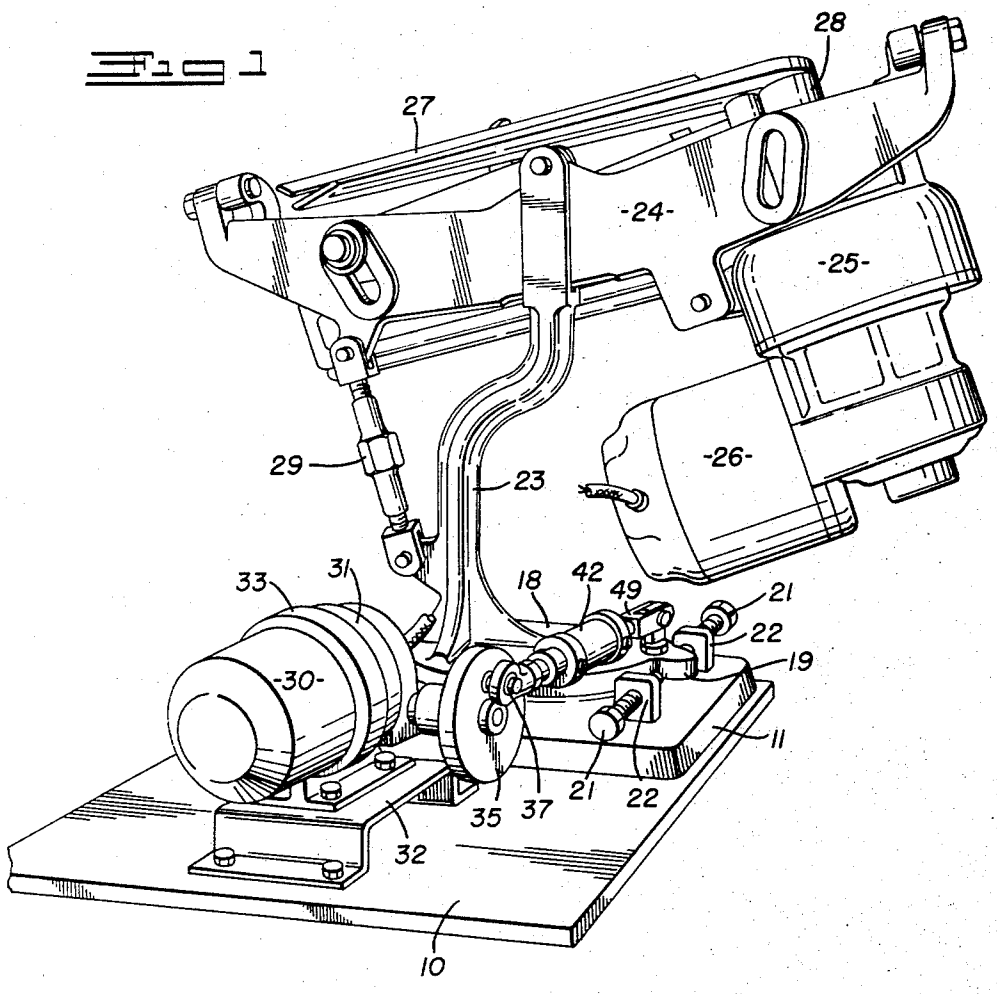
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NON-CYCLIC OSCILLATING DRIVE MECHANISM FOR TARGET TRAPS

