# United States Patent [19]

**Renault**

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[54] **TARGET CARRIAGE ASSEMBLY**


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July 3, 1972 France ..... 72.24834

[52] **U.S. Cl.**..... **273/105.6,** 273/105 Q, 273/102 R

[51] **Int. Cl.**..... **F41j 3/12**

[58] **Field of Search**..... 273/102 R, 105.2, 105.6, 273/127



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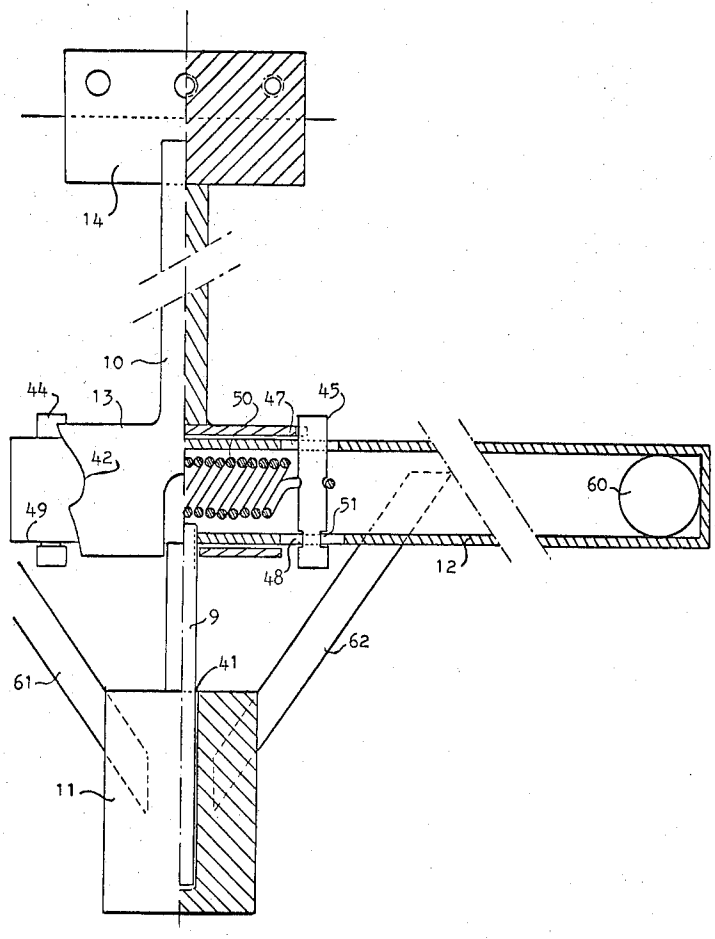
[57] **ABSTRACT**

An electric turning mechanism reverses the direction of target holder movement. An inertia tube having a ball freely movable therein is mounted on a vertical axis. The axis is rotatably secured to a movable carriage at its lower end and supports a target at its upper end. When carriage movement is abruptly slowed the ball moves forward in the tube which causes a rotation of that tube. The tube describes approximately a half circle and the target carried thereby is similarly rotated and is ready for movement in the new direction.


