Sept. 3, 1968 E. SWARTOUT 3,399,660

BALL THROWING MACHINE HAVING TWO ROTATABLE DISCS WITH CONVERGING AND DIVERGING INTERSTICES

Filed Oct. 23, 1965 2 Sheets-Sheet 1

Fig. 1.

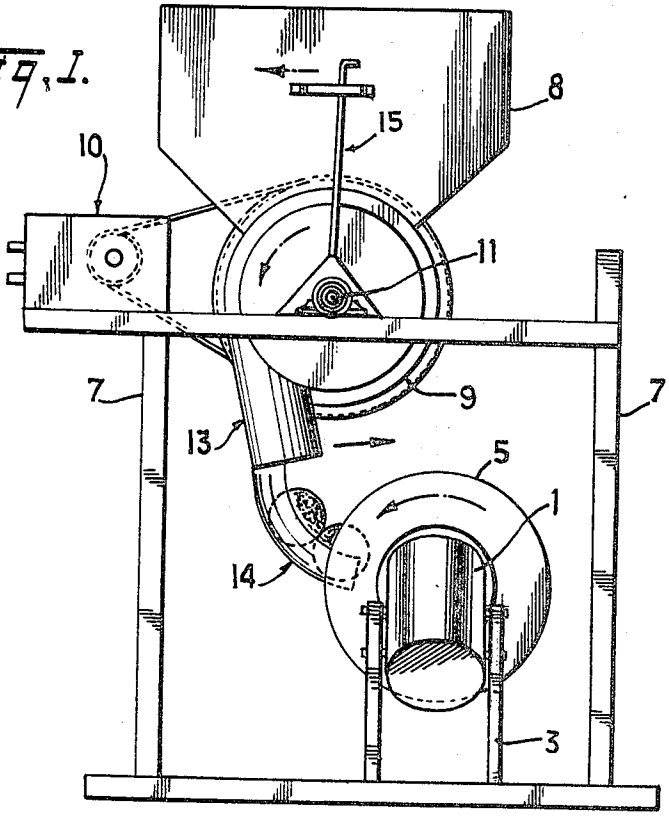
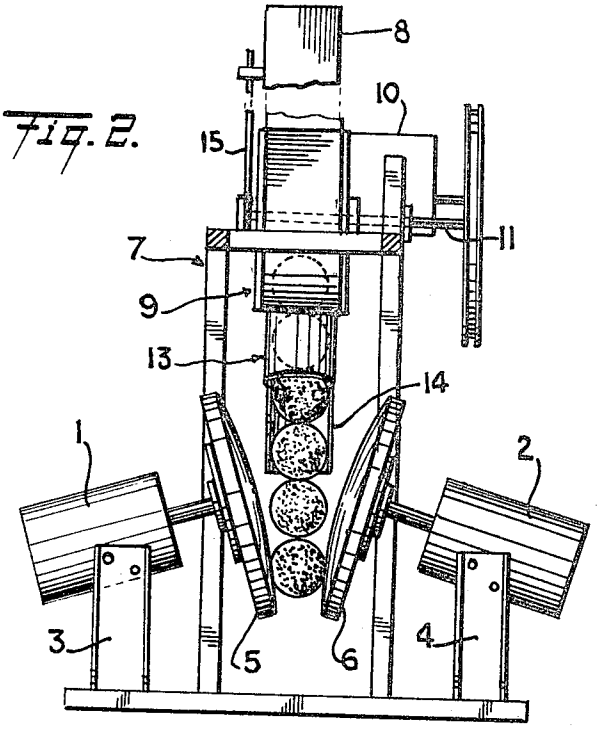


Fig. 2.

