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Laporte et al.

[11] **3,923,033**

[45] **Dec. 2, 1975**

[54] **ELECTRICALLY CONTROLLED TARGET THROWING DEVICE**

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[30] **Foreign Application Priority Data**

July 17, 1973 France 73.26111

[52] **U.S. Cl.** **124/8;** 124/32; 124/43

[51] **Int. Cl.²** **F41B 3/04**

[58] **Field of Search** ..... 124/8, 7, 41 R, 46, 48, 124/33, 50, 32

[56] **References Cited**

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Primary Examiner—Richard C. Pinkham
Assistant Examiner—William R. Browne

[57] **ABSTRACT**

Apparatus for throwing "clay pigeons" for target shooting wherein a spring driven throwing arm is moved to the "cocked" position through the action of a drive including an electric motor. The control for the motor includes a pair of parallel circuits which respectively include a normally open manually operated switch and a normally closed switch operated by a cam on the drive train so as to interrupt the current supply to the drive motor when the throwing arm is in the cocked position. A pin is rotatably and drivingly connected to the shaft of the motor. During rotation of the shaft the pin will rotate and engage a pin connected to the crank mechanism, and cause the last mentioned pin to rotate the throwing arm and cause the normally closed switch to open. The output shaft of the motor is coaxial with the shaft connected to the throwing arm. The pin connected to the shaft of the motor is offset from the motor shaft the same distance as the pin connected to the crank mechanism is from the shaft connected to the throwing arm.

