April 20, 1937. F. H. SCHWERIN 2,078,166

THROWING MACHINE

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Fig. 1.

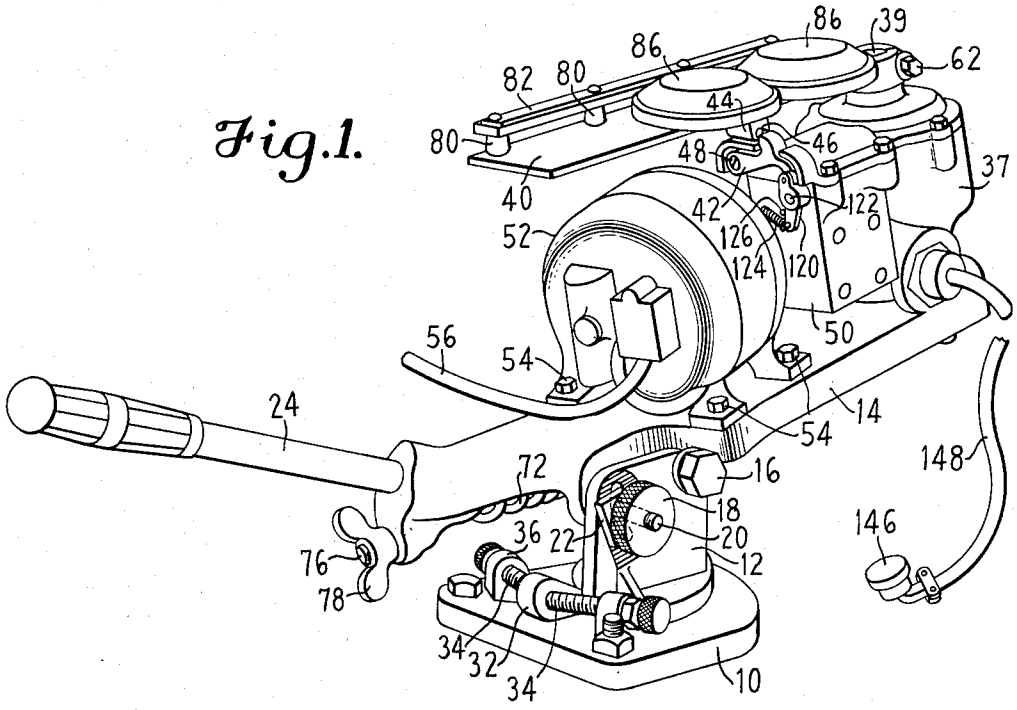


Fig. 2.

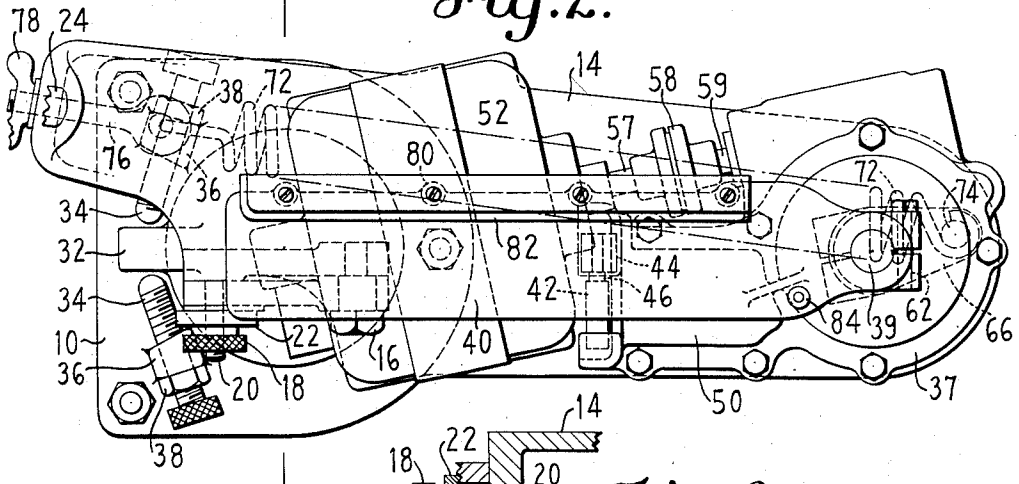
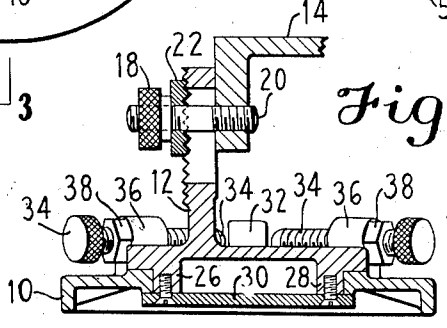


