March 2, 1954 H. M. HESSENBRUCH 2,670,727

CENTRIFUGAL FRANGIBLE TARGET PROJECTOR

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FIG_1_

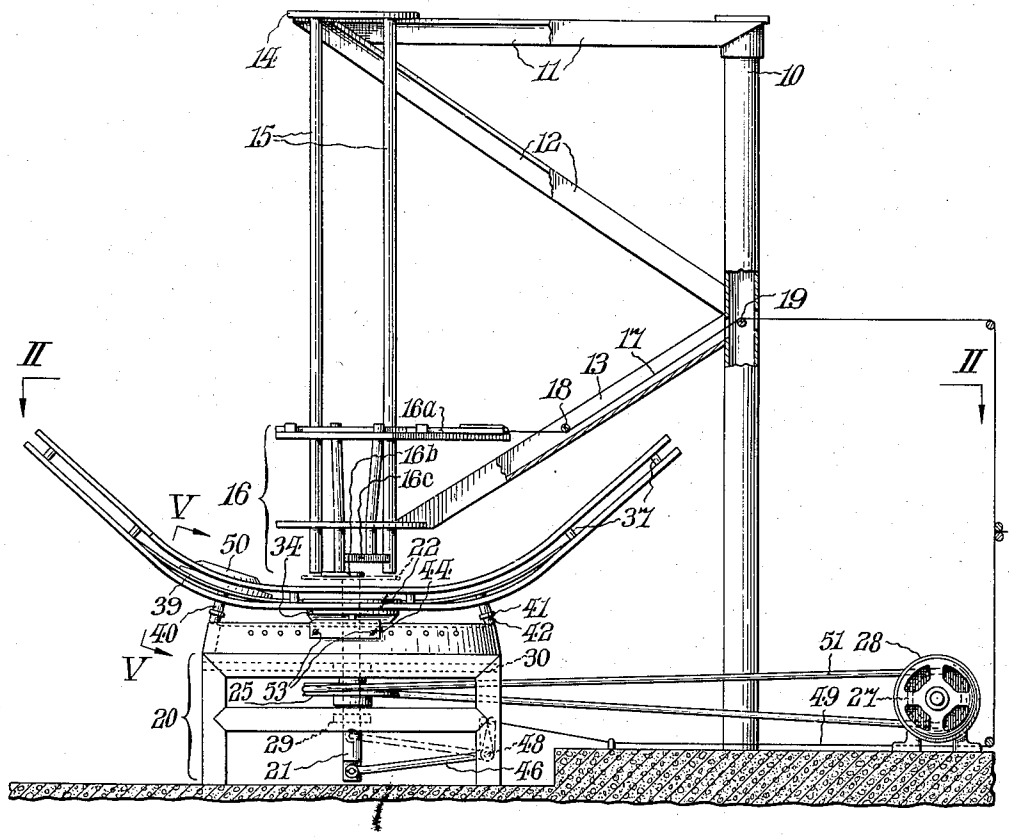


FIG_2_

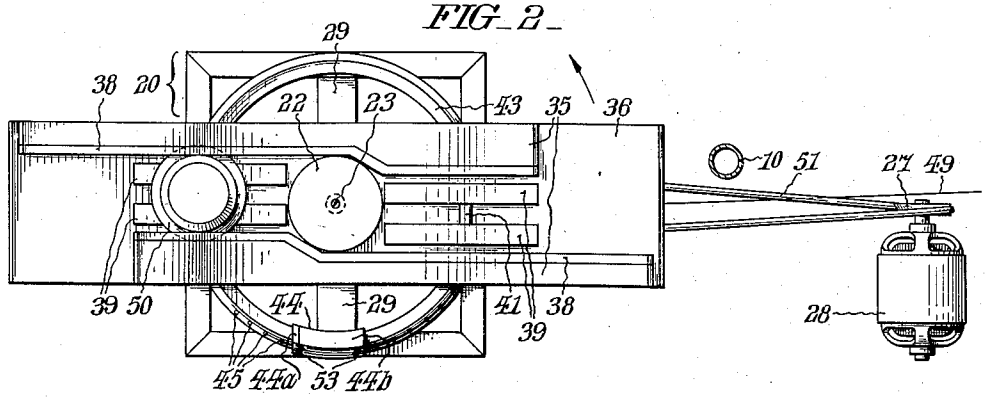


FIG_5_