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Fig 1



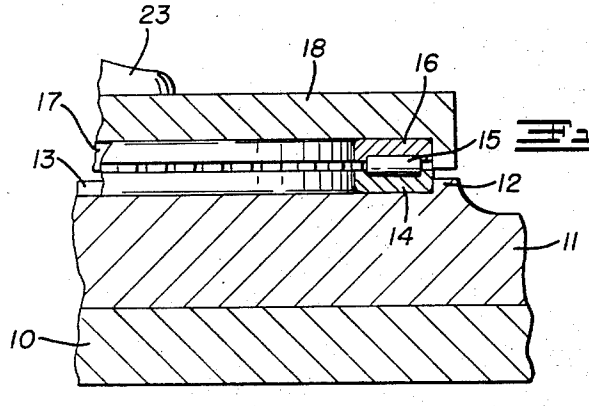


Fig 4

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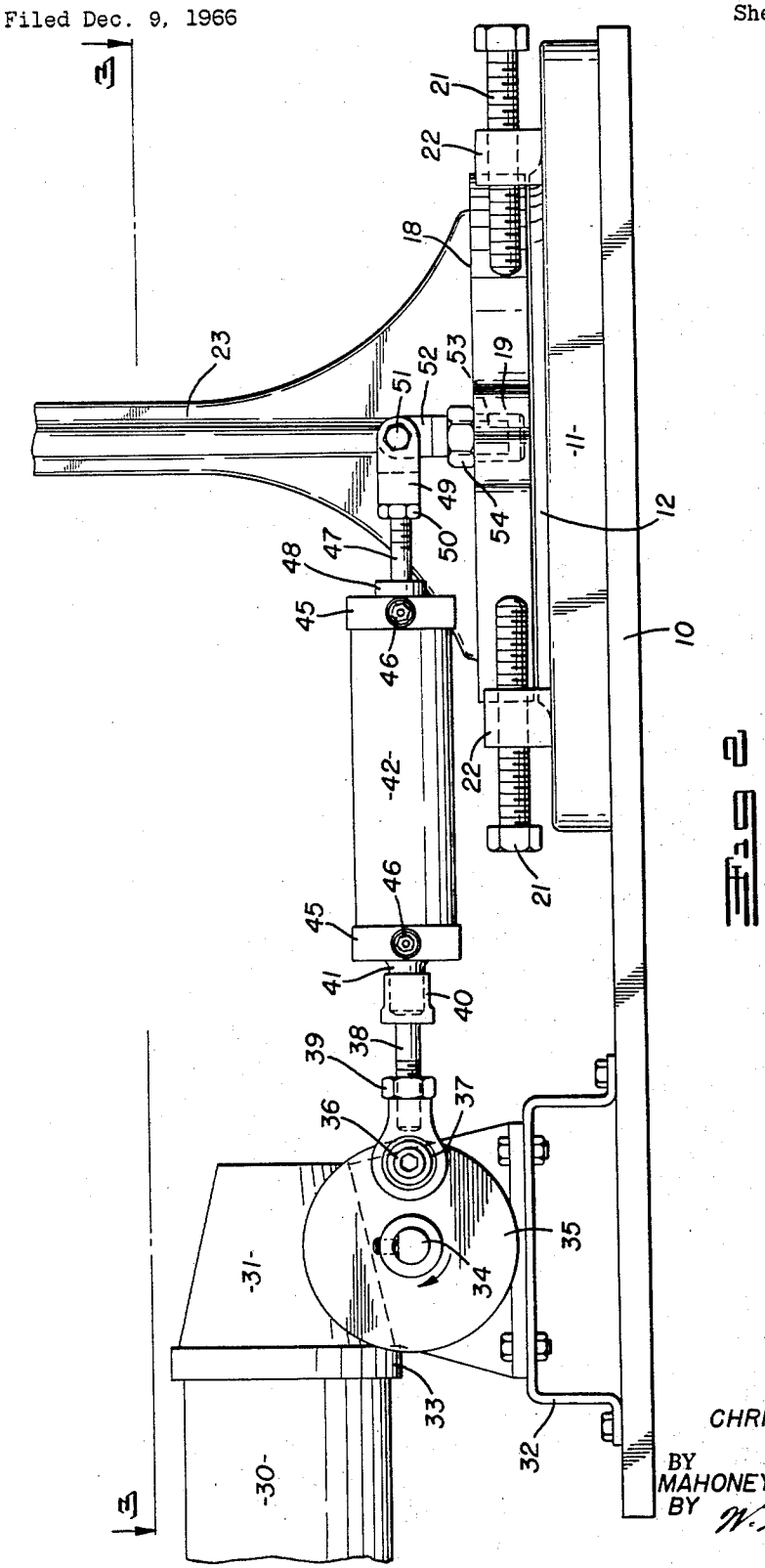