10 Claims, 6 Drawing Figures

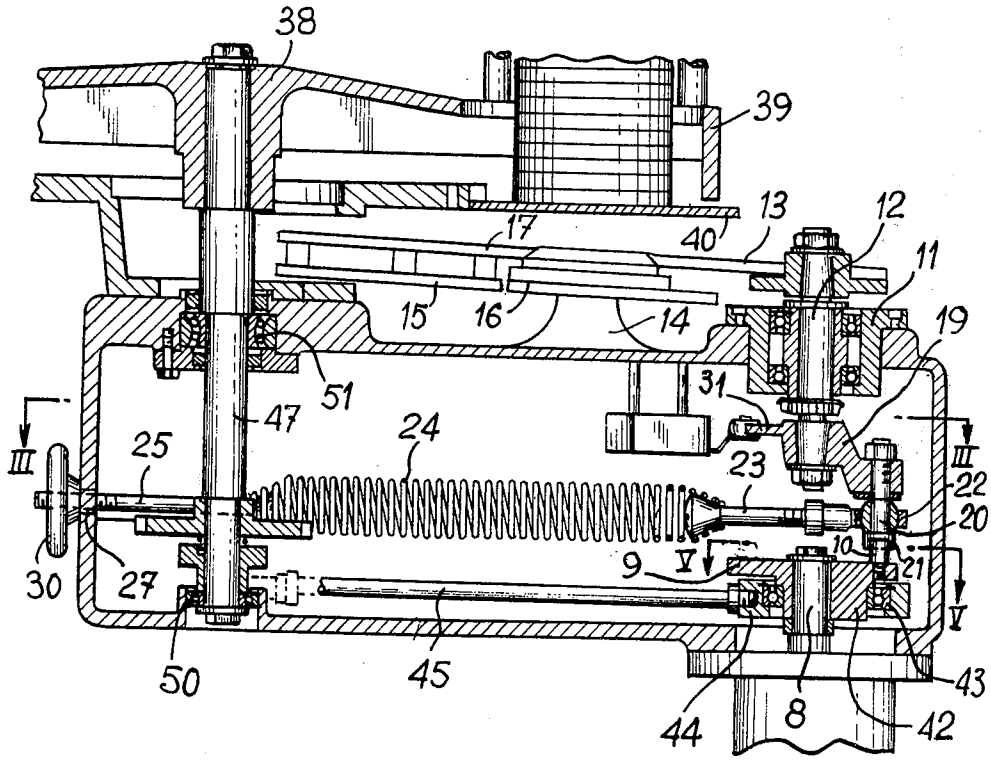

FIG. 1

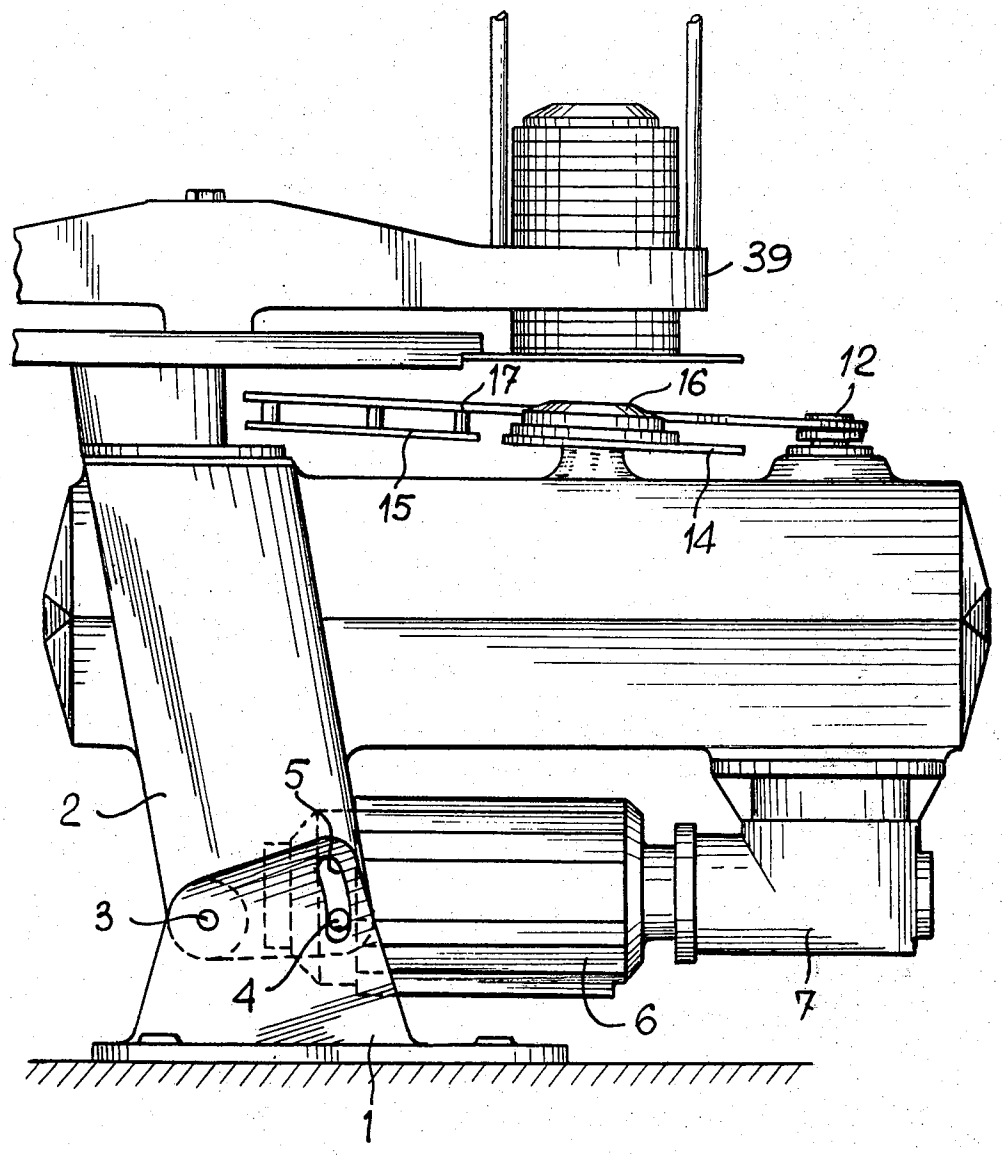

FIG. 2

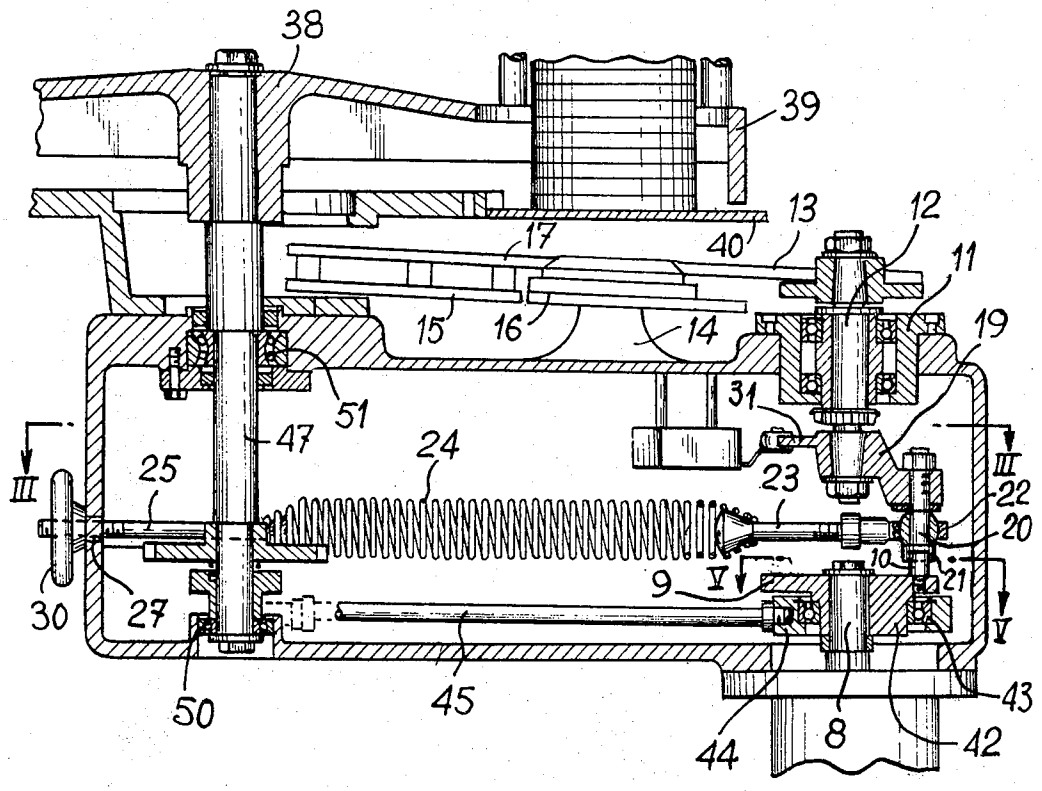