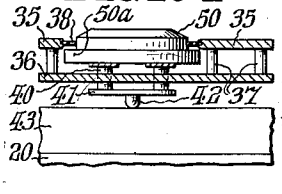
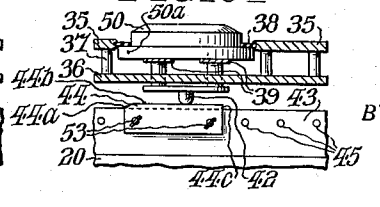


FIG_6_



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FIG. 3

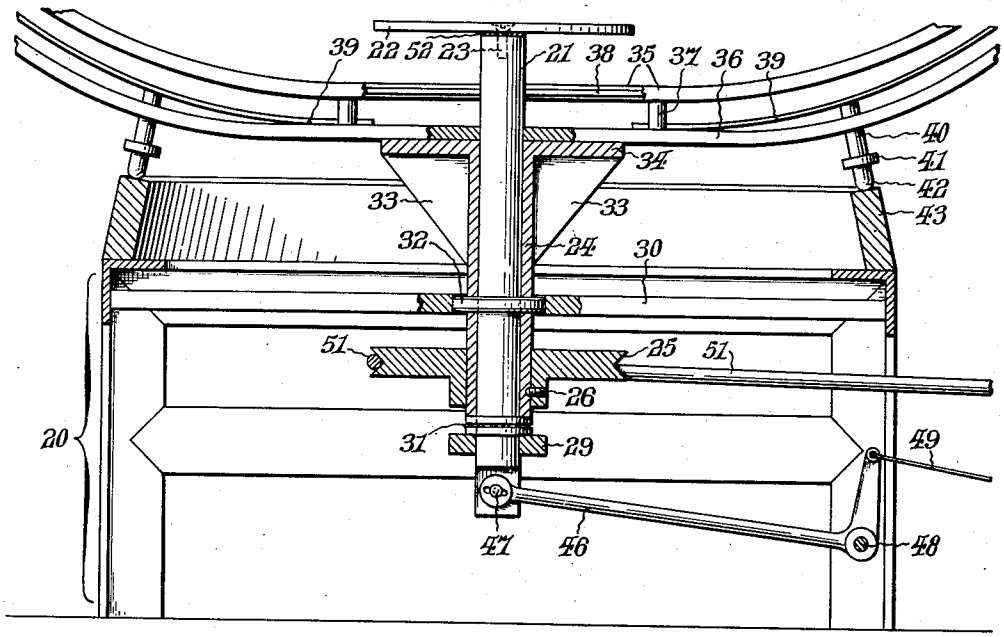
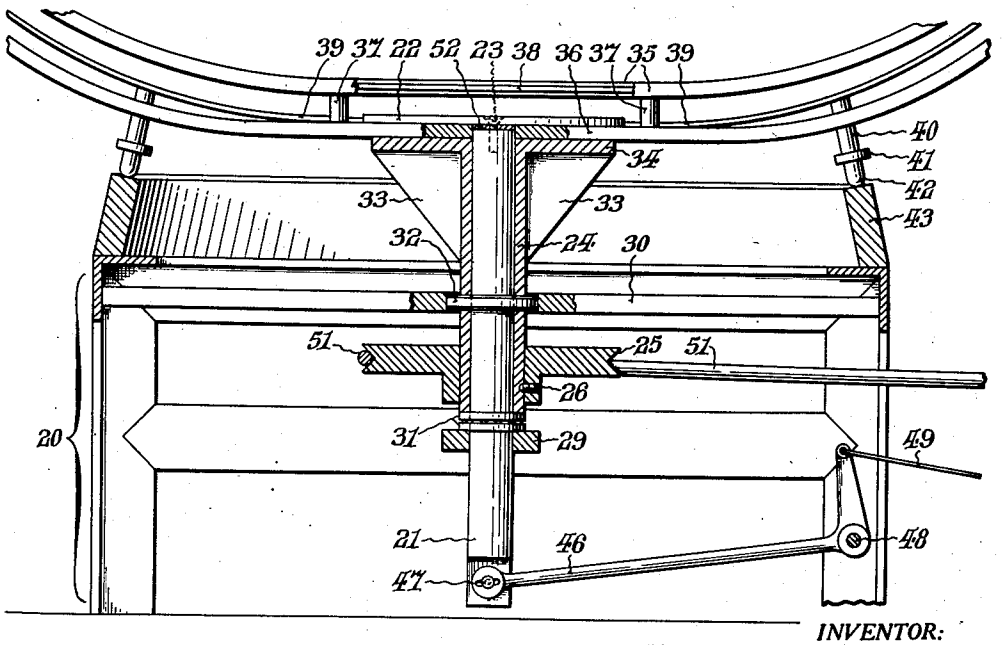


