

July 6, 1965

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3,193,818

METHOD AND APPARATUS FOR READING TARGETS

Filed April 22, 1963

4 Sheets-Sheet 1

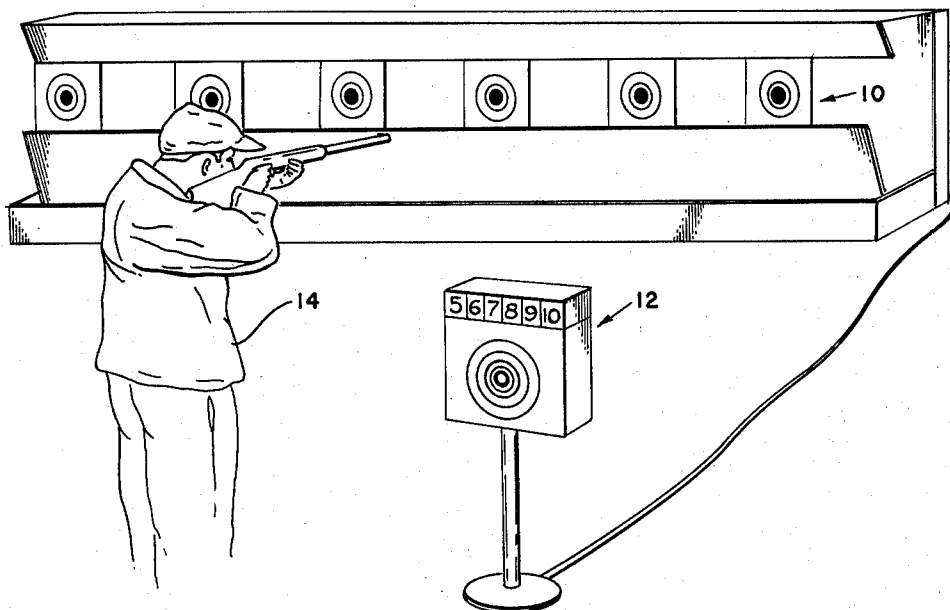


FIG. 1

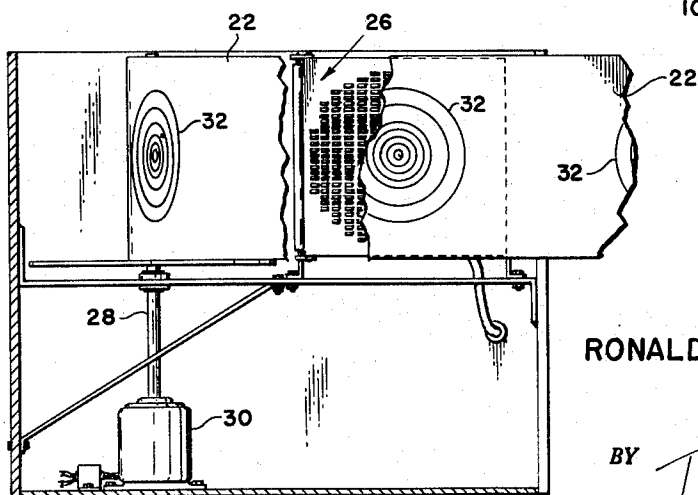
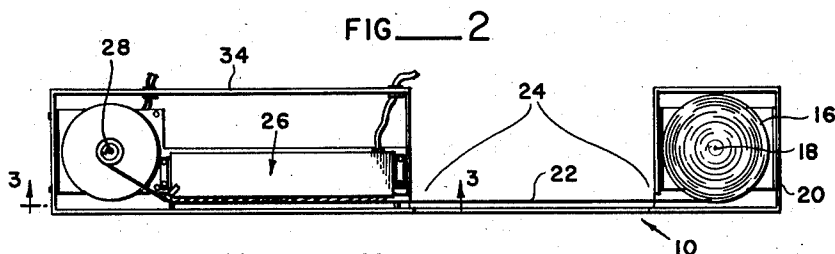