**6 Claims, 10 Drawing Figures**



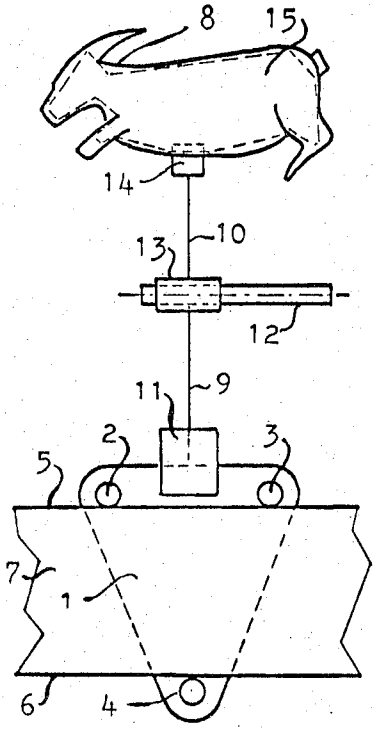



Fig. 1

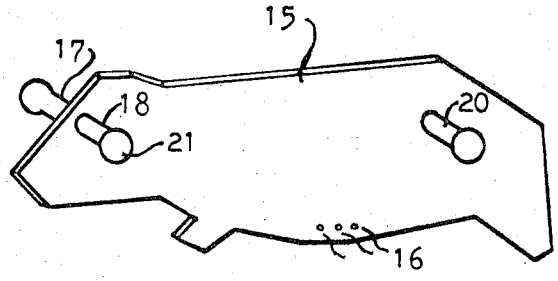



Fig. 2

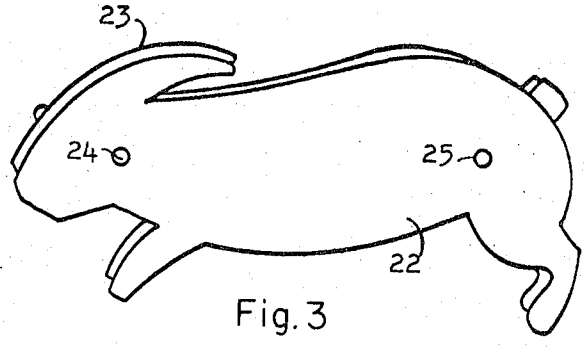



Fig. 3

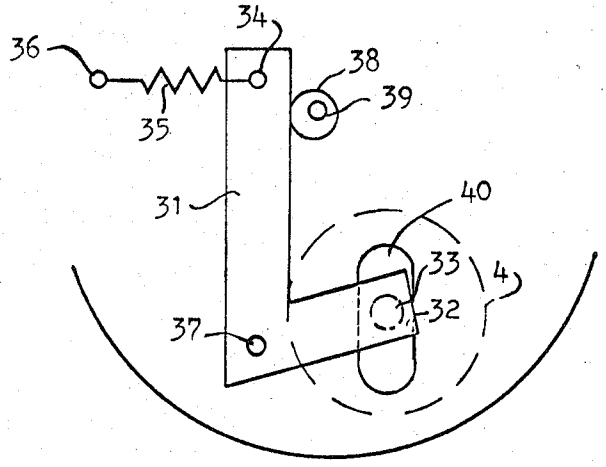



Fig. 5

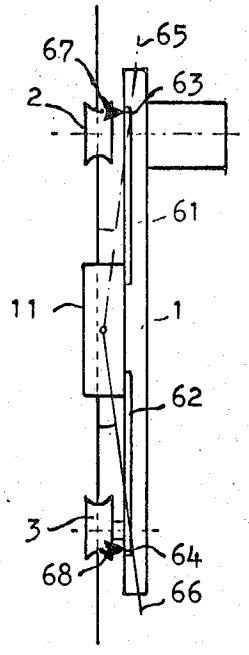



Fig. 9

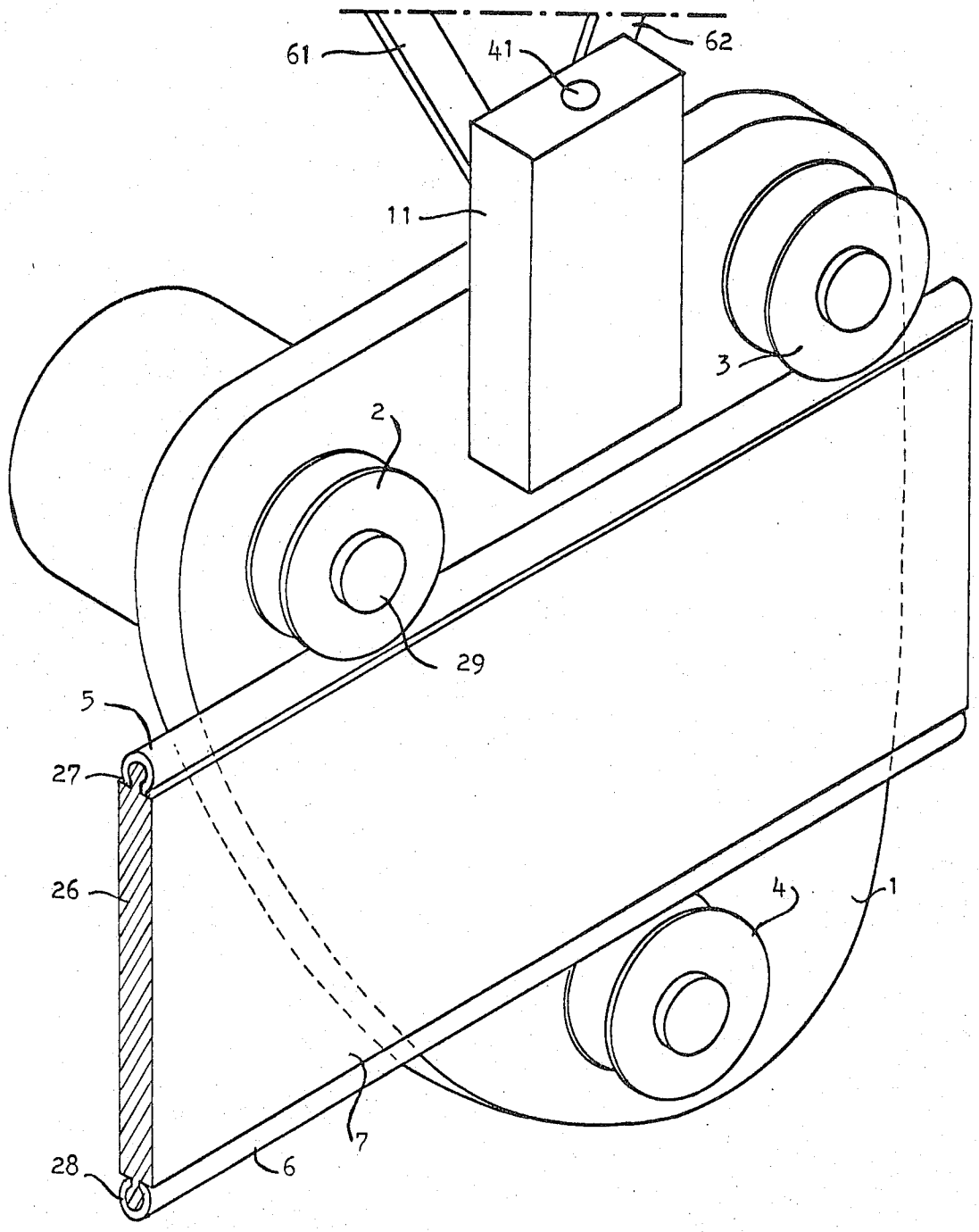



Fig. 4

Fig.6

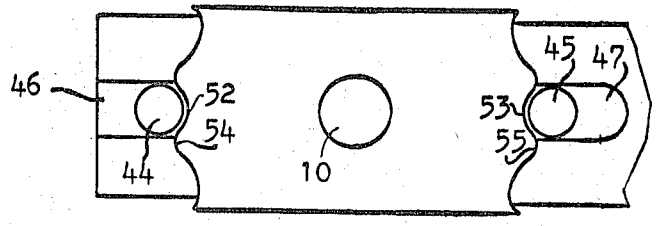



Fig.7




Fig.8

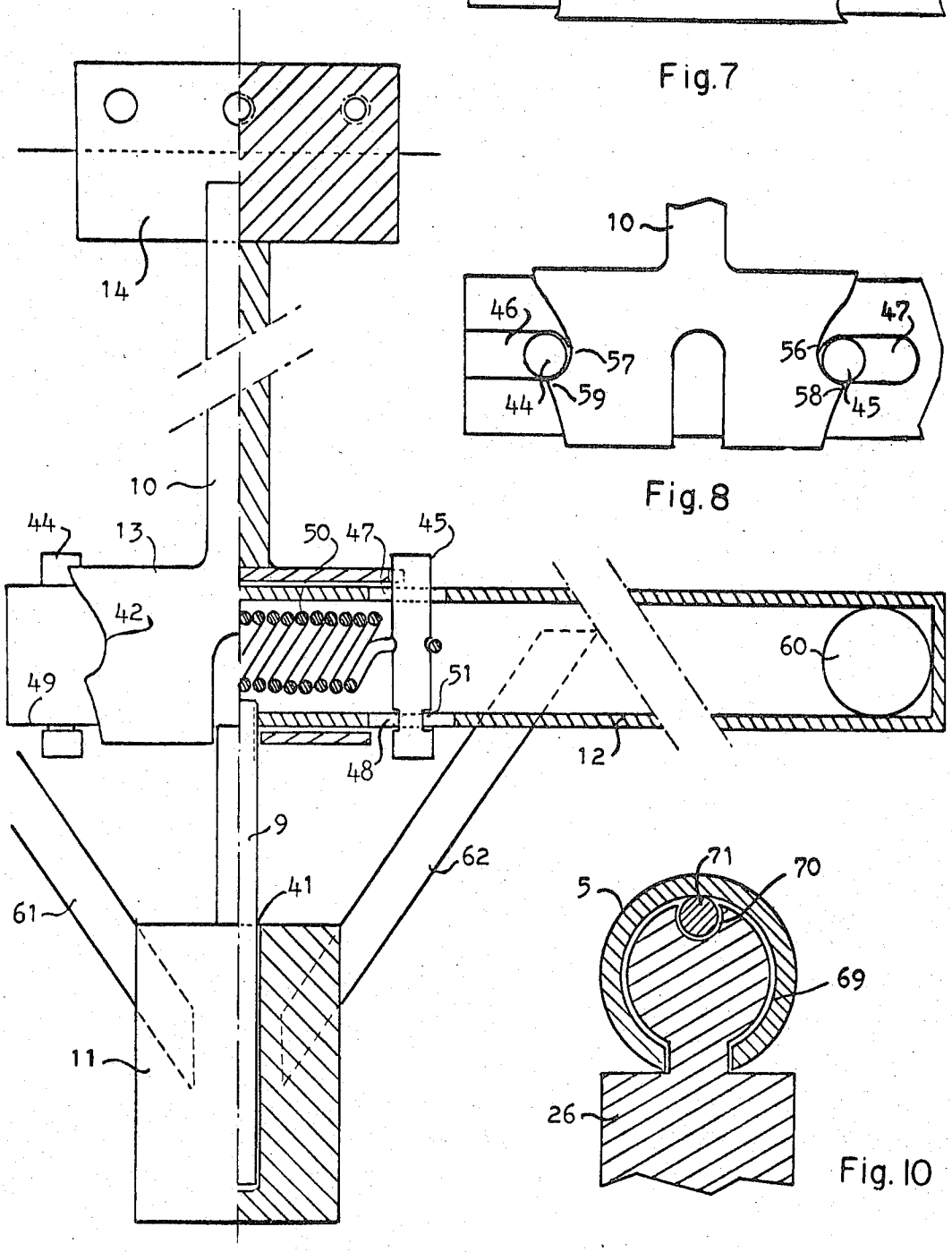






Fig. 10

# TARGET CARRIAGE ASSEMBLY

The present invention relates to a holder for a mobile target designed for shooting practice and, in particular, rabbit shooting practice in conditions as similar as possible to those occurring when actually shooting rabbit.

A rabbit shooting system is already known which is described in my copending U.S. patent application filed on Mar. 23, 1972 under Ser. No. **237,282** and now U.S. Pat. No. 3,744,796 and entitled "Holder for mobile target." In that system, the target holder particularly comprises means for ejecting the target when it is struck by a shot, as well as means for turning the target when target movement is reversed. The interest of that system is already important and its efficiency is the best, however, it has appeared it was possible to bring improvements thereto, which are particularly important when the circuit for the mobile target is large and long to better simulate rabbit hunting in a field.

In the above mentioned system, it was provided electric turning means synchronously controlled with electric means reversing target holder movement direction. It has appeared, according to this invention, that, instead of utilizing electric turning means such as an electric motor or an electromagnet, as also described in the British Pat. No. 28,908, very simple inertia means may be utilized which, as a result, needs no longer maintenance.