FIG. 4



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FIG. 7

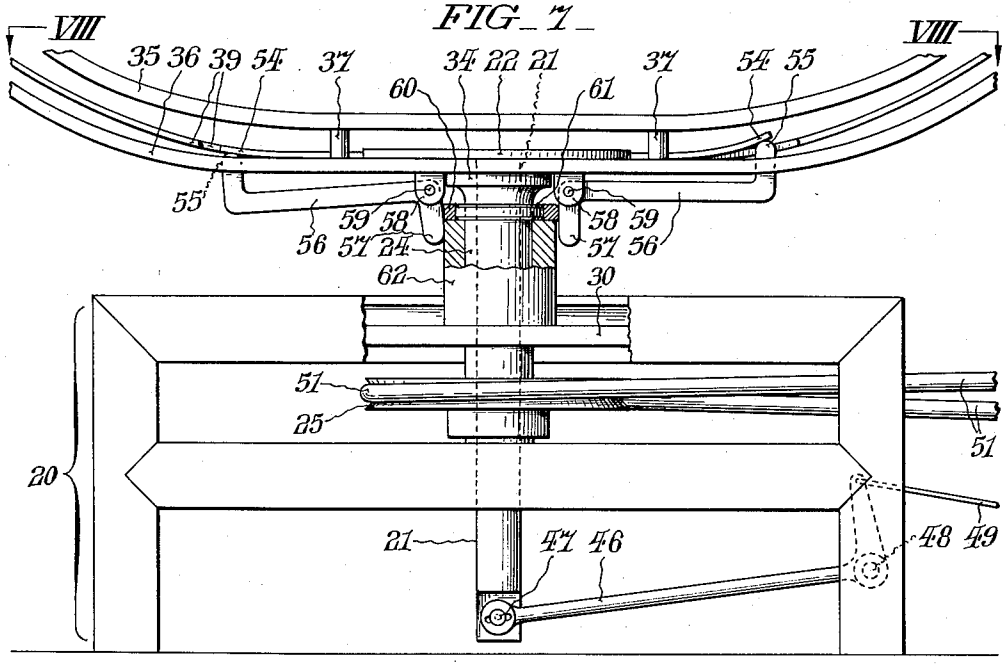


FIG. 8

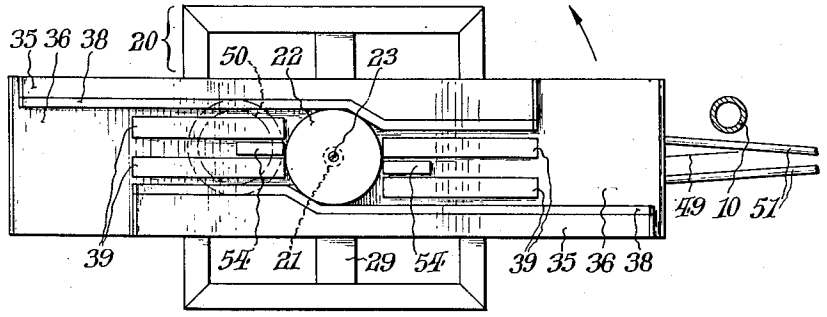
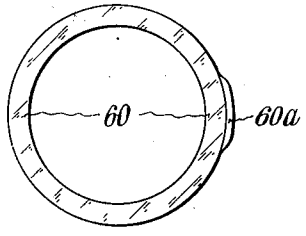


FIG. 9



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CENTRIFUGAL FRANGIBLE TARGET PROJECTOR

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4 Claims. (Cl. 124—6)

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This invention relates to apparatus for throwing targets or like articles, and more particularly concerns a mechanism for throwing relatively frangible articles such as disks or birds commonly used as targets in trap shooting.