FIG. 3

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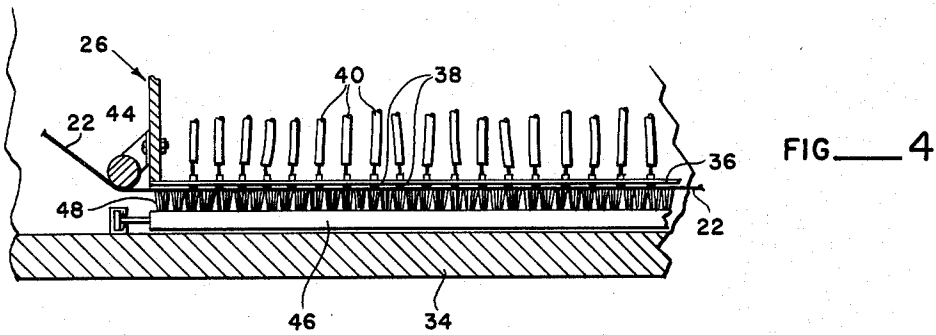


FIG. 5

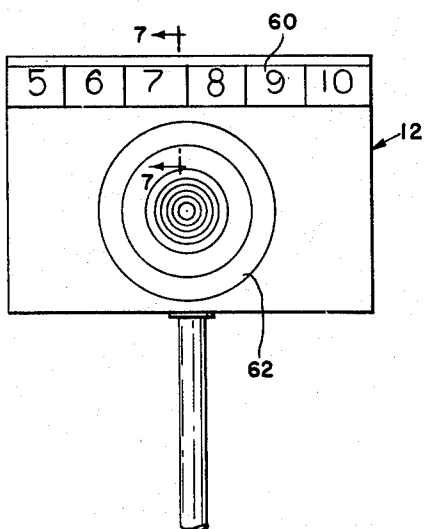
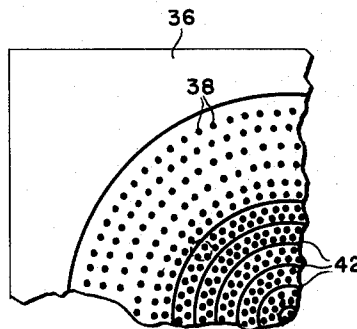


