Aug. 15, 1961 A. W. G. ERVINE 2,996,058

MAGAZINE TARGET TRAP

Filed Feb. 3, 1958 4 Sheets-Sheet 1

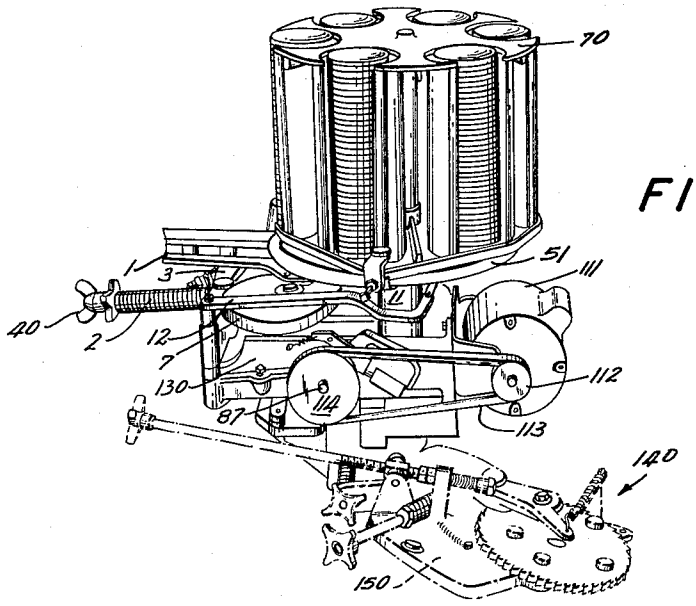


FIG. 1

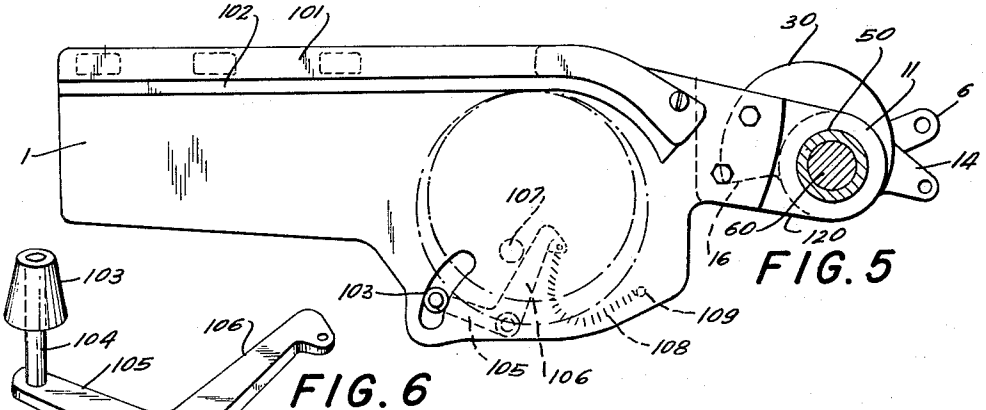
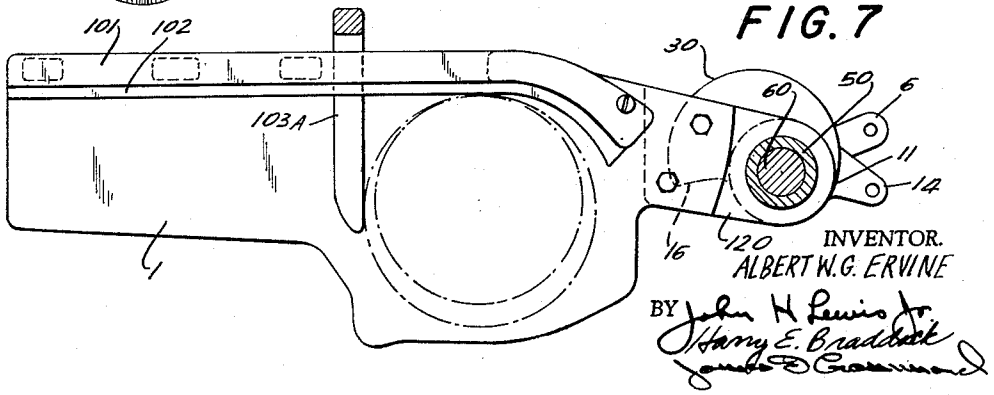