It is conventional to provide target throwing apparatus including a throwing arm on which the target is supported, such throwing arm being rotatable to provide a rather substantial centrifugal force which acts upon the target to throw it outwardly clear of the arm. However the prior art devices have all been subject to the objection that they impose rather sudden forces upon the target, which is commonly composed of clay or other readily breakable material. Moreover, limitations are usually encountered in conventional target throwing devices, in that they have capacity to throw the targets through a fixed path only, and are not readily adapted for the throwing of targets at random through a wide area.

Another disadvantage inherent in target throwing devices of the prior art is that a definite time consistently elapses between the time the device is actuated and the time the target is thrown. In many of these devices the actuation of the throwing mechanism is accompanied by a characteristic sound which notifies the target shooting competitor that the target is about to be thrown. This is objectionable in that keener competition is provided by throwing the target without informing the competitor in advance.

It is accordingly an object of the invention to provide an article throwing apparatus having capacity to handle large numbers of frangible objects without breaking them. Another object of the invention is to provide an article throwing apparatus having capacity to throw the articles in various directions throughout an area of wide scope. A further object is to provide, in connection with such apparatus, means for limiting the scope or area into which the articles can be thrown. It is still another object of the invention to provide a target throwing apparatus having capacity to throw the target at an unpredictable time and in an unpredictable direction. Further objects and advantages of the invention, including the simplicity and economy of the same, as well as the ease with which it may be operated, will appear in further detail hereinafter and in the drawings whereof:

Fig. 1 represents a side elevation of a target throwing apparatus constituting one embodiment of my invention;

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Fig. 2 represents a plan view partly in section, taken as indicated by the lines and arrows II—II which appear in Fig. 1;

Fig. 3 represents an enlarged fragmentary side elevation of a portion of the apparatus represented in Fig. 1, certain of the parts being broken away and shown in section in order more fully to disclose important details;

Fig. 4 represents a side elevation similar to Fig. 3, indicating the positions occupied by certain of the parts in the course of operation of the apparatus;

Fig. 5 represents a sectional view taken as indicated by the lines and arrows V—V which appear in Fig. 1;

Fig. 6 represents a fragmentary view of a portion of the apparatus shown in Fig. 1, with the target throwing arm rotated through an angle of ninety degrees, and shown in section;

Fig. 7 represents a fragmentary enlarged side elevation illustrating another embodiment of my invention;

Fig. 8 represents a sectional view in plan, taken as indicated by the lines and arrows VIII—VIII which appear in Fig. 7; and

Fig. 9 represents a plan view of a cam ring constituting one element of the apparatus illustrated in Fig. 7.

In describing the form of my invention exemplified by the accompanying drawings, specific terms will be employed for the sake of clarity. However it will be appreciated that the scope of the invention is not thereby limited and that each term is intended to embrace all equivalents which perform the same function for an analogous purpose.

Referring now to Figs. 1–6 of the drawings, the apparatus includes an upright 10 to which is secured a horizontal support arm 11 and a pair of inclined braces 12, 13. A support plate 14 is fixed on top of the support arm 11, and guide rails 15 suspend from the plate 14 to form a rack or magazine for the birds to be thrown. The number 16 designates comprehensively a release mechanism for the birds retained in the rack, such release mechanism including a release cable 17 which is attached to a horizontally slidable actuator member 16a and trained around guide pins 18, 19. Release cable 17 serves to move the foot members 16b, 16c thus releasing one target or bird at a time. As release cable 17 is pulled toward the right in Fig. 1, it operates through a connecting linkage (not shown) to move the actuator member 16a and foot members 16b, 16c toward the left. From Fig. 1 of the drawings it

will be appreciated that the foot members 16b, 16c have rigidly attached leg members that extend upwardly therefrom, and that the upper ends of said leg members are rigidly attached to the actuator member 16a of the release mechanism 16 with capacity for horizontal reciprocating sliding movement along said horizontal frame, between limits on the left and right when viewed as in Fig. 1. The left edge of the foot member 16c is relatively thin and has capacity to enter between the two lowermost birds in the rack. Release mechanisms of this type are conventional. Thus the foot member 16c supports the racked targets while the lowermost target is released.