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FIG. 3

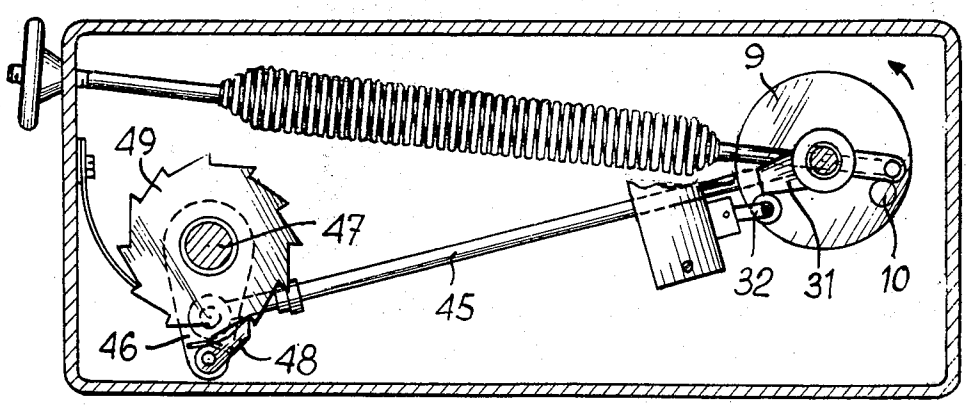
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FIG. 4

