Sept. 6, 1955 P. F. DESI 2,716,973

BALL THROWING MACHINE

Filed Sept. 4, 1952 2 Sheets-Sheet 1

Fig. 1.

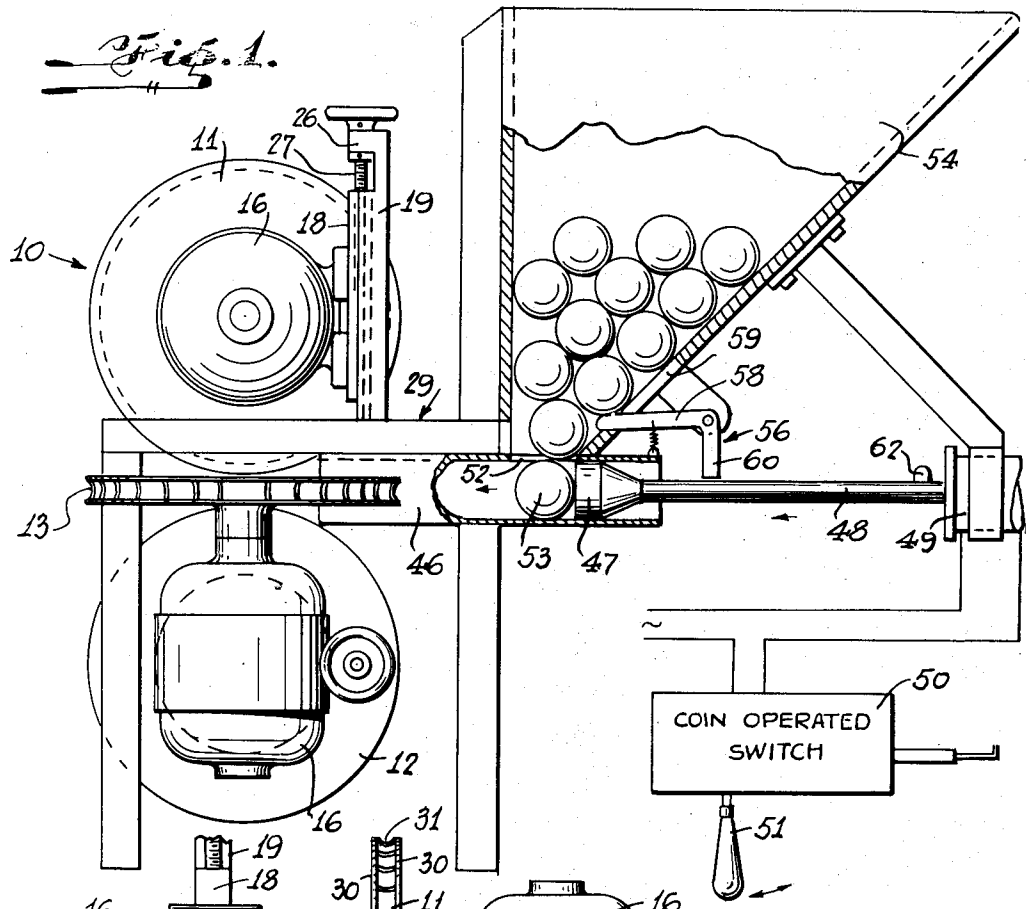


Fig. 2.

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Fig. 3.

