

[54] DEVICE FOR LAUNCHING BALL WITH VARYING TRAJECTORIES

[76] Inventor: **Dornetti Francesco**, Via Duca D'Aosta 6, 26025 Pandino (Cremona), Italy

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[56] References Cited

UNITED STATES PATENTS

3,128,753 4/1964 Politzer..... 124/26

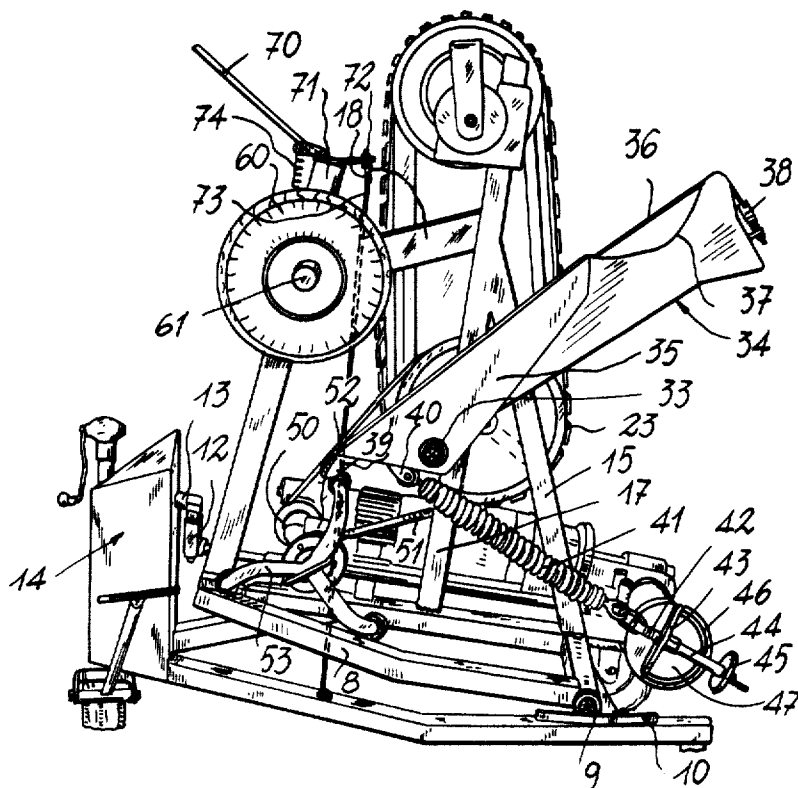
3,421,491 1/1969 Brown..... 124/9
3,722,495 3/1973 Hansen..... 124/9

Primary Examiner—Richard C. Pinkham
Assistant Examiner—William R. Browne
Attorney, Agent, or Firm—Robert E. Burns;
Emmanuel J. Lobato; Bruce L. Adams

[57] ABSTRACT

A device for ball launching in sports trainings is described. The device comprises a first wheel moving frame, a second frame bearing on this first frame at two or more locations, for a rocking movement relative thereto, having vertical uprights carrying a supply cage and a club pivoted to said uprights operated by one or more levers against a spring, a first motor effective on said lever or levers and on said loading cage, and a second motor for rocking said second frame relative to said first frame and rotating a cam cyclically changing the tension in said club operating spring.

