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ABSTRACT: An improved target arrangement for providing selectively a visual and/or audible indication of impacts on the target by preselected projectiles. A segmented target is divided into a plurality of individual discrete segments, which, for example, may be the conventional bull's-eye type target, and also, if desired, a moving target figure may be included, or any other combination of structural arrangements. Each individual segment is responsive to impact by the projectile and, upon receiving an impact in the particular section, closes an electrical circuit. The moving target figure may be similarly responsive. One or more of the discrete targets may be connected to an electrical circuit having an audio or audio signal generator such as an audio frequency oscillator connected to a permanent magnet speaker. Thus, for a particular target segment that is impacted by the projectile and is connected to the oscillator and speaker circuit, a discrete sound is produced indicating a hit on that particular target segment. The same target segments may if desired be provided with both a visual signal means, such as a light bulb, and sound or with either light or sound or any combination thereof that may be desired. Both the lights and the sound are self-extinguishing after a predetermined time interval to allow comparatively rapid utilization of the target for another shot thereat.

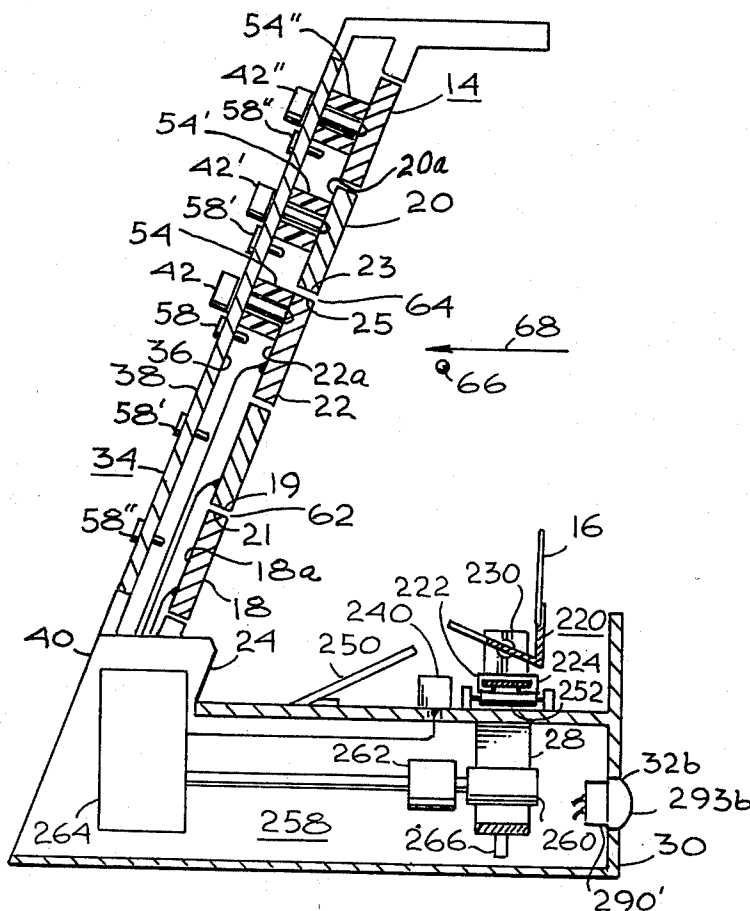
- [54] TARGET WITH HIT ACTUATED ELECTRICAL INDICATION MEANS**
16 Claims, 13 Drawing Figs.

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| [52] | U.S. Cl. | 273/102.2,
273/105.2 |
| [51] | Int. Cl. | A63b 63/00 |
| [50] | Field of Search | 273/102AP,
102.2, 102.2A, 102.2S, 105.2 |

- [56]
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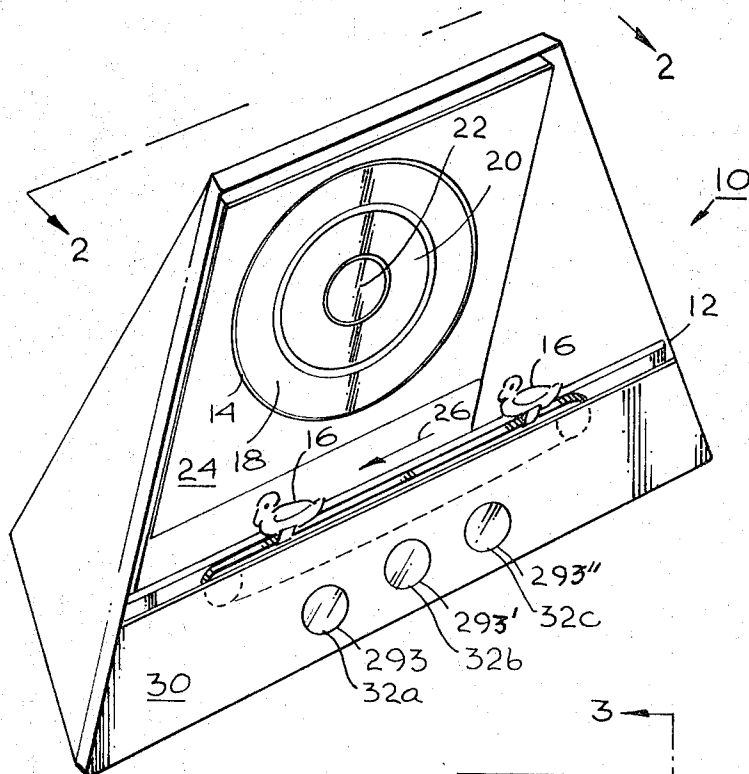