FIG. 6

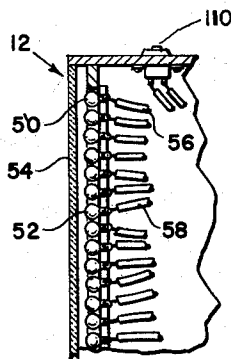


FIG. 7

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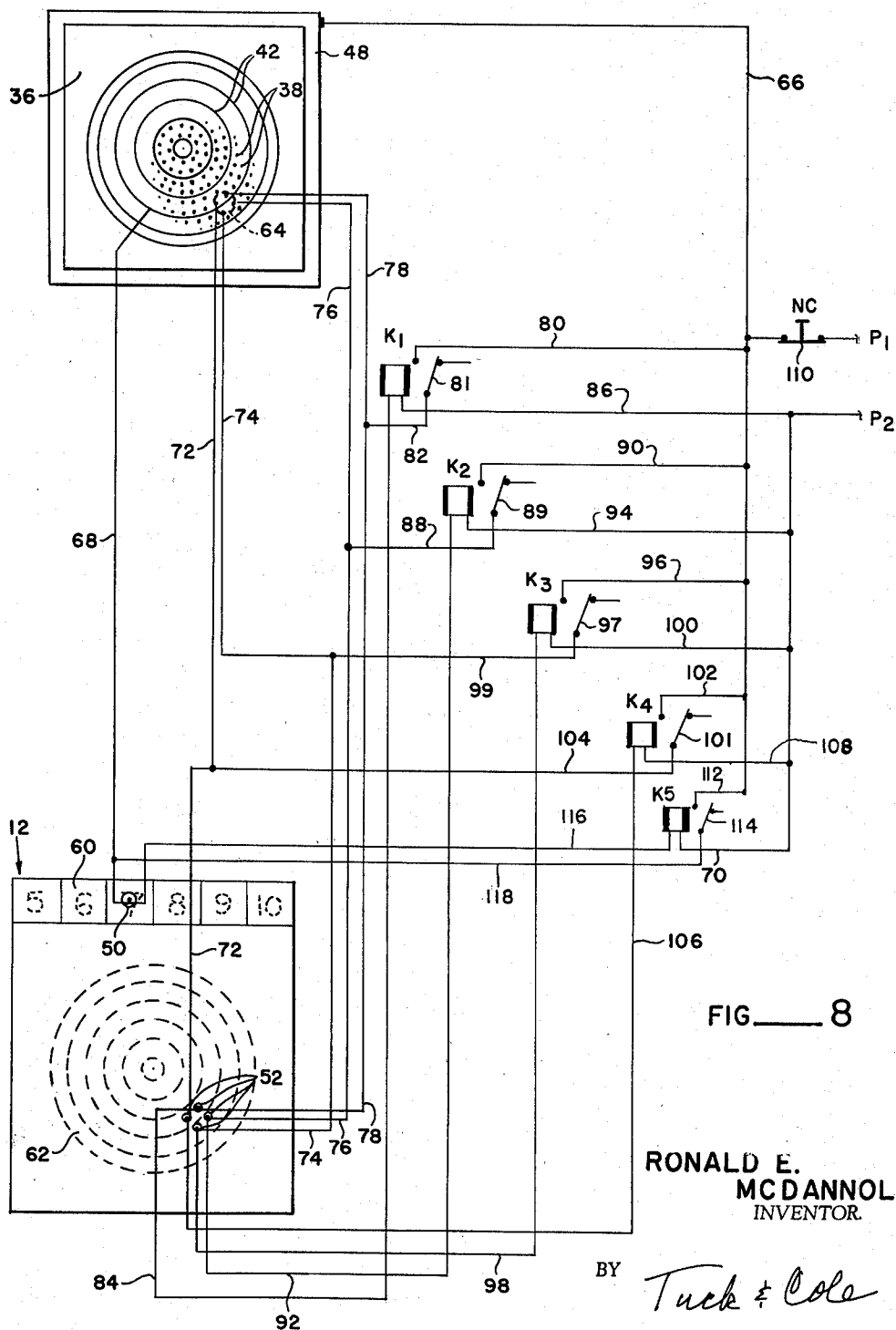
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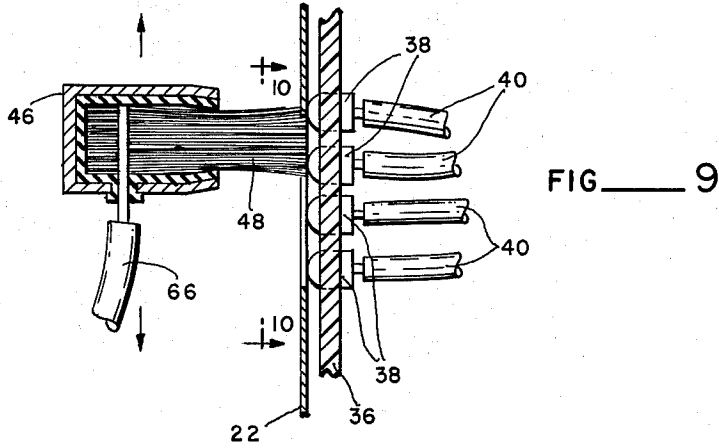