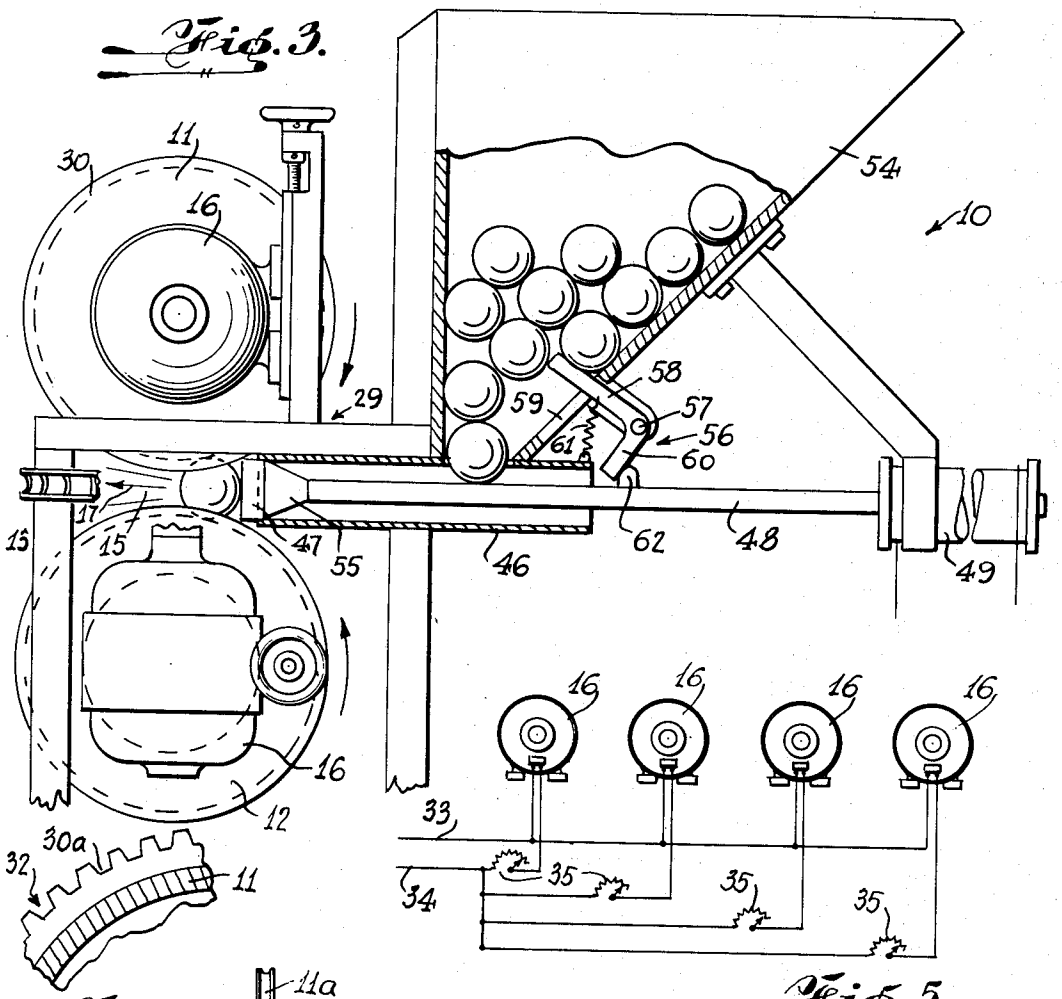


Fig. 7.

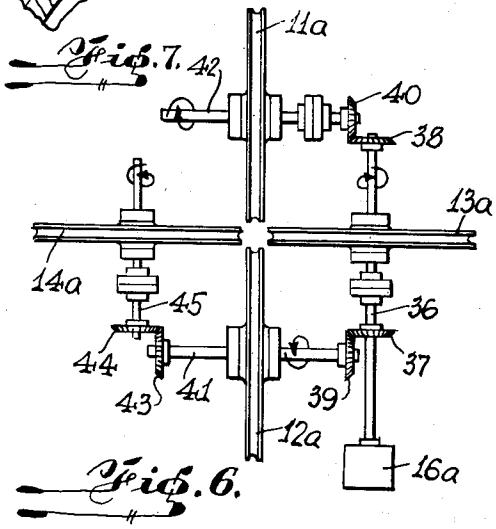


Fig. 6.

Fig. 5.

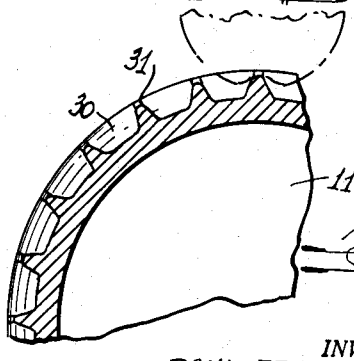


Fig. 4.