In the previous system, it was also provided the possibility to utilize a target made of plastic material or light material, such as of cardboard, to reduce the weight of the whole assembly and to reduce as much energy needed for moving the carriage and the target mounted on the holder secured to the carriage. However, it has appeared that shots could pass through the target without transmitting to it energy enough to trigger target fall. Therefore, according to this invention, it is provided to locate, inside the target, a plate made of a material capable to stop shots.

Finally, in the previous system, only latching means were provided, which were unlatched by a hit, which resulted in the target fall and its separation from the holder. It has been experienced that, if it was always necessary to provide target fall for appreciating hits, it could be, in certain case, preferable not to separate the target from the holder.

Another purpose of the present invention is also to provide a carriage which can be moved at actual rabbit velocity on a circuit including curves and which is prevented from derailing, even in curves of small radius of curvature.

While in the following, reference will be the most often made to a target simulating a rabbit, the target may obviously simulate another animal such as a hare, a wild-boar, a fox, etc., target holder sizes, circuit design and target velocity being fitted to each case, while remaining the scope of this invention.

According to a feature of this invention, there is provided a holder for a mobile target designed for shooting practice, the said target being made of a skin of plastic material or cardboard, which includes a vertical metal stop plate having an outline corresponding to the simplified profile of the animal represented by the target, being thick enough for stopping shots and being set in the target symmetry plane and covered by the said target made of plastic material or cardboard.



According to another feature of this invention, the said vertical stop plate is provided, in its anterior and posterior areas, with pairs of short horizontal pins, each pin of a pair being symmetrical of the other one with respect to the said plate, ends of the said pins bearing ball-shaped buttons, and the target being made of two half-shells having in front of the said buttons low strength areas, which are passed through by the said buttons when hooking the target to the stop plate.

According to another feature of this invention, the mobile target holder is mounted on a mobile carriage and the target is secured to the carriage by means of an axis supported by the carriage, but freely rotatable with respect to the carriage, the said axis being integral with a closed horizontal tube which is coupled to the said axis close to one of its ends and which contains at least one ball, that can freely move inside the said tube, the carriage also supporting stops for limiting the said axis rotation angle, so that mobile carriage movement direction and the said tube direction are normally angularly spaced by about 3°, so that movement direction reversal causes the said free ball to move in turning the said tube round the said axis.

