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(54) **SHOOTING TARGET APPARATUS HAVING PNEUMATIC DRIVE MECHANISM**

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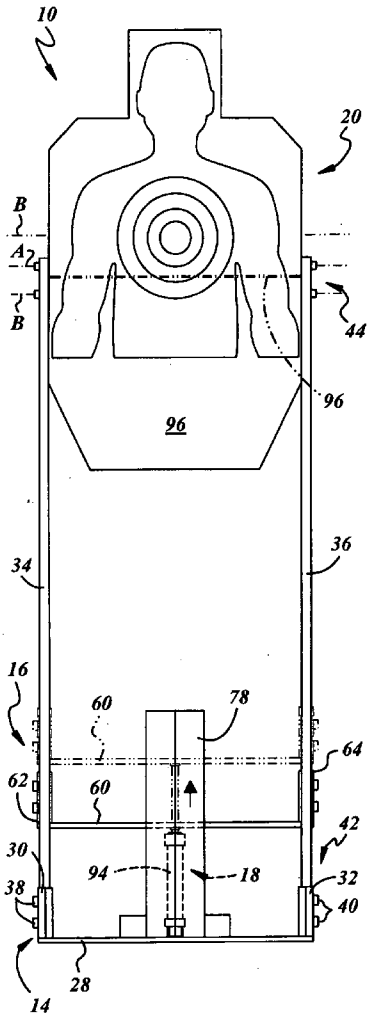
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(57) **ABSTRACT**

A pneumatically-driven shooting target apparatus that can transition between presented and concealed positions and can be used in a variety of shooting environments. The shooting target apparatus generally includes a frame, a movable target holder, a pneumatic drive mechanism attached to the movable target holder, and a target assembly. According to one embodiment, activation of the drive mechanism rotates a target between a horizontal concealed position which is hidden from the shooter, and a vertical presented position that is visible to the shooter. In another embodiment, activation of the drive mechanism causes an obstruction that is concealing the target to rotate out of the way, at the same time that the target is lifted and presented to the shooter.