FIG. 9

FIG. 10

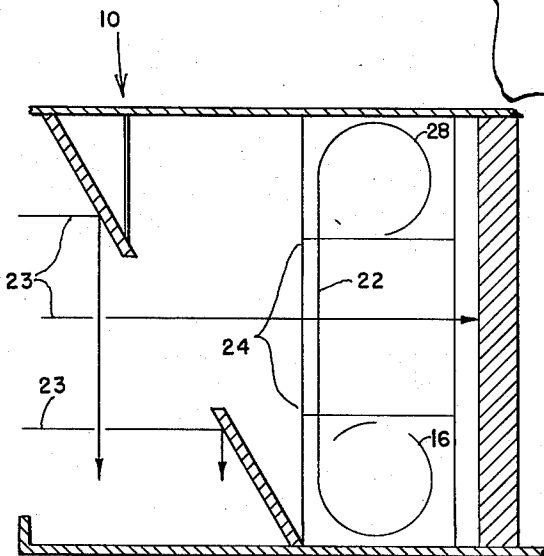
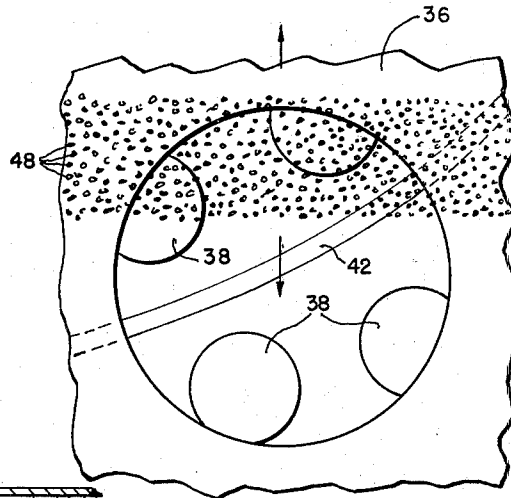


FIG. 11

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METHOD AND APPARATUS FOR READING TARGETS

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5 Claims. (Cl. 340—323)

This invention relates to a new and useful concept in a target reading device and more particularly to a firearms target reading device which automatically indicates the position the bullet has hit on the target and which also shows the score obtained by a particular hit.

One of the primary reasons for the lack of spectator interest in target shooting matches has been the lack of equipment for conveying to the gallery or spectators information as to location and score of a shot. It is well known that many people are and would be interested in target shooting matches were there some method by which target hits and scores could be immediately registered by large display boards. Normally if there are spectators they will lose interest within a short period of time so that by the time the match is well under way all spectators have deserted the area. In some matches it is customary to have a person in the pits signal the general location of the shot to register and convey the score. Many matches will use a telescope through which the shooter will look at the target after he has fired a shot. This auxiliary equipment is expensive and though it may help the shooter it does not help the spectators. Regulation matches entail the use of only one target for each shot made. Thus a series of targets are used so that each target may be removed after a shot has been fired therein. There are numerous types of target moving devices in use but in principle after a shot has been fired the used target is moved away from the target area and a new one moved in to take its place. It is common for participants in a match not to know their scores until the day following the actual shooting.

This invention seeks to remedy a long felt need in the sport of firearms shooting matches. In effect, this target reading device permits the spectators to be informed instantly of a shot location and score. This device comprises a system whereby when a shot has been fired the target is indexed over a reading plate off to one side and in a protected position in regard to the actual target area. When the used target has moved to its indexed position it overlies a plate having a great number of electrical contact points. A brush mechanism sweeps the target from the opposite side of the target paper making contact with one or several of the electrical contact points on the reading plate through the hole made by the bullet. Thus electric circuits are completed through the contact points on the reading plate and the sweep arm which will identify the location of the bullet hit and which will at the same time indicate the score on a numbered board. The circuitry is so designed that the target hit location on the display target and the numbers lighted to register score can be held for as long as is desired until a reset switch breaks the circuit, thereby reading the target reader for the next target.

Accordingly it is an object of this invention to provide a method and apparatus for reading target which is simple in design and concept, flexible in the extent of the electronic circuitry which must be included therein and easy to construct.

Another object of this invention is to provide a method and apparatus for reading a target which permits the audience to know almost immediately the location of the hit and the score achieved.

