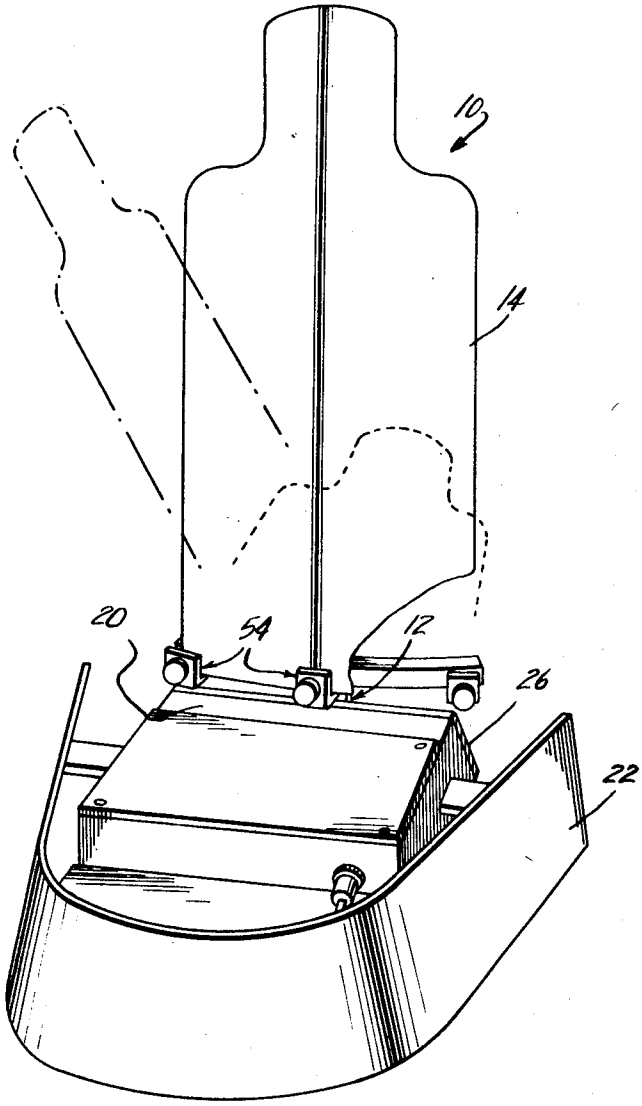
June 2, 1970 A. A. ZACHMEIER 3,515,388

TARGET RAISING MECHANISM

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Fig. 1



August A. Zachmeier
INVENTOR.

BY John M. Pearce

Attorney

June 2, 1970 A. A. ZACHMEIER 3,515,388

TARGET RAISING MECHANISM

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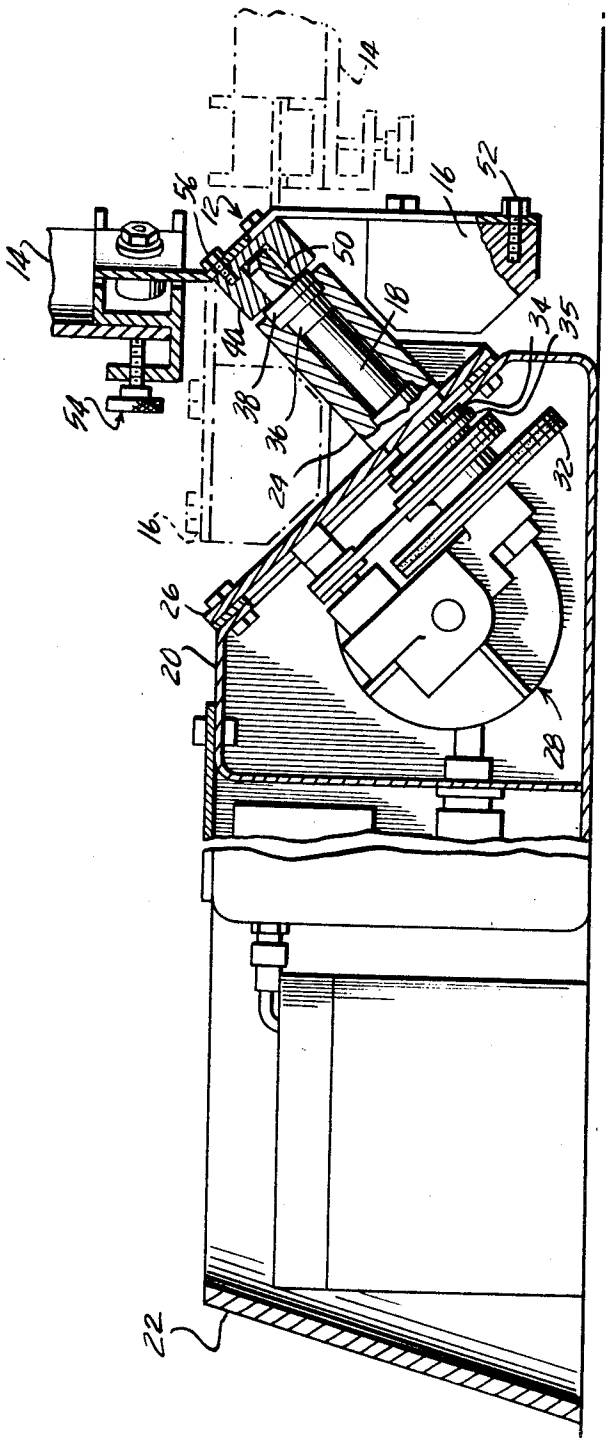