10 Claims, 5 Drawing Figures



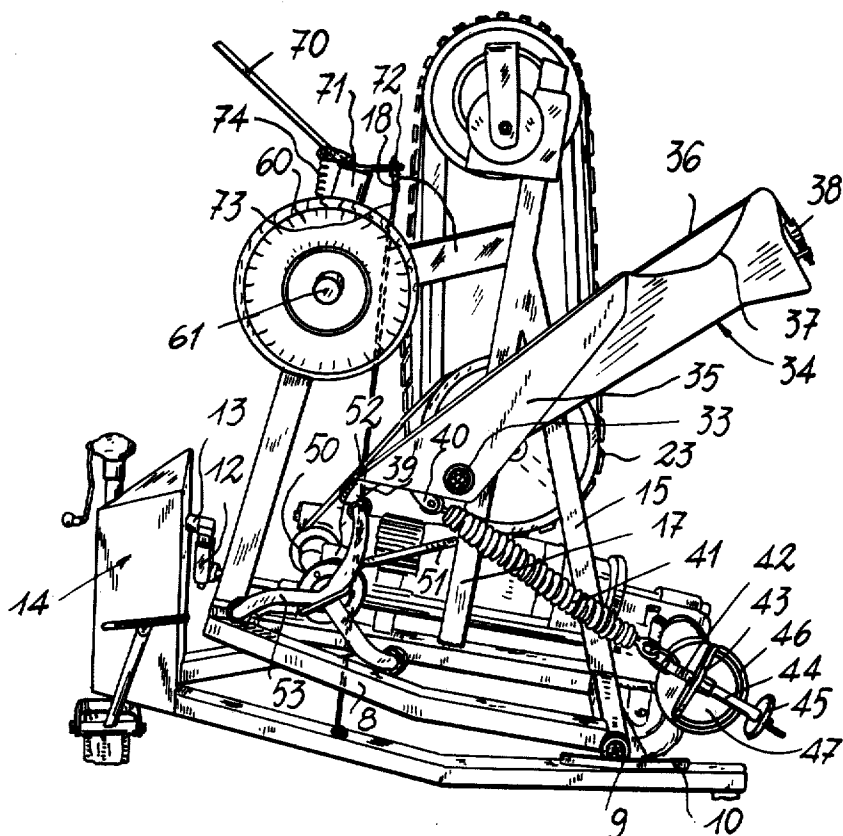
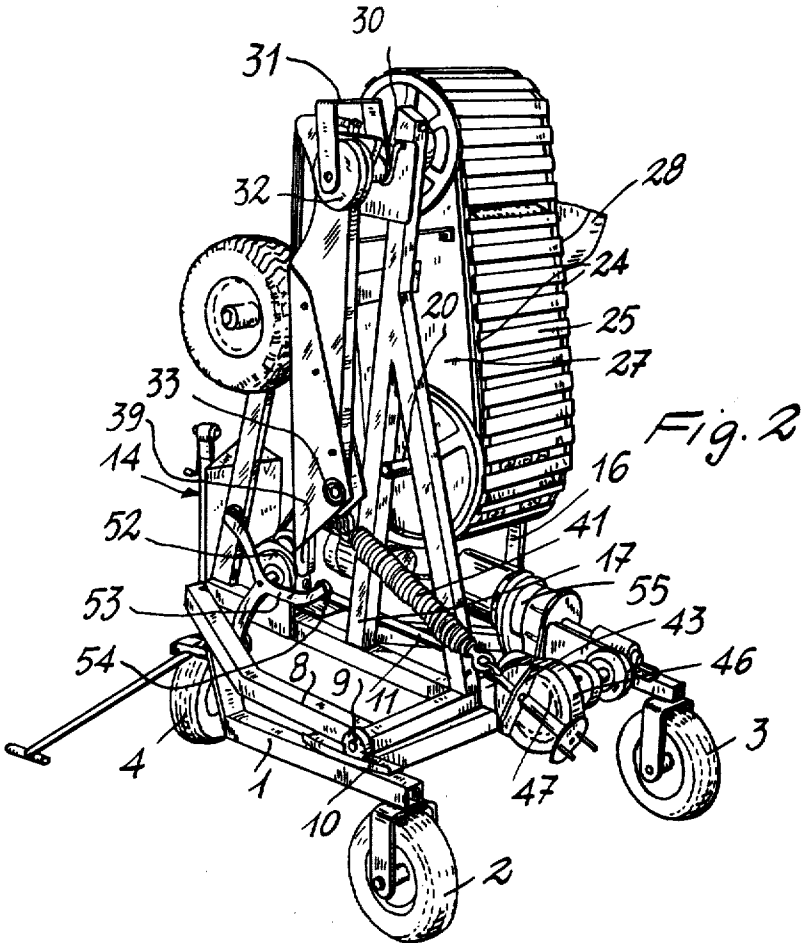