According to another feature of this invention, the target is secured to the carriage by means of an axis made of two half-axes coupled by a joint rotatable round a horizontal axis and determining two stable positions, one where the two half-axes are vertically aligned and the other where the upper half-axis is horizontal and the lower half axis is vertical, the said joint comprising a first cylinder integral with the lower half-axis secured to the carriage and a second cylinder concentric with the first cylinder and integral with the upper half-axis secured to the target, the said second cylinder having at least one of its ends cut out in the form of a cam and the said first cylinder bearing at least one piece capable to horizontally slide along the axis of the said first cylinder and comprising resilience means setting the said pice against the said cam, the cam being shaped so as to present a concave portion lodging the said piece and corresponding to the vertical aligned position of the two half-axes.

According to another feature, on both sides of the said concave cam portion and symmetrically with respect to it, the shape of the cam comprises two ramps so designed as to guide the upper half-axis toward its horizontal stable position in damping its movement.

According to another feature of the present invention, the said first cylinder integral with the lower half-axis is closed at both ends after having received a ball in order to serve as a target turning tube as here-above mentioned.

According to another feature of this invention, the carriage comprises a chassis in the form of a vertical rigid plate provided with three live rollers rolling on a rolling track made of a vertical flat section having its top and bottom edges provided with electric leads, also serving as rails, the first live roller, made of a conducting material, and the second live roller, made of an insulating material, rolling on the top rail and the third live roller, made of a conducting material, rolling on the bottom rail, or vice versa, the second insulated live roller being driven in rotation by an electric motor having its terminals respectively connected to the first and the third conducting live rollers, the first and the second live rollers being in a fixed relation with respect to the chassis while the third live roller is mounted upon

an arm rotatable round an axis secured to the chassis, the said arm being pushed by a spring so as to strongly apply the third live roller against the bottom rail upward.

According to another feature, a stop element mounted on the said chassis and adjustable by an eccentric cam limits movement of the said arm to prevent the carriage from derailing.

According to another feature, there is provided a shooting system comprising a rolling track, made as hereabove mentioned, and on which moved are one or several target holder carriages of the type defined in the above features, the said rolling track having possibly any shape whatsoever and being installed in more or less deep ground trenches so as to let the targets either to appear or not over ground level, thus determining shooting areas, a control box enabling rail current direction to be reversed for reversing rotation direction of the electric motor mounted on each carriage.

Other features of the present invention will appear more clearly from the following description of an embodiment, the said description being made in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic view of a target holder upon a rolling track according to this invention,

FIG. 2 is a perspective view of the stop plate stopping shots, according to this invention,

FIG. 3 is a perspective view of a target made of two half-shells mounted on the stop plate, shown in FIG. 2,

FIG. 4 is a perspective view of a carriage upon a rolling track according to this invention,

FIG. 5 is a schematic view of the device supporting the lower live roller of the carriage, shown in FIG. 4,

FIG. 6 is a partly cross-sectional view of the axis supporting the target and the turning tube according to this invention,

FIGS. 7 and 8 are schematic views of the two respective positions of the cylinders forming the joint between the two half-axes constituting the supporting axis, shown in FIG. 6,

FIG. 9 is a schematic plane view of the carriage and turning tube in order to describe how turning tube operates, and

FIG. 10 is a partial cross-sectional view of the edge of the rolling track section, according to this invention.

FIG. 1 shows a carriage 1 provided with three rollers 2, 3 and 4, rolling on the edges 5 and 6 of a vertical section 7. Carriage 1 carries a target 8, simulating a rabbit in the described embodiment, at the top of a support made of two half-axes 9 and 10, half-axis 9 being held in a block 11 secured to carriage 1, wherein half-axis 9 can freely rotate, and half-axis 10 secured to the target 8. The joint between half axes 9 and 10 consists of two concentric cylinders, inner cylinder 12 being integral with 9 and outer cylinder 13 being integral with 10. Cylinder 12 is prolonged backward and is closed so as to constitute the inertia tube for turning the target when movement of carriage 1 on rolling track 7 changes its direction. The link between half-axis 10 and target 8 comprises a small plate 14 welded to 10 and screwed thereon is a stop plate 15, shown in dashed line in FIG. 1, covered by the properly said target.

FIG. 2 is a perspective view of stop plate 15, shown in FIG. 1. Outline of 15 looks like the target profile. The plate preferably is made of a metal and is thick enough for stopping shots and for not being too rapidly deteriorated by repeated shot impacts. Plate 15 is pierced by holes 16 permitting to secure it to small plate 14 by means of bolts and nuts. In the anterior portion, it carries a pair of short pins 17 and 18 which are arranged horizontally and symmetrically with respect to plate 15. Likely, in the posterior portion, it carries a pair of short pins 19 and 20, only 20 being visible in FIG. 2, which are also horizontal and symmetric. Each pin is ended by a spherical ball, such as 21, having a diameter slightly larger than pin cross-section diameter.

