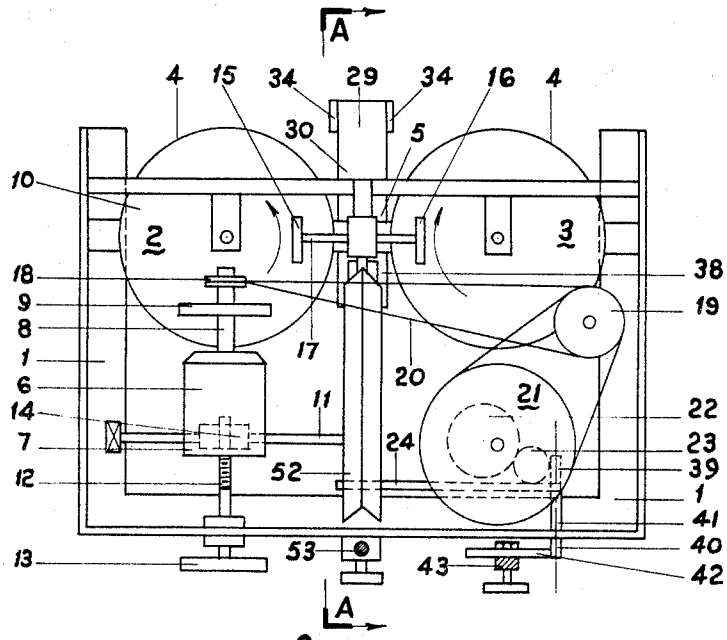


fig. 1

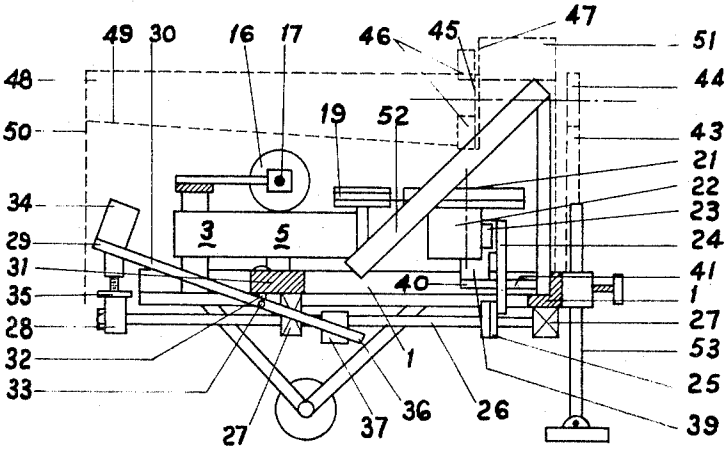


fig. 2

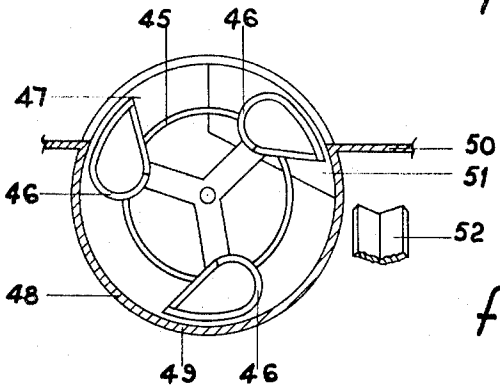


fig. 3

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BALL PROJECTING DEVICE

This invention relates to devices for projecting balls and more particularly to such devices generally used in the coaching of ballgames such as tennis, cricket or baseball, for example.

Devices of this type usually make use of a striking or throwing mechanism to project the balls. In this arrangement difficulty is encountered in designing a suitable controllable deflection mechanism. Also, complications and inconveniences arise in providing a suitable variable feed mechanism, since the ejecting mechanism must be accurately synchronized with the feed of the balls thereto.

It is thus the object of this invention to provide a ball projecting device having a simple arrangement for projecting balls and a variable feeding and deflecting mechanism.

According to this invention there is provided a ball projecting arrangement comprising two wheels rotatable in a plane and spaced apart such that the smallest distance between their peripheries is less than the diameter of a ball to be projected and means to drive the wheels in opposite directions.

Further features of the invention provide for both wheels to have the same diameter and to be driven in unison and for at least one wheel to have a pneumatic tyre on its circumference.