Fig. 2

August A. Zachmeier
INVENTOR.

BY John M. Pease

Attorney

June 2, 1970 A. A. ZACHMEIER 3,515,388

TARGET RAISING MECHANISM

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Fig. 3

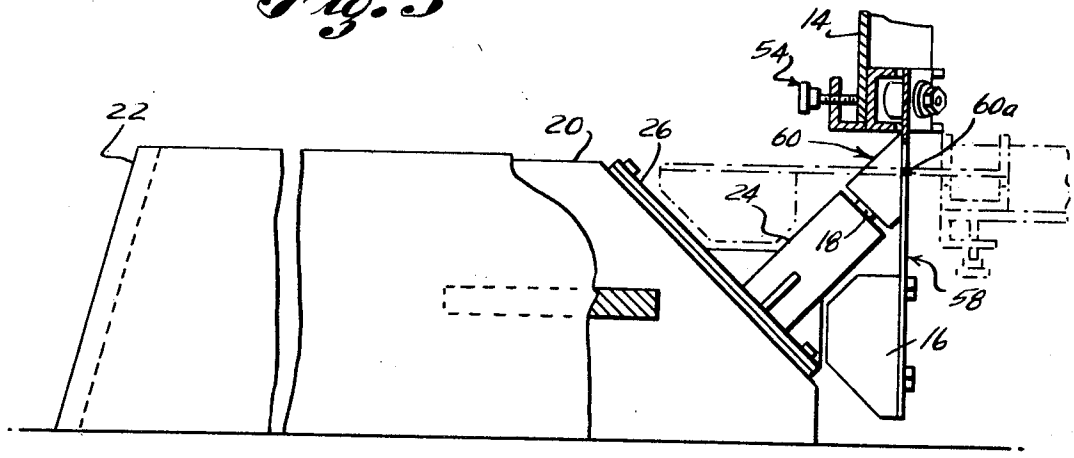
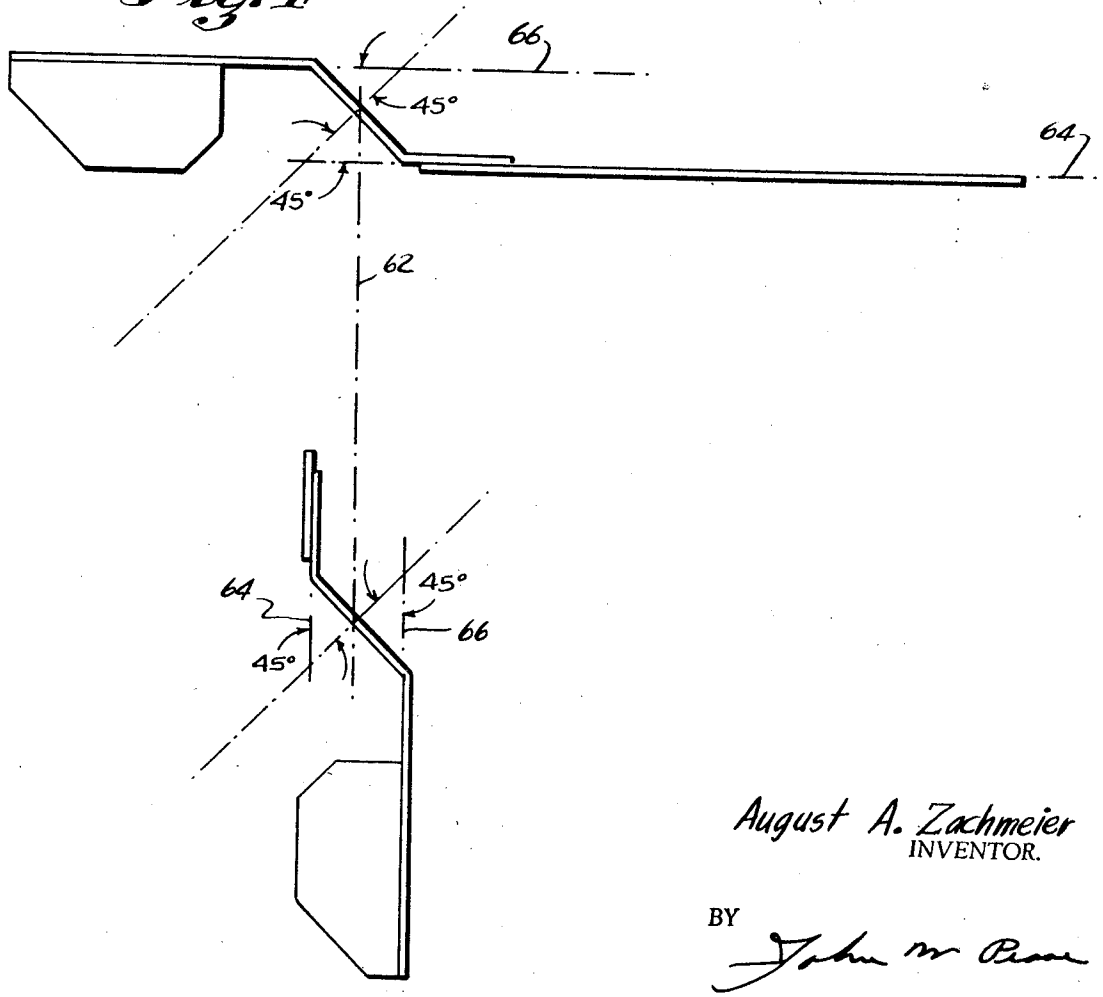