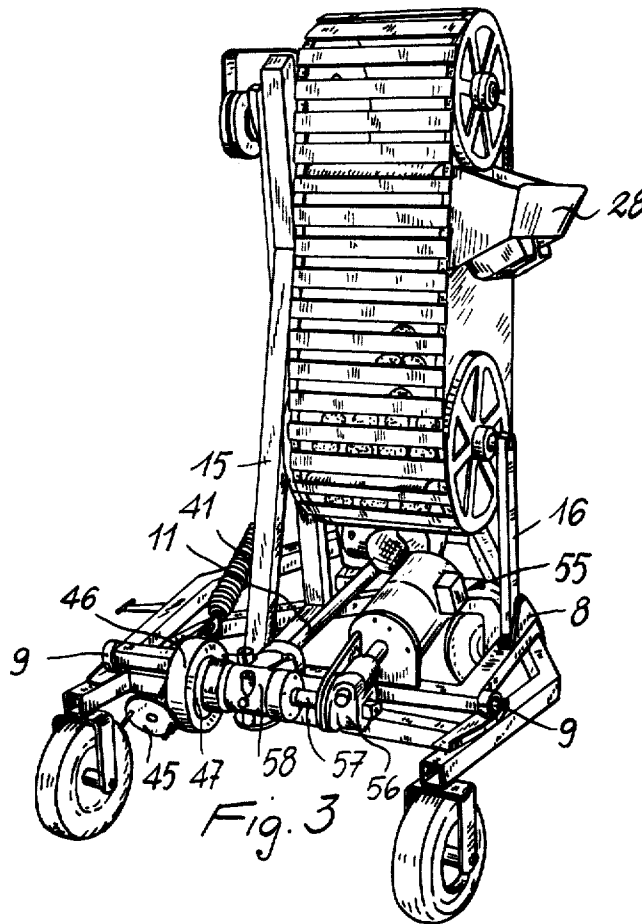
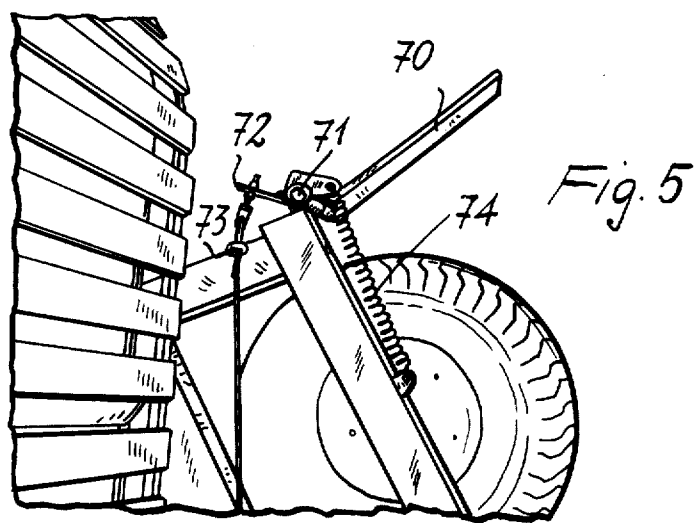
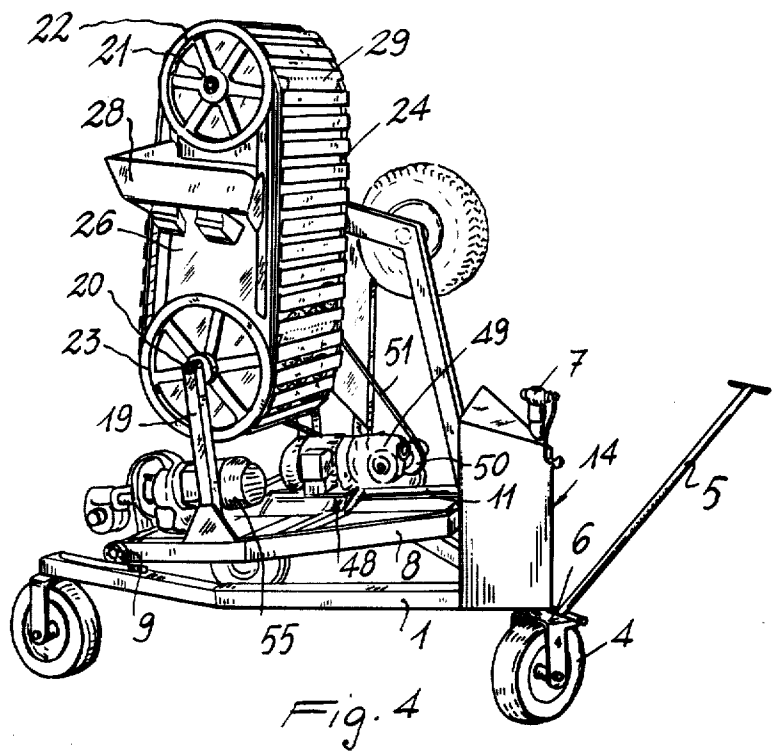