Yet another object of this invention is to provide a target reading method and apparatus for detecting the

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position of a hole in a target made by the passage of a bullet to a prominent display target erected for interested spectators.

Still another object of this invention is to provide a method and apparatus for reading targets which will also indicate the score awarded and the location of the hit to the person at the firing line who actually does the shooting.

A further object of this invention is to supply a method and apparatus for reading targets which may be easily adapted to indoor or outdoor ranges.

An even further object of this invention is to furnish a method and apparatus for reading target which may be easily adapted to conventionally known mechanisms for moving used targets out of the target area and a new target into the target area.

Other objects and advantages, which will become apparent, reside in the details of construction and method of operation more fully hereinafter described and claimed. Reference will be had to the accompanying drawings, forming a part of this disclosure, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is an illustration in perspective indicating how the target may be set up, for instance, in an indoor range and how the scoring numbers and display target may be set up for the advantage of the shooter;

FIGURES 2 and 3 represent a plan view and a front elevational view of a typical mechanism for moving used targets out of the target area and new targets into the target area, and further illustrating how the target method and apparatus of this invention can be adapted to said conventional indexing device;

FIGURE 4 is a cross section plan view taken along the line 4—4 of FIGURE 3 and showing how the target will be disposed between the reader plate contact points and the brushes;

FIGURE 5 is a partial view in elevation indicating the general pattern which will be represented by the electrical contact points on the face of the reader plate;

FIGURE 6 shows how the display target and the score numbers may be shown on a display stand;

FIGURE 7 is a partial side cross sectional elevational view taken along the line 7—7 of FIGURE 6 and showing how the lights for the display target and for the numbers may be arranged;

FIGURE 8 is an electrical schematic diagram showing in its basic form how readings from the reader plate are transmitted to and held on the display target and the score counter;

FIGURE 9 is a typical sectional view showing detail of FIGURE 4 on an enlarged scale;

FIGURE 10 is a face view of a metallic brush passing over the bullet perforation of FIGURE 9 to sense the position of the bullet hole with respect to the bull's eye; and

FIGURE 11 is a typical diagrammatic view through a protected range and illustrating bullet-proof baffles as they are preferably employed.

Referring now to the drawings it will be seen that a series of targets, generally designated by the number 10, may be set up to form a number of shooting lanes, either indoors or outdoors. The target equipment does not take any special form except that, as FIGURE 1 indicates, a target display apparatus and score counter may be set up at the firing end of the lane for the benefit of the shooter 14 and also for the benefit of spectators at the rear of the firing line.

The target indexing mechanism 10 may be of many conventional designs with that shown in FIGURES 2 and 3 being only representative of one type of target appara-

tus. The targets are printed according to regulation specifications and standards on continuous rolls of paper 16. The supply roll 16 is mounted on an axis spindle 18 within a bulletproof enclosure 20. The roll 16 is unwound in a single continuous sheet 22 across the open target area or alley 24. The sheet 22 extends through the reader mechanism generally designated by the number 26 and is rewound on the spindle 28, said spindle 28 also being on an axis spindle and being driven by a motor 30. The unrolling and rolling mechanism is protected, of course, against the danger of stray bullets and is so constructed that it moves forward only enough at any given time to move a fired upon target 32 from the shooting position in alley 24 to its position over the reader plate in the target reader 26. Note that the rewind spindle 28 and the reading device 26 are also housed in a bulletproof enclosure generally designated by the number 34. The indexing mechanism for moving the target roll a predetermined distance is not shown since it forms no part of this invention and only serves to indicate the environment in which this invention is used.

The sensing device or reader 26 as illustrated in FIGURES 4 through 8 comprises primarily an electric conductive plate 36 which in its preferred form would be the material from which printed circuit boards or plates are made. Boards 36 have a myriad number of contact points 38 which are so arranged or patterned that they are closer together than the diameter of the bullet for which the target is designed to receive. Thus the contact points 38 may be formed into the board at any desired density. The only limitation on density is the minimum number of contact points 38 used. For any one hole made in the target at least one of the contact points 38 would have to be exposed by the bullet hole. Stated another way the distance between any two adjacent contact points must be such as to be less than the diameter of the bullet. Such greatest distance is dependent upon the caliber of bullet being fired. Preferably, of course, it is best to have the density of the contact points 38 so that at least one and preferably as many as four contacts are exposed by a single bullet hole.