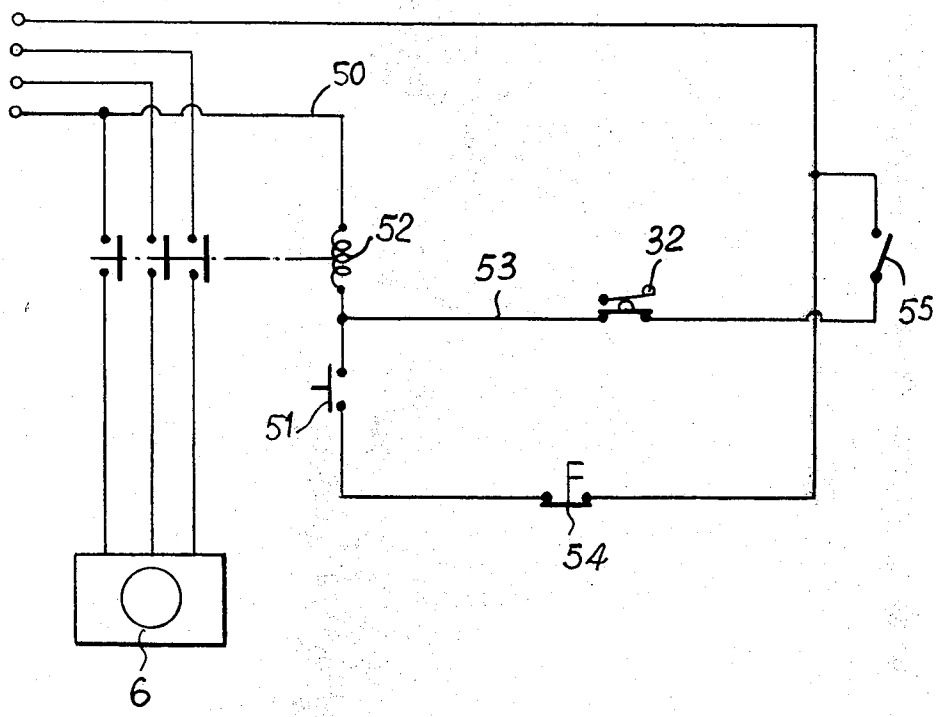


FIG. 5

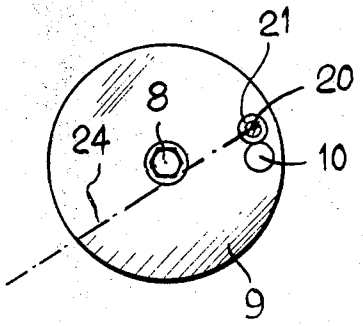
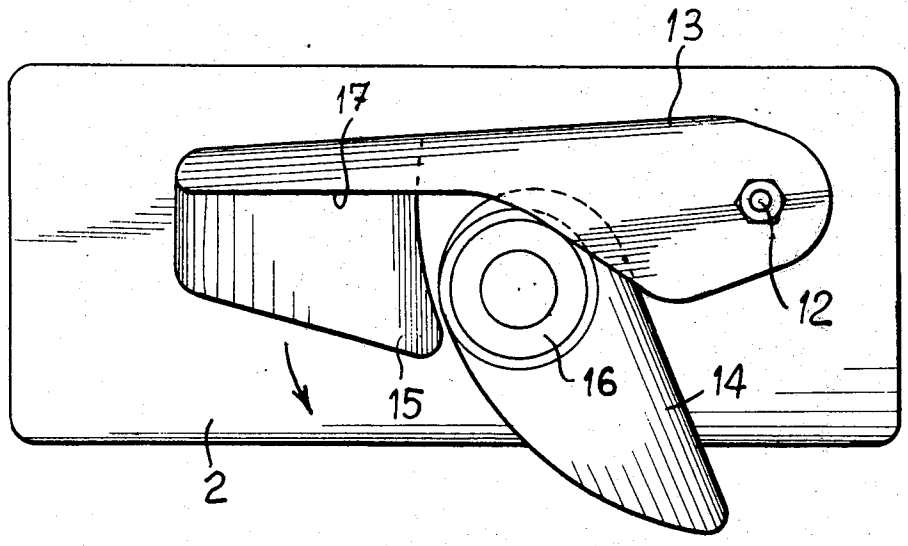


FIG. 6



ELECTRICALLY CONTROLLED TARGET THROWING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the dispensing of objects individually and particularly to the throwing of "clay pigeon" targets. More specifically, this invention is directed to apparatus for receiving and throwing plate type targets characterized by a throwing arm which is automatically recocked subsequent to the throwing of each target. Accordingly, the general objects of the present invention are to provide novel and improved methods and apparatus of such character.

