BASEBALL PITCHING MACHINE WITH BALL CURVING DEVICE

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The present invention relates to machines for propelling baseballs, or the like, towards a target, such as a strike zone, so as to simulate a baseball pitcher's throw, and is particularly directed to baseball curving machines in a pitching machine for causing the ball to be curved in any desired direction and to any desired extent.

Machines are well known in which baseballs, etc., are propelled from a tube or the like toward, for example, the strike zone, i.e., between knee and shoulder height and over home plate. These machines are usually adjustable as to the direction the ball is propelled such that the ball may be pitched high or low, and toward or away from the hitter. For example, where the ball is propelled from a tube, as by means of pneumatic pressure, the ball direction may be readily varied by correspondingly varying the orientation of the tube relative to the strike zone. In addition, the speed of delivery is usually adjustable as by providing for variation of the pneumatic pressure employed to propel the ball. Thus the only remaining requirement of a pitching machine in providing substantially all the actual pitches which may be thrown by a pitcher is that of imparting curvature to the ball in any desired direction.

Hereinafter various devices have been devised for the purpose of causing a ball, pneumatically or otherwise propelled, to be curvilinear in its flight. However, these previous devices, while being theoretically sound, have proven unsatisfactory in actual use with regulation baseballs. Most curving devices are of a type which are arranged to impart spin to the ball during, or immediately subsequent to its propulsion. With sufficient spin on the ball, the ball of course curves in the direction of spin and to an extent directly related to the spin velocity. In previous curving devices, spin has been frictionally imparted to the ball by causing opposed surface portions thereof to experience different degrees of friction at some time during its forward movement. One side of the ball is thereby retarded with respect to the opposite side thereof during forward movement such that the ball is caused to spin. For example, a resilient finger, or the like, may be positioned to engage one side of a ball as it is propelled from a tube, the unbalance between the friction of the finger and that of the air acting on opposite sides of the ball causing same to spin. It will be appreciated, however, that the amount of spin which is imparted to the ball by the finger is quite limited inasmuch as the ball only momentarily engages same, and as a result only a small amount of curvature, at best, is obtained. Similarly, other devices, wherein differential friction are applied to opposite sides of a ball by forcing it through a ring at the exit end of a propulsion chamber, such ring having different coefficient of friction surface portions at diametrically opposed points thereof. Here again the ball only briefly encounters the differential friction surfaces and the spin imparted to the ball is limited. In fact the weight of a regulation baseball, and the relatively high velocities at which it may be desirably propelled, and such that the regulation ball is relatively unaffected in briefly experiencing a friction differential thereacross. According to other attempts to provide a practical curving mechanism have entailed subjecting the ball to a friction differential during an extended period of its forward propulsive movement. However, it has been found in actual practice with devices of this type that a significant curvature is still not imparted to the ball despite the extended period of exposure to differential friction. For example, propulsion of a regulation ball through a cylindrical barrel having an elongated strip member of relatively high coefficient of friction material resiliently mounted longitudinally adjacent the inner periphery of the barrel has been found to effect limited curvature. This is apparently due to the friction differential between the resiliently mounted strip member and interior surface of the barrel being insufficient to impart significant spin to the ball despite its extended period of engagement with the differential friction surfaces.

It is, therefore, an object of the invention to provide a pitching machine for baseballs, etc., which features curving means capable of imparting significant curvature to even a regulation baseball propelled from the machine.

It is another object of the invention to provide a ball curving device of the class described which is adjustable in the direction and extent of curvature imparted to a ball propelled from a pitching machine.

Still another object of the invention is the provision of a ball curving device of the character outlined above which is further adjustable as to the point in the ball trajectory at which the curve breaks, as well as to provide other varied effects.

Yet another object of the invention is to provide a ball curving device having a ball guide arranged to present negligible friction to one side of a ball and substantial friction to the opposite side of the ball over an extended path of guided ball movement.

It is a further object of the invention to provide a ball curving device of the class described which is relatively simple and economical in construction.

The invention possesses the following objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

FIGURE 1 is a side elevational view of a pitching machine having curving device in accordance with the invention.

FIGURE 2 is an end view of the curving device of the machine.

FIGURE 3 is a sectional view taken at line 3-3 of FIGURE 2.

FIGURE 4 is a fragmentary sectional view of a modified form of the throat-forming frame of the machine.

Referring now to FIGURE 1, a pitching machine 11 in accordance with the invention will be seen to include a pneumatic gun 12 or equivalent means for propelling a regulation baseball 13, etc., towards a target. Pneumatic gun 12 is of a conventional type having a pressure chamber 14 and a barrel 15, integratively communicable with the pressure chamber as by means of an unbalanced valve (not shown). The balls 13 may be introduced one at a time to barrel 16 through a loading port 17, and in this regard a hopper (not shown), or the like, may be provided in a conventional manner to effect introduction of the balls automatically. A ball introduced to the barrel 16 is disposed adjacent the seat of the unbalanced valve, and upon actuation of a suitable trigger mechanism 18, the valve is instantaneously opened to thereby expose the ball to substantial air pressure in the chamber 14. As a result, the ball is pneumatically propelled from the barrel. Inasmuch as the gun 12 is of a conventional type and is not per se a feature of the present invention, further details of the gun are not included herein, it sufficing to state that
the pitching machine includes the gun 12 or equivalent means for propelling a ball.