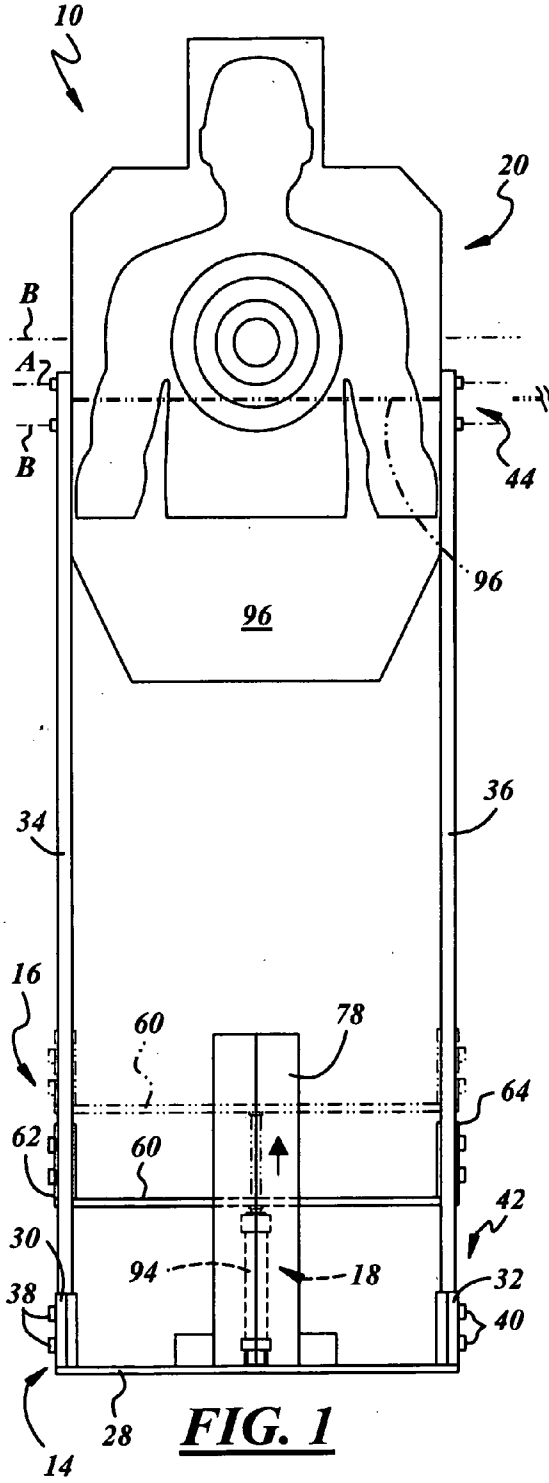

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FIG. 1

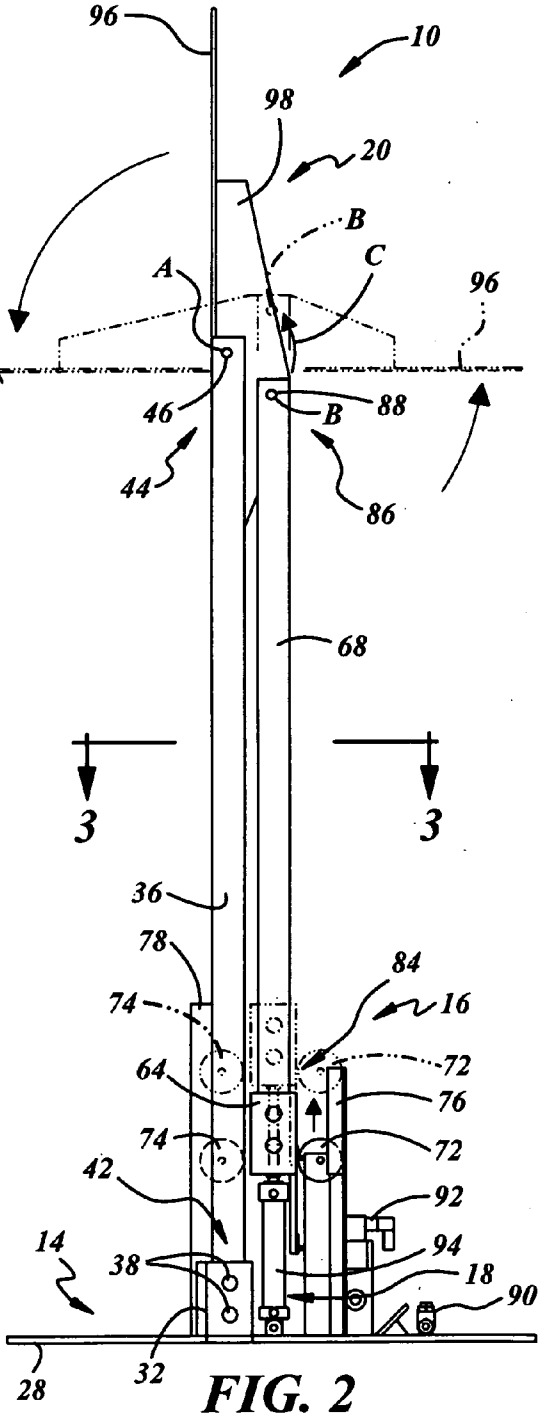

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FIG. 2

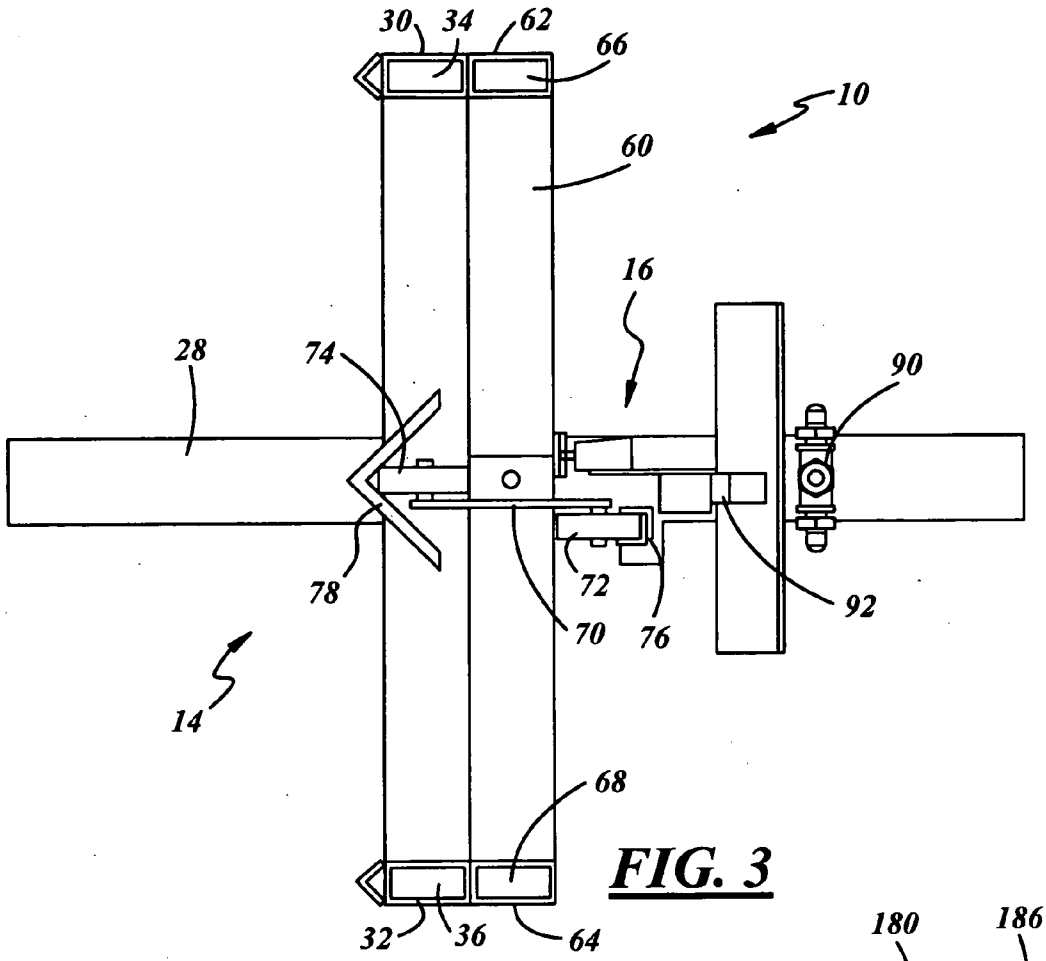

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FIG. 3

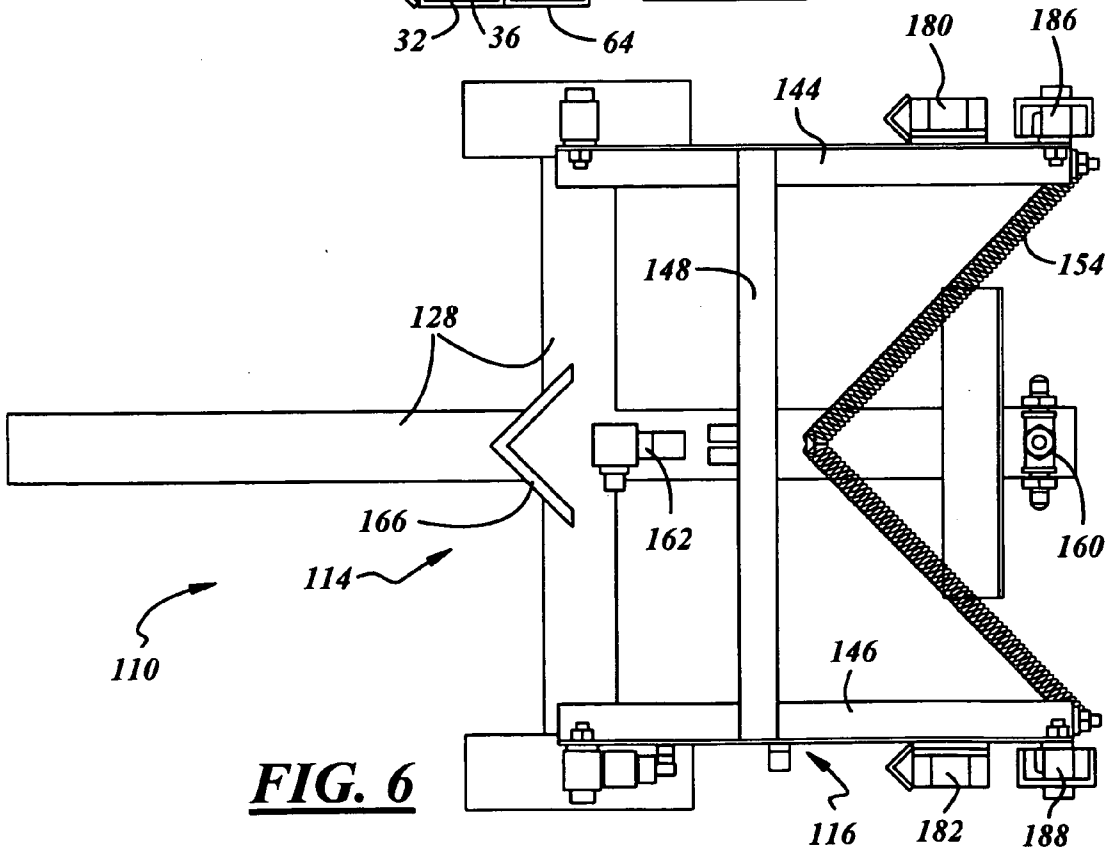

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FIG. 6

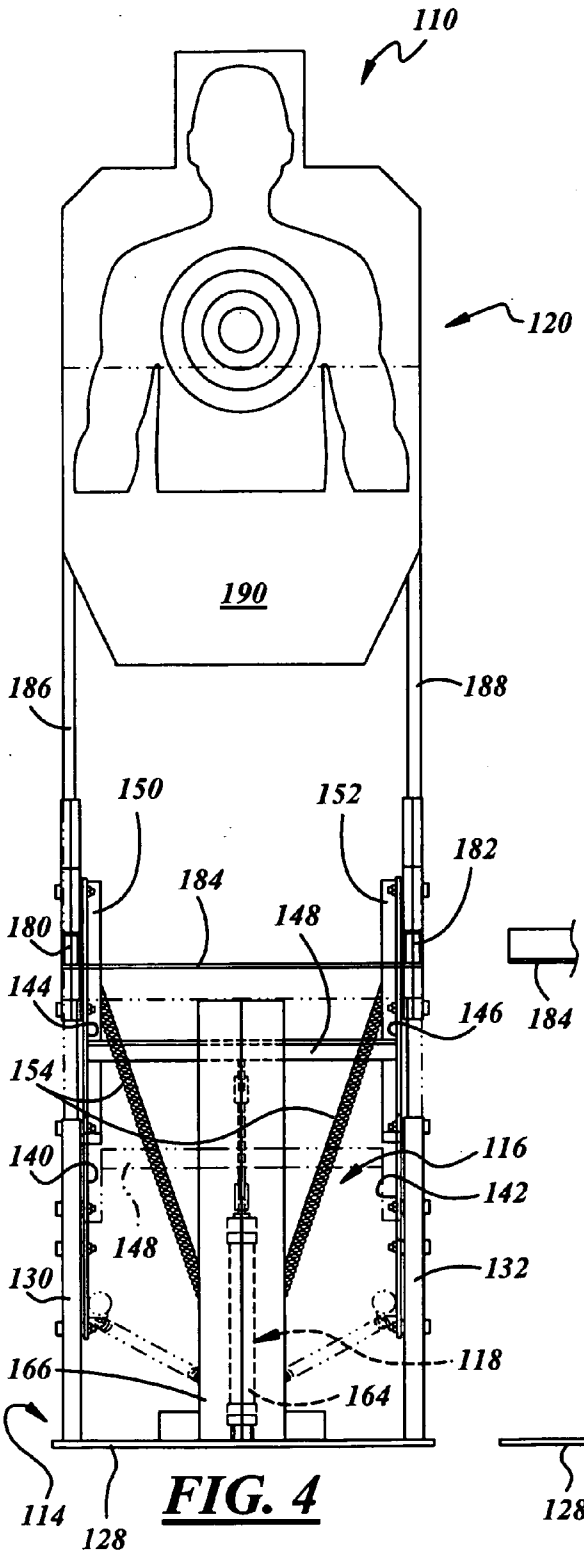

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FIG. 4

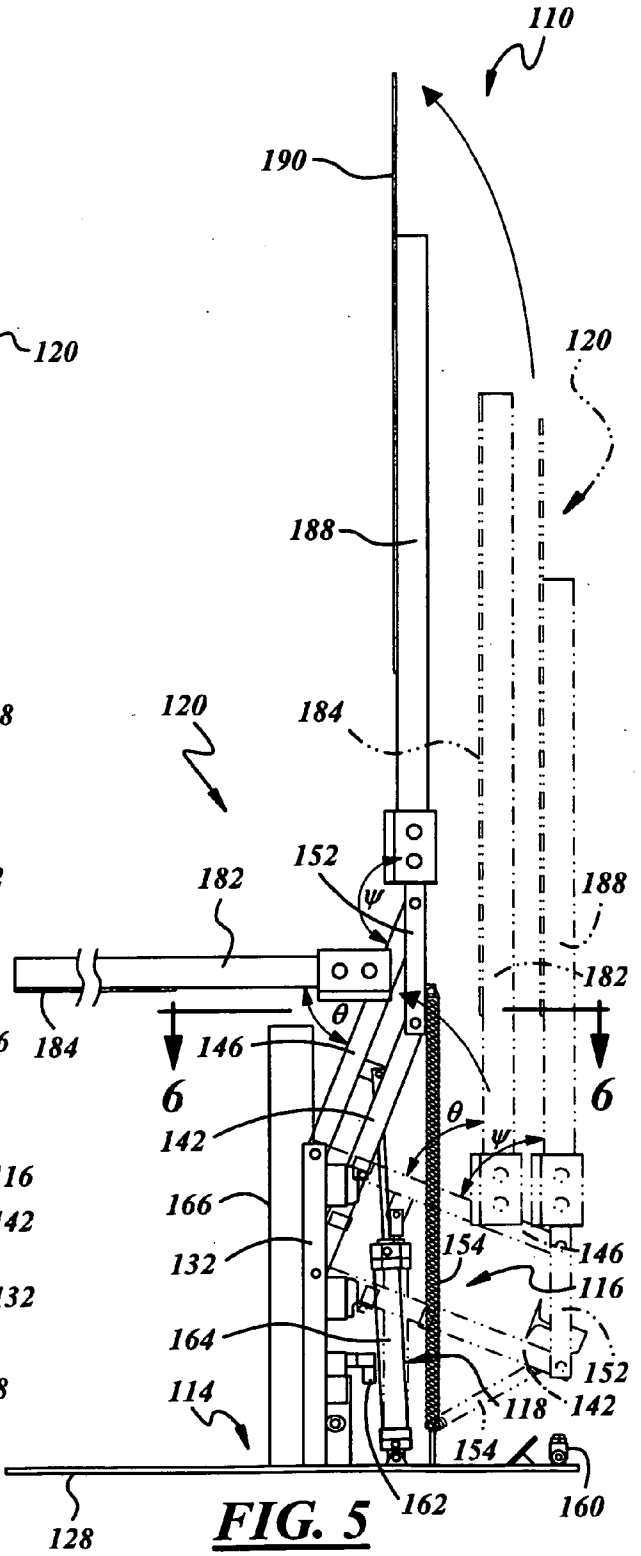

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FIG. 5

SHOOTING TARGET APPARATUS HAVING PNEUMATIC DRIVE MECHANISM

REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Ser. No. 60/692,813 filed on Jun. 22, 2005, the entire contents of which are hereby incorporated by reference.

FIELD OF INVENTION

[0002] The present invention relates generally to shooting targets, and more specifically, to movable shooting targets such as those used in automated targeting systems found in shooting ranges.

BACKGROUND OF THE INVENTION

[0003] Various types of shooting targets have been developed and sold, including both stationary and moving targets. Their designs vary widely and are largely driven by the particular needs of the shooter and the specific environment in which the targets are used.

[0004] For instance, standard bulls-eye type targets having a retrieval drive mechanism powered by an electric motor are commonly found in shooting range firing lanes and are used by shooters who want to practice shooting at a stationary target. Pop-up type targets and moving targets, on the other hand, provide the shooter with a more dynamic target environment, and sometimes move the target with a drive mechanism that is powered by either pneumatic, electric or hydraulic means.