The invention also provides for a deflecting arrangement for projected balls comprising a deflector plate mounted for universal movement and in the path of projection and cams associated with the plate to provide variable movement thereto.

Further features provide for the cams to be independently driven in which case the speed of each cam may be varied or to be driven by the same transmission thus allowance will be made for one cam to be variably located relative to the others.

Provision is made also for a feed mechanism for a ball projecting device comprising a container having an inclined base when in use, a member at the lower end of the container, said member being rotatable about an axis substantially parallel to the base, pockets distributed on the periphery of the member, each of which is adapted to accommodate one ball and a variable drive for the member, the mechanism being such that a single ball is collected by each pocket from the bottom of the container and deposited onto a feed-line at the upper end of the member.

Still further features of the invention will become apparent from the following description of a preferred embodiment of the invention.

The embodiment will be described by way of example only and with reference to the accompanying drawings in which:

FIG. 1 is a plan view of the device;

FIG. 2 is a cross-sectional side view through A—A in FIG. 1; and

FIG. 3 is a cross-sectional view of a ball container having the feeding mechanism at one end.

In this embodiment of the invention a ball projecting device is designed to project tennis balls for coaching purposes.

As shown in the accompanying drawings, in which some details have been left out for clarity, a wheeled framework 1 is adapted to support two wheels 2 and 3 located in the same horizontal plane and having equal

diameters. The smallest distance between the rims 4 of the two wheels is less than the diameter of a tennis ball. The wheels 2 and 3 are rotatable in opposite directions such that a ball fed into the restricted passage 5 between the two wheels may be frictionally drawn therein and expelled outwardly.

In this case the wheels 2 and 3 are driven by discs frictionally engaging the upper surface thereof, but it will be appreciated that a system of vee-belts and pulleys may be used to obtain the appropriate drive. An electric motor 6 is pivotally supported by the frame 1 at the rear end 7 of the motor 6. Its output shaft 8 is fitted with a disc 9 preferably having a rubber rim. The motor 6 is located such that the disc 9 will rest on the upper surface 10 of one wheel 2. It will be understood that since the pivot 11 supporting the motor 6 is off-centre of gravity, the weight of the motor 6 will bias the disc 9 to bear against the surface 10 of the wheel 2.

The position of the motor 6 is axially variable by means of a screw threaded rod 12 projecting through the frame 1 to an operating handle 13 to facilitate turning. The screw threaded rod 12 engages a bracket 14 having a complementarily threaded perforation and slidably mounted on the pivot 11. By varying the axial position of the motor 6 the disc 9 thereon will be supported on the wheel 2 at different positions and different speeds will accordingly be obtained. A variable speed-device for the wheel is thus provided.

Both wheels 2 and 3 are turned at the same speed and in opposite directions by discs 15 and 16 respectively forming a bridge across the passage 5 between the two wheels 2 and 3. Each disc 15 and 16 is secured to a shaft 17 rotatably supported by the frame 1 and located such that both distances from the centre of a wheel 2 or 3 to the respective disc 15 or 16 are the same. Both discs 15 and 16 are also of the same diameter and preferably fitted with rubber rims.

It will be appreciated that in order to provide an effective transmission with discs 15 and 16, as above described, the disc are preferably located such that their common axis crosses the axes of the respective wheels 2 or 3. Also the discs must frictionally engage the upper surface of the wheels and must be biased to press against said surfaces.

The output shaft of the motor 6 is also provided with a pulley 18 to drive ball-deflecting and feeding mechanisms by means of a belt and pulley arrangement.

As shown, the pulley 18 on the output shaft 8 drives a second pulley 19 located on the opposite side of the frame by means of a belt 20. The second pulley 19 in turn drives a third pulley 21 which has located thereunder an eccentric cam 22. Both the ball-deflecting and feeding mechanisms are connected to the cam follower 23 to which reciprocating motion is imparted.

An arm 24 from the follower extends to a ratchet 25 or other simple direction drive mechanism mounted at one end of a shaft 26 extending horizontally under the restricted passage 5 and at right angles to an imaginary line connecting the two centres of the wheels 2 and 3. The shaft 26 is supported by the frame 1 through anti-friction bearings 27 and projects beyond the restricted passage 5. The end of the shaft 26 remote from the ratchet 25 has an adjustable cam 28 supporting the free end 29 of a deflecting plate 30.