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BALL THROWING MACHINE

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Application September 4, 1952, Serial No. 307,832

8 Claims. (Cl. 124—1)

The present invention relates to ball projecting, throwing or pitching devices, and is particularly directed to a device for projecting or throwing balls one after the other at spaced apart intervals so that the same may be hit or batted thereby testing the skill of, and providing batting practice for, the person engaged in hitting such thrown balls.

Ball throwing devices have heretofore been proposed wherein the balls are projected by engagement between the confronting edges or peripheries of two rotated wheels or pulleys which are arranged with their axes in parallel spaced apart relation. It has been found that such devices do not afford sufficient directional control over the thrown ball and, accordingly, that a disturbing and objectionable percentage of the thrown balls are "wild pitches" or outside of the zone in which the pitched balls may be batted by the person using the device. Further, the existing ball throwing or pitching machines provide a hopper from which the balls are intended to be delivered one at a time to the ball throwing elements, and in such machines the balls frequently jam at the outlet from the hopper so that the supplying of balls to the throwing elements is interrupted and the machine continues to operate without throwing balls. Such interruption of the supplying of balls is particularly objectionable when the device or machine is coin operated and functions through a predetermined number of cycles for each deposited coin. In that event, the failure of the machine to deliver a ball during each cycle of operation deprives the player of the full number of thrown balls which are to be expected upon the deposit of a coin. Further, such jamming of the balls at the outlet of the hopper requires the attention of servicing personnel to relieve the jam and restore the machine to its operative condition. The ball throwing or pitching machines heretofore proposed are also deficient in that the structure provided for leading the successive balls from the hopper to the ball throwing elements does not accurately locate each ball relative to the throwing elements at the point of delivery to the latter so that the directional control over the thrown balls is further disturbed. Finally, the existing machines have been found to be faulty and erratic in their operation when the balls are wet and, in that event, the directional control is so deficient as to expose the player to actual physical danger.

Accordingly, an object of the present invention is to provide a ball throwing or pitching machine capable of exercising suitable control over the direction of the thrown balls.

Another object is to provide a ball throwing or pitching machine which is constructed to handle dry or wet balls equally well without any appreciable deterioration of the directional control or the speed at which the balls are thrown resulting from the wetting of the balls.

Still another object is to provide a ball throwing or pitching machine wherein the balls are delivered one at a time from a hopper to a ball throwing mechanism and

embodying means for preventing jamming of the balls at the outlet from the hopper.

In accordance with the present invention, the above, and other objects, features and advantages appearing in the following detailed description, are achieved by providing a ball throwing or pitching machine which includes four ball throwing wheels or pulleys mounted for rotation about right angularly related axes lying in a single vertical plane and with their peripheries substantially enclosing a passageway through which the successive balls are projected. The pulleys are formed with toothed peripheral edges for gripping the balls to ensure reliable operation whether the balls are dry or wet, and the pulleys are driven either by individual variable speed electric motors which are adjustable to provide the same peripheral speed for all of the pulleys or by a single electric motor connected to the several pulleys by a suitable transmission system. Further, the pulleys may be mounted for radial adjustment toward and away from the passage defined by the confronting portions of their peripheries to thereby permit accommodation of balls of different diameters and to permit varying of the gripping pressure exerted by the pulleys against the successive balls. In order to feed balls one at a time to the passageway defined between the confronting peripheral portions of the pulleys, a cylindrical feed duct, open at its opposite ends, is supported in axial alignment with that passageway. The feed duct is formed with an opening at the top which communicates with, and forms the outlet of, a ball containing hopper. A plunger is reciprocable in the feed duct past the opening constituting the outlet of the hopper to drive a ball before it into the passageway defined between the pulleys so that the latter then grip the delivered ball and pitch the ball in a direction axially of the passageway. A suitable and conventional electrical assembly is provided for reciprocating the plunger and the latter has means thereon for actuating an agitator extending into the hopper so that, each time the plunger is reciprocated, the balls in the hopper are agitated to prevent jamming thereof in the hopper.