Fig. 1

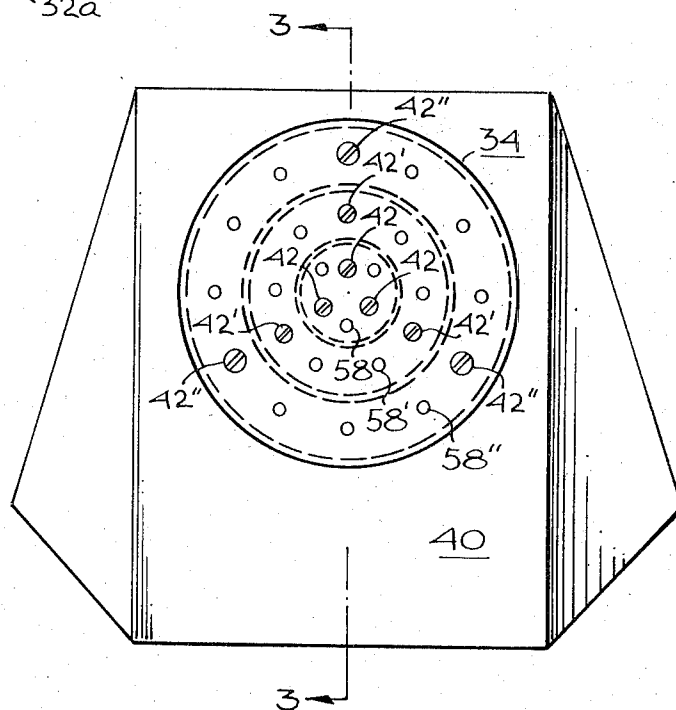


Fig. 2

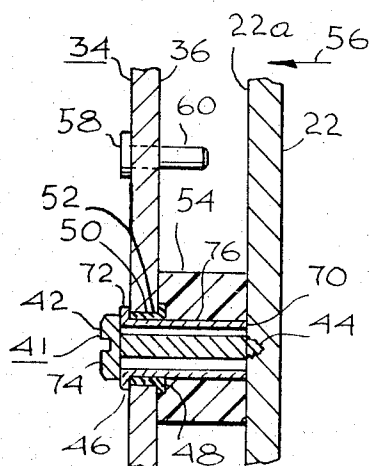


Fig. 4

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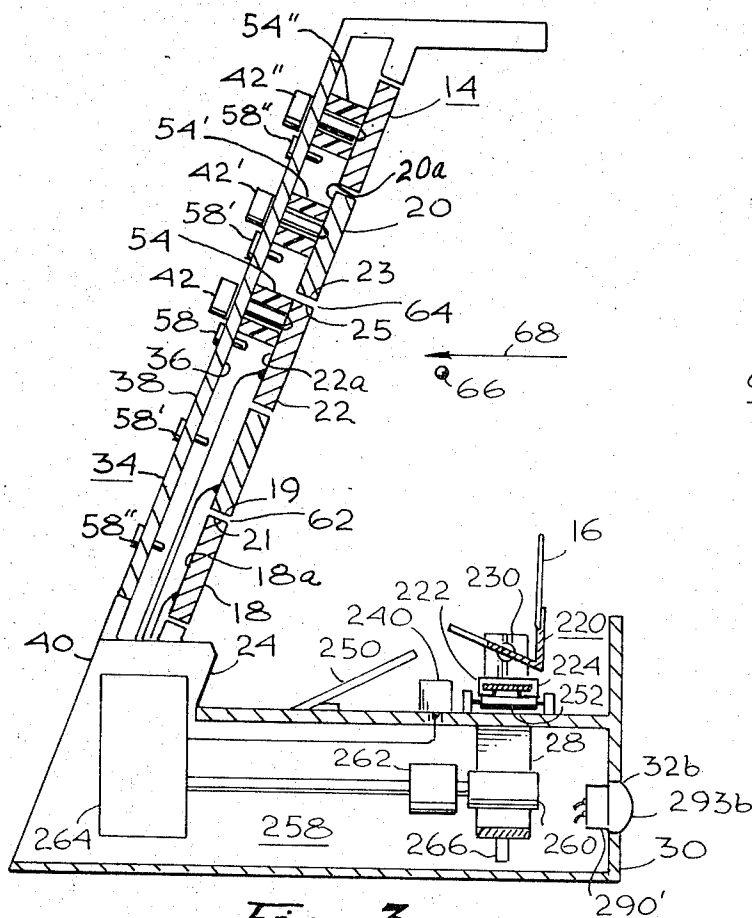