The contacts 38 are connected to conductor wires 40 which lead to the score counter and to the display target. Hence the reader plate 36 is so designed that it covers the entire target area. The contacts 38 are for the purpose of registering the location of the strike on the display target. In order to register a score on the score counter at the display board 12 the reader plate 36 has electrical contact rings 42 also printed thereon. Said contact rings are connected electrically to the score counter in the same manner in which the contacts 38 are electrically connected to the display board. The rings 42 are designed on the target so that a bullet hole will always contact at least one and occasionally two. Score will always be kept on the basis of the higher value ring which is actually broken by the bullet hole. The contact rings 42 on board 36 align accurately with the score rings as printed on the paper target.

In order to roll target strip 22 neatly and smoothly over the sensing device side rollers 24 may be provided. Thus the target paper 22 is prevented from snagging or tearing on the corners of the sensing apparatus. As mentioned above, when the target with the hole in it has been indexed over the reader plate 36 and the hole will leave exposed, as may be seen in FIGURES 5 and 8, at least one of the contact points 38 on the plate. In order to complete the electrical circuit through the contact points so that the display target may be lighted, an electrically conductive brush mechanism 48 sweeps over the front side of the target. The brush 48 is carried on arm 46 and is composed of a great number of fine electrical wires. The arms 46 can be pivoted, move in tracks either up or down, side to side, diagonally or it may also be moved directly toward and away from the target roll 22. In any event when the arm 48 is moved across the front of the

target certain of the brushes 48 will probe through the hole made by the bullet and physically contact at least one of the contact points 38. Hence an electrical circuit is completed through the bullet hole via the brushes 48 and the contact point 38.

As mentioned above, the target scoring rings are so space concentrically that a bullet will always cut at least one and perhaps two of the rings. In the event two rings are cut then the higher value is awarded to the shooter. It is the rings which carry scoring value and which account for the fact that contact rings 42 are connected to the numbers on the display board 12.

FIGURES 6 and 7 indicate one way in which a display board may be designed. The display target has a number of lights corresponding to respective contact points on the reader plate 36. Lights 50, for instance would be connected so as to light the number value "5" or any other number according to the ring cut by the shot. Similarly lights 52 would indicate the target location of the bullet hit according to their corresponding contact points 38 on the reader plate 36. For purposes of illustration a translucent sheet of light conducting material 54 is placed over the lights to give the display an attractive appearance. Obviously specific design of the display board is a matter of design preference. The lights 50 and 52 have leads 56 and 58 by which they are connected to their respective contact points 38 or contact rings 42.

FIGURE 8 shows a schematic electrical diagram indicating how the basic circuitry may be set up to register the hits and scores on the display board. The reader plate 36 has a target on front of it in which the strike has been in the lower right quadrant almost directly centered on the number seven ring. The bullet hole has exposed four contact points 38 and the number seven contact ring 42 for completion of circuits. Arm 46 sweeps the front of the target. Brushes 48 extend through the hole 64 and complete the circuit in the following manner: Power comes from the source P1 into the circuit board by way of conductor line 66 and makes contact with the brushes 48. Rings 42 have conductor line 68 leading to a display light or lights at the score counter valve "7." The circuit is completed through line 70 to the power source P2. For the most desirable use the line 70 is best provided with a holding relay 71 so that all the shots of a string, fired on a single target can be visualized at once and then the various leads cleared for the next shooter.