In order to provide a better understanding of the present invention, several illustrative embodiments are specifically described hereinbelow and shown in the accompanying drawings, forming a part hereof and wherein:

Fig. 1 is a side elevational view, partly broken away and in section, of a ball throwing or pitching device embodying the present invention;

Fig. 2 is a front elevational view of the ball throwing elements included in the embodiment of Fig. 1;

Fig. 3 is a view similar to Fig. 1, but showing the machine during a different phase of its operating cycle;

Fig. 4 is a fragmentary sectional view of a ball throwing wheel or pulley included in the machine of Fig. 1 and taken along a plane at right angles to the axis of rotation thereof;

Fig. 5 is a schematic diagram showing the circuits for energizing motors driving parts of the machine in Fig. 1;

Fig. 6 is a fragmentary front elevational view of the ball throwing elements or pulleys in another embodiment of the present invention, and showing the mechanism for driving such elements; and

Fig. 7 is a fragmentary sectional view similar to Fig. 4, but showing the construction of a ball throwing pulley in accordance with another embodiment of the invention.

Referring to the drawings in detail, and initially to Figs. 1 to 5, inclusive, an embodiment of the present invention is there shown and generally identified by the reference numeral **10**. The ball throwing machine **10** includes four circular ball throwing elements **11**, **12**, **13** and **14** in the form of pulleys or wheels, and which are disposed with their axes of rotation in a single vertical plane. As seen in Fig. 2, the ball throwing elements **11** and **12**

are arranged one above the other and rotate in a single vertical plane, while the ball throwing elements **13** and **14** are arranged side-by-side and rotate in a single horizontal plane which intersects the plane of rotation of the elements **11** and **12** along a line disposed between the confronting edge portions of the elements **11** and **12**. Thus, the confronting edge portions of the circular ball throwing elements **11**, **12**, **13** and **14** define a passageway **15** extending tangentially relative to the ball throwing elements and at right angles to the single vertical plane in which their axes of rotation are disposed.

The ball throwing elements **11**, **12**, **13** and **14** are supported rotatably on a frame structure which is preferably constructed in a manner to permit adjustment of the positions of the axes of the ball throwing elements for varying the cross-sectional dimensions of the passageway **15** (Fig. 2). In the embodiment of Figs. 1 to 5, inclusive, each of the ball throwing elements is rotated by an individual electric motor **16** having its shaft operatively connected to the related ball throwing element for supporting and rotating the latter. The motors **16** are operative to rotate the related ball throwing element in the directions of the arrows appearing on Fig. 2 so that the peripheral edge portions of the elements **11**, **12**, **13** and **14**, which define the passageway **15**, all move in the same direction, as indicated by the arrow **17** on Fig. 3.

In order to permit positional adjustment of the ball throwing elements to provide for variation of the cross-sectional dimensions of the passageway **15**, as noted above, each of the motors **16** is mounted upon a slide which travels along a guideway disposed in the vertical plane containing all of the axes of rotation and extending at right angles to the axis of rotation of the related ball throwing element. Thus, as seen in Fig. 2, the motor **16** driving the element **11** is carried by a slide member **18** which rides upon a suitable guide **19**. Since the ball throwing element **11** rotates about the horizontal axis, the guide **19** is vertically disposed and lies in a plane parallel to the vertical plane containing the axes of rotation of all of the ball throwing elements. Similarly, the motor **16** driving the ball throwing element **12** is mounted upon a slide member **20** which runs upon a vertically disposed guide **21**. In accordance with the general requirements given above, the motor **16** driving the ball throwing element **13** is mounted upon a slide member **22** which rides along a horizontally extending guide **23**, while the motor **16** driving the ball throwing element **14** is mounted upon a slide member **24** which rides upon a horizontally extending guide **25**. Thus, the ball throwing elements **11** and **12** may be adjusted vertically toward and away from each other by displacing the associated slide members **18** and **20** along the related guides **19** and **21**, respectively. Similarly, the ball throwing elements **13** and **14** may be adjusted horizontally toward and way from each other by displacing the associated slide members **22** and **24** along the related guides **23** and **25**, respectively. In order to effect adjustment of the slide members along the related guides, each of the guides is provided with a suitable bearing **26** at its outer end for rotatably supporting a screw member **27** extending longitudinally of the related guide. The screw member **27** is threadably extended into the associated slide member and is provided with a suitable manipulating wheel **28** at its outer end for manual actuation of the screw member in effecting longitudinal movement of the slide member along the related guide. The related guides and slide members are preferably formed with dove-tailed engaging portions to permit relative longitudinal movement of the slide members and guides, while preventing any other relative movement thereof. The guides **19**, **21**, **23** and **25** are rigidly supported by a suitable frame which is generally indicated by the reference numeral **29**.