The number 20 designates a supporting frame carrying a non-rotatable vertical shaft 21 on which is rotatably mounted a table 22 (see particularly Figs. 3 and 4). The table 22 is mounted on the shaft 21 by means of a pin 23. Bearing 52 is disposed between shaft 21 and table 22 to provide for free relative rotation. The number 24 designates a hollow shaft concentric with and surrounding the shaft 21. Fixed to the hollow shaft 24 by means of a set screw 26 is a drive pulley 25 which is rotated, through belt 51 and drive pulley 27, by motor 28. The number 29 designates a lower support plate for the shaft members 21, 24, while the number 30 designates a corresponding upper support plate. Lower and upper bearings 31, 32 are supported on said support plates 29, 30, respectively. Support webs 33 and a head plate 34 are formed integrally with one another and with the hollow shaft 24. Fixed to the head plate 34 is an arm 36 which carries a plurality of spacer pins 37 to which are affixed a pair of spaced apart upper guides 35 (see particularly Figs. 5 and 6). The guides 35 each carry opposed brake strips 38 which consist of resilient material such as rubber or the like. The brake strips 38 form yieldable guides on the arms defining the path of movement, outwardly of the arm 36, of the bird or other article to be thrown.

Disposed at a point removed from the center of rotation of each arm 36, and adjacent the path of movement of the bird along said arm, are a plurality of leaf springs 39 which are fixed to the lower arm element 36. Spring-support pins 40 bear against the central portion of each leaf spring 39 and are both affixed to a common transverse plate 41 which carries a pin 42. The number 43 designates a circular track, supported on the frame 20, having a top face upon which the pin 42 travels. A plurality of holes 45 are disposed at uniform intervals along the circular track 43, providing means whereby a removable cam track 44 is adjustably affixed by thumb screws 53 to the upper outside face of the circular track 43. The cam track 44 has an inclined top face 44a and a substantially horizontal top face 44b upon which the pin 42 travels, as well as a vertical face 44c, and thus the pin 42 is a cam follower serving to move the leaf springs 39 up and down, toward and away from the brake strips 38, in predetermined relation to the positions of arms 36. Accordingly means are provided for retaining the bird or other article at a point spaced from the center about which the arm rotates, and for subsequently releasing the retaining means to free the article for further movement toward the free end of the arm 36.

Means are also provided for receiving each bird or other article as it is discharged by the release mechanism 16, and for moving such article to one of the rotatable arms 36. This means includes, in combination with the table 22 and shaft 21, a bell crank lever 46 having a slotted end pivoted at 47 to the lower end of shaft 21. Bell crank lever 46 is also pivoted at 48 to the supporting frame 20, and has a free end to which a lever operating cable 49 is affixed. The lever operating cable 49 is preferably joined to the release cable 17 for concurrent action.