FIG. 5

FIG. 6

FIG. 7



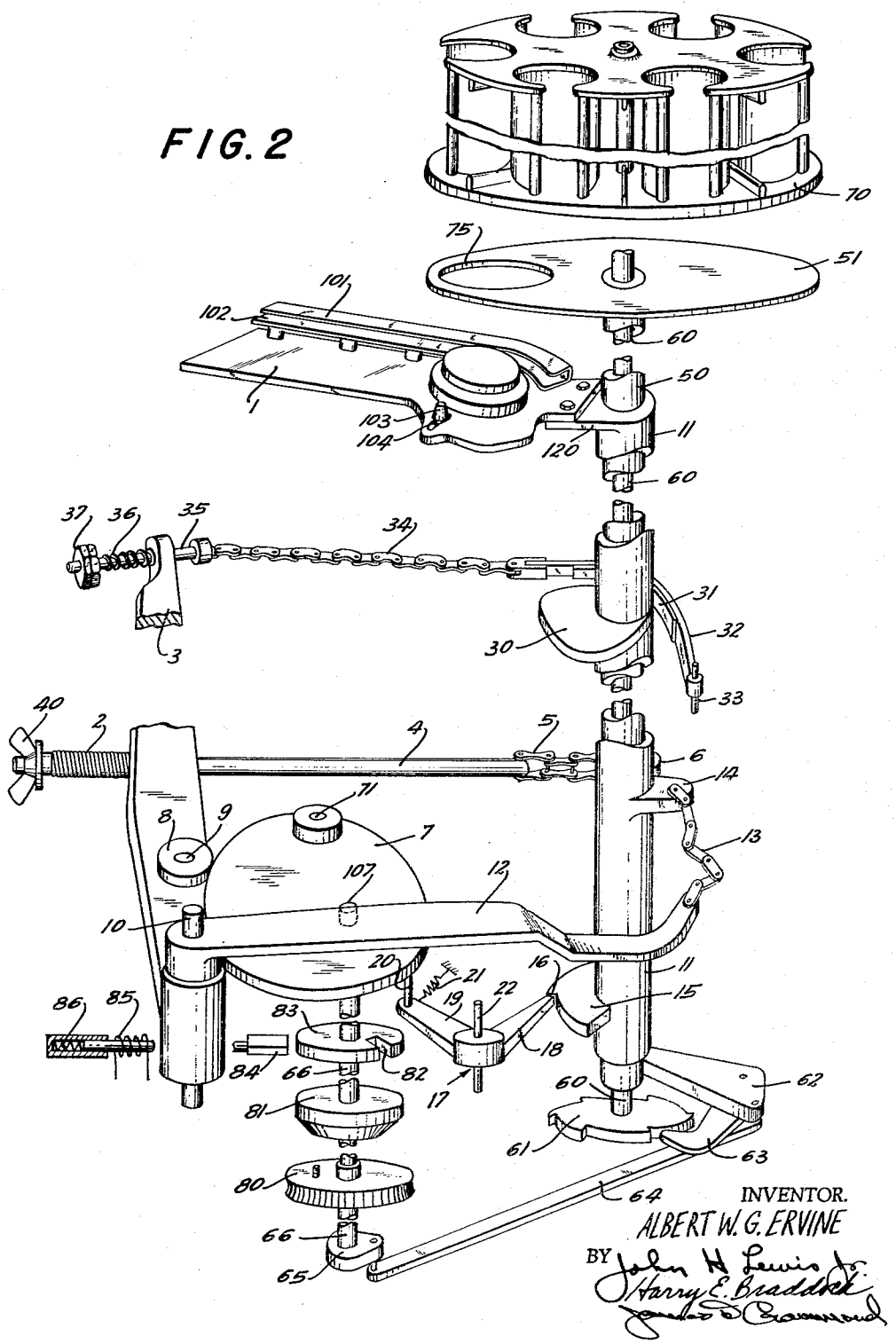
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MAGAZINE TARGET TRAP