It is apparent that any ball delivered to the passageway **15** at the end of the latter opposite to the direction of movement of the peripheral portions of the ball throwing elements as indicated by the arrow **17**, will be gripped by such peripheral edge portions and will be propelled through the passageway in the direction of the arrow **17**. The balls delivered to the passageway **15** are preferably resilient and have a diameter slightly greater than the clearance provided by the passageway **15** between the confronting edge portions of the ball throwing elements. Thus, each ball will be compressed during its passage through the passageway **15** and the peripheral edge portions of the ball throwing elements will securely engage the ball during such passage to provide a uniform speed of discharge and reliable control over the direction in which the ball is propelled out of the passageway **15**. In order to further improve the directional control, each of the ball throwing elements **11**, **12**, **13** and **14** is preferably provided with a pair of axially spaced apart radial rims **30** extending around the circumference thereof. Further, in the structure of the ball throwing element illustrated in Fig. 4, each ball throwing element is formed with a series of circumferentially spaced apart, axially extending teeth **31** between the rims **30** thereof. The teeth **31** are preferably formed with arcuate outer edges, as seen in Fig. 2, to conform to the configuration of the ball to be gripped thereby. Thus, as a ball travels through the passageway **15**, it is gripped by the rims **30** and teeth **31** of the peripheral edge portions of the ball throwing elements defining the passageway. In order to prevent injury to the successive balls, the teeth **31** are preferably formed with rounded edges, as seen in Fig. 4.

In accordance with another embodiment of the invention, illustrated in Fig. 7, the teeth **31** of the structure in Fig. 4 are omitted, and the circumferential rims **30***a* extending radially outward from each of the ball throwing elements is formed with spaced notches **32** so that the rims **30***a* have serrated outer edges to provide secure engagement with the successive balls passing through the passageway **15**. Thus, the constructional features illustrated in either Fig. 4 or Fig. 7 ensure secure and non-slipping engagement between the peripheral edges of the ball throwing elements and the successive balls, so that the balls will be reliably projected whether the same are in a dry or wet condition.

When each of the ball throwing elements **11**, **12**, **13** and **14** is driven by an individual motor, as illustrated in Figs. 1, 2 and 3, the several motors **16** are preferably of the well known variable speed type so that the rotational speeds of the motors may be adjusted to provide the same peripheral speed for each of the ball throwing elements. In the illustrated embodiment, as shown in Fig. 5, the motors **16** are connected in parallel by suitable conductors across power supplying lines **33** and **34**. Each of the motors is connected in series with a variable resistance **35** so that adjustment of the latter will be effective to vary the speed of the motor, and hence the speed of the related ball throwing element.