Fig. 3.



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Fig. 4.

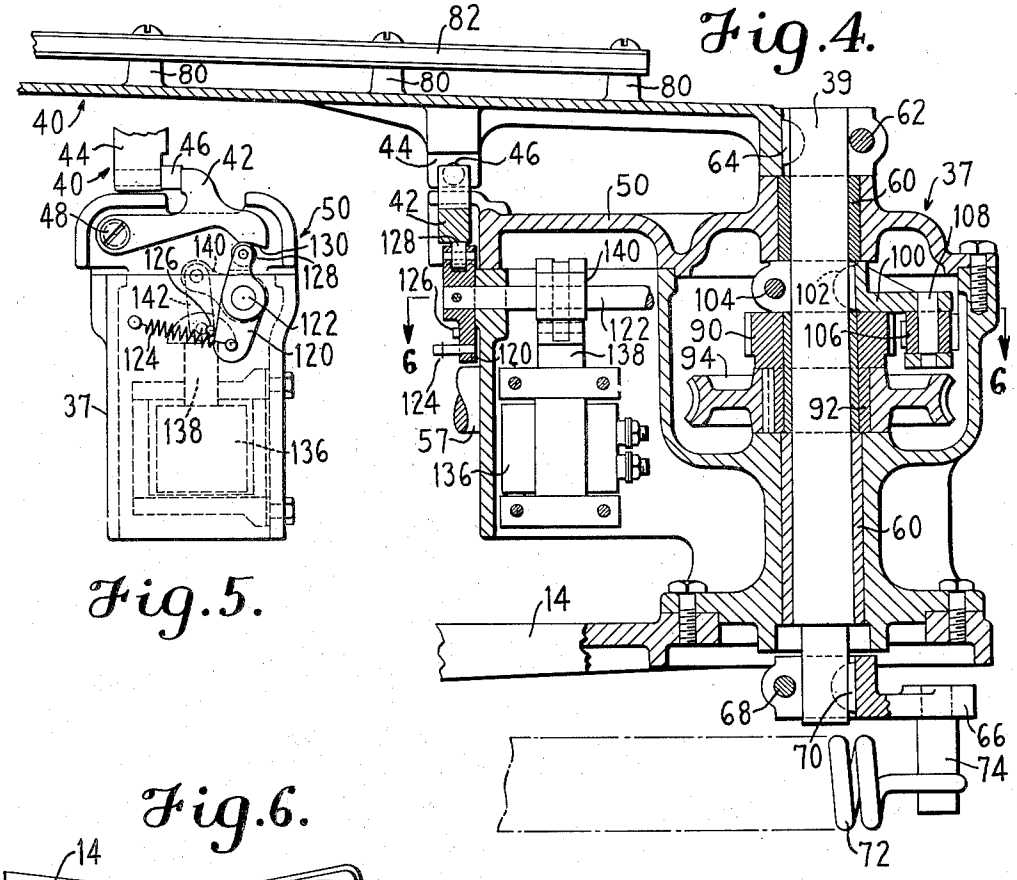
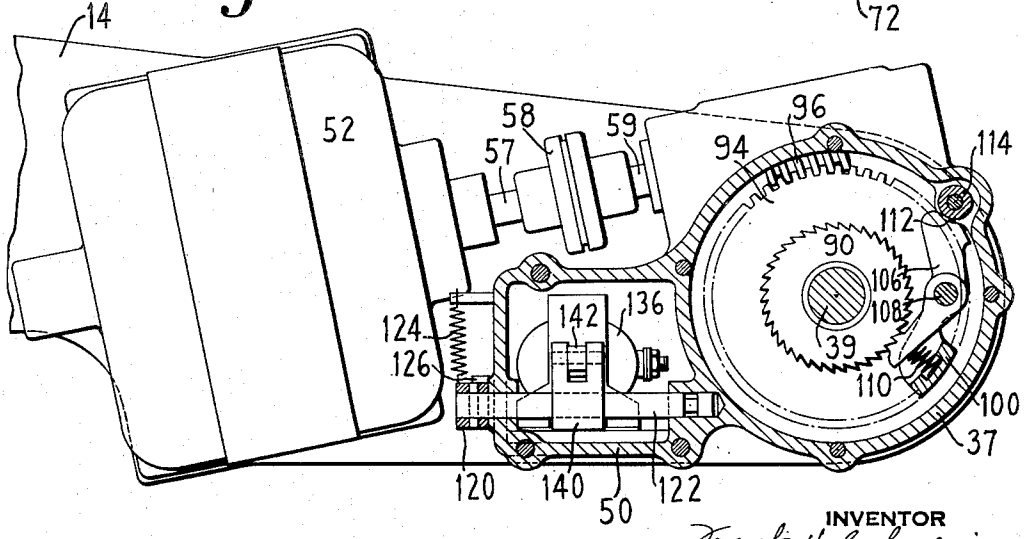