Fig. 3

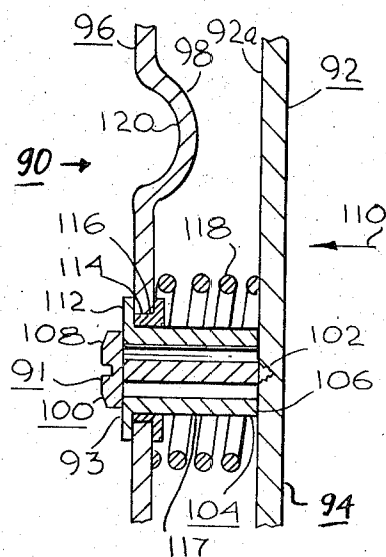


Fig. 5

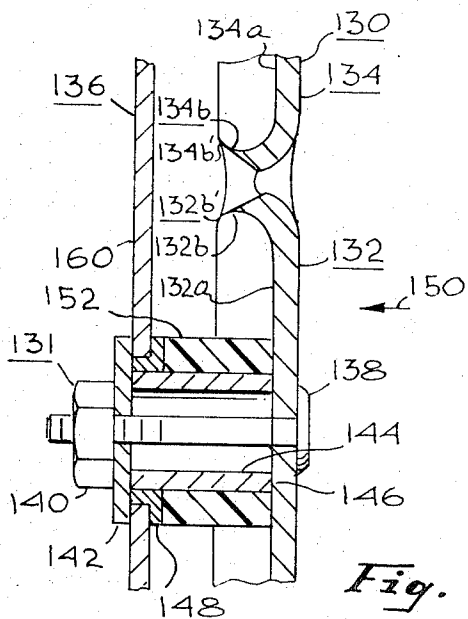


Fig. 6

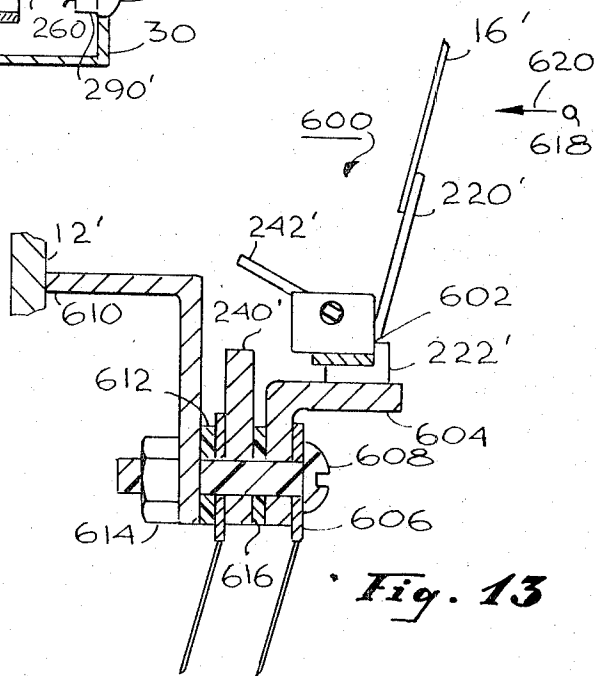


Fig. 13

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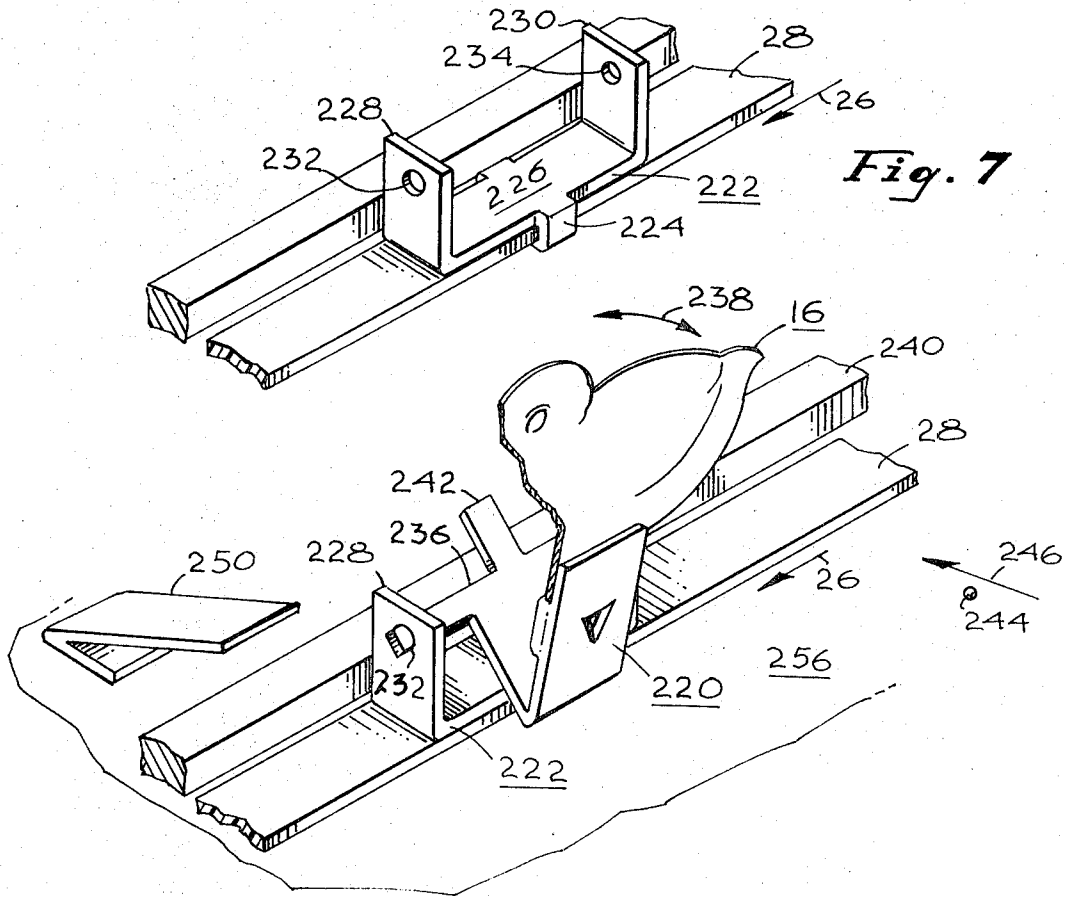