Fig. 1







DEVICE FOR LAUNCHING BALL WITH VARYING TRAJECTORIES

This invention relates to a device for automatically and presettably ball launching in sports trainings, particularly in tennis or the like.

As well known, there are many games, such as tennis or the like, necessarily requiring a partner or teacher for training; is this a requirement both for a game learner and a player having to train for contests or matches. It should be noted that even the availability of a partner or teacher would not assure the possibility of an efficient training either for the position or force of the throw, an effective reply shot to which it is desired to learn.

In order to obviate the above drawbacks, this invention proposes a fully automatic device for ball launching according to predetermined directions and forces subsequently varying by preset cycles, which device can be set on a particular throw or, as desired, caused to accomplish said cycle.

The present invention can be more clearly understood from the following detailed description, given by mere way of not limiting example, particularly referring to the accompanying drawings, in which:

FIG. 1 is a side view of the device according to the invention on the side of the launching club, at the position where a ball is going to be launched;

FIG. 2 is a perspective view of the same device, showing the club at the position taken after a ball launch;

FIG. 3 is a rear perspective view of the device; and

FIG. 4 is a perspective view of the device on the ball loading side opposite to the club side.

FIG. 5 shows a projectile deflecting device.

A device according to the invention substantially comprises a first frame, designated as a whole at 1, substantially of triangular shape and carried on three wheels 2, 3 and 4, the first two of which are fixed, while the third wheel is manually steerable by a long rod 5 fast with a fork 6, a conventional manually controlled jack being provided for lifting the front portion of the frame 1 freely rotating about the axles of the fixed rear wheels 2 and 3.

According to the invention, above said frame 1 a second frame 8 is provided and substantially bears all of the basic portion of the device according to the invention. This frame 8 is rearwardly journalled on two side rollers 9 freely slidable on tracks 10 fast with said frame 1. Through suitable bearings, said frame 8 carries a shaft 11 which on the front is restrained to a square tube 12 at right angles thereto and telescopically threaded on another square tube cranked terminating with a pin 13 within a rocking bearing, the stator of which is carried and restrained by a raised portion forwardly on the frame 1 and designated as a whole at 14. Accordingly, said frame 8 supporting the main portion of the device will bear on three points to said frame 1, and particularly at the two rear side rollers 9 and at the front rocking bearing 14.

Substantially vertical longitudinal members 15, 16 and 17 are secured to the frame 8, on one hand being directly interconnected and connected to one another on one side by a crosspiece 18, a single upright 19 being provided on the other side. An axis or shaft 20 is suitably carried between said uprights 19 and 17 and has two end pulleys. A further axis or shaft 21 is cantilever carried at the end of upright 17 and also has two

opposing pulleys 22 arranged on the same planes as pulleys 23 carried by axis or shaft 20. Each pair of pulleys 22-23 has a closed or looped belt 24, and the two parallel belts 24 are interconnected by suitably spaced apart strips 25. Since the two sides 26 and 27 between the pulleys are closed by fixed walls, a completely closed cage or magazine is thus provided, just comprising said two sides 26 and 27 and striped belt 25, at said side 26 there being provided a feeding inlet fitted with a guide hopper 28.

On that side facing inwardly of said cage, provision is made for channels or gutters 29 fast with some strips 25 and suitably spaced apart from one another, being of the same width as the cage and maximum diameter slightly larger than the balls to be picked up and carried. Moreover, and still within said cage, at the upper axis 21 there is provided a wide feeding channel opening at the side 7 in a feeding inlet 30 for the balls to be launched, a fork 31 cantilever carrying a counter plate 32 being provided. Both the inlet 30 and counter plate 32 are provided with lips or edges made of flexible material, such as rubber, foamed rubber or the like, which are oppositely arranged for holding the ball to be launched in engagement relationship therebetween, as hereinafter described in more detail.

The device according to the invention additionally provides at said upright 17 a bearing support 33 (FIGS. 1 and 2) cantilever carrying a long club, designated as a whole at 34 and comprising, for example, a metal bracket 35 having an end wood portion with a wide front recess or notch 37, in front of which a plurality of strings 36 are tensioned, these strings being of a suitable and per se known material and restrained at one end to a per se known turnbuckle for imparting the desired tension to the strings.

At the bottom, that is below said bearing 33, the club 34 is provided with a driving extension 39; at the same end, a strong spring 41 is bonded at 40, the other end of which is secured to a threaded pin 42, the latter passing through a plate 43 prior to screw-threading in a sleeve 44 terminating with an adjusting handwheel for the tension of said spring 41. Said plate 43 is welded or otherwise restrained to a cylindrical crown member 46 which is perpendicular thereto and within which a circular cam 47 is freely rotatable, the function of this cam 47 being described in the following.