[0005] Some examples of different types of shooting targets are disclosed in U.S. Pat. No. 6,808,177 issued to Dehart; U.S. Pat. No. 6,325,376 to Elliott et al.; U.S. Pat. No. 5,232,227 to Bateman and U.S. Pat. No. 3,515,388 to Zachmeier.

SUMMARY OF THE INVENTION

[0006] According to one aspect of the invention, there is provided a shooting target apparatus capable of transitioning between presented and concealed positions. The apparatus comprises a frame, a drive mechanism, a movable target holder, and a target assembly, whereby activation of the drive mechanism rotates a generally flat component of the target assembly through an angular range so that the apparatus can transition between presented and concealed positions.

[0007] According to another aspect of the present invention, there is provided a shooting target apparatus that comprises a frame, a movable target holder, a pneumatic drive mechanism, and a target assembly. Whereby activation of the pneumatic drive mechanism causes: i) an air cylinder to move the movable target holder, ii) the target assembly to rotate about a first pivot axis, and iii) the target assembly to rotate about a second pivot axis as the second pivot axis moves in a path around the first pivot axis.

[0008] According to yet another aspect of the present invention, there is provided a shooting target apparatus that comprises a frame, a movable target holder, a pneumatic drive mechanism, and a target assembly. Whereby activation of the pneumatic drive mechanism causes: i) an air cylinder to move the movable target holder, ii) a target to move between lowered and raised positions, and iii) an obstruction to rotate between positions that conceal and present the target.

DESCRIPTION OF THE DRAWINGS

[0009] These and other objects, features and advantages of this invention will be apparent from the following detailed description of the preferred embodiments and best mode, the appended claims and the accompanying drawings, in which:

[0010] **FIG. 1** is a front view of a first embodiment of a shooting target apparatus, where solid lines denote the target in a presented position and phantom lines denote the target in a concealed position;

[0011] **FIG. 2** is a side view of the shooting target apparatus of **FIG. 1**;

[0012] **FIG. 3** is a plan or top view of the shooting target apparatus of **FIG. 1**;

[0013] **FIG. 4** is a front view of a second embodiment of a shooting target apparatus, where again solid lines demonstrate the target in a presented position and phantom lines demonstrate the target in a concealed position;

[0014] **FIG. 5** is a side view of the shooting target apparatus of **FIG. 4**; and

[0015] **FIG. 6** is a plan or top view of the shooting target apparatus of **FIG. 4**.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0016] The shooting target apparatus disclosed herein is a pneumatically-driven device that provides a shooter with a dynamic and engaging target shooting experience and can be used in a number of different capacities, including indoor and outdoor training, competition, and recreational settings. Depending upon the particular manner in which it is used, the shooting target apparatus can be set up by itself as a stand-alone target, with other targets as part of a larger shooting course, in a traditional shooting lane, or in any other target shooting application known to those skilled in the art.

[0017] With reference to a first embodiment shown in **FIGS. 1-3**, shooting target apparatus **10** rotates a target between a vertically-aligned 'presented position' (shown in solid lines) and a horizontally-aligned 'concealed position' (shown in phantom), and generally includes a frame **14**, a movable target holder **16**, a drive mechanism **18**, and a target assembly **20**.

[0018] Frame **14** acts as a foundation for supporting the other components of shooting target apparatus **10**, and generally includes a base **28**, a pair of mounting receptacles **30**, **32**, and a pair of upright posts **34**, **36**. Of course, other frame constructions can also be used, including frames formed with plates, ones having wheels or other components for improved portability, or ones made from materials other than steel, to name but a few possibilities. Base **28** preferably includes several, transversely-connected steel members that lie on the ground to provide a solid foundation for the apparatus. Mounting receptacles **30**, **32** are welded or otherwise attached to base **28** and receive posts **34**, **36**, respectively, so that the posts are maintained in a vertically-upright

and generally parallel orientation. Quick-release pins **38**, **40**, which can be connected to mounting receptacles **30**, **32** with cables to prevent them from being lost, are used to non-permanently secure the upright posts in their corresponding receptacles. This makes for easy assembly and disassembly of the shooting target apparatus. Post **36** is preferably an elongated component with a lower end **42** sturdily attached to mounting receptacle **32** via quick-release pin **40**, and an upper end **44** that includes an opening **46** for rotatably receiving a pin, ear, dowel, or some other component of the target assembly **20**. This rotatable connection allows target assembly **20** to rotate about a first pivot axis A when being driven between concealed and presented positions, as will be subsequently explained in more detail. Because of their similarity, a separate description of post **34** has been omitted.