FIG. 3 shows a target simulating a rabbit and consisting of two half-shells 22 and 23, which include areas of less strength such as 24 and 25. Half-shell material may be a plastic material or cardboard, for example of the same type as cardboard serving to constitute egg boxes. For hanging each half-shell on plate 15, areas 24 and 25 are strongly pushed against balls such as 21 up to passing the latter through areas 24 and 25. Then, half-shell material shrinks on smaller cross-section pins, balls preventing it from reversed movement. After a hit, half-shell(s) may be easily removed to be handed to the shooter. Finally, it must be noted that target setting on or removing from plate 15 can be very rapidly made.

FIG. 4 shows an automotive carriage comprising a chassis 1 constituted by a vertical rigid plate provided with three rollers 2, 3 and 4 rolling respectively on leads 5 and 6, also serving as rolling rails. Leads 5 and 6 are made of copper and are cylinder shaped with a longitudinal slot so as to enable them to be engaged on edges of section 7, which may be made of a plastic material. In the cut visible portion in FIG. 4, rectangular flat body 26 of section 7 is ended, at top and bottom, by circular heads 27 and 28 with which 5 and 6 are engaged respectively. It is to be noted that such a plastic section may be rough extruded and that even low copper resilience permits to set the leads rapidly.

Axis 29 of roller 2 is integral with that of DC electric motor 30 which rotates roller 2 to move the carriage. Roller 2 may be of any insulating material, such as a plastic material, and has a groove surface having good rubbing coefficient for rolling on copper of 5. Electric motor 30 preferably is a DC motor which makes it possible to easily reverse carriage movement direction in reversing DC current direction in motor 30. Rollers 3 and 4 are free on their axes and must be made of metal, as copper, entirely or partially, because they serve to collect current passing through 5 and 6. Rollers 3 and 4 are connected to terminals of motor 30 by electric flexible wires, not shown. Obviously, ball-bearings are provided on axes of 2, 3 and 4 passing through chassis 1. As an alternative, ball-bearings may also be provided on the other sides of the rollers, these ball-bearings being mounted in pieces secured to chassis 1. Thus, the rigidness of the assembly may be improved, if necessary.

When rolling track, constituted by section 7, is long and comprises curves which cause the section to be distorted and particularly leads 5 and 6 to move apart, the distance between 5 and 6 varying within tolerable limits, it is however necessary to make sure that rollers 3 and 4 have in any point of the track a good contact with the rail supplying DC current. As to roller 3, carriage weight applies it strongly against rail 5 while, as to rol-

ler 4, it is necessary to provide an additional force applying upward against rail 6. Therefore, according to this invention, there is provided a device as shown in FIG. 5, which comprises a rigid L-shaped piece 31 having one end 32 supporting axis 33 of roller 4 and the other end 34 secured to one end of a spring 35 having its other end secured to chassis 1, at 36, the L-shaped piece 31 being rotatable round an axis 37 secured to chassis 1. Thus, on the contrary to axes of rollers 2 and 3, axis 33 does not pass through a ball-bearing mounted in chassis 1, but through a ball-bearing, not shown, mounted in piece 31. As spring 35 pulls 34 toward 36, L-shaped piece 31 tends to rotate about 37 to move roller 4 up and apply it against rail 6. An accentric cam 38, rotatable about an axis 39, is provided for limiting down move of roller 4 to prevent it from any derailing, the limit being selected by rotating 38 about 39. Once rotated, that cam is also used for removing the carriage from its rails. An opening 40 is pierced in the plate of chassis 1 to allow axis 33 to move with respect to chassis 1.

Considering again FIG. 4, chassis 1 carries a supporting piece 11 having any suitable shape and comprising a recessed hole 41 open on its upper side, the bottom end of half-axis 9 being lodged in recessed hole 41.