The pitching machine 11 further includes a compressed air tank 19 for pressurizing the chamber 14 of the gun 12. The tank is preferably mounted upon a support stand 21 which carries a compressor 22 for supplying compressed air to the tank. The gun 12 is then advantageously mounted upon a platform 23 in turn mounted upon tank 19 by means of a universal coupling 24. The coupling 24 enables the platform to be swiveled up and down, as well as to be rotated about a vertical axis. A pipe 26 connects the compressor output to the tank and a flexible hose 27 connects the tank to the pressure chamber of the gun in order to permit the above noted ends of the pressure chamber to be adjusted.

It will thus be appreciated that the pitching machine 11 may be adjusted to cause the ball 13 to be pitched high or low, and toward or away from a batter. More specifically, the gun 12 may be pointed up or down and from side to side by pivoting the platform 23 upon the coupling 24. The speed and delivery of the ball are also subject to regulation by adjustment of the air pressure in the tank 19, which pressure may be ascertained as by means of a gauge 28 mounted upon the tank. Such adjustments of the machine in the delivery of various straight ball pitches are substantially conventional. The important feature of the present invention is the further provision in the pitching machine of a curving device 29 which may be employed in conjunction with the previously noted regulation of a ball delivered from the machine to provide substantially any pitch that a baseball pitcher is capable of throwing. In addition to straight balls, the machine is capable of delivering curve balls, drops, up-sweeps, screwballs, sliders, etc. Moreover, the curving device 29 is so arranged that the extent of curvature may be varied as well as the point at which the ball breaks.

Considering now the curving device 29 in basic respects, it should be noted that same is arranged to introduce a substantial differential in friction to opposite sides of a ball propelled from the gun, during the forward movement of the ball. As a result, spin is imparted to the ball to thus cause same to curve in the direction of spin and to an extent directly related to the amount of spin. Unlike previously, the curving device operating upon this general principle, the curving device 29 is operable to actually significantly curve a regulation baseball. This apparently accrues from the previously unattainable substantial friction differential which may be established by the curving device 29.

The preferred structure of the curving device 29 to the foregoing ends will be seen to include a ball guide in the form of a throat-forming frame 31 which is adapted for coaxial end attachment to the barrel 16 of gun 12. The outline of the frame is substantially cylindrical and includes a very high coefficient of friction surface over a minor segment of its inner periphery and negligible friction elsewhere. The remainder of the frame is ribbed. More particularly, the frame 31 includes a pair of coaxially spaced end rings 32, 33 respectively provided with rectangular flange portions 34, 36 projecting radially outward therefrom. A plurality of elongated rods 37 or the like of metal or equivalent relatively low coefficient of friction material are longitudinally secured between the rings at circumferentially spaced points therein in the portions of the rings exclusive of the flange portions 34, 36. A plate 38 is secured between the transverse outer end edges of the flange portions 34, 36. In addition, a longitudinal high coefficient of friction strip 39 of arcuate cross section is provided between the rings inwardly adjacent the flange portions 34, 36 to define a minor segment of the frame. The strip 39 is preferably secured to a backing bar 41 received at its opposite ends by rectangular notches 42, 43 formed in the rings to extend into the flange portions 34, 36. The backing bar 41 with strip 39 secured thereto is preferably selectively adjustable radially of the frame, in and out of its interior. In this regard, the bar is advantageously spring loaded in the radially outward direction, i.e., into the notches 42, 43 and towards plate 38. To this end, a pair of bolts 44 are preferably rigidly secured to the bar and slidably extended through apertures 46 at longitudinally spaced-apart positions of the plate 38. Compression springs 47 are concentrically disposed upon the bolts 44 and act between the heads of the bolts and the plate 38 to resiliently urge the bar and strip 39 outward away from the frame axis. The outward movement is limited by a pair of adjustable stop bolts 48 which are threaded through the plate 38 adjacent its opposite ends to engage the backing bar 41. Thus the backing bar, and strip 39 carried thereby, may be adjusted to extend into the frame interior to substantially any desired extent by manipulation of the stop bolts 48. The backing bar and strip may also be adjusted to have a varied inclination to the frame axis by extending one stop bolt a greater extent than the other. Upon full retraction of the stop bolts, the strip 39 is substantially withdrawn from the frame interior.