2. Description of the Prior Art

Apparatus for throwing "clay pigeon" plate type targets wherein the throwing arm is mechanically driven are well known in the art. The drive which actually imparts momentum to the throwing arm is typically a traction spring. In order for such target throwing apparatus to be cycled at an acceptable rate, the throwing arms must be automatically reset or recocked after each target has been thrown. Such "automatic" apparatus generally comprise a throwing arm, designed to accommodate a target plate, mounted on one end of a rotatable shaft. The other end of the rotatable shaft will be mechanically coupled to a crank mechanism which, in turn, is connected to a powerful traction spring. In such prior art apparatus, in order to "cock" or set the throwing arm, the arm must be moved to an angular position in which the traction spring is under tension. The throwing operation is thereafter accomplished by releasing the arm whereby, under action of the spring, a plate resting thereon will be thrown.

Various techniques and apparatus have previously been proposed to accomplish, against the force of the traction spring, the cocking of the throwing arm of plate throwing apparatus. Thus, by way of example, use has been made of compressed air jacks which, via a suitable transmission, pivot the rotatable shaft toward the arm cocked position after each throw. Systems employing compressed air jacks are expensive, complex and have a slow operational cycle. Accordingly, cocking devices for plate throwing apparatus which employ compressed air jacks have not met wide acceptance and most prior art automatic plate throwing apparatus have employed motors which drive the rotatable shaft through reduction gearing.

The prior art motor driven throwing arm setting devices have also been characterized by certain difficulties and deficiencies. Thus, by way of example, the rotatable shaft to which the throwing arm is attached has to be completely free for movement during the throwing stroke and thus the shaft can not be permanently driven. The cocking apparatus must, accordingly, be designed in such a manner that the shaft bears an angle pinion loosely mounted thereon and connected by cooperating pinions to the reduction gearing coupled to the drive motor output shaft. The angle pinion must, of course, be driven only through an arc, for the cocking of the throwing arm, and must be disconnected from the driven apparatus during the throwing stroke. Apparatus of the type described immediately above is shown in French Pat. No.1,435,475 to P. Laporte. The apparatus of French Pat. No. 1,435,475 is complex, and thus comparatively expensive, and requires use of a powerful motor.

As a further example of the prior art, U.S. Pat. No. 2,245,458 discloses apparatus in which the target throwing arm is provided with a crank pin driven by an electric motor. The apparatus of U.S. Pat. No. 2,245,458 requires use of a rather complex device for disconnecting the motor from the transmission during the throwing stroke. The patented device thus provides for a stop which holds the arm in the cocked position. This stop must, of course, be retracted in order to effect the throwing of the target. The apparatus of U.S. Pat. No. 2,245,458 also includes a cam which interacts with an electrical switch in order to open the current supply circuit for the electric motor when the throwing arm comes to rest against the retractable stop. Thus, the apparatus of U.S. Pat. No. 2,245,458, like the other above briefly discussed prior art devices for throwing targets, is complex and, as a result of the manufacturing and assembly accuracies required, is also expensive and lacking in the requisite reliability under strenuous field conditions.

SUMMARY OF THE INVENTION

The present invention overcomes the above discussed and other deficiencies and disadvantages of the prior art by providing a novel and improved device particularly well suited for the throwing of clay pigeon type targets; apparatus in accordance with the present invention being less expensive, less complicated and more reliable than prior art devices of like character. In accordance with a preferred embodiment the present invention comprises a housing which supports a pivotal shaft. The first end of a throwing arm is affixed to a first end of the pivotal shaft and a crank mechanism is connected to the other end of the shaft. A first end of a traction spring is attached to the crank mechanism. A drive motor assembly including an electric motor is provided, via reduction gearing, with an output shaft which is coaxial with the pivotal shaft; the motor output shaft being coupled to the crank mechanism on the pivotal shaft. The coupling means comprises a crank pin situated on a radius of the same length as a cooperating crank pin extending from the crank mechanism. During cocking of the throwing arm the crank pins are in driving engagement.

The invention further comprises a control for the electric motor which includes a normally open switch. The control is closed, to release the throwing arm, after the arm has been driven to the cocked position and the traction spring placed in tension. The motor control comprises a first circuit which includes a normally closed switch having an actuator operated by a cam extending from the crank mechanism. A second parallel circuit is established by the normally open switch; the two control circuits cooperating to energize a relay which has its contacts connected in the current supply to the drive motor. The cam on the crank mechanism is positioned so as to contact the actuator of the normally closed switch to open the first circuit when the throwing arm has reached the cocked position and the cam and switch actuator have assumed relative positions such that the cooperating crank pins onn the motor drive and throwing arm crank mechanism are, at the moment the cam operated switch is opened, in an angular position where the crank pins are urged against one another under the action of the traction spring which is in tension.