Fig. 8

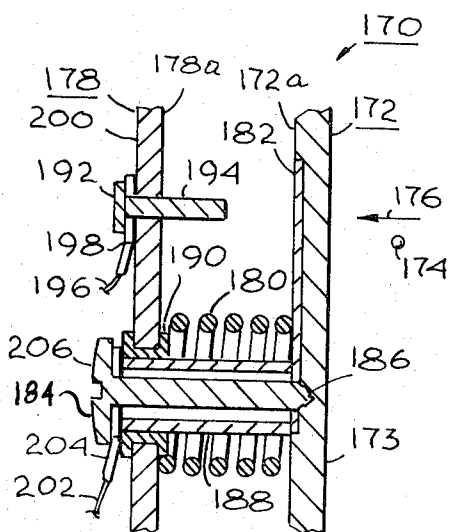


Fig. 10

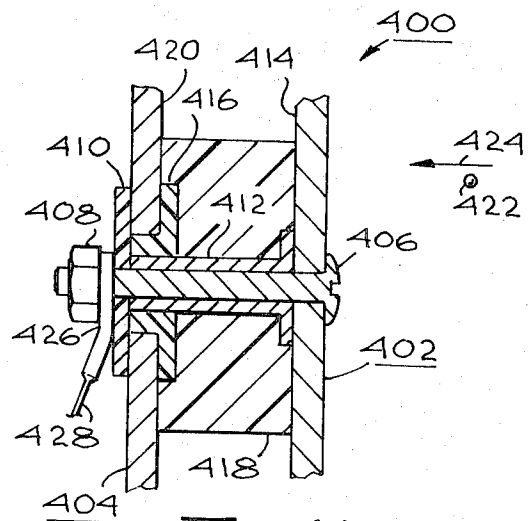


Fig. 11

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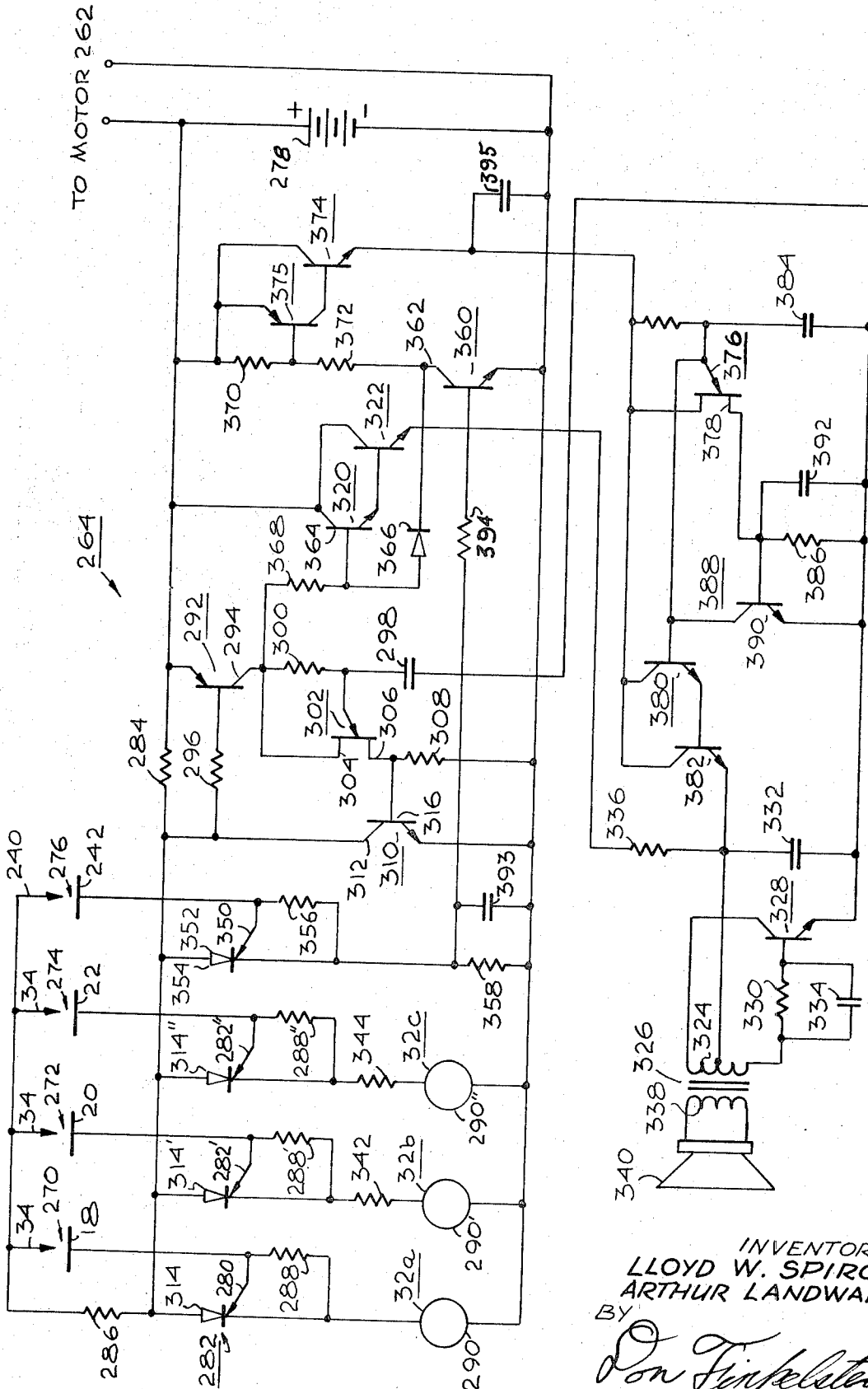
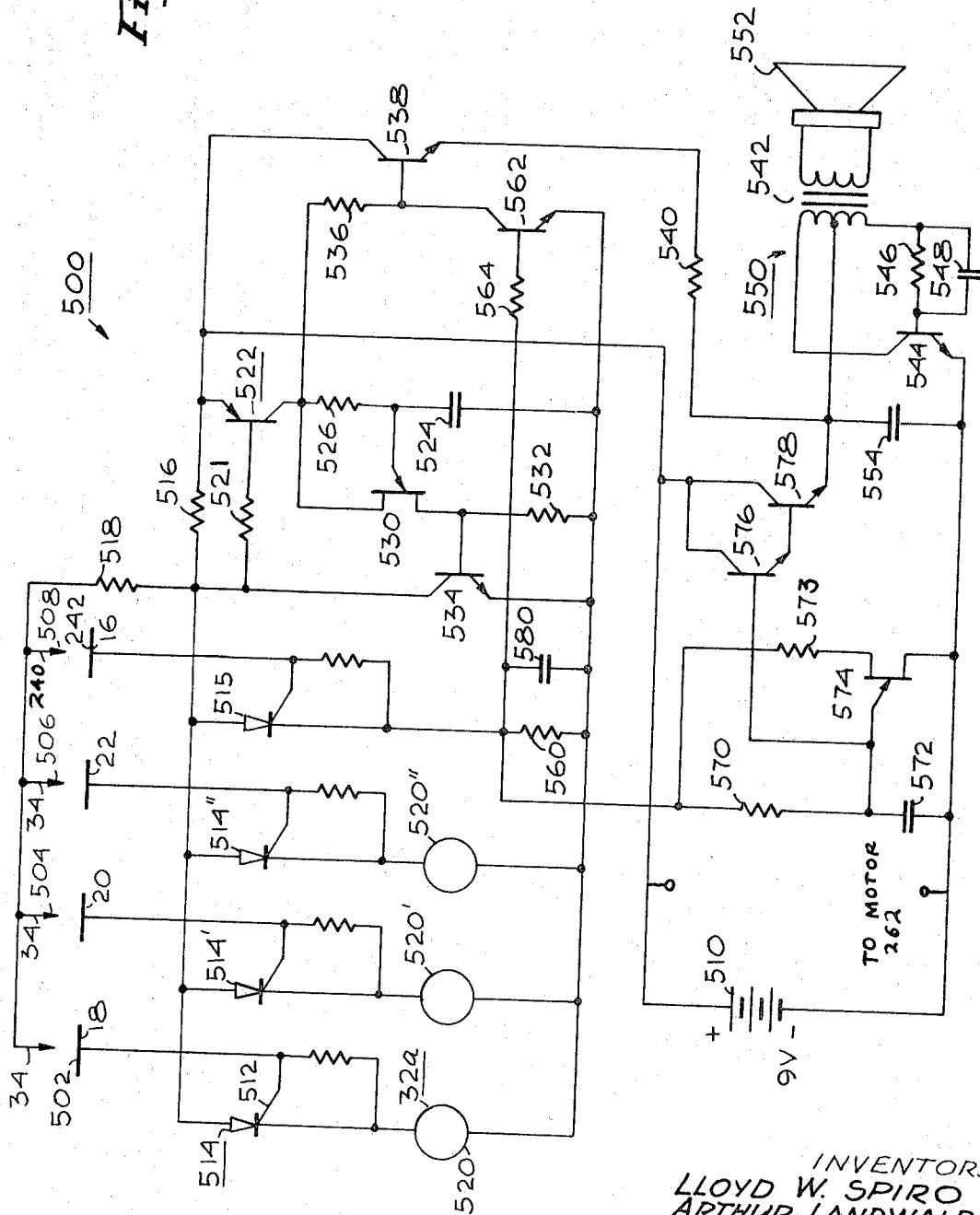


Fig. 9

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Fig. 12



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TARGET WITH HIT ACTUATED ELECTRICAL INDICATION MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the target art and more particularly to an improved target for providing both a visual and/or audio signal upon impact by a preselected projectile.