In operation, the bird 50 is not only released by means of the release mechanism 16, but the table 22 is simultaneously elevated through the action of bell crank lever 46. Assuming the birds are stacked vertically between the guide rails 15, 15 and the foot members 16a, 16b are in the positions indicated in Fig. 1, with the bottom bird resting on the foot member 16b, and assuming the release cable 17 is moved toward the right, the foot members 16b, 16c then slide concurrently toward the left. Foot member 16c, which is initially spaced to the right of the stack of birds, enters between the two lowermost birds in the rack and supports all but the bottom bird. Upon further movement of foot members 16b, 16c toward the left, foot member 16b moves beyond the left edge of the bottom bird (which is retained between the guide rails 15, 15) thus permitting the bottom bird to move downwardly to the table 22. Thus the bird 50, which is made of clay or some other frangible material, is gently deposited on the table 22 when it is elevated, as in Fig. 3. Upon release of the cable 49, the table 22 returns by gravity to the position represented in Fig. 4 of the drawings, establishing frictional contact with arms 36, whereupon the table 22 rotates under the influence of the arms 36, which are rotated at high speed, say 300 R. P. M., for example. By reason of such rotation the bird 50 (which is deposited eccentrically on the table 22) is urged by centrifugal force away from the center line of shaft 21 toward the free end of either of the arms 36. As the arms 36 rotate, the pin 42 periodically travels over the top surface of cam track 44 and is thus moved periodically toward and away from the brake strips 38. Should the bird 50 enter the arm 36 when these parts occupy the position shown in Fig. 5, its passage along the arm 36 will be substantially unimpeded and it will be thrown outwardly by reason of the centrifugal force developed as the arm 36 rotates about the axis of hollow shaft 24. However at certain preselected points in the course of arm rotation, by reason of the action of cam track 44, the central portions of the leaf springs 39 will be elevated or moved toward the brake strips 38, into the path of movement of the bird 50 along the arm 36. Should a bird enter into the arm 36 at such point, the leaf springs 39 will bear upon the bottom face of the bird, as indicated in Fig. 6 of the drawings, thus urging the flange 50a upwardly against the brake strips 38 thereby stopping the bird and retaining it on the arm 36 at a point spaced from the center of rotation of the arm 36. At a subsequent predetermined point the pin 42 will complete its passage over the cam track 44 and will return under the influence of leaf springs 39 to the top face of the circular track 43, thus inactivating the bird retaining means and freeing the bird for further movement outwardly along the arm 36. The arms 36 are rotated in the direction of the arrow in Fig. 2 and the leading brake strip 38 is somewhat shorter than the lagging brake strip 38, whereupon the target, urged by centrifugal force against the lagging brake strip 38, is spun about its axis as it is thrown outwardly of arm 36.

Concurrently with the release of the cable 49,

the release cable 17 permits the foot members 16b, 16c to slide to the right to the position shown in Fig. 1. The stacked birds drop to the lower foot member 16b when foot member 16c moves to the right past the righthand edge of the bottom bird remaining in the stack. The discharge mechanism is thus re-set to place another bird on table 22.

Referring now to Figs. 7–9 of the drawings, it will be observed that the modified embodiment of the invention there illustrated includes a detent spring 54 mounted on each arm 36 in the path of movement of the bird 50 along the arm. A spring actuating lever 56 having an upper arm 55 and a cam follower arm 57 is pivoted at 59 to a bracket 58 supported from the arm 36. Fixed to the upper support plate 30 is a collar 62 which surrounds the hollow shaft 24, a bearing 61 being disposed on top of collar 62 and in contact with the hollow shaft 24. Also supported by collar 62 is a fixed cam ring 60 surrounding the bearing 61. The cam ring 60 carries an integral cam element 60a, see particularly Fig. 9.

In the operation of the modified form of the device, the cam element 60a is periodically effective upon the cam follower arm 57 as the arm 36 rotates about its center. Cam follower arm 57, acting through the spring actuating lever 56 and the arm 55, raises the free end of detent spring 54 into the path of advancement of the bird 50 along arm 36. As the arm 36 rotates, the detent spring 54 is thus reciprocated into and out of the path of movement of bird 50, thereby intermittently blocking the advancement of the bird to retain the bird in position on arm 36, and subsequently releasing it.

The article retaining and releasing means of the character previously indicated constitutes an important feature of the invention, particularly in that the retaining means may be actuated in a predetermined position relative to the upright 10 in order to prevent the release of a bird or other article when the arm 36 is in alignment with the upright 10. The retaining and releasing means of this invention not only provides apparatus for preventing the throwing of articles toward fixed objects such as the upright 10 or the like, but also constitutes means for limiting or regulating the boundaries of the area into which the birds can be thrown. Moreover the effective throwing angle of the apparatus is readily varied by moving the cam means of the apparatus, or by interchanging cam elements of different sizes or shapes.