Fig. 2

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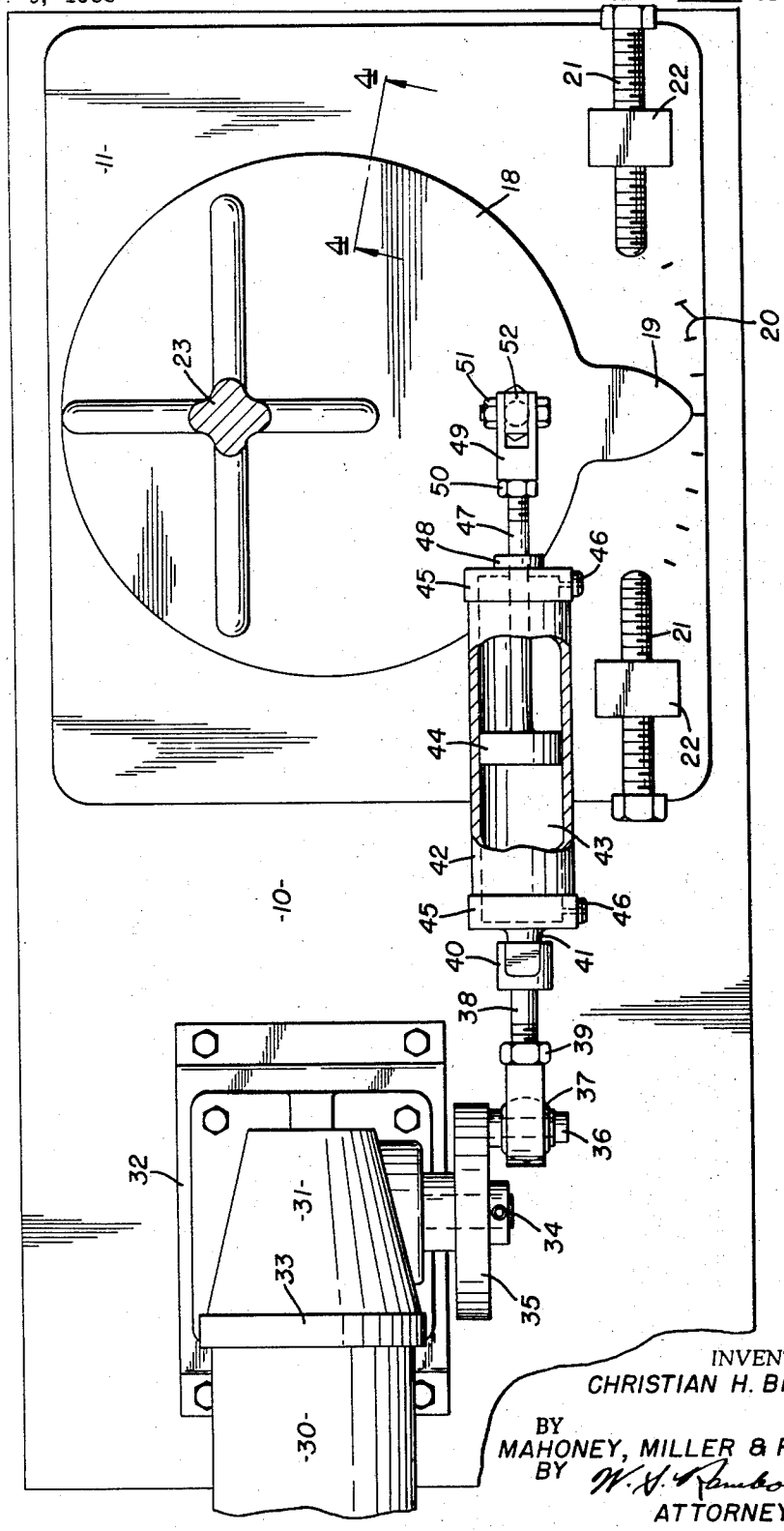
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Fig. 3



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NON-CYCLIC OSCILLATING DRIVE MECHANISM FOR TARGET TRAPS

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U.S. Cl. 124—9 3 Claims
Int. Cl. F41b 3/04; F41f 7/00

ABSTRACT OF THE DISCLOSURE

This application discloses a non-cyclic, variable stroke, oscillating drive mechanism for a target-throwing trap in which a relatively extensible and retractable pneumatic check cylinder-piston device is employed as a coupling between a continuously operable, motor-driven crank and the oscillatory turntable of the target-throwing trap, and wherein the cylinder-piston device functions to vary the pattern and stroke of oscillation of the turntable in a manner to render the cycle of oscillation of the trap unpredictable.