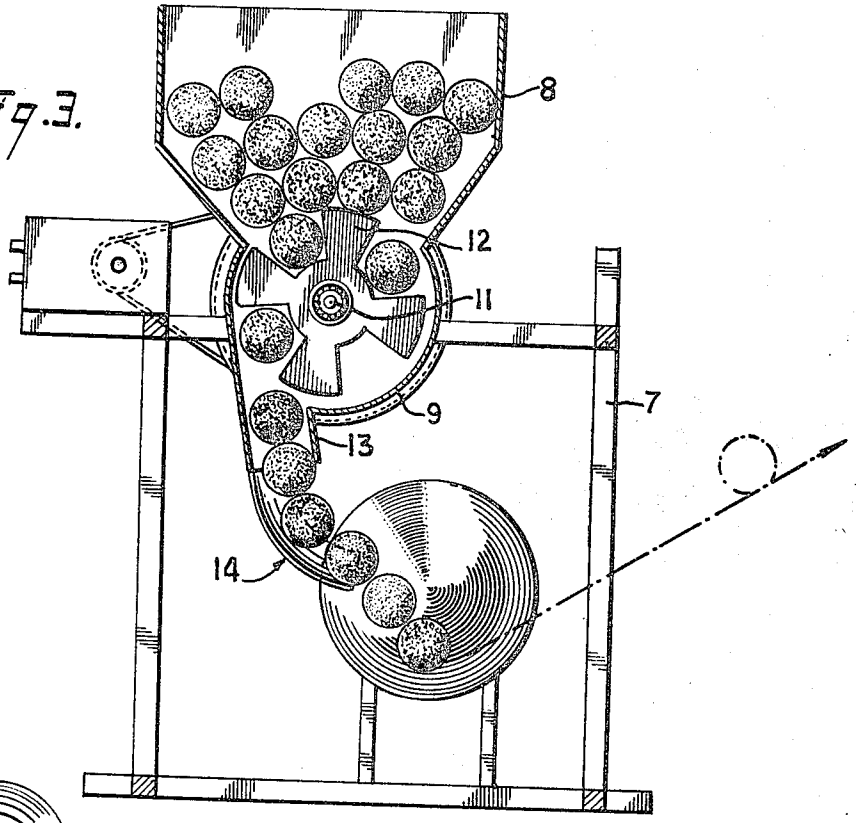


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Fig. 3.



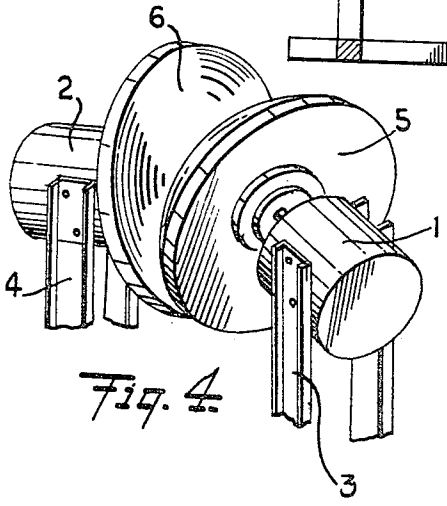


Fig. 4.

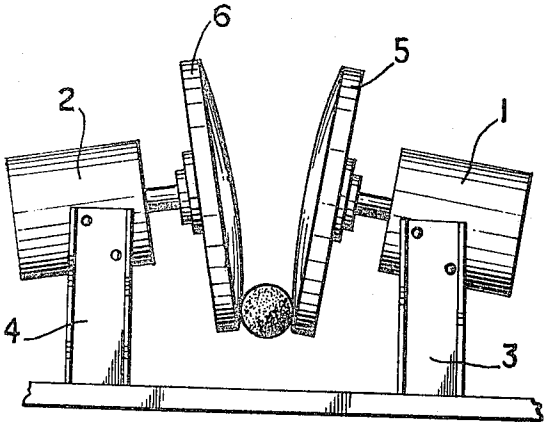


Fig. 5.

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BALL THROWING MACHINE HAVING TWO ROTATABLE DISCS WITH CONVERGING AND DIVERGING INTERSTICES

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7 Claims. (Cl. 124—6)

This invention relates to a machine for projecting a series of tennis balls at regular intervals for the purpose of permitting a novice or professional player to practice the game without the necessity of having available another player.

A number of machines have been constructed and marketed in the past for this purpose. These machines have had a number of deficiencies, and it is the purpose of this invention to provide a machine which is based on an entirely different principle of ball projection and which corrects or alleviates the deficiences of its predecessors.

Some of the objections to present ball throwing machines which this invention proposes to correct are as follows:

(a) Machine causes excessive wear and damage to the ball. Most machines designed for throwing baseballs and adapted to tennis balls are in this category.

(b) Machines which give an undesirable rotation to the ball when it leaves the machine.

(c) Inability to vary the speed of the ball when it leaves the machine. Most of the presently available machines will not eject a ball fast enough to satisfy the professional tennis player.

(d) Inability to conveniently control the timing of the interval between successive balls.

(e) Inability to adjust the vertical angle of ejection of the ball.

(f) Balls must be loaded into feeding mechanism one by one; a basket or bag full of balls cannot be dumped into the machine.

The features of the present invention which provide the means to eliminate or reduce the disadvantages of presently available machines will become evident in the following description of the machine which embodies the present invention and its operation.

FIGURE 1 of the drawings which are a part of this application shows a side view of the complete assembled machine. The balls are fed into the hopper at the top and ejected toward the right.

FIGURE 2 shows a front view of the machine. Balls are being ejected in the direction of the viewer.

FIGURE 3 is a diagrammatic cut-away side view of the hopper and ball feed mechanism.

FIGURE 4 is a rear angle view of the ball ejection mechanism.

FIGURE 5 is a rear view of the ball ejection mechanism.

The construction and operation of the ball ejection mechanism will be first described for the reason that its operation is less self-evident than that of the ball feed mechanism, and for the additional reason that the requirements of the ball ejection device have dictated the design of the other parts of the complete machine. The device consists essentially of two motors **1** and **2** mounted each on a welded steel standard **3** and **4**. The shaft of each motor extends toward the other motor in an angular direction as shown in the drawings. The shaft of each motor carries mounted thereon a flanged steel hub upon which is mounted a flat or cone-shaped disc which has been turned and balanced from built-up laminated wood. The motors are so positioned that the gap between the discs at the closest point is about two inches.