Fig. 5.

Fig. 6.



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2,078,166

THROWING MACHINE

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Application November 7, 1933, Serial No. 696,963

4 Claims. (Cl. 124—6)

This invention relates to throwing machines, and more particularly to target throwing machines of the type having a spring-operated throwing arm with an electric motor and clutch mechanism for restoring the throwing arm and tensioning the spring.

Such machines have a continuously running motor and driving mechanism through which the motor moves the carrier or throwing arm into retracted position and slightly beyond dead center so that the tension of the spring tends to move the arm further in the same direction. As soon as the arm reaches such a position, the clutch is automatically disengaged and the arm is held in retracted position by a trip latch. When this latch is released, the throwing arm is rotated rapidly by the spring through an angle of approximately 180° and throws the target. The clutch is automatically engaged when the arm again slows down to the rotative speed of the clutch mechanism.

The trip latch is ordinarily released by a solenoid which can be controlled from an electric push-button switch at the end of a flexible cable. This is advantageous when trap shooting because it makes the location of the referee, or puller, optional, and thus makes the command of "pull" always audible to him. When the button is pressed, the target release is substantially instantaneous and with such smooth action that there is no danger of breaking the target while releasing it.

Target throwing machines of this character eliminate the "flinch producing" pull, and there is no wobbling or jumping of the frame when the target is released regardless of the speed at which it is operated.

It is an object of this invention to provide an improved electric throwing machine which is efficient and dependable, and has its parts in a particularly compact relationship, and in which the spring tension, angle of elevation, and/or direction of release can be controlled manually from the rear of the machine where the operator is not exposed to injury in case of accidental operation of the machine. The invention is particularly intended for throwing targets, but features of the invention are applicable to the throwing of various objects. With a suitable carrier arm, the invention can be used for throwing balls or other projectiles.

Another object of the invention is to provide an electric target throwing machine in which the force and direction of throwing can be accurately controlled to obtain such uniform results that two machines, because of perfect synchronization, are all that are necessary for throwing singles, perfect doubles and skeet.

Other objects, features and advantages of the invention will appear or be pointed out as the specification proceeds.

In the accompanying drawings, forming part hereof:

Fig. 1 is a perspective view showing the rear and one side of a target throwing machine embodying the invention;

Fig. 2 is a fragmentary, enlarged top plan view of the machine shown in Fig. 1, with the targets removed;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary, enlarged vertical section showing most of the operating mechanism and latching means of the machine illustrated in the other views;

Fig. 5 is a rear elevation of the latching means shown in Fig. 4; and

Fig. 6 is a sectional view along the line 6—6 of Fig. 5, with the motor also shown.