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FIG. 2



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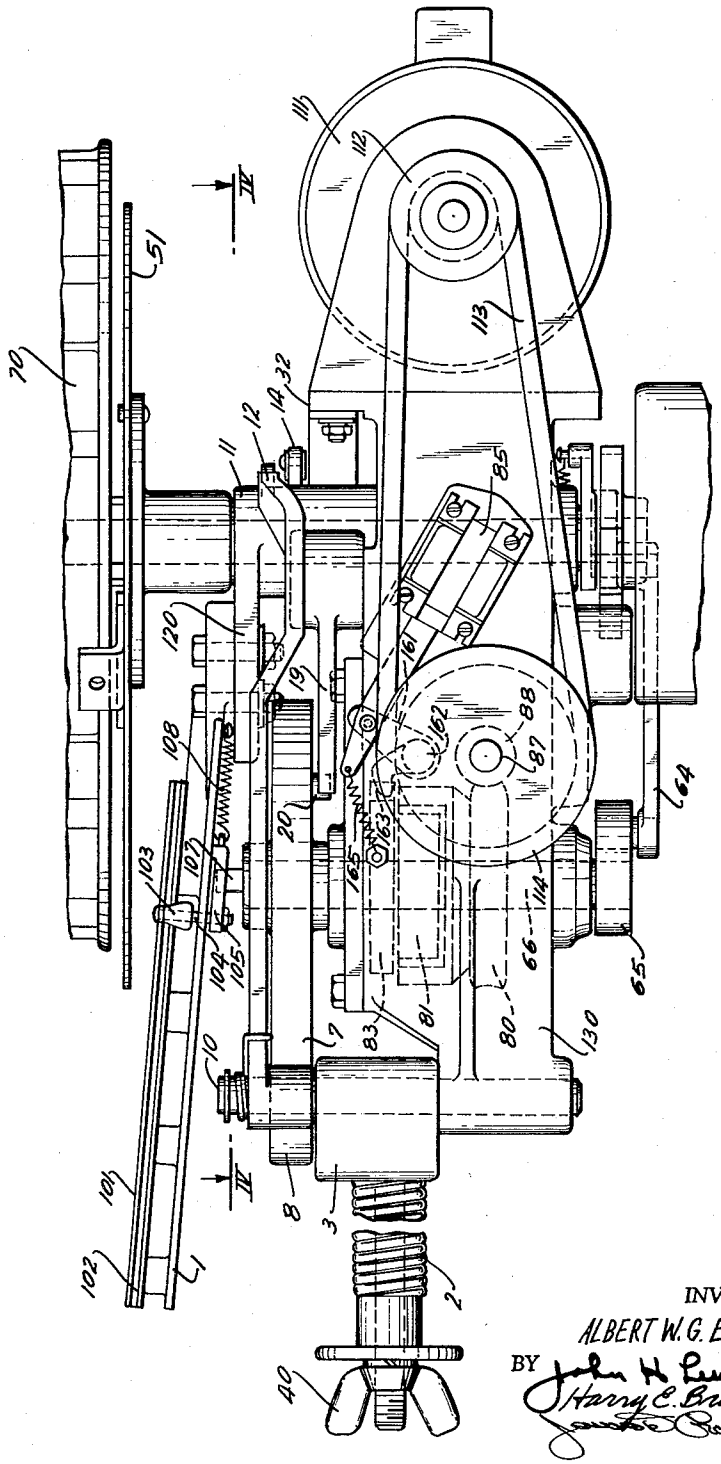