In like manner to begin circuit through contact points 38, power is brought from P1 to brush 48 through line 66. Since the contact made by brushes 48 with contact points 38 and contact rings 42 is only momentary, it is necessary to use relays in order to hold the circuit closed. A first circuit is completed through 78 coming from its contact point 38, to a target light 52, and to relay K1 via line 84, and thence to P2 through line 86. In this way a temporary circuit actuates K1 to close switch 81 and establish a closed circuit P1 through line 80, switch 81, line 82, line 78, light 52, line 84, through relay K1, line 86, and to source P2. This circuit will remain closed until the reset switch 110 is pressed to interrupt the power supply and thus open the circuit.

Similarly a second temporary circuit is achieved from another of the four exposed contact points 38 through line 76, lights 52, line 92, relay K2, and line 94 to source P2. A second closed circuit is then established from P1, through line 90, relay switch 89, line 88, line 76, light 52, line 92, through relay K2, line 94, to source P2.

In like manner a third actuating circuit is established from the appropriate contact point 38, through line 74, target light 52, line 98, relay K3, and line 100 to source P2. Thus relay K3 actuated establishing a closed circuit from P1, through line 96, relay switch 97, line 99, line 74, light 52, line 98, back to relay K3, line 100 and source P2.

A fourth temporary circuit may be traced from contact point 38, line 72, light 52, line 106, relay K4, line 108 to

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source P2. The relay is thereby picked closing switch 101 and establish a closed circuit from P1 through line 102, switch 101, line 104, line 72, light 52, line 106, returned to K4, line 108 and thence to source P2.

At such time as the location of the strike has been noted by the shooter and by the spectators and the score noted on the score counter 60, the reset button 110 may be pressed to break the actuated circuits and thereby clear the display board and ready it for the next target reading. Basically this or a similar type circuit would be used in this device. Obviously it could be refined to include memory devices for totalizing scores. Use of such equipment however is strictly optional and whether it is used would depend on need and financing available.

FIGURE 11 shows how a range such as is shown in FIGURE 1 would look in diagrammatic cross section. Note that the mechanism for moving targets through the alley or target area 24 could be mounted on horizontal shafts or on vertical shafts as illustrated in FIGURES 2 and 3. The arrows 23 represent projectile trajectories in order to show how the baffles may act to protect the shooter.

It should be observed that this target reading device is not limited in method or structure to a firearms projectile. The method and apparatus is intended to be adapted to other types of projectiles such as in archery lanes and for the objects fired from compressed air guns and the like. The principle of a multiple contact reader plate as touched or physically contacted by another element through a projectile hole in a target is an essential part of this invention. Those skilled in the art will recognize that the brush of the preferred embodiment is only one of numerous alternatives. The means for contacting the reader plate points could be solid or made of spring type contacts and it need not necessarily sweep or move with respect to the reader plate. It is apparent that holding circuits as shown herein could be eliminated and that the means contacting the reader plate through the projectile hole whether in brush form or otherwise could be stationary thus providing a closed circuit for as long as desired without benefit of relays and a reset switch.

The above is considered as illustrative only and the principle of this invention. Numerous modifications and changes will readily occur to those skilled in the art and hence it is not desired to limit the invention to the exact construction and method of operation as shown and described. Accordingly all modifications and equivalents which may suitably be resorted to and which fall within the scope of the invention are intended to be included.

What is claimed is:

1. A reading and scoring device for projectile targets, comprising:

- (a) a reader plate having a plurality of small electrical contact points and a plurality of contact rings thereon,
- (b) an electrical contact arm means facing said reader plate in close proximity thereto and being adapted to contact said contact points through a projectile hole in a target adapted to be moved between said arm means and said reader plate,
- (c) a display target means remotely situated from said reading and scoring device having a plurality of lights thereon,
- (d) a plurality of first electrical circuit means connecting said contact points on said reader plate with correspondingly located lights on said display target,
- (e) a score counter display board means having target numerical values and also having at least one light for each of said target numerical values, and
- (f) a plurality of second electrical circuit means connecting said contact rings on said reader plate with the appropriate numerical value on said display board means.