The throwing machine includes a base 10 and an upwardly extending support 12. A frame 14 is pivotally connected to the support 12 by a bolt 16 and can be held against pivotal movement by a locking knob 18, which threads on a stud 20 extending from the frame 14 and through an arcuate slot in the support 12. The locking knob clamps a square washer 22, having a notched face, against a notched surface along the sides of the slot. The frame 14 is thus securely locked against pivotal movement.

When the frame 14 is to be moved about the pivot bolt 16 to change the angle of elevation at which the targets are thrown, the knob 18 is backed off so that the washer 22 can move out of the notches on the surface of the support 12, and the stud 20 move freely along the slot. Thus, the knob 18 and its associated elements comprise manually operated means for controlling the angle of elevation at which the targets are thrown. The frame 14 has a rearward extension, and a handle 24 connected to this extension of the frame provides a convenient lever arm for moving the frame.

The connection between the support 12 and the base 10 is shown in section in Fig. 3. The support 12 has a downwardly extending ring 26, which fits within a bearing 28 in the base. A retaining plate 30 is of larger diameter than the bearing 28 and is fastened to the ring 26 by screws. The retaining plate 30 prevents verti-

cal movement of the support 12 with respect to the base 10, but permits rotary movement of the support.

A lug 32 on the support 12 extends between screws 34. Each of these screws threads through a lug 36 upstanding from the base 10. Locknuts 38 hold the screws 34 in any set position. The lug 32 abuts against the screws 34 to limit the rotary movement of the support 12 on the base 10. The screws 34 are set to permit a limited angular movement of the lug 32 before striking the screws 34, so that the operator can move the support 12 and vary the direction in which the objects are thrown sufficiently to allow for variations in the wind conditions. Thus, the screws 34 and the parts with which they cooperate comprise manually operated means for controlling the direction in which the targets are thrown.

Referring again to Fig. 1, a housing 37 is secured to the forward end of the frame 14. A shaft 39 is journaled in the housing 37 and has a carrier or throwing arm 40 fastened to its upper end. When the carrier arm is in retracted position, as shown in the drawings, it is directly above the frame 14 and substantially parallel to the frame. Different kinds of carrier arms are used, depending on the shape and size of the targets or other projectiles to be thrown.

The carrier arm 40 is held in retracted position by a trip latch 42 and has a downwardly extending lug 44 with a hardened button 46 which abuts against the trip latch 42 when this latch is in raised position.

The trip latch 42 is supported for pivotal movement by a pin 48 on the back of a solenoid housing 50. This solenoid housing is located behind and is preferably an integral part of the housing 37. A motor 52 is fastened to the frame 14 by screws 54. Power is supplied to the motor through a cable 56. The motor is angularly disposed on the base 14, as shown in Fig. 2, so that the driving connections between the motor 52 and the mechanism in the housing 37 pass to one side of the solenoid housing 50. These driving connections include a motor shaft 57, a flexible coupling 58, and a worm shaft 59.

Referring to Figs. 4 and 6, the shaft 39 turns in bearings 60 in the housing 37 and both ends of the shaft extend from the housing. The carrier or throwing arm 40 has a split clamp end fitting the upper end of the shaft 39 clamped to the shaft by a screw 62. A key 64 prevents the arm 40 from turning on the shaft 39.

A crank 66 fastened to the lower end of the shaft 39 by a split clamp end with a screw 68 and a key 70 causes the crank and shaft to turn as a unit. A spring 72 is connected with a pin 74 extending downward from the crank. This spring extends under the frame 14 and is anchored to the rearward extension of the frame 14 by an eye bolt 76 in which the end of the spring hooks. The eye bolt 76 passes through the end of the frame 14 and is threaded to receive a wing nut 78. Turning of the nut 78 in one direction draws the eye bolt further through the end of the frame 14 and increases the tension of the spring. By turning the nut 78 in the opposite direction the tension of the spring is decreased. The force with which the machine throws a target depends on the tension of the spring 72, and the eye bolt and wing nut therefore comprise means for controlling the force with which the machine throws the targets.

The crank 66 is secured to the shaft 39 in such relation that when the throwing arm is stopped in retracted position by the trip latch 42, the crank 66 is slightly beyond dead center so that the spring 72 holds the throwing arm against the trip latch. The "dead center" position of the crank 66 is the position which it occupies when it has tensioned the spring as far as possible and further movement relieves some of the tension of the spring.

