

- [54] **BALL COLLECTING AND FEEDING DEVICE**
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- [73] Assignee: **Vic Braden**, San Diego, Calif.
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- [51] Int. Cl..... **B65h 1/30**
- [58] Field of Search ..... **221/175, 178, 179, 192, 221/274; 214/6 BA**

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**FOREIGN PATENTS OR APPLICATIONS**

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[57] **ABSTRACT**  
 An apparatus for feeding a ball throwing machine of a type having an elevated ball inlet comprising a rotating plate disposed below ground surface for guiding balls collected therein one-by-one to a vertical upright and a piston reciprocally received in the upright for lifting a column of said balls to said ball inlet.

**7 Claims, 8 Drawing Figures**

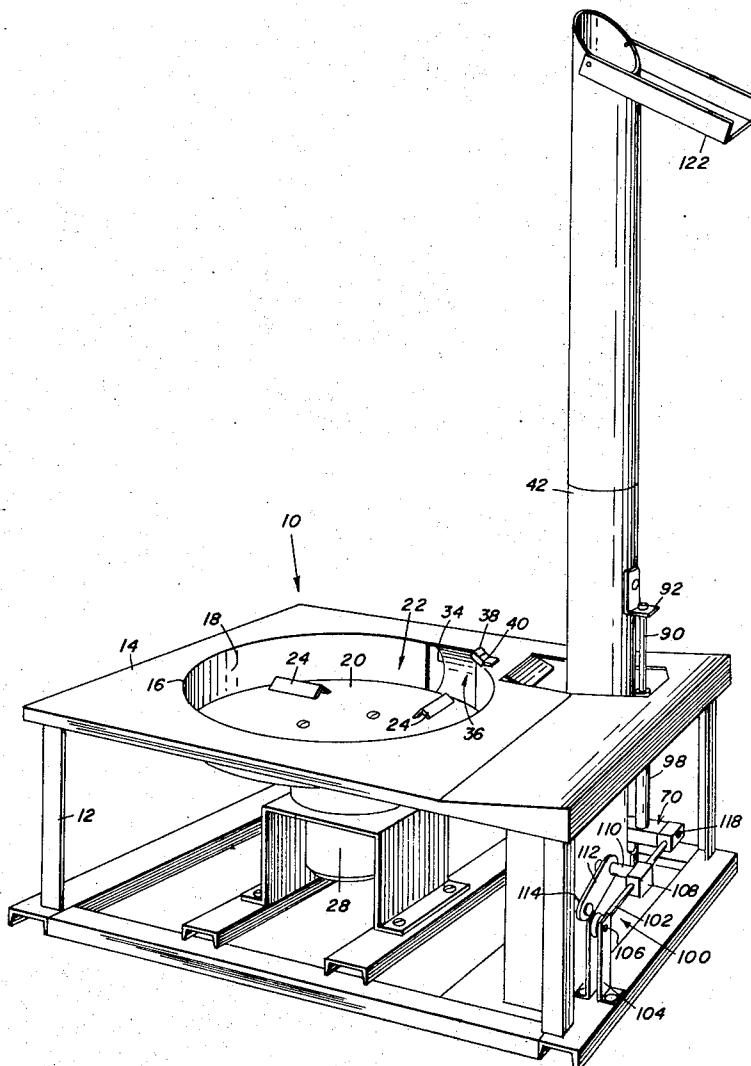
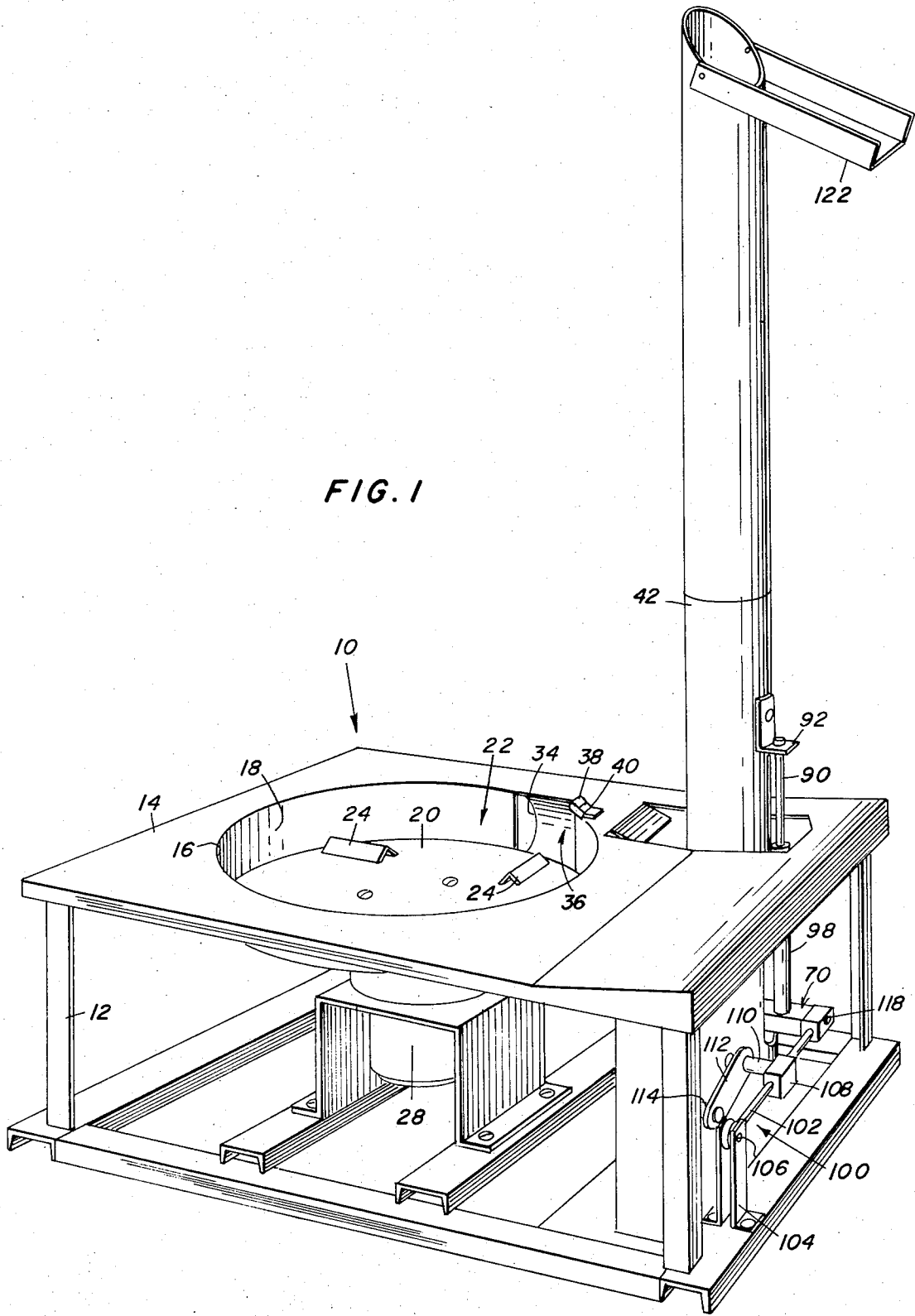