It will be appreciated that the rods 37 present substantially negligible friction to a ball 13 propelled from the gun barrel 16 through the frame 31. The high coefficient of friction of the frame combined with the low coefficient of friction of the ball results in a considerable amount of friction to the ball. As noted previously, the friction differential must be of relatively high order to cause the ball to curve significantly. In order that such friction differential may be made very large, the strip 39 is preferably of soft rubber or equivalent material. In addition, the exposed surface of the strip is preferably toothed, as shown in FIGURE 3, to provide longitudinally spaced circumferentially extending teeth 49 inclined in the direction of ring 32, i.e., towards the barrel of gun 12. Such soft rubber teeth inclined in a direction opposite to that of the forward motion of the ball present substantial friction thereto. The amount of friction of course depends upon the pressure exerted by the strip upon a ball propelled through the frame, and this pressure is determined by the extent to which the strip projects into the frame. Accordingly, by adjustment of the stop bolts 48, the pressure is variable as are therefore the sharpness of the curvature produced. The point of the ball trajectory at which the curve breaks may be varied, and other varied effects obtained by inclining the strip relative to the frame axis. In any case, the direction in which the ball curves is towards the strip 39. Thus as shown in the drawing where the strip is at the bottom of the frame, the ball curves downwardly or else upwardly.

In order that the device curve the ball in other directions, a selectively rotatable connection is employed in the attachment of the frame 31 to the gun barrel 16. For example, the ring 32 may be formed with a rabbot 51 for rotatably receiving the end of the gun barrel. Set screws 52 threaded through tapped radial bores of the ring may be tightened against the barrel to lock the frame in any desired position of rotation. Accordingly, the strip 39 may be disposed to curve the ball in any desired direction by locking the frame in different positions of rotation with respect to the barrel. Of course, straight balls may still be delivered by the pitching machine 11 upon adjusting the strip 39 to its fully retracted position.

In FIGURE 4 is illustrated a portion of a modified form of the throat-forming frame 31. In this embodiment, the guide rods 37 are replaced with ball races 53 which extend longitudinally of the throat in the same manner as the rods 37.

What is claimed is:
1. A pitching machine comprising a pneumatic gun including a barrel from which a ball may be propelled, means mounting said gun in an elevated position for selective movement about a vertical axis and a horizontal axis transverse to said barrel, a ring mounted upon
the end of said barrel for selective concentric rotation relative thereto, a second ring coaxially spaced from said first ring away from said barrel, a plurality of longitudinally elongated low coefficient of friction rods secured between said rings at circumferentially spaced positions thereof, a high coefficient of friction strip member mounted longitudinally between said rings and having an arcuate cross section means mounting said strip member for movement radially of said rings, means spring loading said strip member in a direction radially outward of said rings, and adjustable stop means for variably limiting radial outward movement of said strip member.

2. A pitching machine according to claim 1, further defined by said strip member being of soft resilient material and having an arcuate exposed surface with longitudinally spaced circumferential teeth inclined in the direction of said first ring.

3. A pitching machine comprising a pneumatic gun including a barrel from which a ball may be propelled, means mounting said gun in an elevated position for selective movement about a vertical axis and a horizontal axis transverse to said barrel, a ring mounted upon the end of said barrel for selective concentric rotation relative thereto, said ring having a radially outwardly projecting rectangular flange with a rectangular notch extending radially thereto, a second ring coaxially spaced from said first ring away from said barrel, said second ring having a radially outwardly projecting rectangular flange with a rectangular notch extending radially thereto, a plurality of low coefficient of friction rods longitudinally secured between said rings at circumferentially spaced positions thereof, a plate secured between the transverse outer edges of said flanges, a backing bar longitudinally disposed between said rings within said notches in slidable relation thereto, means spring loading said bar in the direction of said plate, a pair of stop bolts threaded through said plate and engaging said bar, and a strip of soft resilient material secured to said bar, said strip having an arcuate exposed surface with longitudinally spaced circumferential teeth inclined towards one of said rings.

5. A ball curving device for a pitching machine which includes a barrel from which a ball may be propelled, said device comprising a ring adapted to be mounted about the discharge end of said barrel for selective concentric rotation relative thereto, a second ring coaxially spaced from said first ring, a plurality of longitudinally elongated low coefficient of friction rods secured between said rings at circumferentially spaced positions thereof, a high coefficient of friction strip member mounted longitudinally between said rings and having an arcuate cross section, the concave portion of said strip member and said rods defining a guide for the passage of a ball after such ball has been discharged from said barrel, means mounting said strip member for movement radially of said rings, and stop means for adjustably positioning said strip member at various radial locations relative to said rings.

6. A ball curving device for a pitching machine which includes a barrel from which a ball may be propelled, said device comprising a frame defining an elongated generally cylindrical ball guide passage peripherally bounded by a plurality of spaced-apart longitudinal low coefficient of friction members and a longitudinally mounted high coefficient of friction strip member, means mounting said strip member for movement radially of said passage, said strip member being elongated in the direction of said passage and each end thereof being independently movable radially said passage, and stop means associated with each end of said strip member for independently adjusting the radial positioning at each end of said strip member at various radial locations relative to said passage whereby said strip member can be variably inclined to the axis of said passage.

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