According to the invention, a first drive motor is provided, designated as a whole at 48, particularly but not exclusively of electric type, driving through a first reduction gear 49 (FIG. 4) a small pulley 50, in turn driving said pulley 23 (FIG. 1) by means of a belt 51, thus rotating the assembly comprising the two belts 24 and associated strips 25, as well as the inner conveying channels 29. By means of a further reduction gear 52, the output shaft of said reduction gear is effective to drive a spider 53 (FIGS. 1 and 2), this spider being provided with a plurality of arms, at the ends thereof having rollers or ball bearings 54 for engaging said lower extension 39 of the club 34 against the action of the spring 41.

According to the invention, a second drive motor is provided, designated as a whole at 55 (FIG. 3), particularly but not exclusively of electric type, driving through a reduction gear 56 a shaft 57 arranged rearwardly of the device. By means of a T-shaped transmission 58, said shaft 57 will drive on onehand said shaft 11 at right angles thereto, and on the other hand said

circular cam 47 which is eccentrically mounted to its drive shaft, this cam being suitably angularly timed relative to said shaft 11, as more clearly explained in connection with the operation description.

As it will be appreciated from the foregoing, as a principle the device according to the invention has two motors completely separate from each other, so that the operation description will become clearer when first examining the movements provided by said first motor 48 and then those provided by said second motor 55, it being however apparent that both said motors could jointly operate, providing for the combination of the individual movements.

As above shown, upon starting, the motor 48 will rotatably drive through said pulley 50 and belt 51 the strip conveyor 25 and associated inner channels 29. Before hand, the device is filled with a substantial amount of balls through the hopper inlet 28, these balls accumulating of course in the bottom of the cage. By the above mentioned movement, the channels 29 pick up a number of balls, which are moved upwards and dropped into the feeding channel at the inlet 30, upon reaching the top of the cage, the channels being evidently overturned prior to initiating a downward movement. Thus, the feeding channel is always full of balls, continuously supplied to the inlet owing to the channel slope. At the same time, through said two reduction gears 49 and 52, the motor 48 also rotatably drives said spider 53, the latter engaging through the rollers 54 the club extension 39 against the action of said spring 41. Thus, the club is brought to the position shown in FIG. 1, while the ball to be launched is automatically positioned between said flexible lips as provided between the inlet 30 and counter plate 32. On continued rotation, the spider 53 will suddenly release the extension 39 and the strong spring 41 promote the rotation of club 34, the latter through the strings 36 striking the ball retained by the flexible lips, thus providing for the launch. After striking the ball, the club is stopped by a damper which, in the case shown, comprises a wheel 60 idly mounted on an axis or pivot 61 restrained at the connection between said upright 16 and crosspiece 18. It is apparent that the force by which the ball is stricken and launched will exclusively depend on the tension of the spring 41 which can be manually set by said handwheel 45. The slope to a horizontal plane of the launching direction can be changed as desired by positioning said arm 12 as desired, and hence the slope for the frame 8 relative to frame 1, or by acting on the manual jack 7 causing the slope for the entire device with respect to the front wheel 4. Finally, the transverse direction can be also selected and set by positioning said arm 12, or the entire device as a limit. Obviously, the position of the device and the tension of the spring 41 having been set, by operating the only motor 48, a continuous sequence of throws will be provided, such throws having identical characteristics as to direction and force.

On continued operation of motor 48, should the motor 55 be operated, this motor would rotatably drive the shaft 11 which, as above mentioned, is connected through the cross arm 12 to the articulated bearing 13, the stator of which is attached to the front side 14 of the device, thereby providing a constant rotation of the entire frame 8, rearwardly bearing on the rollers 9 about the bearing 13, this cyclically causing transverse and inclined movements of the ball launching position. At the same time, the motor 55 is effective through the

shaft 57 on the cam 47 cyclically moving the circular crown 46, the latter cyclically varying the tension in the spring 41. Since, as above mentioned, the cam 47 is suitably angularly phased relative to said shaft 11, there will be provided, for example, a lower tension in the spring 41 when the device is oriented to the center of the field, a lower force in the throw being required for a shorter distance to be travelled by the ball, whereas the tension in the spring will become respectively higher when the device is oriented to the corners of the field (this being true of course on the presupposition that the device is positioned at the center of the field).

It should be noted that the change in the tension of said spring 41 due to cam 47 is for providing more or less stretched throws depending on the launch slope, that is on the height being attained by the ball.