FIG. 1



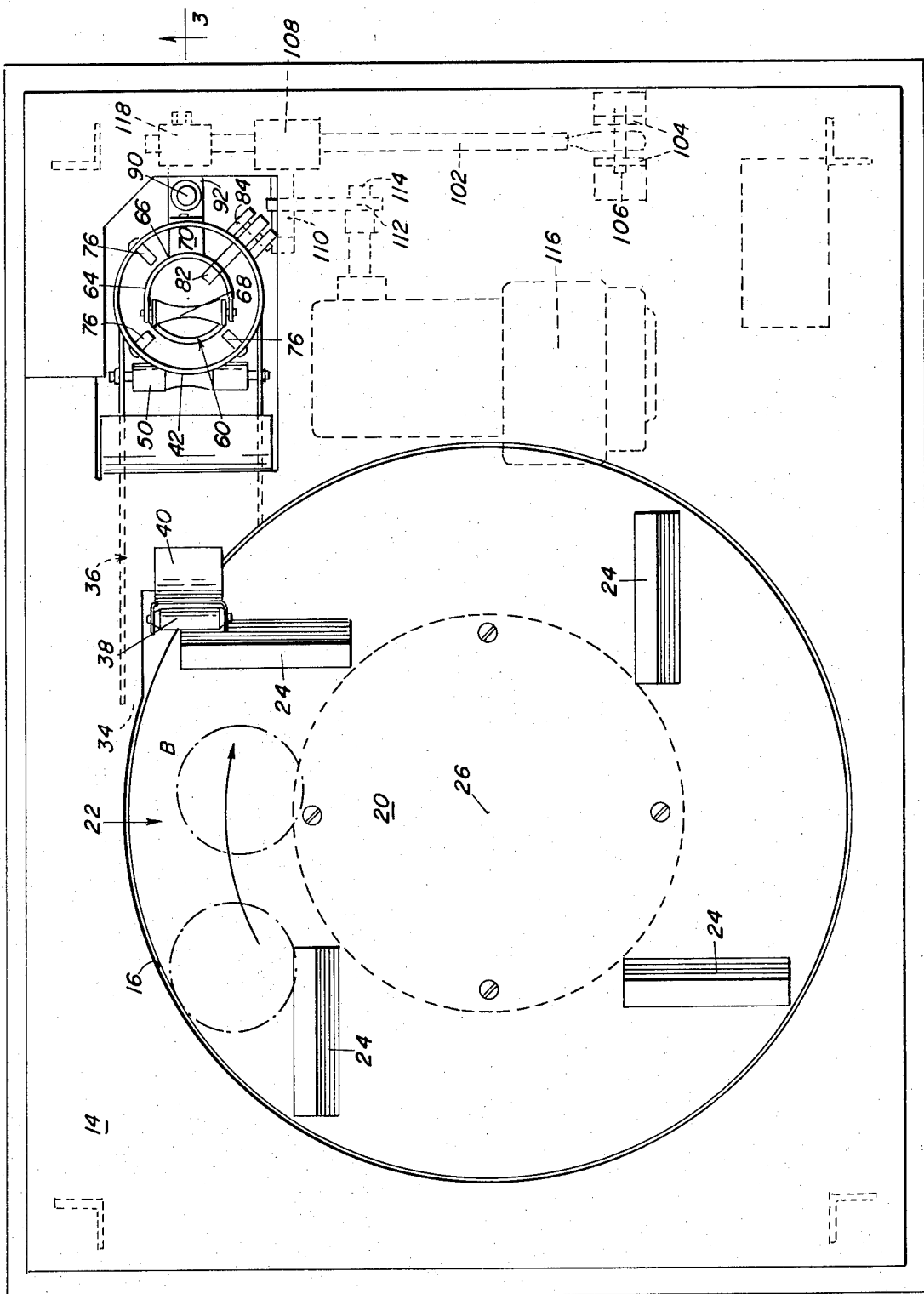


FIG. 2

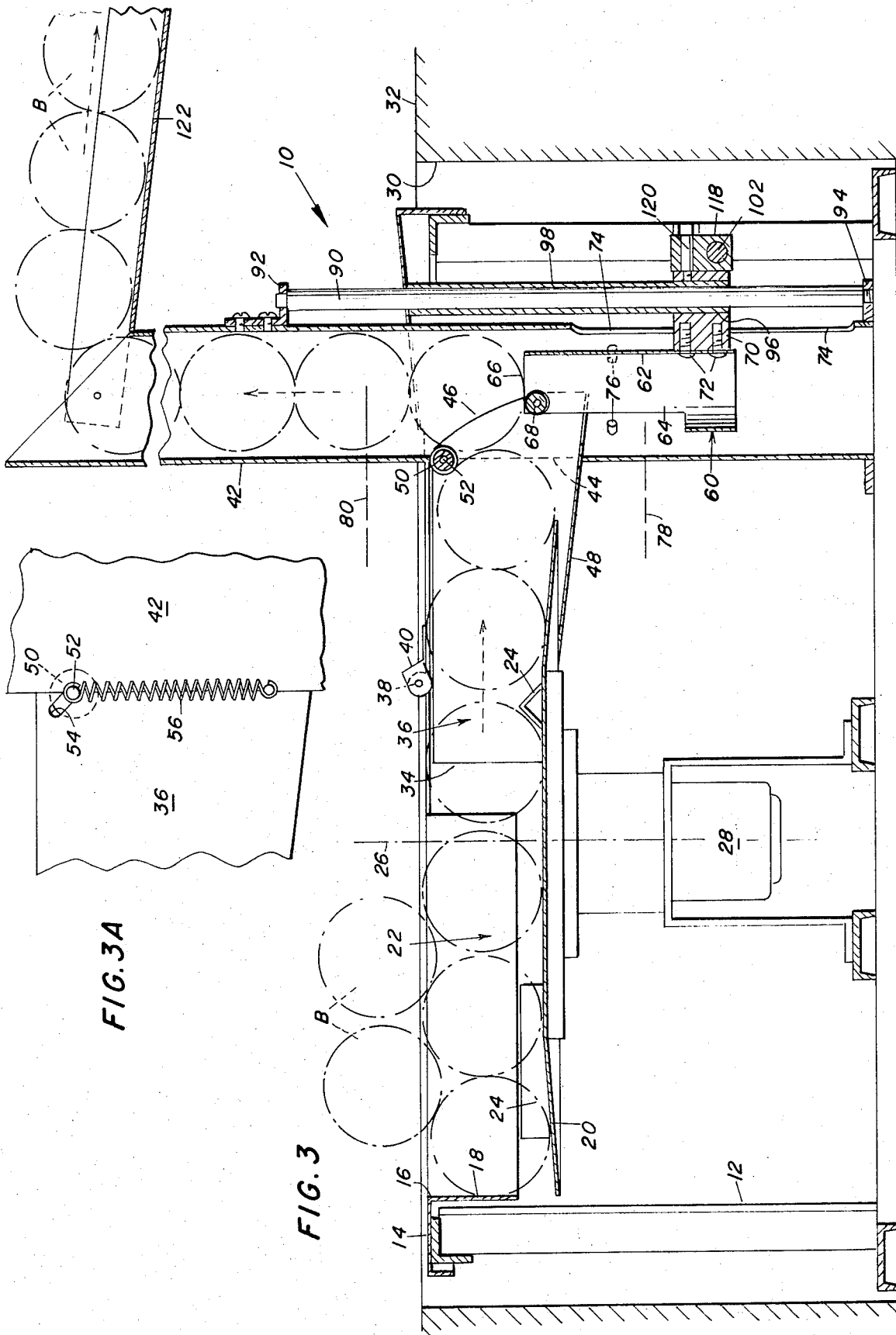


FIG. 3A

FIG. 3

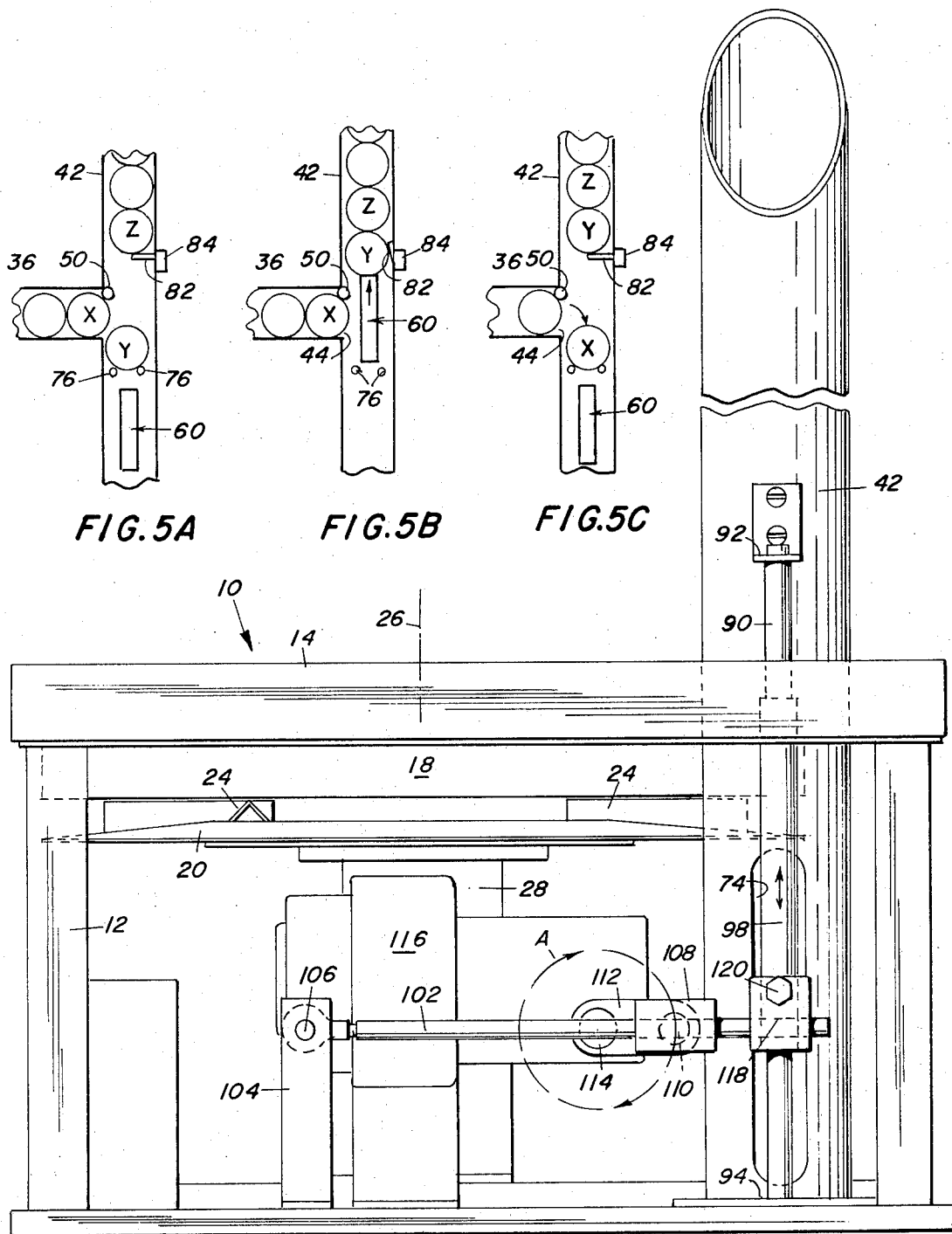


FIG. 4

**BALL COLLECTING AND FEEDING DEVICE**

This invention relates to an apparatus for utilization with a tennis ball projection machine. Many popular tennis ball throwing machines are gravity fed from an elevated hopper. The inlet to the ball-throwing apparatus from the hopper arranges the balls in a single, usually zigzag, column where they are fed, a single ball at a time, to the actual propelling mechanism. In most instances, the balls are lifted into the hopper by hand. This requires time-consuming labor. Additionally, hopper feeds often become "jammed" which causes laborious and objectionable time delays. Therefore, a principle objective of this invention is to provide a novel and improved method of collecting balls from a surface and feeding them to a ball projection machine in a single column.