BRIEF DESCRIPTION OF THE DRAWING

The present invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawing wherein like reference numerals refer to like elements in the several figures and in which:

FIG. 1 is a side elevation view of a preferred embodiment of a target throwing device in accordance with the present invention;

FIG.2 is a partial cross-sectional side elevation view of the apparatus of FIG. 1;

FIG. 3 is a top plan view, taken along line III-III of FIG. 2, of the apparatus of FIG. 1;

FIG. 4 is an electrical schematic drawing depicting the control circuit for the drive motor of the apparatus of FIG. 1;

FIG. 5 is a top plan view, taken along line V—V of FIG. 2, of the apparatus of FIG. 1; and

FIG. 6 is a top plan view of the throwing arm of the apparatus of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to FIG. 1, a target throwing device in accordance with a preferred embodiment of the invention comprises a base 1 which is intended for mounting, for example by bolts, to a frame or other suitable support. The body or housing of the throwing device, indicated at 2, is mounted from base 1 so as to be rotatable, in a vertical plane, about a horizontal shaft 3. The housing 2 may be locked in the desired position, thus defining the trajectory of the plates which are to be thrown, through the use of screws 4 which pass through arcuate slots 5 provided in vertical extension of base 1.

An electric motor 6 is mounted within housing 2. Appropriate reduction gearing, indicated at 7, is keyed to the output shaft of motor 6. In the manner to be described below, the throwing arm of the target throwing device of the present invention is driven to the cocked position via a rotatable drive shaft 8 coupled to motor 6 via reduction gearing 7. As may be seen from joint consideration of FIGS. 2 and 3, a plate 9 provided with a crank pin 10 is keyed onto the shaft 8.

The housing 2 also provides support for a bearing assembly 11. A further rotatable shaft 12 is supported in bearing assembly 11 as shown. The upper end of shaft 12 is keyed to the first end of a throwing arm 13; the throwing arm including a plate 15 and a guide bar 17 as may best be seen from FIG. 6. The plate to be thrown, for example plate 16 of FIG. 2, will be serially dropped onto a fixed support 14 so as to be in position to be picked up by the moving throwing arm.

A crank assembly 19 having a generally downwardly extending crank pin 20 is keyed to the lower end of shaft 12. A connecting ring 22 is mounted on the crank pin 20. Ring 22 is provided with a socket which receives the first end of a bar 23. A roller 21 is also affixed to the crank pin 20 at a point disposed beneath the ring 22.

The second end of bar 23 is coupled to the first end of a traction spring 24. The second end of traction spring 24 is affixed to a further bar 25 which extends through and threadably engages a tapped hole 27 provided in the housing 2. Adjusting means, in the form of a regulating wheel 30, is provided whereby the tension of spring 24 may be adjusted by varying the point of engagement of the threaded portion of bar 25 with the tapped hole 27 in housing 2.

As will be obvious from FIG. 2, the rotatable shafts 8 and 12 are coaxial and their respective crank pins 10 and 20 are situated on radii of the same length. Referring again jointly to FIGS. 2 and 3, the crank 19 which supports pin 20 includes an integral outwardly extending finger 31. Finger 31 operates the actuator for an electrical switch 32 which forms part of the control circuit of FIG. 4.

A target throwing apparatus in accordance with the invention also includes means for serially depositing the plates or targets 16 on the fixed support 14. An automatic plate distributor is indicated at 38 and may be of the type described in French Pat. Nos. 1,472,432 and 1,435,475 of P. Laporte. Such a target plate distributor comprises a turret 39, in which columns of plates 16 are stacked, and a slide path defining member 40 which enables the plates to serially fall onto support 14 after each movement of the throwing arm 13.

Referring again to FIG. 6, the throwing arm 13 comprises a horizontal plate 15 having a configuration, on the side facing shaft 12, which is complementary to the shape of the fixed support 14. Referring again to FIG. 2, it may be seen that the guide bar portion 17 of the throwing arm has a gradient which, when the throwing arm rotates in the direction indicated by the arrow on FIG. 6, will cause the target plate 16 to move toward the free end of arm 13.