According to the invention, a device is also provided (FIG. 5) as comprising a simple blade 70 pivoted to the frame at the connection between said upright 16 and crosspiece 18, on an axis 71, this blade being connected to a lever 72, on which one end of a rope 73 is secured, the other end of which is restrained at the bottom to the fixed frame 1. A spring 74 is provided on the opposite side and secured on one side to said blade and on the other side to the upright 16. The blade will immediately move over the damper 60 at the ball launching region, that is on the front side of the opposing lips 30-32.

The operation of the blade 70 is extremely simple and unique. When the arm 12 operates to raise the assembly of frame 8, the rope 73 as restrained to the fixed frame 1 will apply a downward traction or pull on the lever 72, the latter causing an automatic lift for the blade 70 against the action of the spring 74. The higher the frame 8 is raised, the greater is the slope taken with respect to the horizontal by the blade 70 intercepting the ball being launched, causing it to shift upwards, thus providing for so-called lob type of throws. Of course, as the frame moves down again, the spring 74 will automatically lower the blade 70, which accordingly does not any longer intercept the launched or thrown ball.

As herein previously mentioned, the length of said arm 12 is adjustable and accordingly also the excursion of the entire rocking carriage 8 is adjustable relative to the supporting frame 1.

It should be noted that, since the device is preferably fitted with electrical motors, such motors can be remote controlled readily by a player, thereby enabled to adjust as desired the type of throw and also the cycle or sequence of the desired throws.

The device has been shown with the omission of the several safeguards for better showing the inner details and operation of the various members. However, the device would provide at least one safeguard or crankcase for completely covering the two geared motor units and at least a second safeguard or crankcase, preferably of the mesh type for completely covering the space as occupied by the club 34 in its movement.

Although only one embodiment has been described, those skilled in the art can now readily provide many modifications and changes, all of which are to be intended as within the scope of the present invention.

What I claim is:

1. A device for ball launching in sports training, the device comprising; a supporting structure movably mounted on wheels and having at least two spaced

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apart tracks mounted rearwardly thereof; a frame means bearing on said tracks and adapted to be rotated with respect to the supporting structure; a ball magazine mounted on said frame means; a pivotally mounted ball propelling club mounted on said frame means; upright members mounted on said frame means for supporting said magazine and said club; means mounted on said frame means for rotatably engaging and disengaging said ball propelling club to pivot the club to a cocked position and then release same so that the club may propel a ball; spring means for biasing the pivoted club from a cocked position to a ball propelling position; means for cyclically biasing the spring means so as to vary the tension of the spring means; and motor means for operating said cyclically biasing means and for rotating said frame means with respect to the supporting structure.

2. A device as set forth in claim 1, wherein said motor means rotably drives through a reduction gear a shaft carried by said frame means and connected to a lever having an adjustable length to an articulation fast with said supporting structure, two rollers being provided on said frame means and resting on said tracks of said supporting structure.

3. A device as set forth in claim 2, wherein at the ball hitting region said club is provided with a plurality of adjustable tension strings.

4. A device as set forth in claim 3, wherein the end of said club operating spring is restrained by a crown sector carried by a cam through a threaded tie-rod, the position of which can be adjusted by a handwheel-fitted sleeve.

5. A device as set forth in claim 4, wherein said maga-

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zine cage substantially comprises four pulleys, arranged two by two on parallel planes, with belts interconnected by strips, internally of which ball lifting channels are provided, which are at the top overturned at a main supply channel for an inlet.

6. A device as set forth in claim 5, wherein provision is made for a counter plate in front of said inlet, which counter plate is carried by a fork, said inlet and plate being provided with lips made of yieldable material for retaining therebetween the ball which is to be hit by the club.

7. A device as set forth in claim 6, wherein a damper is provided for restraining said club after hitting the ball, said damper comprising a wheel carried by said upright member.

8. A device as set forth in claim 7, wherein provision is made for a shifting blade of varying orientation and located in front of the launching lips for intercepting the thrown ball at least at some positions thereof.

9. A device as set forth in claim 8, wherein said blade is pivoted to a point or location of said frame means and driven against a spring by a rope restrained at one end to a lever fast with said blade and at the other end to said supporting structure of the device, so that upon the frame means being raised with respect to the supporting structure an upward rotation of said blade is automatically caused against the action of said spring.

10. A device as set forth in claim 9, wherein said first frame is provided with two stationary wheels and a third wheel orientable by means of a rod, a jack being provided for raising said frame relative to said orientable wheel.

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