FIG. 3

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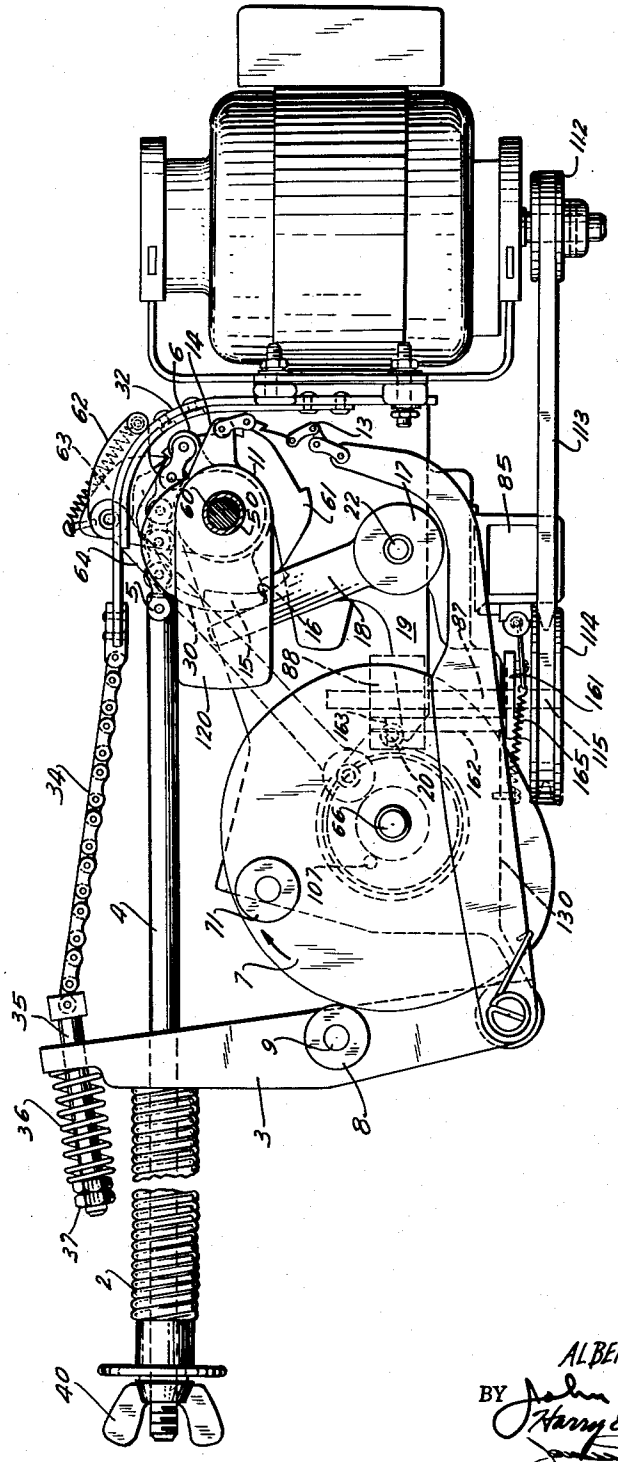


FIG. 4

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MAGAZINE TARGET TRAP

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1 Claim. (Cl. 124—8)

This invention relates to automatically operating target throwing traps, and contemplates as an object a novel means for insuring that targets are projected accurately in the desired direction.

Another object of the invention is the provision of an improved target throwing trap which is automatic in operation, which is smooth and rapid in operation with a minimum of jams, which holds target breakage to a minimum, which is simple in construction, and of sufficient strength to withstand long hard periods of service.

Further objects will be apparent from a consideration of the following description and accompanying drawings, wherein:

FIG. 1 is a general side view of the target throwing trap showing the general appearance and construction.

FIG. 2 is an exploded perspective schematic view of the operating parts of the trap with parts broken away. For greater clarity, the brake device is shown separate from the detent means for holding the throwing arm in cocked position.

FIG. 3 is a fragmentary side elevation of the trap and magazine.

FIG. 4 is a fragmentary sectional plan view substantially on the line IV—IV of FIG. 3, with certain parts omitted to show the operative features more clearly.

FIG. 5 is a plan view of the throwing arm of the trap, showing one version of the means for positioning a target on the arm.

FIG. 6 is a perspective view of the target positioning lever shown in FIG. 5.

FIG. 7 is a plan view of the throwing arm of the trap, showing a modified means for positioning a target on the arm.

Generally speaking, the improved target throwing trap of this invention is of the type comprising a pivotally mounted throwing arm 1 which is moved by a main spring 2 from a set position in which position the targets to be thrown are successively placed upon the arm substantially in position to be thrown therefrom. The throwing arm is held in the set position until released by a rotary cam means 7 operated by the power source 111, which cam means 7 also supplies the power for the remaining elements of the trap, to permit the main spring 2 to rapidly rotate the throwing arm 1 to the target releasing position. After the arm 1 moves through the target releasing position, it is decelerated by a brake 31. The power source, electric motor 111, drives through a 360° clutch mechanism 81, 83, to actuate the cam member 7 for timing the sequence of operation of and actuating the various elements of the trap during the operating cycle.

After the throwing arm 1 has been stopped by the brake 31, the brake is released and the throwing arm 1 is returned to the set position by the cam 7 without stressing the main spring 2. This return action also delivers the next target to the arm by rotating the next stack of targets in the magazine 70 into position above the arm 1, the lowermost target being released to drop on the arm 1 through opening 75 in stationary plate 51. Any suitable means known in the art could be used to control the dropping of targets through opening 75 of plate 51.