The beam 31 of the frame 1 supporting the two wheels 2 and 3 at their centres passes under the restricted passage 5 where a pivot 32 for the deflecting

plate **30** extends downwardly. A second pivot **33** at right angles to the first supports the deflecting plate **30.** Due to the two pivots **32** and **33** at right angles to each other, the deflecting plate **30** will be capable of universal movement relative to the frame **1.** The deflecting plate **30** extends from the pivots **32** and **33** outwardly where the free end **29** is supported by the cam **28** at the end of the shaft. The free end **29** is provided with upwardly projecting wings **34** to direct the projected balls.

The cam **28** therefore provides vertical movement to the deflecting plate **30.** The deflecting plate **30** may be optionally provided with an adjustable foot **35** bearing on the cam **28** and a friction clutch allowing the deflecting plate **30** to be set and retained at an angle to the axis of the passage and in the horizontal plane.

The inward extension **36** of the plate **30** from the pivots **32** and **33** is bifurcated and passes over the shaft **26** where a second cam **37** is provided thereon. The latter is adapted to interact with the arms **38** of the bifurcation and consequently to provide horizontal movement to the deflecting plate **30.**

Due to the two cams **28** and **37** the plate **30** will therefore be simultaneously provided with vertical and horizontal movement upon rotation of the shaft **26.** The cam **28** at the end of the shaft **26** is provided with a friction clutch arrangement so that it may be set at any angle relative to the other cam **37** to afford a multitude of different motions to the deflecting plate **30.**

In the case where the deflecting plate **30** is provided with a friction clutch, oppositely disposed and horizontal locating bolts are adjustably positioned relative to the frame **1.** The bolts act with the outer side of the wings to limit the horizontal movement of the deflecting plate. Thus, although the cam **37** will provide a fixed amplitude to the movement of the deflecting plate, the clutch and bolts will afford a variable amplitude to the free end of the plate. The plate may even be fixed in a desired position.

The cam follower **23** is also connected to an arm **39** of a bell-crank lever **40** being part of the feeding mechanism. A shaft **41** separating the arms **39** and **42** of the bell-crank lever **40** extends through and is rotatably supported by the frame **1.** The arm **42** is releasably connected to a connecting rod **43** such that an end of the connecting rod **43** may be located along the length of the arm **42.** This affords a variable stroke to the connecting rod **43.**

The connecting rod **43** extends upwardly to a ratchet **44** secured to a shaft, the opposite end of which is fixed to a circular framework **45** having in this case three spaced C-shaped cups **46** at the periphery thereof. Each cup **46** is adapted to accomodate a tennis ball and is shaped such that a ball may be scooped at the lower end of the framework **45.**

The movement of the circular framework **45** is preferably inhibited by means of a brake associated with the ratchet **44.** This prevents the circular framework **45** from turning further than the increments provided thereto by the connecting rod **43.** The feed of the balls may thus be more easily controlled by varying said increments, this being afforded by the variable stroke of the connecting rod **43.**

The shaft connecting the ratchet **44** to the circular framework **45** passes centrally through an end **47** of a part-cylindrical container **48** having a substantially horizontal axis. The upper part of the cylindrical container **48** is absent to allow the insertion of balls therein. Also, the lower part, being the base **49** of the container, is preferably inclined towards said end **47.** The container **48** is conveniently made integral with a sheet metal housing **50** for the ball projecting device.

The upper part of the end **47** of the container **48** has a passage **51** leading into a slide **52** conveniently made from a length of angle iron. The slide is inclined and leads the balls to the restricted passage **5.** Further, the circular framework **45** rotates parallel to the end **47** of the container **48.**

It will be appreciated that the projecting device, the feeding mechanism and the deflecting mechanism are all driven by the same motor **6.** Further, the device allows for variations in ball speed, ball feed and direction of projection. Many combinations are thus possible and the device may be programmed to suit a particular player.