The drive for turret 39 comprises an eccentric cam 42 which is either keyed onto shaft 8 or, as shown FIG. 2, formed as a part of the plate 9. A bearing 43 is mounted on eccentric 42 and has its outer race received in a ring 44. The ring 44 is integral with the first end of a rod 45. The second end of rod 45 is articulated to a bar 46 (FIG. 3) which rotates loosely on shaft 47. Bar 46 supports a pawl 48 which interacts with a ratchet wheel 49 keyed onto shaft 47. Shaft 47 is supported in housing 2 by means of bearings 50 and 51 and is provided with an upward extension which drives turret 39 of the plate dispensing apparatus 38. In the disclosed embodiment the ratchet wheel 49 is provided with twelve teeth whereby each rotation of shaft 8 causes the angular position of turret 39 to be advanced by 30°. This amount of rotation is sufficient to cause a plate 16 to be dropped onto support 14.

FIG. 4 is an electrical schematic diagram of the control circuit for drive motor 6. In the disclosed embodiment motor 6 is a three-phase motor. The control for motor 6 includes, in a circuit 50, the series connected solenoid 52 of a relay, a push button switch 51 and a disconnect switch 54. Normally open contacts of the relay which includes solenoid 52 are connected in each of the phases of the current supply for motor 6. The control circuit further comprises a branch circuit including the switch 32, which is operated by finger 31, and a main power switch 55. The control thus provides two distinct parallel circuits by which solenoid 52 can be supplied with current to thus energize motor 6. Switch 32 is normally closed and is opened only when the finger 31 on crank 19 is in contact with the switch actuator. The relative positions of the actuator of switch 32 and finger 31 are such that when finger 31 contacts the actuator the crank pin 20 occupies a position slightly offset from its equilibrium position, depicted in FIG. 5, wherein pin 20 and shaft 12 are in the same vertical plane passing through the axis of traction

spring **24.** Beyond this equilibrium position the traction spring actuates the crank pin **20** and the throwing arm **13** thus pivots under the action of spring **24.**

To discuss the operation of the invention, it will be assumed that crank pin **20** initially occupies the angular position shown in FIGS. **3** and **5.** In this position the switch **32** will be open since the finger **31** contacts the actuator for the switch. The main power switch **55** and the disconnect switch **54** will be closed. Accordingly, both parallel paths for delivering current to solenoid **52,** will be open. Operation of the push button of switch **51** will permit current to flow through solenoid **52** thus causing the circuit to the motor **6** to be closed and motor **6** to be energized. The shaft **8** will accordingly be set in rotation in the direction of the arrow in FIG. **3** and crank pin **10** will urge roller **21** on crank pin **20** in the counterclockwise direction, thus stretching spring **24,** until crank **19** passes the equilibrium point. At this point crank **19** will be free to rotate under the influence of spring **24,** which is in tension, and arm **13** will accordingly be driven at a high speed. The plate **16** resting on support **14** is thus picked up by the arm and thrown.

After the target throwing stroke motor **6** continues to operate since switch **32** is closed due to the fact that finger **31** has been moved out of contact with the actuator for switch **32.** Thus, solenoid **52** is energized and the current supply circuit for motor **6** is closed. The crank pin **10** again contacts and drives roller **21** on pin **20.** The crank **19** is thus moved toward the "arm cocking" position until finger **31** again contacts the actuator of switch **32** thus, presuming that switch **51** has been released, interrupting the current supply for solenoid **52** and thereby causing the motor **6** to be deenergized.

During each rotation of shaft **8** the transmission rod **45,** operated by the eccentric **42,** causes the shaft **47** to rotate through an angle corresponding to one tooth of ratchet wheel **49.** The turret **39** of distributor **38** is thus rotated causing a plate **16** to fall onto the fixed support **14;** i.e., each rotation of shaft **8** causes the feeding of a new plate to support **14** where it will be thrown by the throwing arm the next time switch **51** is closed.