The control cam 7 is so contoured that its 360° rotation that results upon energization by a solenoid 85 of the 360° clutch 81, 83, examples of which are well known in the art, operates the trap through one complete cycle.

During the operating cycle of the trap a first portion of the cam means releases the spring loading means after the arm has been moved to the target releasing position so that a second portion of the cam means can operate a lever 12 to return the throwing arm to the set position wherein the arm is restrained by a locking means, detent 17, as the next target is released downwardly from the magazine to the throwing arm. The first portion of the cam means then operates the spring loading means including pivoted lever 3 to exert a loading force on the main spring 2. A large force is exerted by the main spring and consequently the detent 17 locking the arm in the set position is tripped by pin 20 on the underside of rotary cam means 7.

The throwing arm 1 has a rail 102 extending along one side thereof as a guide for the target as it is thrown. One end of the arm has a hollow sleeve 11 which surrounds a shaft 60 projecting from the frame of the trap in a substantially vertical direction so that the arm can pivot between the set position and the target releasing position. The 360° rotation of the cam means also drives the magazine in step-by-step rotation through ratchet drive means 61, 62, 63, and 64, so that each stack of targets is sequentially moved into target-feeding position at which the lowermost target is released through the aperture in stationary magazine plate 51.

The brake comprises a brake drum 30 secured to the sleeve 11 of the throwing arm 1 and having a braking surface 31 surrounded by a brake band 32 having one end secured to the frame. The other end of the brake band is fastened to a lever 3 which is pivotally connected to the frame 130. A spring 36 is provided to urge the lever 3 in a direction to tighten the band upon the brake surface thus applying the brake. The lever 3 also bears against a portion of the control cam 7 so that the lever is maintained against the force of the spring so that the brake is released as the throwing arm returns to the set or target receiving position; and is applied to decelerate the arm when the arm is released by detent arm 18 and has proceeded in its throwing motion beyond the target releasing position.

Describing the structure more specifically, it can be seen in FIG. 1 that the base 150 supports the trap by an articulated mounting which permits movement of the operative parts of the trap in azimuth and elevation. The details of this mounting do not form a part of the invention and will not be treated in detail, examples of such mountings being known in the art. Also, generally shown on base 150 but not forming a part of the invention is a device which shifts the direction of the target flight in a step-by-step manner and actuated by each target throwing cycle of the trap.

The portions of the trap with which the invention is more directly concerned are: the casing or housing 130 in which is mounted in substantially a vertical position the hollow movable shaft 11 on which the throwing arm 1 is mounted, the stationary concentrically mounted inner tubular element 50 which supports magazine plate 51, and concentric movable innermost solid shaft 60 upon which is supported the rotatable magazine 70. Also mounted in casing 130 for movement about substantially vertical axes which are parallel to the axes of the aforementioned concentric shafts are rotary cam 7 and levers 3 and 12. Electric power drive motor 111 is mounted by suitable means at one end of the casing 130 and continuously drives substantially horizontal input shaft 87 which is mounted in casing 130. The continuous rotational drive of the input shaft is shown to be accomplished by pulleys 112 and 114 interconnected by belt 113. Shaft 87 is journalled in the side of casing 130 and extends into the interior thereof. Shaft 87 drives the input member of a 360° intermittent drive clutch, which