2. Description of the Prior Art

In many applications involving the impact of comparatively low velocity projectiles upon a target, it is desirable to know the particular area of the target upon which the projectile has impacted. For example, in many bb gun, dart gun, air gun and the like applications, the velocity of the projectile, while comparatively low, is still sufficiently high so that visual tracking of the projectile to the particular target portion upon which it impacts is generally not practical. Further, for safety reasons the person shooting the projectile is generally placed a sufficient distance from the target so that visual detection of the results of the impact, such as a colored mark on the target surface, indentations from the projectile, or the like, cannot be readily ascertained.

Therefore, there has long been a need for a target structure for such comparatively low velocity projectiles that provides an indication of the portion of the target that has been impacted by the projectile. In the targets heretofore utilized, in general, there has been provided visual signals specific to discrete portions of the target such that if the projectile impacted on a particular target section a particular visual signal would be provided. Such signals persisted for a predetermined time period and, in many targets, were either automatically extinguished or manually extinguished so that the target could then be utilized again.

While such visual signals have proved advantageous to determining the particular portion of the target impacted by the projectile, for a greater sensory effect it would be useful in such target structures to provide a signal effecting senses other than the visual sense of the observer. For example, it has been desirable to provide an audio signal either in substitution for or in addition to the visual signal. For maximum utilization and effect the visual signal should be particularized to a specific target portion such that each portion impacted gives rise to a different visual signal such as, for example, a different color individual signal and, similarly, the audio signal, for greater effectiveness, should also provide a different audio signal specific to the particular target section impacted. Thus, for a particular target section struck by the projectile a specific visual signal and specific audio signal may be generated, or combinations thereof. By providing the two sensory modes of indicating target impact, it will be appreciated that a much greater variation, such as audio signal alone for a particular target section, visual signal alone for a particular target section or combined audio and visual signals may be utilized to increase the flexibility of such a target arrangement.

SUMMARY OF THE INVENTION

Accordingly, it is an object of applicants' invention herein to provide an improved target structure.

It is another object of applicants' invention herein to provide an improved target structure in which both an audio and visual signal may be presented upon impact of the target.

It is yet another object of applicants' invention herein to provide an improved target structure for comparatively low velocity projectiles to provide a specific visual signal and/or specific audio signal for a particular target portion impacted by the projectile.

The above and other objects of applicants' invention herein are achieved, according to one embodiment of applicants' invention, by providing a target structure in which a common electrode comprising a substantially flat, platelike means having a planner inner surface is positioned in the rear portion of the target structure. Overlying the flat, platelike means comprising the common electrode are a plurality of, in this em-

bodiment of applicants' invention, concentrically mounted and separate segments comprising a disc for a center or bull's-eye and a plurality of annular rings concentrically mounted therewith each having an inside face adjacent the inner surface of the common electrode. Each of the rings and bull's-eye are electrically insulated from each other and are resiliently mounted on and electrically insulated from the first or common electrode. Thus each of the rings and the disc comprise a separate second electrode.

On other the inside face of the second electrodes or the inner surface of the first electrode there are provided preselected projections extending therefrom. These projections extend a predetermined distance above the surface from which they project and provide the structure for establishing momentary contact between the two electrodes under the influence of the impact on an outside face at the second electrodes of a projectile such as a bb, a dart, air gun pellet or the like. Resilient mounting of the second electrodes on the first electrodes insures that this contact is only due to the transfer of the energy associated with the impact of the projectile to the resilient means.

When the projectile is fired towards the target, it may strike the outside face of any of the second electrodes such as one of the concentric annular rings or the center disc which second electrode then resiliently moves towards the first electrode. In this movement, which is generally a rocking movement rather than a movement of the entire ring section towards the second electrode, the resilient mounting arrangement absorbs a portion of the energy associated with the impact of the projectile and the ring section touches the above-mentioned projections. As described below, each of the ringlike segments comprises a momentary switch under impact by the projectile to close an electrical circuit that includes both the common electrode and the second electrode, and the resilient mounting returns the segment to its original position. A moving target figure may also be utilized in applicants' improved target structure that may also comprise a second electrode. Upon impact by a projectile, the target figure is knocked over causing contact portion thereat, to engage a strip electrode comprising a portion of the first electrode to complete an electrical circuit. The moving target figure may, for example, be mounted on a continuous belt and provided with automatic righting means to realign the knocked down, moving target figure after each such impact.

An electrical circuit is provided for generating an indicating signal such as a visual signal and/or audio signal unique to the individual second electrode target portions impacted by the projectile in response to an intermediate signal generated after such impact. For example, in this embodiment of applicants' invention, different colored lights may be connected in the electrical circuitry as the visual indicating signals so that the closing of any one of momentary contact switch closings could by the striking of one of the second electrodes such as the annular rings and disc, by a projectile will light a particular colored light that remains "on" a predetermined time and is then self-extinguishing. At the same time if desired, an audio signal having a frequency unique to that one second electrode is also generated so that both a unique visual signal and a unique audio signal are provided to indicate a strike of the projectile upon a particular, specific second electrode.

If desired, the moving target figure may also be connected to both a visual and audio signal generating circuit or, as described below in great detail, a unique audio circuit may be utilized to provide a preselected audio sound. Thus, in this embodiment of applicants' invention, the moving target figure is in the form of a duck and an audio signal simulating the "quack-quacking" of a duck is provided when the moving duck is knocked down due to the impact of a projectile.