In a co-pending application of assignee, Victor Braden (Ser. No. 270,350 Tennis Teaching Facility, filed July 10, 1972), a tennis training facility is set forth which shows a plurality of ball-throwing machines disposed at the lower ends of sloping training alleys. The instant invention has particular usefulness when used with such a facility since the balls tend to gravitate to a position where they can be collected and elevated for column feeding to the throwing machine. Another important objective of this invention is to provide an apparatus which mechanically aligns tennis balls that are guided thereto and arranges them in a single file fashion where they are conveniently lifted to a level suitable for use with ball-throwing machines.

Another important objective of this invention is to provide an apparatus of the type described having a plurality of anti-jamming means which prevent the balls from wedging between mechanical elements.

A still further objective of this invention is to provide an apparatus for collecting and feeding tennis balls which is of rugged construction, relatively inexpensive to manufacture, install and operate and which is adaptable for use in outside environments without damage or rendered inoperative by weather elements such as rain, mud and debris.

These and other objects of the invention will become more apparent to those skilled in the art by reference to the following detailed description when viewed in light of the accompanying drawings wherein:

FIG. 1 is a perspective view of the machine;

FIG. 2 is a top plan;

FIG. 3 is a vertical section along the line 3—3 of FIG. 2;

FIG. 3a is a partial diagrammatic view showing operation;

FIG. 4 is a right elevational view; and

FIGS. 5A, 5B, and 5C are diagrammatic views showing the sequence of operations.

Referring now to the drawings wherein like numerals indicate like parts, the numeral 10 indicates a machine incorporating the concepts of this invention. A framework 12 supports a platform 14 having an opening 16. Extending downwardly from the opening is a generally circular sidewall 18. The sidewall is bottomed by a rotatable plate 20 to form a shallow depression 22. The depression has a depth of approximately one tennis ball diameter. A series of triangularly spaced baffles 24 are affixed to the upper surface of plate 20. Plate 20 is rotated about an axis 26 by way of an electric motor 28. The plate 20 tapers downwardly toward its periphery as best seen in FIG. 3. Balls collected in depression 22 are

thus caused to move toward the sidewall by the force of gravity and the centrifugal force of the rotating plate.

The unit is placed in a compartment 30 formed in a playing surface 32. The compartment has a depth sufficient to cause platform 14 to be level with, or slightly below, the surface 32. The balls B can then be received either by gravity or be fed thereto by mechanical or manual means. As the balls reach the plate 20, a clockwise rotation of plate 20 urges them into the opening 34 of a channel 36. Channel 36 is disposed generally tangential to sidewall 18. In addition to their feed function, baffles 24 also cause a gentle turbulence within the confines of the depression preventing any serious stoppage or wedging of the balls. A roller 38, supported by a leaf-spring 40, is affixed to the upper surface of the platform just above opening 34. The roller will permit only a single ball to reach channel 36 and will prevent jamming at that stage.

An upright 42 is disposed at the outer end of channel 36. The upright 42 is formed with an opening 44 to receive the exit end 46 of channel 36. The lower surface of channel 36 is flared downwardly at 48. Mounted above opening 44 is a roller 50 rotatably secured about a shaft 52. The ends of shaft 52 are slidably received in slots 54 formed in channel 36. The shaft 52 is biased downwardly by action of springs 56. Movement of the roller against the bias will diminish the chance of jamming at this critical feed point.

Reciprocally received in the upright 42 is a cylindrical piston 60. Throughout most of its length, the piston is segmented as at 62 to provide a U-shaped section 64 having an upper, ball-engaging rim 66. A roller 68 is rotatably mounted across leg sections of the U-shaped section. Near its lower end, the piston is secured to a drive arm 70 by way of fasteners 72. The upright 42 is formed with an elongated vertical slot 74 to accommodate the movement of arm 70. Slightly below the opening 46, a group of stop pins 76 extends into the interior of upright 42 but not sufficiently to interfere with the movement of the piston 60.

In FIG. 3, the piston 60 is shown in an intermediate position. The lower extent of its movement is shown by the dotted line 78. The uppermost extent of its movement (of rim 66) is shown by the dotted line 80.