2. A reading and scoring device for projectile targets, comprising:

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(a) a reader plate having a plurality of small electrical contact points on one side thereof, said contact points being disposed over said side in such a manner that spacing between said contact points is less than the diameter of the projectile which said target is designed to receive, said reader plate also including electrical contact rings corresponding to the scoring rings on said target,

(b) an electrical contact arm means facing said reader plate in close proximity thereto, said arm means being designed to sweep said one side of said reader plate and adapted to make physical electrical contact with at least one contact point and at least one contact ring through a projectile hole in a target adapted to be moved and indexed between said arm means and said reader plate,

(c) a display target means having a plurality of lights disposed over said display target,

(d) a plurality of first electrical circuit means including holding circuits connecting said contact points on said reader plate with correspondingly located lights on said display target,

(e) a scoring counter display board having target numerical values and also having at least one light for each of said target numerical values, and

(f) a plurality of second electrical circuit means including holding circuits connecting said contact rings on said reader plate with lights lighting the appropriate numerical value on said display board.

3. A device for displaying the location and score of a projectile hole in a target, comprising:

(a) a reader plate having a great plurality of small electrical contact points on one side thereof, said contact points being disposed in an evenly distributed pattern over the face of said plate in such a manner that spacing between said contact points is less than the diameter of the projectile which said target is designed to receive, said reader plate also including electrical contact rings corresponding to the scoring rings on said target,

(b) a movable electrical contact brush adapted to sweep the face of a used target adapted to be placed over said reader plate and to make physical contact with at least one contact ring and at least one contact point through a projectile hole in said target,

(c) a display target means and scoring board means each having a great plurality of lights therein; and

(d) first electrical circuit means connecting said contact points on said reader plate with lights having the same general location on said display target, and second electrical circuit means connecting said contact rings on said reader plate with lights on said scoring board corresponding to the score value of said contact rings.

4. A device for displaying the location and score of a projectile hole in a target, comprising:

(a) a reader plate having a great plurality of small electrical contact points on one side thereof, said contact points being disposed in an evenly distributed pattern over the face of said plate in such a manner that spacing between said contact points is less than the diameter of the projectile which said target is designed to receive, said reader plate also including electrical contact rings corresponding to the scoring rings on said target,

(b) a movable electrical contact brush adapted to sweep the face of a used target adapted to be placed over said reader plate and to make physical contact with at least one contact ring and at least one contact point through a projectile hole in said target,

(c) a display target means and scoring board means each having a great plurality of lights therein,

(d) first electrical circuit means connecting said contact points on said reader plate with lights having the same general location on said display target,

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and second electrical circuit means connecting said contact rings on said reader plate with lights on said scoring board corresponding to the score value of said contact ring, and

- (e) a reset switch means for said first and second electrical circuit means for opening said circuits and preparing said device to read another target. 5

5. A device for displaying the location and score of a projectile hole in a target, comprising:

- (a) a reader plate having a great plurality of small electrical contact points on one side thereof, said contact points being disposed in an evenly distributed pattern over said side in such a manner that spacing between said contact points is less than the diameter of a projectile which said target is designed to receive, said reader plate also including electrical contact rings corresponding to the scoring rings on said target, 15

- (b) a movable electrical contact brush facing said reader plate in close proximity thereto, said brush being designed to sweep said one side of said reader plate and adapted to make physical electrical contact with at least one contact point and at least one contact ring through a projectile hole in a target adapted to be disposed between said brush and said reader plate, 25

- (c) a display target means having a plurality of lights therein disposed over said display target,

- (d) a plurality of first electrical circuit means including relay holding circuits connecting said contact points 30

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on said reader plate with correspondingly located lights on said display target,

- (e) a scoring counter display board having numerical values and also having at least one electric light means for each value,

- (f) a plurality of second electrical circuit means including relay holding circuits connecting said contact rings on said reader plate with lights lighting the appropriate numerical value on said display board, and

- (g) a reset switch means for said first and second electrical circuit means for interrupting said circuit and preparing said device to read another target.

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