Fig. 4



August A. Zachmeier
INVENTOR.

BY John M. Pearce

Attorney

United States Patent Office 3,515,388 Patented June 2, 1970

3,515,388

TARGET RAISING MECHANISM

August A. Zachmeier, Joppa, Md., assignor, by mesne assignments, to the United States of America

Filed May 8, 1968, Ser. No. 727,539
Int. Cl. F137j 7/00
U.S. Cl. 273—105.6 6 Claims

ABSTRACT OF THE DISCLOSURE

This invention is directed to an improved target raising mechanism for small arms targets, the mechansim being arranged to rotate the target and its counterweight simultaneously about a drive axis mounted 45° in relation to ground level and about the centroidal axes of the counterweight and target which are positioned 45° to the drive axis. In this arrangement for 180° rotation of the drive axis the target is continuously moved in omni-planal fashion from a horizontal lowered position to a vertical raised position.

BACKGROUND OF THE INVENTION

In the field of target raising mechanisms for silhouette targets simultating an enemy, previous methods included mechanisms which raised and lowered the target with the target in fixed attitude in relation to the drive axis for movement. This method has been found unsatisfactory because of power requirements to raise the target with the required time frame (usually one second) under variable wind conditions imposing surface pressure loading of the target. Thus, for example, the target might at one time be raised broadside into the wind and another time an edge of the target might be directed into the wind. Variable wind loading also has a direct variable effect on target motion. In addition to the above, the moment of inertia of target and counterweight in present targets has been an appreciable factor in creating added power requirement. Also in the prior art type mechanisms the target is driven from lowered to raised position through an arc of 90° and reversal of the drive axis has been required for each raise and lower movement, thereby requiring additional power for additional inertial forces.

In contrast to the above, mechanism incorporating the subject invention reduces power requirements by providing an omni-planal motion to the target which is continuously variable with respect to wind direction. At the same time power requirements are further reduced by minimizing the inertial forces required to rotate the target and counterweight about the drive axis, by eliminating the need to reverse the drive axis and by providing 180° rotation of the drive axis between each raised and lowered target position. Inherent also in subject invention mechanism is a reduction in the overall silhouette or height of the down position of the target and associated mechanism.

SUMMARY OF THE INVENTION

The invention comprises a target raising mechanism in which a target and counterweight are fixed to a drive shaft in an attitude of 45° to the drive shaft axis and the drive shaft is mounted in a support housing for rotation on an axis 45° to the ground when the housing is ground supported such that in operation the target is rotated simultaneously about the drive axes and the centroidal axes of the target upon rotation of the drive shaft, together with indexing means and clutch means rotating the drive shaft in increments of 180° rotation.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a target raising mechanism showing rotation of the target as it is raised.

FIG. 2 is a side elevation partially in section showing details of the drive and drive supporting housing of the mechanism of FIG. 1,

FIG. 3 is a side elevational view showing the mechanism of FIG. 1 and FIG. 2 with a modified form of mounting the target and counterweight to the drive shaft, and also incorporating the invention, and

FIG. 4 is a single line side elevation diagrammatic representation of the target and drive axes relationship of the mechanism of FIG. 1.