BRIEF DESCRIPTION OF THE DRAWING

The above and other embodiments of applicants' invention may be more fully understood from the following detailed

description taken together with the accompanying drawing wherein similar reference characters refer to similar elements throughout and in which:

FIG. 1 is a perspective view of one embodiment of applicants' invention;

FIG. 2 is a view along the line 2-2 of FIG. 1;

FIG. 3 illustrates a sectional view taken along the line 3-3 at FIG. 2;

FIG. 4 illustrates one form of mounting of the second electrodes on the first electrodes;

FIG. 5 illustrates another embodiment of applicants' invention;

FIG. 6 illustrates another embodiment of applicants' invention;

FIGS. 7 and 8 illustrate a moving target figure;

FIG. 9 is an electrical schematic diagram of a preferred electrical circuit for applicants' invention;

FIG. 10 illustrates another embodiment of applicants' invention;

FIG. 11 illustrates another mounting arrangement;

FIG. 12 is a schematic diagram of another electrical circuit; and

FIG. 13 illustrates another moving target structure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1, 2 and 3 there is shown in FIG. 1 a general perspective view of one embodiment of applicants' invention generally designated 10. The target 10 is comprised of a case means 12 upon which is mounted a segmented bull's-eye target portion 14 and a plurality of moving target figures 16. It will be appreciated that the segmented target portion 14 shown in the form of a bull's-eye type of target having three members comprising an outer ring 18, an inner ring 20 and a center or bull's-eye disc 22 is only one form of a segmented target that can be utilized in the practice of applicants' invention herein. That is, the segments may be in any desired size and shape and geometric configuration and in any desired relation to each other according to the principals of applicants' invention herein and applicants' invention herein is not limited to include those targets having only at least a portion thereof a bull's-eye type segmented target.

The three members comprising the concentrically mounted outer ring 18, inner ring 20 and bull's-eye disc 22 are mounted substantially flush on wall portion 24 of the case means 12 that, to minimize the potential injuries that could occur from the ricochet of projectiles therefrom back towards the person firing the projectile, is rearwardly and downwardly slanted so that ricocheted projectiles therefrom are generally directed towards the ground level immediately in front of the target 10, or are caught in a target trap portion.

As described below in greater detail, each of the moving target figures 16 which, for example, may be in the form of a simulated picture of a duck, move at a predetermined rate in a direction indicated by the arrow 26 on an endless belt 28.

On the front panel 30 of the case means 12 there is also provided three visual signal means 32a, 32b and 32c. The three visual signal means 32a, 32b and 32c are visible from positions forwardly of the target, that is, in the position generally occupied by the person firing the projectiles at the target. Each of the visual signal means 32a, 32b and 32c may be provided to radiate a different color from the other and, as described below in greater detail, each one is adapted to be illuminated upon the impact of the projectile on a particular portion of the segmented target 14. The visual signal means 32a, 32b and 32c each may comprise a lens 293, 293' and 293'', which provides the different colors even though the lamps such as lamp 290', are identical.

As shown in FIGS. 2 and 3, there is also provided a flat, unitary, platelike means 34 positioned behind the segmented bull's-eye target 14 and substantially coextensive with the outer annular ring 18, inner annular ring 20 and disc 22. The plate 34 is, in this preferred embodiment of applicants' inven-

tion, a unitary structure or, at least, preselected portions thereof are at the same electrical potential, as described below in greater detail. The plate 34 is mounted substantially parallel to the segmented bull's-eye target portion 14 and the platelike means 34 has an inner surface 36 that is substantially parallel to a planar inside face 18a of the outer ring 18, 20a of the inner ring 20 and 22a of the disc 22 so that the inner surface 36 and the inside faces 18a, 20a and 22a are substantially parallel and spaced a preselected distance apart and define substantially parallel planer surfaces, in this embodiment.

The platelike means 34 may be considered a common or first electrode and each of the outer ring 18, inner ring 20 and disc 22 may be considered a second electrode. It will be appreciated that the outer ring 18 is electrically insulated from the inner ring 20 and disc 22, the inner ring 20 is electrically insulated from the disc 22, and the outer ring 18, inner ring 20 and disc 22 are, for the position shown in FIGS. 1, 2 and 3, electrically insulated from the common electrode 34 and from each other.

The outer surface 38 of the platelike means 34 is, in this embodiment of applicants' invention, substantially parallel to the rear wall 40 of the case means 12.

Each of the outer ring 18, inner ring 20 and disc 22 are resiliently mounted by a resilient mounting means 41 on the platelike means 34 as shown, for example, in FIG. 4. As shown in FIG. 4, which illustrates the mounting of the disc 22 on the platelike means 34, the disc 22 is spaced a preselected distance from the platelike means 34 so that the inner surface 36 of the platelike means 34 is positioned this preselected distance from the inside face 22a of the disc 22. It will be appreciated that the outer annular ring 18 and inner annular ring 20 are mounted on the platelike means 34 in a manner similar to the arrangement shown in FIG. 4 for the mounting of the disc means 22 on the platelike means 34.

In the mounting arrangement shown in FIG. 4, a screw means 42 is in threaded engagement through the inner face 22a with the disc 22, as shown at 44. In the preferred embodiment of applicants' invention there are three such screws 42 supporting the disc 22 and, similarly, there are three such screws supporting each of the inner ring 20 and outer ring 18. The screw 42 is electrically insulated from the platelike means 34 by electrically insulating sleeve means 46 which, for example, may be plastic or any other dielectric material, and in order to minimize wear and friction, applicants prefer to include a collar means 48 around the walls 50 defining the orifice 52 through the platelike means 34 in which the screw 42 is positioned.

A resilient pad means 54 is positioned around the sleeve means 46 and between the inside face 22a of the disc 22 and the inner surface 36 of the platelike means 34. The resilient pad means 54 is also dielectric and may, for example, be polyurethane, sponge rubber, or the like and provides a yielding resilient force on the disc 22 when the disc 22 moves in the direction indicated by the arrow 56. From the above, it can be seen that the disc 22 is thus resiliently supported on the plate 34 by the screws 42 and is also electrically insulated from the platelike means 34 by the dielectric sleeve means 46 and the dielectric collar means 48.