The throwing arm 40 has spaced bosses 80, and a rail 82 is connected to these bosses by screws. A stud 84 (Fig. 2) near the shaft end of the arm 40 serves as a stop for positioning the target. The arm 40 shown in the drawings is designed for throwing double targets, but other kinds of throwing arms can be employed. Targets 86 are shown in position on the throwing arm in Fig. 1.

Referring again to Figs. 4 and 6, a ratchet wheel 90 is freely rotatable on the shaft 39. The ratchet wheel 90 has a downwardly extending hub 92 on which is keyed a worm wheel 94. A worm 96 on the worm shaft 59 is driven by the motor 52. The worm 96 rotates the worm wheel 94 in a counter-clockwise direction in Fig. 6.

A pawl cage 100 has a split clamp end fastened to the shaft 39 by a key 102 and clamping screw 104. A pawl 106 is connected to the pawl cage by a vertical pin 108. A spring 110 compressed between the pawl 106 and the cage 100 urges the pawl into engagement with the teeth of the ratchet wheel. A cam surface 112 on the tail of the pawl contacts with a roller 114 located in a recess of the housing 37 and cams the pawl out of engagement with the teeth of the ratchet wheel just after the crank 66 passes dead center.

The worm wheel 94 and ratchet wheel 90 rotate continuously at a uniform speed. When the tail of the pawl is not against the roller 114, the spring 110 holds the pawl against the ratchet wheel, which rotates the pawl cage and shaft 39 to tension the spring 72 and move the throwing arm 40 into retracted position. This pawl and ratchet mechanism is a clutch between the motor-operated mechanism and the shaft 39. The roller 114 cooperates with the cam surface 112 on the tail of the pawl 106 to automatically disengage the clutch as soon as the spring 72 is tensioned, the arm 40 in retracted position, and the crank 66 beyond dead center so that the spring 72 tends to rotate the shaft 39 in the same direction as it was turned by the motor. The trip latch 42 holds the arm in retracted position.

Fig. 5 shows the button 46 of the throwing arm in contact with the trip latch. The pin 48 by which the trip latch is pivotally supported is located in such position that the portion of the latch with which the button contacts has a component of movement in the same direction as the arm 40 tends to move. The pressure of the arm 40 against the trip latch 42 therefore tends to move the latch about the pin 48 and out of the path of the arm.

The trip latch 42 is held in the path of the arm 40 by a trip latch dog 120, which is pinned on a crank shaft 122 extending from the solenoid housing 50. A spring 124 normally holds the trip latch dog against a stop 126 projecting from the side of the housing 50. A roller 128 at the upper end of the trip latch dog 120 contacts with a curved face 130 of the trip latch.

The center of curvature of this face 130 is on the axis of the crankshaft 122, so that the movement of the roller 128 along the face 130 does not move the trip latch. This design accurately

positions the trip latch even though there is some variation at times in the position of the trip latch dog.

When the crank-shaft 122 is turned in a counter-clockwise direction in Fig. 5, the roller 128 moves beyond the end of the face 130 and permits the trip latch 42 to drop and release the throwing arm 40.

The power for turning the crank-shaft 122 is furnished by a solenoid 136 which attracts an armature 138. A crank arm 140 pinned on the crank-shaft 122 inside of the housing 50 is connected to the armature 138 by a link 142.

The operation of the solenoid is controlled by an electric push-button switch 146 at the end of a flexible cable 148. This remote control of the solenoid by the switch on the end of the flexible cable is advantageous when trap shooting because it makes the location of the referee, or puller, optional, so that he can always be in a position to hear the command to pull.

The operation of the machine will be reviewed briefly. When the carrier or throwing arm 40 is in the retracted position shown in the drawings, the spring 72 is tensioned and the crank 66 is slightly beyond dead center so that the spring 72 tends to move the arm through its throwing angle. The arm 40 is held in retracted position by the trip latch 42.