[**0019**] Movable target holder **16** rotatably supports target assembly **20** on a second pivot axis B and is coupled to drive mechanism **18** so that it can move up and down during operation. According to the embodiment shown here, the movable target holder preferably includes a horizontal lift bar **60**, a pair of mounting receptacles **62**, **64**, a pair of upright posts **66**, **68**, a roller mount bracket **70**, a pair of rollers **72**, **74**, and a pair of corresponding roller guides **76**, **78**. Lift bar **60** essentially extends the width of the shooting target apparatus and carries a mounting receptacle **62**, **64** at each end, as well as the roller mount bracket **70**. The mounting receptacles **62**, **64**, which are welded or otherwise attached to lift bar **60**, respectively receive upright posts **66**, **68** via quick release pins similar to those previously described such that the posts are maintained in a generally vertical orientation. Upright post **68** includes a lower end **84** that fits into mounting receptacle **64** and an upper end **86** that preferably includes an opening **88** for rotatably receiving a pin, ear, dowel, or some other pivotal component of target-assembly **20**. It should, of course, be appreciated that alternatively target assembly **20** could include the opening and the upper end of post **68** could include the protruding item. Regardless of the particular implementation, this rotatable connection enables the target assembly to pivot about the second pivot axis B. Roller mount bracket **70** is welded to lift bar **60** and rotatably carries rollers **72**, **74** which act as wheels for rolling up and down within roller guides **76**, **78**, respectively. The roller guides are preferably vertical channels made from angled steel and are sized to receive the rollers such that they freely roll up and down under the power of drive mechanism **18**, but do so in a stable manner.

[**0020**] Pneumatic drive mechanism **18** uses pressurized air to drive movable target holder **16** up and down, thereby rotating target assembly **20** so that the target transitions between presented and concealed positions. Preferably, the pneumatic drive mechanism includes an air connection **90**, a valve **92**, and an actuator or air cylinder **94**. Pressurized air from a compressor or some type of air rail is provided to connection **90** (all air connections preferably use push lock or other quick-release fittings) and is regulated by an electrically controlled valve **92**. Air connection **90**, as well as other components of the pneumatic drive mechanism, can be protected from stray bullets with a shield like component **78**, which also serves as a guide for roller **74**. Air cylinder **94** is preferably a dual-direction, single-rod pneumatic cylinder that has a lower end pivotally attached to base **28** and an upper end attached to lift bar **60**. The pivotal connection to the base is accomplished with a clevis bracket or some other type of connection that allows the air cylinder **94** to pivot slightly during operation, as will be explained.

[**0021**] Target assembly **20** includes a target **96** and a pair of pivot plates **98** and is designed for easy rotation between presented and concealed positions. Target **96** is a generally flat component that preferably has target-related indicia on its surface, such as those that conform with International Practical Shooting Confederation (IPSC) guidelines. Furthermore, target **96** can be in the shape of a person, animal, or some inanimate object, with one or more zones indicating the quality of different shots, for example. Each of the pivot plates **98** is mounted to a side of target **96** and has a pair of holes; the first of which corresponds with opening **46** in post **36**, and the second of which corresponds with opening **88** in post **68**. Preferably, these openings receive dowels which are secured by cotter-type pins and allow for pivotal movement of target **96** about both of axes A and B.

[**0022**] During operation, drive mechanism **18** moves the movable target holder **16** up and down so that the target assembly **20** is rotated between presented and concealed positions. Beginning with the presented position shown in solid lines, activation of the pneumatic drive mechanism causes air cylinder **94** to extend its rod such that lift bar **60** of the movable target holder **16** is pushed upwards. This in turn causes rollers **72**, **74** to roll upwards within roller guides **76**, **78** and causes the upper ends of posts **66**, **68** to exert an upward force on the target assembly. As target assembly **20** is being pushed upwards, it is pivoting about both axis A and axis B, which causes target **96** to rotate counter-clockwise (indicated with arrows) through an angular range of about ninety degrees. As one skilled in the art will appreciate, the upper end **86** of post **68** most follow an arcuate path C in order for target assembly **20** to rotate about axis A. Thus, axis B moves along arcuate path C around axis A, so that it is repositioned with respect to axis A. Once this operation is complete, target **96** ends up in a horizontally-aligned or concealed position (shown in phantom). A subsequent activation of pneumatic drive mechanism **18** causes target assembly **20** to pivot back to the presented position, but this time in a clockwise direction.

[**0023**] Turning now to **FIGS. 4-6**, there is shown a second embodiment of shooting target apparatus **110** that lifts a target upwards so that it is presented to the shooter at the same time that an obstruction is rotated downwards to expose the target; this is also referred to as a lift-and-tilt configuration. According to the embodiment shown here, shooting target apparatus **110** generally includes a frame **114**, a movable target holder **116**, a drive mechanism **118**, and a target assembly **120**. It should be appreciated that some of the components of this second embodiment are similar to those previously described in connection with the first embodiment. Thus, where appropriate, the previous explanations and descriptions of components, parts, assemblies, functionality, etc., apply to this embodiment as well.

[**0024**] As before, frame **114** functions as a supportive framework for the other components of the shooting target apparatus, and preferably includes several, transversely-connected steel members including base **128** and upright posts **130**, **132** which are attached to the base. The frame can further include a number of additional items, such as steel gussets for added strength, protective angle irons, mounting receptacles, components for electrical and/or pneumatic connections, wheels, etc.