This invention relates generally to target (clay pigeon type) throwing or launching machines, and more particularly to an improved non-cyclic, oscillatory drive mechanism for such machines.

The ordinary trap used in present day trapshooting generally comprises a semi-automatic, motor-driven machine which includes a spring-actuated target-throwing arm arranged on an oscillatory turntable and frame which is oscillated by a motor-driven gear train through an angle of approximately 45°. The target-throwing arm of the machine may be inclined at various angles, so as to launch targets in a generally upwardly inclined angle of flight, and the oscillating drive mechanism functions to vary the horizontal or lateral angle of flight of successively launched targets. The main purpose of the oscillating drive mechanism is to vary the horizontal angles of flight of successive targets so as to test the skill of the trapshooter in breaking targets launched or thrown at different horizontal angles. Theoretically, while the trapshooter verbally controls the instant of release of a target, he has no control over the particular angle of flight of the target and must be prepared to sight and fire upon targets launched at any give angle within the 45° angle of oscillation of the trap. However, an experienced trapshooter by prolonged observation, can become so familiar with the time cycle of oscillation of a gear-oscillated trap that he can fairly well "read" or predict the pattern of oscillation of the trap. This places the experienced trapshooter at an extreme and undesired advantage, in that he can time his verbal command ("pull") for the release of a target with the cycle of oscillation of the trap and thereby be prepared to sight along the actual line of flight of a target at the instant of launch.

While various mechanisms and devices, such as "chance wheels" and variable cam drives, have been heretofore proposed for varying the cycle of oscillation of a trap between successive throws, such mechanisms or devices by and large, are either ineffective, or unnecessarily complicate the trap-oscillating mechanism and greatly increase the cost of manufacture and maintenance of traps incorporating the same.

Accordingly, it is the principal object of this invention to provide a mechanically efficient, yet structurally simple and economical trap-oscillating drive mechanism which functions to make the cycle and pattern of oscillation of the trap completely unpredictable even by the most experienced of trapshooters.

Another object is to provide a non-cyclic, oscillating drive mechanism which may be simply and economically incorporated in a target-throwing trap at the time of original manufacture thereof, or which may be attached to existing traps without extensive or expensive modifications thereto.

A further object of the invention is to provide a trap-oscillating drive mechanism which incorporates a motor-driven, rotary crank, and a relatively extensible and retractable pneumatic cylinder-piston linkage drivingly connected between the crank and the oscillatory base frame of the trap and operable to impart a variable pattern of oscillation to the trap upon rotation of the crank, the arrangement of the cylinder-piston linkage being such that the pattern of oscillation of the trap may be varied with each successive target launch or throw.

For a further and more detailed understanding of the present invention and the additional objects and advantages thereof, reference is made to the following description and the accompanying drawings, wherein:

FIG. 1 is a perspective view of a target-throwing trap embodying a non-cyclic, variable stroke, oscillating drive mechanism according to the present invention;

FIG. 2 is a side elevational view on a somewhat larger scale showing the trap-oscillating drive mechanism;

FIG. 3 is a horizontal sectional view taken along a plane indicated by the line 3–3 of FIG. 2; and

FIG. 4 is an enlarged, detailed vertical sectional view taken along the line 4–4 of FIG. 3.