In use, the device is prepared by inserting balls in the container **48** and by adjusting the device to a desired angle by means of an adjustable leg **53.** The tilt of the device provides an upward angle of projection of the balls and a greater angle of inclination of the base **49** of the container **48.**

The motor **6** is then switched on, whereupon the circular framework **45** will be caused to turn. Balls will be scooped at the bottom of the container **48** by the C-shaped cups **46** and will be dropped into the passage **51.** The balls will roll down the slide **52** and through the restricted passage **5** to be projected outwardly by the rotating wheels **2** and **3.** The deflector plate **30** may be adjusted so that it will be cleared by the projected balls or placed in their path in which case the balls will be deflected.

On passing through the restricted passage **5,** the balls will be squeezed and will be accelerated to the tangential velocity of the wheels. It will thus be understood that the velocity of projection will be the tangential velocity added to the velocity gained by the force provided due to the resiliency of the ball.

Prior to starting the motor it is possible that a ball may be resting at the bottom of the slide. Due to the low starting torque of an electric motor, the ball may prevent rotation of the wheels and consequently of the motor when it is switched on. This may cause damage to the motor. A safety device is optionally included in the machine. In one form the device forms part of the slide. The lowermost portion of the slide is divided from the main part of the slide to provide a separate member, not shown. The member is pivotally mounted on the frame and has an adjustable counterweight depending therefrom. The upper end of the member is prevented from swinging downwardly and is aligned with the rest of the slide by means of a stop.

When the wheels are in motion and have gained momentum a ball will roll down the slide, over the member and will be projected out. However, when the wheels are stationary, the ball will stop at the lower end of the member resulting in an imbalance which will cause the member to tilt and discharge the ball.

It will be appreciated that the above example is not limitative to the scope of the invention and other mechanisms are possible for the feed and deflection of the balls. Should hard balls be used such as cricket balls, the rims **4** of the contrarotating wheels **2** and **3** are fitted with pneumatic tyres which will provide the desired resiliency. This construction may also be used with resilient balls.

What I claim as new and desire to secure by Letters Patent is:

1. A ball projecting arrangement comprising a framework, a pair of wheels rotatably supported in the same plane on said framework and spaced apart such that the smallest distance between their peripheries is less than the diameter of a ball to be projected, means connected with the wheels to drive the wheels in opposite directions, means for feeding balls between the wheels from behind the wheels relative to the exit point of the balls from the wheels, a pivotally mounted ball deflector plate having a portion thereof located between and in front of the wheels in the path of balls projected by the wheels, a rotatable shaft supported on the framework adjacent the wheels and to one side of the plane of the wheels, said shaft extending substantially at right angles to a line extending between the axes of rotation of the two wheels, and means carried on said shaft operatively associated with the pivotally mounted deflector plate for causing said deflector plate to have simultaneous vertical and horizontal movements upon rotation of said shaft, and said means carried on said shaft comprising a set of cams.

2. A ball projecting arrangement as claimed in claim 1 in which the periphery of each wheel is provided with a pneumatic tyre.

3. A ball projecting arrangement as claimed in claim 1 in which the means for feeding balls comprises a container for balls, an inclined base to the container, a member at the lower end of the container, said member being rotatable about an axis substantially parallel to the base of the container, pockets distributed on the periphery of the member, each pocket adapted to accommodate a single ball, and a drive for the member, and a discharge chute extending from the upper edge of said member to a position between and behind the wheels relating to the direction of rotation to which the wheels are adapted.

4. A ball projecting arrangement as claimed in claim 3 in which the drive for the ball feed mechanism is a variable speed drive.

5. A ball projecting arrangement as claimed in claim 1 in which the means for feeding the balls comprises a container for balls, an inclined base to the container, a member rotatably mounted in the container and at the lower end thereof, said member having pockets distributed on the periphery threof, each pocket being adapted to accommodate a single ball, and a discharge chute extending from the upper region of the container to a position between and behind the wheels relative to the direction of rotation of the wheels, for receiving one ball at a time from the member.

6. A ball projecting arrangement as claimed in claim 1 in which the cams on the shaft are rotatably adjustable relative to each other.

7. A ball projecting arrangement as claimed in claim 1 in which the means to drive the wheels include a disc rotatable on the surface of one of said wheels and a motor connected to the disc, the disc being adjustable along a radius of the wheel to afford a variable wheel speed drive.

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