DESCRIPTION THE PREFERRED EMBODIMENT

Referring to the drawings and initially to FIGS. 1 and 2, the numeral **10** in FIG. 1 indicates generally a target raising mechanism incorporating the invention. Mechanism **10** includes a positioning arm **12** having opposite ends to which are mounted a target **14** and counterweight **16**. Arm **12** is connected, as will be described hereinafter, to a drive shaft **18** mounted at a 45° angle to ground level in a ground supported housing **20** which is shielded from projectiles by a U-shaped shield **22**.

Referring to FIG. 2, the shaft **18** is journaled in a shaft housing **24** welded or otherwise suitably fixed to a motor plate **26** forming part of the housing **20**. The shaft **18** is rotated by a drive motor **28** and drive belt **30** through a clutch **32**, the rotation being limited to 180° increments by suitable mechanism including an indexing cam **34** which is connected by suitable actuator means **35** to engage and release the clutch **32**. Suitable bearing means, for example bearing **36**, and shaft seal means as indicated at seal **38** are provided for the shaft **18**.

To provide for rotation of the target **14** and counterweight **16** about the centroidal axis of each as well as about the axis of drive shaft **18** while providing a 45° angular relationship of the drive shaft axis to said centroidal axes, a collet **40** is keyed as at **50** to the shaft **18** and the positioning arm **12** is shaped as indicated in FIG. 2 to attach the counterweight **16** to one end thereof through fastenings **52** and the target **14** to the opposite end thereof through a curved target apron fastener **54**. Suitable fastenings **56** are employed to secure the central portion of the arm **12** to the collet **40**.

In a modified form of the invention as shown in FIG. 3, a straight positioning arm **58** is employed and a collet **60** having a 45° angular face **60***a* is employed to provide the necessary 45° relationship of centroidal and drive axes mentioned above.

In each of the arrangements described above, rotation of the drive shaft **18** from an indexed down target position to a raised target position rotates the target **14** in an omni-planal fashion as indicated in FIG. 1 and shown diagrammatically in FIG. 4. FIG. 4 indicates the lowered and raise positions of the target **14** in relation to a vertical centerline shown at **62** and the angular relationship of the target centroidal axis **64** and counterweight centroidal axis **66** in reference to the drive shaft **14** axis. The target rotation effected continuously varies the attitude of the target in relation to a prevailing wind direction and effects a 90° elevation of the target with 180° rotation of the drive shaft **18**, each function contributing to a reduction in required power capacity of the drive motor **28**. At the same time the 45° relationship maintained between the centroidal axes of the target and counterweight to the drive axis of the drive shaft **18** reduces inertial load, thereby reducing power requirements and also contributes to a minimum height of target raising mechanism silhou-

ette. In addition, since the drive shaft **18** may be rotated in the same direction from both raising and lowering of the target, the drive motor **28** may be continuously run and the kinetic energy of the rotating motor is applied through the clutch **32** in moving the target **14**. Inertia of the motor itself is eliminated since the motor need not be reversed.

It will be understood that various changes in the details, materials, and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. An improved target raising mechanism comprising,
(a) a drive shaft having a drive axis,
(b) housing means for supporting said shaft with its drive axis at an angle of 45° to the ground when said housing means is ground supported,
(c) drive means for rotating said shaft in 180° increments,
(d) a target,
(e) a counterweight means for counterweighting the mass of said target,
(f) mounting means shaped and disposed to hold said target and said counterweight means with respective centroidal axes thereof at a 45° angle to said drive axis to rotate said target and counterweight means about said drive axis and also about said respective centroidal axes responsive to rotation of said drive shaft.

2. A target raising mechanism according to claim **1**,
(a) said drive means including a drive motor, a clutch and an indexing cam and clutch actuator means for controllably rotating said shaft in 180° increments to raise and lower the said target.

3. A target raising mechanism according to claim **1**,
(a) said mounting means including a positioning arm having means at opposite ends for securing said target and said counterweight to said arm and an adapter having an inclined face for connecting said arm to said shaft at a 45° angle.

4. A target raising mechanism according to claim **3**,
(a) said drive means including a drive motor, a clutch and an indexing cam and clutch actuator means for controllably rotating said shaft in 180° increments to raise and lower said target.

5. A target raising mechanism according to claim **1**,
(a) said mounting means including a positioning arm having means at opposite ends for securing said target and said counterweight to said arm and a central portion for securing said arm to said shaft, the ends of said arm being bent to position said centroidal axes of said target and counterweight at 45° to said drive axis.

6. A target raising mechanism according to claim **3**,
(a) said drive means including a drive motor, a clutch and an indexing cam and clutch actuator means for controllably rotating said shaft in 180° increments to raise and lower said target.

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ANTON O. OECHSLE, Primary Examiner
M. R. PAGE, Assistant Examiner