At the command of "pull" the operator presses the push-button switch 146 to supply power to the solenoid 136 which attracts the armature 138. The armature moves the crank arm 140 to turn the crank-shaft 122. This turning movement of the crank-shaft 122 rocks the trip latch dog 120 counter-clockwise in Fig. 5 and permits the trip latch 42 to drop out of the path of the arm 40. When the arm 40 is released, the spring 72 swings the arm quickly through its throwing angle and the targets 86 are hurled into the air with a high speed of rotation resulting from the rapidity with which the throwing arm moves.

The momentum carries the throwing arm beyond its outer dead center and further movement causes the crank 66 to again tension the spring 72. During the throwing movement of the arm 40 it turns very much faster than the rotative speed of the ratchet wheel 90, and the pawl therefore ratchets over the teeth of the ratchet wheel. As soon as the rotative speed of the arm 40 and shaft 39 slows down to that of the ratchet wheel, the pawl engages the ratchet teeth, and the shaft 39 is rotated with the ratchet wheel to again tension the spring 72 and move the throwing arm 40 back into retracted position.

After the spring 72 is fully tensioned, the shaft 39 turns slightly further to move the crank 66 beyond dead center and bring the arm 40 against the trip latch 42. The roller 114 causes the pawl 106 to move out of engagement with the ratchet wheel just after the crank 66 has passed dead center and just before the arm 40 strikes the trip latch 42. The spring 72 moves the arm 40 and pawl 106 through their final movement after the crank 66 passes dead center, and the spring 72 holds the arm 40 against the trip latch 42.

The throwing arm 40 approaches retracted position slowly enough to enable the operator to place every target in exactly the right position without danger.

The preferred embodiment of the invention has been described, but changes and modifications can be made, and various features of the invention used alone or in combination with other features without departing from the invention defined in the claims.

I claim:

1. A throwing machine of the character described comprising a frame, a shaft journaled in the frame at the forward end of the frame with the opposite ends of said shaft extending above and below said frame; a throwing arm connected with the upwardly extending end of the shaft and located directly above the frame when in retracted position; a crank below the frame and connected with the downwardly extending end of said shaft; a spring connected with the crank for supplying power to operate the throwing arm; mechanism connected with the frame and located between the spring and the retracted throwing arm, said mechanism including an electric motor for tensioning the spring and moving the throwing arm into retracted position; and an extension at the rearward end of the frame providing an anchor for one end of the spring so that the spring extends under substantially the entire length of said mechanism and beyond the rearward end of said mechanism.

2. The combination in a throwing machine of a frame; a housing on the frame; a shaft journaled in the housing with its upper and lower ends extending from the housing; a throwing arm secured to the upwardly extending end of the shaft; a crank secured on the downwardly extending end of the shaft; a spring connected with the crank for supplying power to operate the throwing arm; and mechanism within the housing including a continuously-rotated, motor-driven clutch which automatically engages the shaft and continues its rotation after each throwing operation to bring the arm back into retracted position and tension the spring.

3. The combination in a throwing machine, of a frame; a housing on the frame; a shaft journaled in the housing with its upper and lower ends extending from the housing; a throwing arm secured to the upwardly extending end of the shaft; a crank secured on the downwardly extending end of the shaft; a spring connected with the crank for supplying power to operate the throwing arm; clutch mechanism within the housing including a pawl and ratchet, one of which is connected with the shaft and the other of which is rotated by a motor; and cam means including a roller on the inside of the housing for disengaging the clutch by moving the pawl out of contact with the ratchet.

4. In a throwing machine of the character described, a shaft extending through a housing, a carrier arm connected with the upper end of the shaft above the housing, a crank connected with the lower end of the shaft below the housing, a spring connected with the crank for operating the shaft and carrier arm to throw a projectile, mechanism including an automatic clutch for tensioning the spring and moving the throwing arm into retracted position, after each throwing operation, a latch for holding the carrier arm in retracted position, latch-operating means at the back of the housing, an electric motor behind the latch-operating means, speed-reduction gearing in the housing including a worm wheel connected with the clutch, and a worm for driving said worm wheel, and driving connections between said motor and reduction gearing including shafting extending past one side of the latch-operating means and diagonally across the machine between the motor and the worm.

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