FIG. 1 of the drawings illustrates, by way of example, one form of target-throwing trap to which the present invention is applicable. The trap shown in FIG. 1 comprises a generally rectangular table or platform support **10**, at one end of which is rigidly secured a relatively elevated, rectangular base plate **11**. The base plate **11** is formed in its upper central region with a raised, annular shoulder or flange **12** (see FIG. 4) which defines on the base plate a relatively shallow, circular depression or cavity **13** for the reception and support of the lower, stationary race **14** of an annular, antifriction, thrust-type, roller bearing **15**. The upper race member **16** of the thrust bearing **15** fits and is confined within a relatively shallow, circular cavity or chamber **17** formed in the bottom surface of a generally circular disc-like turntable **18**. The turntable **18** is thus supported for free rotation or oscillation about its central vertical axis by means of the roller bearing **15**. The turntable **18** is further formed with a radially projecting, substantially pointed boss or indexing arm **19** whose outer pointed end is disposed in registration with a graduated angle scale **20** printed or otherwise formed on the upper surface of the base plate **11**. Disposed at the opposite ends of the scale **20** are a pair of stop screws or bolts **21** which are threadedly carried in a pair of upstanding collar blocks **22** welded or otherwise rigidly secured to the upper surface of the base plate **11**. The stop bolts **21** are thus disposed in the path of movement of the arm **19** of the turntable and may be threadedly adjusted in the collar blocks **22** so as to determine the angular extent of oscillation of the turntable **18**.

The turntable **18** is formed or otherwise provided with an upstanding pedestal-type frame **23**, the main body portion of which joins the turntable in radially offset or eccentric relation to the central vertical axis of rotation of the turntable. The upper end of the pedestal-type frame **23** is bifurcated and pivotally supports an inclined carriage frame **24** from the forward end of which is suspended a housing **25** containing the usual spring and spring-cocking mechanism, not shown, for the trap. Connected with the housing **25** is an electric motor **26** which is energizable to actuate the cocking mechanism and tension the throwing spring contained in the housing **25**. The trap

also includes the usual target-throwing arm **27** which is carried by and extends radially outwardly from the spring-actuated shaft **28** of the trap.

Connected between the rearward end of the carriage frame **24** and the pedestal-type frame **23** is an adjustable turnbuckle **29** which may be adjusted in the usual manner to control the angle of inclination of the frame **24** and, consequently, the vertical angle of flight of targets thrown by the arm **27**. The trap may also include an automatic target-feeding magazine, not shown, by means of which targets (clay pigeons) may be properly deposited on the throwing arm **27** after each actuation thereof. It should be here understood that the general structure and parts of the trap heretofore described are common to present day types of semiautomatic target-throwing traps, and aside from their combination with the trap-oscillating mechanism to be hereinafter described, such parts form no part of the present invention.

Referring now more particularly to FIGS. 2 and 3 of the drawings, the present trap-oscillating mechanism comprises a unitary electric motor **30** and right angle reduction gear drive **31** rigidly mounted on the platform **10** as by means of a supporting bracket **32** and a clamp strap **33**. The reduction gear drive **31** includes a driven shaft **34** to which is drivingly connected a crank wheel **35**. The wheel **35** is provided with an eccentric crank arm or shaft **36** to which is rotatively connected a ball and socket-type connector fitting **37** which provides for rotation as well as limited universal swiveling movement of the fitting **37** on the shaft **36**. The fitting **37** is further formed with a screw-threaded socket into which is threaded one end of a connector rod **38**. A lock nut **39** is provided on the rod **38** to hold the rod **38** against rotation after it has been properly adjusted in the socket of the fitting **37**. The opposite end of the connector rod **38** is provided with a relatively rotatable female adaptor coupling **40** which is threadedly connected with a stub shaft **41** projecting axially outwardly from the rear end of a pneumatic check cylinder **42**.