While each of the ball throwing elements is driven by an individual motor in the embodiment illustrated in Figs. 1 to 5, inclusive, all of the ball throwing elements may be driven by a single motor with a suitable transmission interposed therebetween, as shown in Fig. 6. In the embodiment of Fig. 6, the ball throwing elements **11***a*, **12***a*, **13***a* and **14***a* are arranged in the manner previously described. The single driving motor **16***a* is connected to a shaft **36** which supports the ball throwing element **13***a*. The shaft **36** carries bevel gears **37** and **38** at the opposite sides of the ball throwing element **13***a* and respectively meshing with bevel gears **39** and **40** mounted upon shafts **41** and **42** carrying the ball throwing elements **12***a* and **11***a*, respectively. Finally, the shaft **41** carries another bevel gear **43** at its end remote from the shaft **36** and meshing with a bevel gear **44** provided upon a shaft **45** supporting the ball throwing element **14***a*. Thus, the several ball throwing elements will be simultaneously rotated in the directions indicated by the arrows on Fig. 6.

In order to deliver balls one at a time to the inlet end of the passageway **15**, an open ended cylindrical feed member **46** is supported in axial alignment with the passageway **15** and extending toward the latter in the direction of the arrow **17** representing the movement of the peripheral portions of the ball throwing elements defining the passageway **15**. The cylindrical guide member **46** has an internal diameter only slightly larger than the balls to be delivered to the passageway **15** and is effective to positively direct the successive balls into that passageway so that the correct alignment and engagement of the balls with the ball throwing elements is always achieved. Such correct alignment prevents any misdirection in the throwing of the balls. A plunger **47** is reciprocable longitudinally in the cylindrical feed member **46** and is provided with an elongated stem **48** which connects the plunger to mechanism for effecting the controlled reciprocation of the plunger. In the embodiment illustrated in Figs. 1, 2 and 3, the mechanism for actuating the plunger **47** consists of a solenoid **49** which may be periodically energized to effect reciprocation of the plunger. However, it is to be understood that other mechanism, for example, hydraulic means, may be provided for effecting reciprocation of the plunger.

The solenoid **49** is preferably energized by an electrical circuit having a conventional coin operated switch **50** (Fig. 1) interposed therein. Further, the circuit for energizing the solenoid **49** may include a manually operable switch **51**, for controlling the successive operating cycles of the solenoid, or it may include an automatic switching means, of conventional form, for energizing the solenoid **49** at uniformly spaced apart intervals.

The cylindrical feed member **46** is formed with an opening **52** in the top thereof adjacent the end of the feed member remote from the passageway **15**. The opening **52** is provided to permit balls **53** to be deposited within the feed member, one at a time, in advance of the plunger **47** when the latter is withdrawn, as shown in Fig. 1, to its position remote from the passageway **15**. The successive balls **53** are preferably delivered through the opening **52** from a hopper **54** disposed above the feed member **46**. The hopper **54** tapers downwardly toward the opening **52** and is adapted to contain a substantial quantity of the balls **53**. Thus, each time the plunger **47** is withdrawn to its position illustrated in Fig. 1, a ball **53** will be deposited in front of the plunger to be propelled by the latter into the passageway **15** when the plunger is displaced in that direction by the action of the solenoid **49**, as shown in Fig. 3. When the plunger **47** is in its forward position, shown in Fig. 3, the stem **48** of the plunger will prevent balls from falling into the feed member **46** behind the plunger **47**. It will be seen that the plunger **47** is provided with a tapered rear portion **55** so that, when the plunger is returned to its inoperative or withdrawn position, the balls disposed in the opening **52** will ride over the tapered portion and drop in front of the plunger **47**.

In order to prevent jamming of the balls **53** in the hopper **54**, a bell crank member **56** is pivotally mounted, as at **57**, upon the structure of the hopper. The bell crank member **56** includes an arm **58** extending into the hopper through a suitable opening **59** formed in the latter. The bell crank member **56** includes another arm **60**, extending substantially at right angles to the arm **58**, and terminating at a location adjacent to the stem **48** of the plunger. A spring **61** is connected to the bell crank member **56** to yieldably urge the latter to rotate in the counter-clockwise direction, as viewed in Figs. 1 and 3. An abutment **62** is provided upon the stem **48** and follows a path of travel into which the arm **60** projects, so that, when the plunger **47** is moved in the direction toward the outlet end of the feed member **46**, the abutment **62** will engage the arm **60** to cause the bell crank member **56** to rock in the direction opposite to the movement imposed by the spring **61**. Thus, the arm **58**, extending into the hopper, will serve to agitate the balls within the hopper each time the plunger **47** is reciprocated and will thereby prevent jamming of the balls within the hopper.