FIG. 6 particularly shows the two half-axes 9 and 10 and their joint mainly comprising concentric cylinders 12 and 13. Upper end of 9 is screwed in lower part of 12. Edges of ends of 13 are cut out according to cam profiles, a profile 42 being shown in FIG. 6. FIGS. 7 and 8 show two cam profiles 42 and 43. Two slides 44 and 45, which may be moved longitudinally in upper longitudinal slots 46 and 47 and lower longitudinal slots 48 and 49 of cylinder 12, are pushed against cams 42 and 43 by a spring 50 secured to each slide middle. Slides 44 and 45 are cylindric-shaped. At their middle parts, they comprise grooves enabling spring 50 to be secured to them and, at their lower parts in front of the surface of tube 12, they comprise deeper grooves 51. Slot 48 as well as slot 49 is shaped as a button-hole. In its right part, slot 48 is slightly wider than cross-section of 45 and, in its left part, is wide as cross-section of groove 51. As shown in FIG. 8, slot 47 is slightly wider than diameter of 45 and is ended by two half-circles. Slot 49 is symmetrical of slot 48 with respect to axes 9 and 10. Slot 46 is wide as slot 47, but is open to outside. To set slides 44 and 45 into tube 12, the process is as follows: slide 45 is successively put into right part of slot 48, then into slot 47 and finally moved leftward so as to engage groove 51 into left part of 48; spring 50 is set into tube 12 and hung to 45; spring 50 is set leftward to be secured to 44; slide 44, pulled by 50 is slided along 46 and set into left part, then into right part of 49.

FIG. 7 shows a plane view of the joint, comprising cylinders 13 and 12, when the two half-axes 9 and 10 are vertically aligned, that is when target is at rest. Slides 44 and 45 are engaged with concave portions 52 and 53, and are held pushed against those concave portions by spring 50. Efforts which target is subject to when moving on rolling track, particularly in curves, are not sufficient for moving half-axis 10 aside from its equilibrium position. On the contrary, if target is hit, axis 10 will be deviated, for example toward top portion of the drawing, and projections 54 and 55 will move 44 and 45 aside, then will pass beyond them, and force of spring 50, moving then nearer to one another, will still deviate 10 up to another stable position where it is normal to 9.

FIG. 8 shows a plane view of the joint when 9 and 10 are normal to one another. Slides 44 and 45 rest in concave portions 56 and 57 and cannot pass beyond them due to projections 58 and 59. Moreover, it must be noted that, between projections 54, 55 and projections 58 and 59, the shape of 42 is such that 10 reaches that stable position with the lowest possible velocity. In fact, while target has a relatively small mass since it is made of a simple plate plus two very light half-shells, due to the relatively great length of half-axis 10 so that, in shooting areas, mechanical means do not appear under the target to the shooter, a too fierce stop in concave portions 56 and 57 would possibly cause 10 to break. Obviously, as target may be turned in the reverse direction, according to carriage movement direction, cam 42 is symmetric with respect to a vertical plane.

FIG. 6 still shows that tube 12 is dissymmetric and lengthened rightward. It is mounted on half-axis 9 which passes through an opening of 13 which makes it possible to center 13 with respect to slots 46 – 49. Moreover, 9 is free to rotate in recessed hole 41 of supporting piece 11. Inside tube 12, a ball 60 is set which has a diameter slightly shorter than diameter of tube 12. When carriage 1 is moving in a uniform or accelerated movement, ball 60 has the position, shown in FIG. 6, against bottom of tube 12. When carriage 1 is abruptly slowed for reversing its movement direction, ball inertia moves ball 60 forward, the ball being projected against 45 or a diametrical pin protecting 45. Moreover, FIG. 6 shows two stops 61 and 62 secured to supporting piece 11. In the position shown in FIG. 6, stop 61 contacts surface of tube 12, at a point 63. If tube 12 was set in the other direction, it would contact stop 61 at a point 64.

FIG. 9 will permit to explain the purpose of stops 61 and 62. FIG. 9 is a schematic view of carriage 1 from above, tube 12 being only indicated by its two possible directions, i.e., 65 and 66. Arrows 67 and 68 represent actions of stops 61 and 62 at points 63 and 64. One understands that, the carriage being for example moved toward top of FIG. 9, tube 12 has direction 66 and is applied to stop 62 at 63. If carriage movement is abruptly slowed, as a rabbit so can make, ball 60 moves forward in tube 12 moving tube 12 apart from stop 62 and tube substantially describes half a circle to be stopped by stop 61, ball 60 being moved back to the bottom of tube 12, so holding it against 61. Angle of directions 65 and 66 with movement direction is about either 3° or 177°.

It will be appreciated that that inertia turning means is extremely reliable because it does not include any items, but simple components: rotatable axis 9, tube 12, ball 60, stops 61 and 62. Therefore, it needs no specific maintenance operation. Finally, it does not rely on any outside energy source and is then not costly.