[0025] Movable target holder **116** has a spring-loaded linkage-type construction and carries target assembly **120** while moving between a raised position (shown in solid lines) and a lowered position (shown in phantom). The movable target holder preferably includes a pair of lower linkage members **140**, **142**, a pair of upper linkage members **144**, **146**, a lift bar **148**, a pair of upright members **150**, **152**, and a pair of springs **154**. The lower and upper linkage members **140-146** are pivotally attached to upright posts **130**, **132** with hardware such as shoulder bolts, flange bearings, thrust washers, and/or nuts so that the linkage members can smoothly move through a range of motion. Lift bar **148** is transversely connected between upper linkage members **144**, **146** and provides the movable target holder with lateral support. All four linkage members are designed to move together such that they stay in a relatively parallel orientation throughout their range of motion. Upright members **150**, **152** pivotally interact with the various linkage members and are designed to stay in a generally vertical orientation during operation. Optional stop brackets can be attached to either the upper or lower linkage members in order to limit the range of motion during extension of the linkage members. Springs **154** exert a downward force on the movable target holder, and are preferably attached to base **128** at a lower end and upright posts **150**, **152** at an upper end so that they extend in a generally diagonal direction. The springs assist in stabilizing the various linkage members during operation, and provide a downward bias that is helpful in returning the apparatus to a concealed position.

[0026] Drive mechanism **118** is also preferably driven with pneumatic power and uses an air connection **160**, a valve **162**, and a single-rod actuator or air cylinder **164** to raise movable target holder **116** up and down. According to the embodiment shown here, the lower end of air cylinder **160** is attached to base **128** and the upper or rod end of the air cylinder is attached to lift bar **148**; preferably, both of these connections are made with a clevis bracket or some other type of pivotal connection. Air connection **160** can include a pipe tee welded to base **128** with a standard 37-degree fitting, as an example, and the entire drive mechanism **118** is preferably protected behind an angle iron or other shielding component **166**.

[0027] Target assembly **120** is designed to lift and tilt so that a target is selectively concealed from and revealed to a shooter, and generally includes a first pair of posts **180**, **182** for supporting an obstruction **184**, and a second pair of posts **186**, **188** for supporting a target **190**. Posts **180**, **182** can be welded directly to upper linkage members **144**, **146**, respectively, or they can be attached via mounting receptacles such as those previously described. In either event, the posts **180**, **182** should be fixedly attached to the upper linkage members so that a uniform angle θ is maintained during rotation of the obstruction. Obstruction **184**, which is a generally flat component, is mounted to posts **180**, **182** and blocks the shooter's view of target **190** when the apparatus is in a concealed position (shown in phantom lines). Posts **186**, **188**, on the other hand, are rotatably attached to upright members **150**, **152**, respectively, and are designed to stay in an upright or vertical orientation so that a varying angle ψ (extending between post **188** and upper linkage member **146**) during movement of the target. As is demonstrated in **FIG. 5**, angle ψ is greater when the apparatus is fully extended and is presenting target **190** to the shooter (solid lines), than it is in the concealed or retracted position where the target is hidden from the shooter (phantom lines). Again, the target can be a IPSC-type target, or it can be a target of a different type and/or size. In any case, the obstruction **184** should be large enough to fully obstruct or conceal target **190** when shooting target apparatus **110** is in the concealed position.

[0028] During operation, the pneumatic drive mechanism **118** moves the movable target holder **116** up and down so that the apparatus **110** is transitioned between presented and concealed positions. Beginning with the concealed position shown in phantom lines, the shooter is unable to view the target **190** because the obstruction **184** is blocking their view. Upon activation of air cylinder **164**, the drive mechanism exerts a force on lift bar **148** which causes the lower and upper linkage members **140-146** to be extend upwards. As these linkage members are extending, the orientation of posts **180**, **182**, with respect to upper linkage members **144**, **146**, remains constant (angle θ) and thereby causes obstruction **184** to rotate or tilt downwardly and expose the target to the shooter. At the same time, target **190** is lifted upwardly into a presented position that can be viewed by the shooter. In the presented position, the rod of air cylinder **164** is fully extended and springs **154** are tensioned. Further activation of the pneumatic drive mechanism **118** causes a reverse action which, with the help of springs **154**, quickly returns obstruction **184** and target **190** to the concealed position previously described.

[0029] It is to be understood that the foregoing description is not a definition of the invention itself, but is a description of one or more preferred exemplary embodiments of the invention. The invention is not limited to the particular embodiment(s) disclosed herein, but rather is defined solely by the claims below. Furthermore, the statements contained in the foregoing description relate to particular embodiments and are not to be construed as limitations on the scope of the invention or on the definition of terms used in the claims, except where a term or phrase is expressly defined above. Various other embodiments and various changes and modifications to the disclosed embodiment(s) will become apparent to those skilled in the art. All such other embodiments, changes, and modifications are intended to come within the scope of the appended claims.

[0030] For instance, it is possible to replace the pneumatic drive mechanism with another adapted power source, such as an electric motor, a hydraulic drive mechanism, or some other drive mechanism know to those skilled in the art. Furthermore, one or more protective angle irons or other shielding-type components can be added to any one of the shooting target embodiments to protect their components from stray bullets. This is particularly useful for protecting the components of the pneumatic drive mechanism, although other components can and should be protected as well. Even though most of the components described above are preferably made of steel, they could alternatively be made of aluminum or another metal, plastic, composite, wood, or any other suitable material known to those skilled in the art, such as Amortex which is a bullet proof material made of fiberglass and resins.