The cylinder **42** is formed with an axial bore or piston chamber **43** in which is slidably carried a piston **44**. The ends of the cylinder **42** are closed by end caps **45** each of which is provided with a fixed, relatively restricted orifice plug **46**. The orifices provided in the plugs **46** communicate directly with the opposite ends of the piston chamber **43** of the cylinder and provide for the restricted passage of air to and from the chamber **43** upon reciprocation of the piston **44** therein. The piston **44** is provided with an axially extending piston rod **47** which extends outwardly through a bushing **48** carried by the outer end cap **45** of the cylinder. The outer end portion of the rod **47** is threaded and is connected with a clevis **49**. A lock nut **50** is provided on the threaded end of the rod **47** to hold the clevis **49** in properly adjusted position on the rod **47**. The bifurcated end of the clevis **49** is pivotally connected, as by means of a nut and bolt **51**, with the upper end of a swivel stud **52**. The stud **52** is formed at its lower end with a smooth cylindrical shank **53** which is rotatably mounted in a socket or bore formed in an externally threaded bushing nut **54**. The bushing nut **54** is threaded in a cooperatively threaded bore or socket formed in the turntable **18**. Thus, the swivel stud **52** is free to turn or rotate within the bushing nut **54** upon reciprocation of the pneumatic cylinder **42** and its associated piston **44** and piston rod **47**.

In operation, the motor **32** is energized to continuously drive the crank wheel **35** and thereby impart reciprocation to the pneumatic cylinder-piston linkage. As the cylinder-piston linkage reciprocates, the piston **44** and its rod **47** will move axially a relatively slight extent relative to the cylinder **42**, due to the load imposed by the turntable **18** and the trap mechanism supported thereby. This relatively slight movement of the piston within the cylinder is made possible by the restricted escape and intake of air into the cylinder chamber on the opposite sides of the piston, by way of the orifice plugs **46**. However, due to the restricted size of the orifices of the plugs **46**, for example, 0.025 inch, coupled with the antifriction support of the turntable and the trap mechanism, the extent of movement of the piston **44** in the cylinder **42** is relatively slight and variable during the normal oscillation of the trap. However, when the trap is triggered to release and throw a target, some of the recoil force generated by the spring mechanism of the trap is transmitted to the turntable by way of the eccentrically offset pedestal frame **23**, and thus tend to cause the turntable to rotate one way or the other, depending upon the relative angle of the trap with respect to the cylinder-piston linkage at the point of release of the target. These recoil forces thus cause the piston rod **47** to either extend or retract a short distance relative to the cylinder **44** and thereby lengthen or shorten the overall length of the linkage between the crank wheel **35** and the swivel stud **52**. At the same time, the pneumatic cylinder-piston-arrangement acts in a manner similar to a door check to cushion the recoil forces, but also acts to vary the effective length of the driving linkage an unpredictable amount. Thus, the pattern of oscillation of the trap will be varied slightly during the normal reciprocation of the cylinder-piston linkage and will be unpredictably varied with each successive target throw. This makes it practically impossible for even the most skilled trapshooter to predict the cycle of oscillation of the trap and, consequently, the angle of flight of a target at the time of its release from the trap.

In view of the foregoing, it will be seen that the present invention provides a mechanically simple, yet efficient and economical trap-oscillating drive mechanism which is characterized by its ability to oscillate the trap through the desired range of angularity, but in a continuously variable and unpredictable pattern.

While a single preferred embodiment of the invention has been illustrated and described in detail, it will be understood that the specific embodiment is susceptible to modification as to details of construction and design without departing from the spirit of the invention or the scope of the following claims.

Having thus described this invention, what is claimed is:

1. In a target-throwing trap which includes a base, a turntable supported by said base for oscillating movement about a substantially vertical axis, and target-throwing means carried by and movable with said turntable, operation of said throwing means producing a reactive force on said turntable; that improvement which comprises a motor-driven crank; and a relatively extensible and retractable pneumatic cylinder-piston device connected between said crank and said turntable for oscillating said turntable upon rotation of said crank, said cylinder-piston device being operable in response to reactive forces generated by the operation of said target-throwing means to vary the pattern of oscillation of said turntable.

2. The apparatus defined in claim **1**, including adjustable stop means carried by said base and engageable with said turntable for limiting the extent of oscillation of said turntable.

3. The apparatus defined in claim **1**, wherein said cylinder-piston device comprises a pneumatic check cylinder pivotally connected with said crank and provided at opposite ends thereof with relatively restricted air intake and discharge orifices, and a piston slidable in said cylinder between said orifices and having a piston rod extending outwardly from said cylinder and pivotally connected with said turntable.

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