The platelike means 34 is provided with a plurality at projection means 56 extending from the inner surface 36 of the platelike means 34 towards the inside face 22a of the disc 22. In the embodiment of applicants' invention shown on FIG. 4, this plurality at projection means 58 is provided by the rivet-like means 58 that is fixed to the platelike means 34 and has a contact portion 60 extending from the inner surface 36 towards the inside surface 22a. Each of the projection means 58 is electrically conductive and is in electrically conductive contact with the platelike means 34.

As shown more clearly on FIG. 2, there is provided in this embodiment of applicants' invention, three mounting screws 42 for holding the disc 22 in the predetermined space relationship to the platelike means 34, three mounting screws 42' which may be similar to the screws 42 for mounting the inner

ring 20 in the predetermined space relationship to the platelike means 34 and three mounting screws 42' for mounting the outer ring 18 in the predetermined spaced relationship to the common platelike means 34. Similarly, there is provided in this embodiment of applicants' invention, eight rivetlike projections 58'' spaced circumferentially around the common platelike means 34 in regions adjacent the outer ring 18 and the rivetlike means 58'' may be similar to the rivetlike projections means 58 described above. Similarly, there is provided eight rivetlike projection means 58' spaced circumferentially around the common platelike means 34 in regions adjacent to the inner ring 20 and the rivetlike projection means 58' may be similar to rivetlike projection means 58 described above. Similarly, there is provided three of the rivetlike projection means 58 spaced circumferentially on the common platelike means 34 in areas adjacent the disc 22.

As shown in FIG. 3, resilient pad means 54' are positioned around each of the mounting screw 42' to resiliently resist motion of the inner disc 20 and a resilient pad means 54'' is positioned around each of the mounting screws 42'' to resiliently resist motion of the outer ring 18.

Annular spaces 62 and 64 are provided, respectively, between the outer edge 19 of inner ring 18 and outer edge 21 of inner ring 20, and inner edge 23 of inner ring 20 and outer edge 25 of disc 22 so that each of the outer ring 18, inner rings 20 and disc 22 are electrically insulated from each other and do not inhibit movement of each other.

When a projectile such as the projectile 66, moves towards the target in the direction indicated by the arrow 68 and impact, for example, on the disc 22, the disc 22 moves in the direction of the arrow 56 shown in FIG. 4 until the inside surface 22a of the disc 22 contact the contact portion 60 of projection means 58. The energy associated with the momentum of the projectile 66 is transferred to the disc 22 to provide this motion which is yieldingly resisted by the resilient pads 54. The momentum of disc 22 and the resilient pad 54 absorb most of the energy and the movement of the disc 22 continues until contact with the contact portion 60 is made which results in an electrical circuit being completed between the common platelike means 34 and the disc 22. As noted above, the common platelike means 34 may be considered a first electrode and the disc 22 may be considered a second electrode. The resilient pad 54 insures that the contact between the inside face 22a and the contact portion 60 is only momentary and after the contact the resiliency of the resilient pad 54 restores the disc 22 to its original spaced-apart relationship with the common platelike means or common electrode 34.

As shown in FIG. 4, the sleeve-like means 46 has a first end 70 that is in contact with the inside face 22a of the disc 22 and a second end 72 that is in contact with the head 74 of the mounting screw 42. Thus, when the disc 22 moves in the direction indicated by the arrow 56 in FIG. 4, which is the same direction as the arrow 68 shown in FIG. 3, the sleeve 46 and the screw 42 move with the disc 22 and the outer peripheral surface 76 of the sleeve 46 slides on the collar means 48. By providing the sleeve means 46 and collar means 48 of comparatively low coefficient of friction plastic materials such as nylon, polyurethane, polyethylene, or the like, comparatively little frictional loss occurs in this motion and the movement of the disc 22 for a given momentum of the projectile 66 may be accurately controlled by the control of the resiliency of the pad 54. It will be appreciated, of course, that while friction between the sleeve 46 and the collar 48 would also absorb energy, such friction is generally not easily controlled and applicants prefer to provide more precise control of the movement of the disc 22 by means of the resiliency of the pad 54.

From the mounting arrangement indicated on FIGS. 2, 3 and 4, it will be appreciated that the movement of the disc 22 with respect to the common electrode 34 is essentially a tilting motion until one portion of the inside surface 22a contacts the contact portion 60. The momentum associated with the projectile 66 which, in this embodiment of applicants' invention,

may comprise bb's, darts, pellets, or the like, is generally not sufficient to move the disc 22 (or the outer annular ring 18 or inner annular ring 20, depending upon which portion of the segmented bull's-eye target 14 is impacted by the projectile 66 in a direction substantially parallel to the plane defined by the inner surface 36 of the common electrode 34. Thus, the three-screw mounting of the preferred embodiment of applicants' invention as indicated on FIG. 2 is desirable to provide this type of relative movement between the portions of the segmented bull's-eye target 14 and the platelike common electrode 34.

Since, as shown in FIG. 3, the segmented target 14 is mounted at an angle to the vertical, the mounting arrangements as indicated in FIG. 4 and as described below, must take both shear and tension loads due to gravity forces. That is, the eight of each of the annular outer ring 18, annular inner ring 20 and disc 22 must be supported by the mounting means 41 described herein which, because of the angular alignment with respect to the vertical, take both shear and tension loads therein.

FIG. 5 illustrates another embodiment of applicants' invention generally designated 90 and shows the details of another mounting means 91 for mounting one of a plurality of segments 92 of a segmented target portion 94 with respect to a common electrode and platelike means 96. The segment 92 may be similar to the disc 22, outer annular ring 18 or inner annular ring 20 shown in FIGS. 1, 3 and 4 and the common platelike means 96 may be similar to the common platelike means 34 shown therein.

The segment 92 has an inside face 92a that is spaced a preselected distance apart from an inner surface 98 of the common platelike means 96.

The segment 92 is resiliently mounted on the common platelike means 96 by a mounting screw 100 that, for example, may be similar to the mounting screw 42 described above. In this embodiment 90 of applicants' invention the mounting screw 100 threadingly engages the segment 92 through the inside face 92a as indicated at 102. A generally cylindrical sleeve-like means 104 has a first end 106 abutting the inside surface 92a of the segment 92 and a second end 93 abutting the head 108 of the mounting screw 100 so that, for movement of the segment 92 in the direction indicated by the arrow 110 with respect to the common platelike means 96, the screw 100 and the sleeve means 104 move therewith. The sleeve means 104 is of an electrically insulating nature and, preferably, is made from plastic such as nylon or similar material such as those described above for the sleeve means 46 so that there is little friction between the sleeve means 104 and a collar means 112 positioned around the inner wall edges 114 defining an orifice 116 through which the mounting screw 100 projects. The collar 112 may be similar to the collar 48 described above and may be fabricated from similar materials to provide a very smooth and low friction contact between the outer peripheral walls 117 of the sleeve-like means 104 and the collar means 112 during relative motion between the segment 92 and the platelike common electrode 96.