is mounted for rotation about a vertical axis, by means of a worm 88 engaging wormwheel 80 which is rigidly attached to the clutch input member. Clutches of this type are well known, an example of which is disclosed in United States Patent No. 2,140,737 to Dickens, issued December 20, 1938. The input member of the intermittent 360° clutch 81 is continuously rotated by shaft 87 as above described. The output member of this clutch is connected to vertical shaft 66 which is journalled in the upper and lower sides of casing 130 and extends therethrough. Fixedly attached at the upper end of vertical shaft 66 is rotary cam 7. Fixedly attached to shaft 66 inside casing 130 is notched disk member 83. Ordinarily, a locking finger 163 is spring-urged into the notch in disk 83 to prevent rotation of the shaft 66 and its cam 7 mounted thereon. Locking finger 163 is rigidly mounted on pivot shaft 162 which is mounted in casing 130 parallel to shaft 87 and extending through the side of casing 130. Fixed to the outer end of pivot shaft 162 outside the casing 130 is a lever arm 161 which is connected to the armature of solenoid 85. Movement of lever 161 by the armature 85 is opposed by spring 165. Spring 165, acting through lever arm 161 and shaft 162 holds the locking finger 163 on the shaft in engagement with the notch in disk 83 to prevent movement of shaft 66 and cam 7 until the solenoid 85 is actuated. Upon actuation of solenoid 85 which causes disengagement of locking finger 163 from the notch in disk 83, the output element of intermittent clutch 81 is able to drive shaft 66 and cam 7 through 360 degrees before the notch in disk 83 is again engaged by locking finger 163. This 360° rotation of cam 7 actuates the trap through one complete cycle of operation. The periphery of cam 7 is engaged by a cam follower roller 8 mounted on lever 3. Lever 3 is connected to fixed arm 6 on throwing arm shaft 11 through chain links 5, rod 4 and compression spring 2. Mounted on the upper side of cam 7 is roller 71 which engages and moves lever arm 12 during a portion of the cam rotation. Lever 12 is connected to fixed arm 14 on throwing arm shaft 11 through chain links 13. Throwing arm shaft 11 is normally held against rotation by engagement of a pivotable detent 17 mounted on the upper side of casing 130. Arm 18 of detent 17 engages an abutment 16 on throwing arm shaft 11 and is normally urged by spring means 21 into engagement therewith. Another arm 19 of detent 17 is engaged by a pin 20 projecting from the lower surface of cam 7 during a given portion of the cam rotation to move the detent arm 18 against spring pressure out of engagement with abutment 16 to release the throwing arm and shaft 11 for rotation. Lever 3 is also connected to brake band 32 through chain links 34, rod 35, and compression spring 36. In the rest position between operating cycles, the cam 7 is stationary substantially in a position shown in FIG. 4 with a target in position on the arm. In this position it can be seen that the cam 7 acting through roller 8 on lever 3 is holding lever 3 nearly at the limit of its counterclockwise movement, compressing spring 2 and applying a force on throwing arm shaft 11 to turn the same in a counterclockwise direction. However, the throwing arm shaft is prevented from such movement by the engagement of arm 18 of the locking detent abutment 16 on the throwing arm shaft. It is to be noted that in this position shown in FIG. 4 that pin 20 projecting from the underside of cam 7 is about to engage arm 19 of the locking detent and cause detent arm 18 to be disengaged from abtument 16 on throwing arm shaft 11. It is shown (FIGURE 4) also that the brake surface 30 of throwing arm shaft is formed as a portion of abutment 16 and is in the position of FIG. 4 shown disengaged and displaced from the brake band members 31 and 32.

Upon actuation of the solenoid 85 by a control switch not shown, the locking finger 163 is moved out of the notch in disk 83 and cam 7 commences its 360° movement to cycle the trap. The first event is the pivoting of detent 17 by pin 20 on cam 7. This removes detent arm from the abutment 16 on throwing arm shaft which permits the compressed spring 2 to rapidly turn the shaft 11 and arm 1 in a rapid counterclockwise movement projecting a target. The brake surface 30 on throwing arm shaft 11 engages the brake band members 31 and 32 to decelerate the throwing arm after the target is projected. Brake members 31 and 32 will be tightened by the lever 3 for a brief period after brake engagement. Shortly thereafter, cam 7 releases lever 3 for clockwise movement to remove the tension of spring 2 from the throwing arm shaft and release the brake. As cam 7 rotates, roller 71 then contacts arm 12 to move it in a clockwise direction. This motion through chain links 13 moves the shaft 11 and throwing arm clockwise back to the set position where the next target drops on the arm and abutment 16 is again caught and engaged by detent arm 18. Cam 7 rotates to again tension spring 2 and having completed its cycle, stops until solenoid 85 is again actuated.

Magazine 70 receives its step-by-step feeding motion by means of a ratchet device on the lower end of its shaft 60 which is actuated by a reciprocating rod 64 driven by a crank 65 on the lower end of shaft 66.