It will be apparent that the time lag between the time of actuation of cables 17, 49 and the time the bird is actually thrown will vary considerably. Slight differences of eccentricity as the target is placed on the rotatable table 22, as well as slight differences of residual speed of rotation of table 22 before it is lowered to the arm 36, are found to vary the time required for moving the target from table 22 to arm 36. Thus the exact time of release of the target is to a considerable extent unpredictable, even though the time of actuation of the cables 17, 49 be known. Yet in no event will an unduly extended time delay be encountered. Since the arms 36 rotate continuously no characteristic sound is made as an incident to the throwing of the target. The element of surprise thus introduced requires quick action on the part of the target shooter in aiming and firing. Accordingly it will be appreciated that the targets, when placed on the table at a substantial distance from its center, will be quickly thrown outwardly while a target placed very near the center of the table will be thrown outwardly after a relatively long delay. Thus, the degree of eccentricity of the target with respect to the table may be varied within wide limits from very substantial degrees of eccentricity down to substantially zero eccentricity. Accordingly the word "eccentrically" as used in the appended claims is intended to cover all the operative degrees of eccentricity as just discussed, and is intended only to eliminate a precisely concentric relationship which would be inoperative to throw the target outwardly of the center of the table.

Another important feature of my apparatus resides in the interaction of the releasing means, elevatable table and rotatable arm. By reason of this construction and arrangement, the targets are moved under the influence of gradually applied forces rather than sudden, damaging ones. Accordingly the frangible birds or targets are readily handled at high speed with minimum breakage.

While I have described the construction and operation of two embodiments of my invention, it will be appreciated that numerous modifications may be made in the form of the device including, but not limited to, reversals of parts and substitutions of equivalents for the various elements or mechanisms herein represented. Moreover, various features of the invention may be used independently of the use of other features, all within the spirit and scope of the invention as defined in the annexed claims.

Having thus described the invention, I claim:

1. A device for throwing a flanged article comprising an arm member rotatable about a central area, a table in said central area, elevating means for raising and lowering said table, release means connected to said elevating means for placing said flanged article eccentrically on said table when the table is elevated, means for lowering said table to the level of said arm, means for rotating said table in response to the rotation of said arm, thereby moving said article to said arm, a track on said arm including yieldable guides disposed adjacent one face of the flanges on said article as it travels along said track, resilient means opposite the other face of said article, cam means for urging said resilient means into the path of movement of the flanged article along said track for contact with said other face, thereby urging the flanges of said article against said yieldable guides and stopping said article, and means for releasing said resilient means to free the flanged article for further travel along said arm.

2. Target throwing device comprising a rack for storing said targets, a rotatable base below said targets, release mechanism for liberating a target from the bottom of said rack eccentrically to said base, means for raising and lowering said base toward and away from the bottom of said rack, a rotatable target-throwing arm, means for rotating said arm, and means for rotating the base in response to the rotation of said arm when the base is lowered, thereby moving said target outwardly by centrifugal force from said base to said arm.

3. Article throwing device comprising an article holder, release mechanism for releasing an individual article from said holder, a table, table elevating and lowering means interconnected with said release mechanism to elevate said table to receive the article eccentrically at the time it

is released from said holder, a rotatable arm below said table, means for rotating said arm, said arm being arranged to contact said table when the table is lowered, said table and arm having surfaces arranged to engage one another when the table is lowered thereby causing said table to rotate with said arm, and guide means forming a path on said arm for said article as it is thrown outwardly under the influence of centrifugal force from said table to said arm.

4. Article throwing device comprising an article holder, release mechanism for releasing an individual article from said holder, an upright non-rotatable shaft below said holder, a table mounted on top of said non-rotatable shaft with capacity to rotate relative thereto, an upright hollow tube surrounding said non-rotatable shaft, means for rotating said hollow tube about its axis, means for raising and lowering said non-rotatable shaft and the table mounted on top of said shaft, an article throwing device fixed for rotation with said tube below said table, said table being normally in contact with said throwing device and rotatable therewith when lowered, said table being free of contact with said throwing device when said table and non-rotatable shaft are raised, and said table also being free to rotate independently of said throwing device when said table is raised, and means for raising and lowering said table toward and away from said article holder and toward and away from said throwing device in predetermined timed relation to the release of articles from said article holder, said table being positioned to receive said articles eccentrically from said article holder.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
540,318	Jenkins	June 4, 1895
1,662,629	Baden-Powell	Mar. 13, 1928
1,783,053	Baden-Powell	Nov. 25, 1930
2,171,623	Connell	Sept. 5, 1939
2,267,525	Kemp	Dec. 23, 1941