While a preferred embodiment has been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:

1. In a device for the throwing of plate-type frangible targets, said device comprising a body which supports a first rotatable shaft having a throwing arm affixed to a first end thereof and a crank mechanism affixed to the second end thereof, a traction spring, the crank mechanism being coupled to the extendable end of the traction spring and including a crank which extends radially outwardly with respect to the first rotatable shaft, the crank mechanism crank supporting a first crank pin which is driven to extend the spring to store energy for the throwing stroke of the arm, an improved mechanism for controlling the cocking of the throwing arm against the tension of the traction spring comprising:

drive motor means for providing power for the movement of the crank mechanism against the force of the traction spring to place the spring in tension, said motor means including an electric motor and having a rotatable output shaft arranged coaxially with the first rotatable shaft of the throwing device;

means for coupling movement of said drive motor means output shaft to the crank mechanism, said coupling means including a second crank pin connected to and radially offset from said drive motor means output shaft axis by the same radial distance as the first crank pin is offset from the axis of the first rotatable shaft, the first and said second crank pins extending through a common plane so as to be in driving relationship; and

means for controlling the energization of said drive motor means, said energization controlling means interrupting the supply of current of said electric motor when the throwing arm has been moved to the cocked position, said energization controlling means including:

a relay, said relay having a solenoid and including normally open contacts in series with said electric motor;

first relay energization circuit means for completing a current path between said relay solenoid and a current source, said first circuit means including a normally open switch, the closing of said normally open switch permitting current flow through said relay solenoid to energize said relay to close said normally open contacts to thereby energize said electric motor;

second relay energization circuit means for completing a current path between said relay solenoid and a current source, said second circuit means being connected in parallel with said first circuit means and including a normally closed switch, the opening of said normally closed switch when said first circuit means normally open switch is in the open condition de-energizing said relay and said electric motor;

finger means, said finger means extending generally outwardly with respect to the first rotatable shaft of the throwing device and being rotatable therewith so as to engage an actuator means to open said normally closed switch and permit the deenergization of the solenoid; and

actuator means for causing opening of said normally closed switch, said switch actuator means being supported on the throwing device body in a position so as to be contacted by said finger means, said finger means and actuator means being relatively positioned such that said normally closed switch of said second circuit means will be opened when the first and said second crank pins are in contact under the effect of the traction spring and the traction spring is under tension.

2. The apparatus of claim **1** wherein said energization controlling means finger means comprises:

a cam projection extending from the crank mechanism.

3. The apparatus of claim **1** further comprising:

means for serially delivering targets to the throwing arm; and

means coupled to said drive motor means output shaft for indexing said delivering means after each spring induced throwing arm stroke.

4. The apparatus of claim **3** wherein said indexing means comprises:

eccentric cam means for providing a force for operating said indexing means, said eccentric cam means being affixed to said drive motor means output shaft for rotation therewith;

ratchet means connected to said delivery means for imparting stepwise rotation thereto; and

means operated by said eccentric cam means for transmitting motion to said ratchet means to advance the delivery means in stepwise fashion, said motor transmitting means translating each rotation of said drive motor means output shaft to a reciprocation which advances said ratchet means.

5. The apparatus of claim **1** wherein said coupling means further comprises:

a roller on a first end of a first of said crank pins, said roller contacting the first end of a second of said crank pins for establishing a driving connection between said crank pins.

6. The apparatus of claim **5** wherein the crank mechanism is free to rotate solely under the influence of the traction spring when the second pin has driven the first pin and crank beyond an equilibrium position.

7. The apparatus of claim **6** wherein said energization controlling means finger means comprises:

a cam projection extending from the crank mechanism.

8. The apparatus of claim **7** further comprising:

means for serially delivering targets to the throwing arm; and

means coupled to said drive motor means output shaft for indexing said delivering means after each spring induced throwing arm stroke.

9. The apparatus of claim **8** wherein said indexing means comprises:

eccentric cam means for providing a force for operating said indexing means, said eccentric cam means being affixed to said drive motor means output shaft for rotation therewith;

ratchet means connected to said delivery means for imparting stepwise rotation thereto; and

means operated by said eccentric cam means for transmitting motion to said ratchet means to advance the delivery means in stepwise fashion, said motion transmitting means translating each rotation of said drive motor means output shaft to a reciprocation which advances said ratchet means.

10. The apparatus of claim **1** wherein the crank mechanism is free to rotate solely under the influence of the traction spring when the second pin has driven the first pin and crank beyond an equilibrium position.

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