[0031] Furthermore, one of any number of additional features could be added to any one of the embodiments described above. For example, position sensing switches could be used throughout any one of the shooting targets in

order to provide an electronic controller with feedback as to the position of one or more components. It is also possible to use the shooting target in a larger targeting system where some type of main control unit communicates with each of the shooting targets so that they function in a coordinated manner as the shooter advances through a course. In that regard, the various shooting targets and the main control unit may communicate via some type of wired medium or even a wireless link. These are, of course, only some of the additional features that may be used with any number of the embodiments disclosed herein, as other features and aspects of the shooting targets would be apparent to those skilled in the art.

[0032] As used in this specification and claims, the terms "for example," "for instance," "such as," and "like", and the verbs "comprising," "having," "including," and their other verb forms, when used in conjunction with a listing of one or more components or other items, are each to be construed as open-ended, meaning that that the listing is not to be considered as excluding other, additional components or items. Other terms are to be construed using their broadest reasonable meaning unless they are used in a context that requires a different interpretation.

I claim:

1. A shooting target apparatus capable of transitioning between presented and concealed positions, comprising:

a frame;

a drive mechanism mounted to said frame;

a movable target holder coupled to said drive mechanism; and

a target assembly coupled to said movable target holder and having at least one generally flat component, wherein activation of said drive mechanism rotates said generally flat component through an angular range so that said apparatus can transition between said presented and concealed positions.

2. The shooting target apparatus of claim 1, wherein said frame includes a first pair of upright posts having lower ends that attach to a base, and upper ends that rotatably support said target assembly on a first pivot axis.

3. The shooting target apparatus of claim 2, wherein said movable target holder includes a second pair of upright posts having lower ends that attach to a lift bar and upper ends that rotatably support said target assembly on a second pivot axis.

4. The shooting target apparatus of claim 3, wherein said movable target holder further includes at least one roller element for providing smooth movement in response to activation of said drive mechanism.

5. The shooting target apparatus of claim 4, wherein said generally flat component of said target assembly is a target for a shooter to shoot at.

6. The shooting target apparatus of claim 5, wherein activation of said drive mechanism can: i) raise said lift bar, ii) reposition said second pivot axis with respect to said first pivot axis, and iii) rotate said target assembly about said first pivot axis so that said target transitions between a vertically-aligned presented position and a horizontally-aligned concealed position.

7. The shooting target apparatus of claim 1, wherein said movable target holder includes a plurality of linkage members for supporting said target assembly.

8. The shooting target apparatus of claim 7, wherein said generally flat component of said target assembly is an obstruction for concealing a target from a shooter.

9. The shooting target apparatus of claim 8, wherein activation of said drive mechanism can: i) extend said linkage system, ii) raise said target, and iii) rotate said obstruction so that it transitions between a vertically-aligned position concealing said target and a horizontally-aligned position presenting said target.

10. The shooting target apparatus of claim 1, wherein said drive mechanism is a pneumatic system that includes an air cylinder and a controllable valve.

11. A shooting target apparatus, comprising:

a frame including a first plurality of upright posts;

a movable target holder including a second plurality of upright posts;

a pneumatic drive mechanism including an air cylinder attached to said frame and said movable target holder; and

a target assembly rotatably coupled to said first plurality of posts via a first pivot axis and rotatably coupled to said second plurality of posts via a second pivot axis, wherein activation of said pneumatic drive mechanism causes: i) said air cylinder to move said movable target holder, ii) said target assembly to rotate about said first pivot axis, and iii) said target assembly to rotate about said second pivot axis as said second pivot axis moves in a path around said first pivot axis.

12. The shooting target apparatus of claim 11, wherein said movable target holder further includes at least one roller for providing smooth travel of said movable target holder.

13. The shooting target apparatus of claim 12, wherein said air cylinder includes a first end attached to said frame via a pivotal connection for providing said movement of said second pivot axis around said first pivot axis.

14. The shooting target apparatus of claim 11, wherein said frame further includes a shield for protecting said pneumatic drive mechanism.

15. A shooting target apparatus, comprising:

a frame including a plurality of upright posts;

a movable target holder including a plurality of linkage members;

a pneumatic drive mechanism including an air cylinder attached to said frame and said movable target holder; and

a target assembly attached to said movable target holder and including an obstruction and a target, wherein activation of said pneumatic drive mechanism causes: i) said air cylinder to move said movable target holder, ii) said target to move between lowered and raised positions, and iii) said obstruction to rotate between positions that conceal and present said target.

16. The shooting target apparatus of claim 15, wherein said plurality of linkage members includes upper and lower linkage members that generally move together in a parallel manner.

17. The shooting target apparatus of claim 15, wherein said obstruction is fixedly attached to said movable target holder such that a uniform angle is maintained therebetween during rotation of said obstruction.

18. The shooting target apparatus of claim 15, wherein said target is rotatably attached to said movable target holder such that a varying angle is maintained therebetween during movement of said target.

19. The shooting target apparatus of claim 15, wherein said movable target holder further includes at least one spring attached to said frame and one of said linkage members.

20. The shooting target apparatus of claim 15, wherein said frame further includes a shield for protecting said pneumatic drive mechanism.

* * * * *