The operation of the device is as follows: The motors are energized and the discs are rotated in the same direction at a high speed, corresponding to a peripheral speed of about one hundred miles per hour, which is the approximate top speed of a fast tennis ball. When the rotating discs have reached maximum speed a ball is dropped into the converging interstice between the two discs at the rear of the machine. The ball is grasped and compressed between the two discs and its position is maintained by friction between itself and the disc surfaces during the time that its speed of motion is being raised to the speed of the disc surface. At the point where the disc surfaces diverge the pressure on the ball is released and it is ejected from the device at a rate of speed which is dependent on its distance from the centers of the rotating discs.

The ball ejection mechanism as described above provides a means for throwing a very fast ball, and provides as well a simple and effective means for varying the speed of same. When the ball is dropped from such a position that its is grasped at the periphery of the discs, it is ejected at a maximum rate of speed. However it may be dropped from a position closer to the center of rotation of the discs and its speed of ejection will be proportionately reduced. The ball is subject only to the compression between two smooth surfaces and is subjected to little more abuse than being struck by a racket. The angle of ejection of the ball may be varied by a slight adjustment in the horizontal position of the motors. When the motors are so adjusted that the point at which the discs are closest together is moved slightly forward, the angle of ejection of the ball may be raised. Furthermore, no undesirable rotational motion is imparted to the ball when it leaves the machine.

The ball feeding mechanism which delivers the ball to the ejection device previously described is shown in FIGURES 1 and 2, and diagrammatically in FIGURE 3. It consists of an open steel frame **7** carrying a hopper **8**, a rotor housing **9** and a control box **10**. Rotating very slowly within the rotor housing upon a shaft **11** is a rotor having four lobes **12**. Attached to the bottom of the rotor housing is an outlet tube **13**, and a ball guide **14**. The rotor housing is so fitted that it may be rotated about the axis **11** independently of the rotor, through a small angle. By this means the position of the guide **14** may be changed so that its outlet will be close to the disc periphery or toward the center of the discs. A handle **15** is provided for changing the position of the ball guide **14** by rotation of the rotor housing. The feed device having four lobes is arranged to feed one ball for each one-quarter revolution of the rotor.

The feed rotor is driven by a belt which is driven in turn by a small motor within the control box **10**. Electrical means are provided for operating this motor over a wide speed range.

Machines have been constructed on the principle of operation herein described using both flat discs and cone shaped surfaces in the ball ejection mechanism. It has been found that by using the cone-shaped surface a somewhat better control over the ejection speed of the ball may be attained.

Having hereinbefore described my invention, what I claim is:

1. A ball-throwing machine comprising two discs rotatably mounted in such relative positions that the axes of said discs shall intersect at a point midway between the two discs, and that the planes of said discs shall intersect at a point outside the peripheries of said discs; means for rotating said discs; means for introducing a ball into the converging interstice between said discs in such a manner that said ball shall be ejected from the diverging interstice between said discs at a high rate of speed.

2. A ball-throwing machine as described in claim 1, wherein the means for rotating said discs comprises two shafts extending axially away from the interstice between said discs, each of said shafts being driven by an electric motor.

3. A ball-throwing machine as described in claim 1, wherein the means for introducing said ball into the interstice between said discs comprises a hopper for holding a plurality of balls, a rotating wheel at the outlet of said hopper fitted with a plurality of lobes attached to its periphery in such a manner that the space between any two of said lobes forms a pocket holding one of said balls, means for rotating said wheel, a receptacle for receiving said balls falling from said pockets and delivering said balls successively into said interstice.

4. A ball-throwing machine comprising two conical surfaces rotatably mounted in such relative position that the axes of said conical surfaces extended through the apices of said conical surfaces shall intersect at a point midway between the two surfaces and that the planes forming the bases of said surfaces shall intersect at a point outside the peripheries of said bases, means for rotating said conical surfaces each about its conical axis, means for introducing a ball into the converging interstice between said surfaces in such a manner that said ball shall be ejected from the diverging interstice at a high rate of speed.

5. A ball-throwing machine as described in claim 4,

wherein the means for introducing said ball into said interstice is so constructed that the point of delivery of said ball may be changed to varying points between the peripheries of said surfaces and the axes thereof, thereby modifying the speed of ejection of said ball while maintaining constant the speed of rotation of said discs.

6. A ball-throwing machine as described in claim 4, wherein the means for rotating said conical surfaces comprises two shafts extending axially away from the interstice between said surfaces, each shaft being driven by an electric motor.

7. A ball-throwing machine as described in claim 4, wherein the means for introducing said ball into the interstice comprises a hopper for holding a plurality of balls, a rotating wheel fitted with a plurality of lobes, the space between any two of said lobes forming a pocket holding one of said balls, means for rotating said wheel, a receptacle for receiving balls falling from said pockets and delivering said balls successively into said interstice.

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