It is apparent that the provision of four ball throwing elements arranged as herein set forth and having the edge configurations described above will provide a ball throwing or pitching machine capable of exercising improved control over the direction of the thrown balls. Further, the particular ball throwing element configuration herein set forth makes it possible for the machine to reliably handle balls which are either in the wet or dry condition, and the provision of agitating means in the ball containing hopper prevents any jamming of the balls and resultant misfiring of the machine.

It has been found in practice that to obtain an efficient result, all of the electric motors can be run at the same speed and/or constant speed.

Furthermore, it is understood that any other known means may be employed to feed the balls to feed member or tube **46**, also that tube **46** may be rifled inside similar to artillery to give the ball a twist as it shoots through the tube. Again the tube **46** may be slightly inclined as a preventative, if necessary against permitting more than one ball to pass through opening **52** at a time. It is evident, however, from Figs. 1 and 3, that as soon as one ball is shot through tube **46**, another ball descends in engagement with stem **48** of the plunger **47** (Fig. 1) and as the plunger retracts, this ball will ride up the tapered surface of portion **55** of the plunger and then drop into a position in front of the plunger **47** as clearly seen in Fig. 1.

While I have illustrated and described several preferred embodiments of my invention, it is to be understood that the invention is not limited to the precise details of such embodiments and that various changes and modifications may be made therein without departing from the scope of the invention which is intended to be defined in the appended claims.

What I claim is:

1. A ball throwing machine comprising two pairs of circular ball throwing members, means supporting said members for rotation about axes lying in a single plane with one pair of said members rotating in a first plane and the other pair of said members rotating in a second plane disposed at right angles to said first plane and intersecting the latter along a line between said first pair of members so that the confronting peripheral edge portions of said two pairs of throwing members define a tangential passageway for the reception of the balls to be thrown, said first pair of members constraining a thrown ball to movement in said second plane and said second pair of members constraining a thrown ball to movement in said first plane, means for effecting the continuous rotation of said throwing members to achieve movement of said confronting peripheral edge portions in one direction, and means for delivering balls one at a time to said passageway in said one direction of movement.

2. A ball throwing machine according to claim 1; wherein said supporting means include members adjustable radially of the related throwing members in the directions toward and away from said passageway for varying the cross-sectional dimensions of the latter to accommodate balls of different diameters.

3. A ball throwing machine according to claim 1; wherein said supporting means includes a fixed frame having a guide thereon for each of said throwing members and extending parallel to the plane of rotation of the related throwing member, a support for each throwing member slidable on the related slide, and means for effecting adjustment of each of said supports along the related guide so that the cross-sectional dimensions of said passageway may be varied to accommodate balls of different diameters.

4. A ball throwing machine according to claim 1; wherein each of said circular ball throwing members is formed with a serrated periphery for gripping the successive balls delivered to said passageway.

5. A ball throwing machine according to claim 4; wherein said supporting means include members adjustable radially of the related throwing members in the directions toward and away from said passageway for varying the cross-sectional dimensions of the latter to accommodate balls of different diameters and to control the contact pressure between said serrated peripheries and the balls.

6. A ball throwing machine according to claim 1; wherein each of said ball throwing members is formed with axially spaced apart circumferential rims on the periphery thereof, said rims being serrated to provide secure gripping contact with the successive balls in said passageway.

7. A ball throwing machine according to claim 1; wherein each of said ball throwing members is formed with axially spaced apart circumferential rims on the periphery thereof, and spaced apart radially extending teeth on said periphery between said rims to provide secure gripping contact with the successive balls in said passageway.

8. A ball throwing machine according to claim 1; wherein said means for rotating the ball throwing members includes an individual electric motor for each of said ball throwing members and operatively connected to the related one of said throwing members, and means for energizing said motors.

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