Means have been provided to accurately control the point in the throwing arm rotation at which the target leaves the arm. This means the direction of target flight will be likewise accurately controlled. To accomplish this, the target is caused to be firmly engaged against the throwing arm rail 102 at a given point on the arm at the time the throwing motion is commenced. This means that the target will leave the end of the arm at the same angular position of arm travel, assuming that the throwing motion remains constant from cycle to cycle, as is the case here. Many times if a target is spaced from this rail when the throwing motion commences, it will be broken upon impact of the arm against it and will have moved relatively outward from the initial position on the arm, before the rail is engaged. This means that the point in arm rotation at which the target leaves the arm will vary and, hence, target projection will be varied and inaccurate. One of the disclosed versions of this feature comprises a spring biased bell crank lever pivotally mounted on the underside of the throwing arm 1, as shown in FIG. 5. At the end of one of the arms of the lever is an upstanding lug 104 which projects through an arcuate slot in the arm. A resilient roller is mounted on the lug 104. The resilient roller in the slot moves between a first position in which a target on the arm is restrained against outward movement and is held against the rail 102 and a second position in which the roller is disengaged from the target to permit its outward movement on the arm. The roller is spring biased toward the disengaged position but this spring bias is overcome by the engagement of a pin 107 on the upper surface of cam 70 abutting the arm 106 of the lever when the arm is moved to the set position. This motion moves the target, which has dropped on the arm, against the rail 102 and holds it until the arm moves in the throwing motion away from the pin 107, allowing the spring 108 to move the roller to disengaging position with respect to the target.

A second version of the feature for controlling target flight direction is shown in FIG. 7. A retaining finger 103A is fixedly mounted by suitable means on the underside of magazine plate 51, as shown in dotted lines in FIG. 3, in a position to overlie the throwing arm 1 when in the rest or set position. The finger 103A extends downwardly from the magazine plate 51 to a point adjacent the upper surface of the throwing arm and is extended along the surface of the arm at a substantially right angle to the main arm dimension. As shown, this right angle extension actually passes between the rail 102 and the upper arm surface. When the throwing arm commences its throwing motion, finger 103A engages the target through an initial portion of the motion and will prevent outward radial motion beyond the desired point until the target

arm reaches a given angular position, at which position the target will be also in the desired engagement with the rail **102**.

Although the preferred forms of embodiment of my invention have been disclosed, it is to be understood that various modifications and changes could be made therein without departing from the scope of the appended claim.

What is claimed is:

An automatic target throwing trap comprising a housing, a first hollow shaft mounted on said housing and a second concentric shaft mounted within said first shaft, a target throwing arm structure mounted on said first shaft for angular movement in substantially a horizontal plane from a cocked position through a target release point to a terminal position and return, said throwing arm structure having a target guide rail along the trailing edge thereof and a target positioning means mounted thereon to retain a target in its initial position on said arm structure until said arm structure has moved through a given angular displacement in its throwing movement to control the point at which the target leaves the end of said arm structure and consequently its direction of flight, said target positioning means comprising a spring-biased bell crank lever mounted on said arm structure having a lug mounted thereon and carrying a roller thereon, said roller movable between a first position to engage a target on said arm structure and a second position where it is disengaged from a target, said roller spring-biased toward said second position; a rotary target magazine mounted on said second shaft for intermittent rotation in timed relationship to the movement of said arm structure, spring means operatively connected to said throwing arm for rapidly driving said throwing arm structure from said cocked

position through said target release point, brake means mounted on said housing for braking said throwing arm structure in its travel beyond said target release point, said brake means comprising a brake surface mounted on said first shaft, a brake band connected between said first shaft and a lever pivotally mounted on said housing, said lever maintaining said brake band in engagement with said brake surface for a brief period after said target release point, detent means engageable with said arm structure for releasably holding said throwing arm structure in said cocked position against the action of said spring means, cocking means mounted on said housing for stressing said spring means, said cocking means comprising said lever, means operatively connected to said throwing arm structure for returning said arm structure from said terminal position; said arm structure, said target positioning means, said rotary target magazine, said spring means, said brake means, said detent means, said cocking means, and said means for returning said arm structure from said terminal position actuated and controlled by the rotation of a power driven control cam mounted on said housing, means to latch said control cam against rotation, said means to latch said control cam against rotation comprising a notched disc and a spring-biased finger to engage said notch, and means to intermittently release said latch means and drive said control cam.

References Cited in the file of this patent

UNITED STATES PATENTS

2,652,820	Darrel	Sept. 22, 1953
2,827,036	Ervine et al.	Mar. 18, 1958