The sequence of operation can be seen by the diagrammatic showing of FIGS. 5A, 5B and 5C. In FIG. 5A the piston 60 is at the lowermost end of its stroke and a ball Y is resting on pins 76. The distance between the roller 68 of the piston and the roller 50 across the upper end of opening 44 will not permit a ball X to enter upright 42. An arm 82 of a spring-urged, one-way latch assembly 84 supports a column of balls. The lowermost ball is indicated by the letter Z. As piston 60 moves upwardly, ball Y is carried past the ball X and arm 82 is urged out of position by ball Y. Upward movement is continued until arm 82 again moves to the horizontal and ball Y becomes the bottom ball. While the piston is moving upwardly, the piston itself will maintain ball X in channel 36. Unless the piston moves below the opening 44, the ball X will fall to the top surface (rim) of the piston and remain there until the piston withdraws below the pin 76. The sequence is then repeated.

The mechanism for causing the movement of piston 60 will now be described. A vertical guide member 90 is affixed to the outside of upright 42 by way of brack-

ets 92 and 94. The drive arm 70 is apertured at 96 to receive a guide sleeve 98 which is fixedly secured to the arm 70 and moves therewith. The guide sleeve 98 is slidably mounted on the guide shaft 90. As sleeve 98 moves vertically on shaft 90, the piston 60 is caused to reciprocate.

The drive mechanism causing reciprocation of the piston is generally indicated by the numeral 100. A shaft 102 is pivotally secured to a support 104 about an axle 106. Intermediate the length of shaft 102, and slidably received thereon is a block 108. Block 108 rotatably receives a shaft 110 which, in turn, is rotatably received by the outer end of a linking arm 112. The linking arm 112 is caused to rotate by the output shaft 114 of an electric motor 116. The outer end of shaft 102 is slidably received in the block 118 which is affixed to the arm 70 but is rotatably mounted with respect thereto about a pin 120.

As best seen in FIG. 4, link 112 is caused to carry the pin 110 in the circular path indicated by the arrow A. The pin 110 will cause the block 108 to follow this path which causes a vertical oscillation in rod 102. The outer end of the rod 102 carries the block 108 vertically and the piston is moved accordingly through the arm 70.

As previously described, reciprocation of the piston will cause a vertical column of balls to reach the top of the upright 42 where they are fed in single-file fashion to a trough 122. The balls are gravity-fed in a single column to the inlet of a ball throwing machine.

In a general manner, while there has been disclosed an effective and efficient embodiment of the invention, it should be well understood that the invention is not limited to such embodiment, as there might be changes made in the arrangement, disposition, and form of the parts without departing from the principle of the present invention.

I claim:

1. An apparatus for collecting and lifting balls to the inlet of a ball-throwing machine comprising in combi-

nation

a framework,  
a top surface over said framework having an aperture formed therein,  
a sidewall depending downwardly from said aperture a plate rotatably disposed below said sidewall and forming a ball-receiving depression therewith,  
an elongated hollow upright of a diameter only slightly larger than that of said balls and having an opening therethrough intermediate its longitudinal ends,

first means transferring balls from said plate to said upright through said opening,

a piston within said upright and having an upper end, second means to reciprocate said piston in a stroke wherein said upper end in its lowermost position is below said opening a sufficient distance to permit a single ball to be received in said upright and in its uppermost position, lifts said single ball to a point above said opening,

third means to hold the balls elevated above said opening by said piston.

2. The apparatus of claim 1 wherein said first means includes a channel member communicating with said opening and vanes on said plate for directing balls toward said opening when said plate is rotated.

3. The apparatus of claim 2 wherein the upper surface of said plate tapers downwardly adjacent its periphery.

4. The apparatus of claim 1 wherein a spring urged roller is mounted above said opening.

5. The apparatus of claim 1 wherein said first means includes a channel having one end communicating with said opening, a roller across said opening and spring means connected to said roller.

6. The invention of claim 5 wherein said piston has a roller across the upper end thereof.

7. The invention of claim 6 wherein said third means is a one-way latch mechanism.

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