The design of rolling track 7 may extermely varied and its length may be important. Therefore, several suitably coupled pieces must be provided, coupling between two blocks being important particularly with respect to electric continuity. Thus, according to this invention, heads 27 and 28 of block 26 of section 7 are preferably shaped as head 69 shown in FIG. 10. Head 69 has an open circular groove 70, wherein in coupling areas a copper lead 71 is located, 71 being pushed against bottom of groove 70 by either lead 5 or 6 for

providing a good electric contact between **71** and **5** or **6.** As lead **71** overlaps the coupling area, it provides a good electric continuity between the two adjacent leads **5** or **6.**

It must be noted that the shooting system may comprise more than one carriage on the rolling track, provided obviously that an energy source large enough is installed. In a preferred alternative of the system according to this invention, two carriages will be utilized which will enable a cleaver shooter to successively utilize the two cartridges set in his gun for shooting the two targets.

Considering again FIG. **4,** it is recalled that there are provided one insulated driving roller **2** and two conducting rollers **3** and **4** serving to supply current from rails **5** and **6** to motor **30.** Alternately, roller **3** may be designed for serving both to collect DC current, its groove being conductor, and as a driving roller by mounting, in addition to motor **30,** a second motor upon axis of **3.** That second motor and motor **30** would be serially connected which permits to operate with a double voltage and, driving effort being shared between the two motors, a smaller current intensity which reduces losses in leads **5** and **6.**

Considering again FIGS. **6** and **8,** it must be noted that cylinder **13** is provided with a slot **72** to let cylinder **13** to freely rotate with respect to half-axis **9.**

It has been hereabove mentioned that rollers **3** and **4** had grooves made of copper, but they can be made of any other conducting material such as bronze which has larger hardness.

Finally, it must be noted that sections **7** are installed over the ground, in order to clear a passage for roller **4,** by means of pegs provided with suitable coupling parts.

While the principles of the present invention have been hereabove described in relation with a specific embodiment, it must be understood that the said description has only been made by way of example and does not limit the scope of this invnetion.

What is claimed is:

**1.** A holder for a mobile target designed for shooting practice including:
- a target;
- a mobile carriage;
- a mobile target holder mounted on said carriage;
- a normally vertical axis secured at its upper end to the target and at its lower end to the carriage;
- said axis being freely rotatable with respect to the carriage;
- a closed horizontal tube containing a ball so sized as to be freely movable within the tube;
- said axis including upper and lower half-axes;
- said upper axis being integrally coupled to the horizontal tube close to one end of the tube; and
- stops supported by said carriage;
- said stops limiting the axis rotation angle such that the carriage movement direction and the tube direction are angularly spaced by 177°;
- the apparatus operating upon reversal of direction of carriage movement to move the ball causing rotation of the tube causing rotation of the target about the axis.

**2.** A holder according to claim **1** characterized in that the first cylinder is closed at both ends after receiving the ball to serve as a target turning tube.

**3.** A holder according to claim **1,** characterized by the fact that the carriage comprises a chassis in the form of a vertical rigid plate provided with three live rollers rolling on a rolling track made of a vertical flat section having its top and bottom edges provided with electric leads, also serving as rails, the first live roller, made of a conducting material, and the second live roller, made of an insulating material, rolling on the top rail and the third live roller, made of a conducting material, rolling on the bottom rail, the second insulated live roller being driven in rotation by an electric motor having its terminals respectively connected to the first and the third conducting live rollers, the first and the second live rollers being in a fixed relation with respect to the chassis while the third live roller is mounted upon an arm rotatable round an axis secured to the chassis, said arm being pushed by a spring so as to strongly apply the third live roller against the bottom rail upward.

**4.** A holder according to the claim **3,** characterized by the fact that a stop element mounted on said chassis and adjustable by an eccentric cam limits movement of said arm to prevent the carriage from derailing.

**5.** A holder for a mobile target designed for shooting practice including;
- a carriage;
- a target;
- a first horizontal cylinder,
- a normally vertical axis made of an upper and lower half axis;
- said lower axis secured to said carriage at its lowermost end and secured to the cylinder at its upper end;
- said target secured to said upper axis and said upper axis integrally formed with the first cylinder;
- a joint formed at the junction of the upper and lower axes and the cylinder, said joint being rotatable about a horizontal axis and determining two stable positions, one where the two axes are vertically aligned and the other where the upper axis is horizontal and the lower axis is vertical;
- a second horizontal cylinder, having one of its ends cut out in the form of a cam, also disposed at the joint;
- a piece extending from said first cylinder to slide against said cam;
- said piece positioned to slide horizontally along the axis of the first cylinder;
- resilient means setting said piece against said cam;
- said cam so shaped as to present a concave portion for lodging said piece and corresponding to the vertically aligned position of the upper and lower axis.

**6.** A holder according to the claim **5,** characterized by the fact that on both sides of the said concave cam portion and symmetrically with respect to it, the shape of the cam comprises two ramps so designed as to guide the upper half-axis toward its horizontal stable position in damping its movement.

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