An electrically insulating spring means 118 such as a plastic spring or plastic coated metallic spring is fabricated from any desirable plastic such as nylon or the like, and is positioned between the inside face 92a of the segment 92 and the inner surface 98 of the platelike common means 96 to provide a yielding resistance to motion of the segment 92 in the direction indicated by the arrow 110. It will be appreciated, of course, that the spring 118 could be utilized in place of the resilient pad means 54 for the mounting arrangement illustrated in FIG. 4 and, similarly, a resilient pad similar to the pad 54 could be utilized in place of the spring 118 in the embodiment shown in FIG. 5.

Projections 120 which, in this embodiment of applicants' invention shown on FIG. 5, take the form of dimples pressed into the common or platelike means 96 provide the portions designed to make momentary contact with the inside face 92a of segment 92. Thus, the dimples 120 replace the rivetlike

projection means such as rivetlike means 58 shown in FIG. 4. In some embodiments of applicants' invention, it is preferable to use the dimple means 120 for obvious economic factors in fabrication. Further, it will be appreciated, the dimples 120 could be utilized as the projection means in the embodiment of applicants' invention shown in FIG. 4 and, similarly, the rivetlike projection means 58 could be utilized in the embodiment of applicants' invention 90 shown in FIG. 5 to replace the dimples 120 or as in addition thereto as may be desired. Similarly, lances could be utilized to provide the projections. Thus, the utilization in any one embodiment of applicants' invention illustrated herein of a particular form of projection is not exclusive of that type of projection but, rather, several different types of projections may be utilized as desired.

FIG. 6 illustrates another embodiment of applicants' invention generally designated 130 and, more particularly, another mounting arrangement 131 for mounting portions of a segmented target in a resilient and electrically insulated manner on a common electrode. As shown in the embodiment 130 of FIG. 6 there may be provided segments 132 and 134 which, for example, may be similar to the disc 22 and inner annular ring 18 described above. The segment 134 may be considered an annular ringlike segment.

A flat platelike common electrode 136 is provided and, in this embodiment of 130 of applicants' invention as shown on FIG. 6, the flat platelike common electrode 136 may be similar to the platelike means 34 described above. The disc segment 132 and annular ring segment 134 are resiliently mounted on the common platelike means 136. As shown on FIG. 6, a bolt 138 extends through the disc segment 132 and, common platelike means 136 and is restrained by nut 140. An electrically insulating washer means 142 provides electrical insulation between the bolt 138 and nut 140 and the common platelike means 136. Similarly, a sleeve-like means 144 which, for example, may be similar to the sleeve-like means 104 shown in FIG. 5, has a first end 146 abutting against an inside face 132a of the disc segment 132 and against the washer 142. The sleeve means 144 is electrically insulating and fabricated from a comparatively smooth and slippery plastic material such as nylon or the like so that the friction between the sleeve-like means 144 and a collar means 148 during movement of the disc segment 132 in the directions indicated by the arrow 150 relative to the common platelike means 136 is comparatively low for the reasons hereinabove set forth. The collar means 148, therefore, may be similar to the collar means 112 shown on FIG. 5 or the collar means 48 shown on FIG. 4.

A resilient pad means 152 which, for example, may be similar to the resilient pad means 54 shown in FIG. 4, is positioned, in this embodiment of applicants' invention, between the inside face 132a of the disc segment 132 and the collar means 148 and the resilient pad means 152 provides yielding resisting forces to movement of the disc segment 132 in the direction indicated by the arrow 150 toward the platelike common means 136.

When the disc segment 132 moves in the direction indicated by the arrow 150 relative to the platelike common means 136 it will be appreciated that the bolt 138, nut 140, sleeve means 144 and washer 142 all move therewith as the resilient pad means 152 is compressed.

It will be appreciated that the mounting of the annular ringlike segment 134 though not shown in FIG. 6 is similar to that shown for the mounting of the disc segment 132.

The projection means 132b and 134b shown on FIG. 6 project from the inside face 132a of the disc 132 and the inside face 134a of the annular ringlike segment 134 towards the inner surface 160 of the platelike common means 136. The projection means 132b and 134b comprise rims with edge portions 132b' and 134b' that are preferably comparatively narrow so that essentially line contact with the inner surface 160 may be made when the segments 132 or 134 are impacted by a projectile.

It will be appreciated that in each of the embodiments of applicants' invention heretofore described the mounting of the

segments in respect to the common platelike means is a resilient mounting so that the segment moves and there is momentary contact between the projection means, the segment and the common plate and then, under the influence of the yielding resisting means such as the resilient pad 152 or 154 or the spring 118.

FIG. 11 illustrates another mounting arrangement useful in the practice of applicants' invention herein. This arrangement, generally designated 400, is similar to the mounting arrangement 131 shown in FIG. 6, and provides the resilient mounting between an electrically conductive target segment 402 and a base or common electrode 404. The target segment 402 may be similar to the target segment 132 or 134 shown in FIG. 6, and the base electrode 404 may be similar to the platelike common electrode 136 shown thereon. A bolt 406 extends through the target segment 402 and is in electrical contact therewith and protrudes through the base electrode 404 and is retained by a nut 408. The electrically conductive bolt 406 and nut 408 are insulated from the base electrode 404 by an insulating washer 410. The washer 410 may be similar to the washer 142 described above. Further, there is also provided a rigid, such as a metal headed sleeve means 412 surrounding the bolt 406 and bearing against the inside surface 414 of the target segment 402 and against the electrically insulating washer 410. If the headed sleeve member 412 is electrically conductive, then an insulating bushing 416 may be provided to insure electrical isolation of the base electrode 404 from the target segment 402. A dielectric resilient pad 418 is provided between the inner face 414 of the target segment 402 and the inner face 420 of the base electrode 404 to provide the resilient movement therebetween as described above.

When a projectile, such as the bb 422, moving in the direction indicated by the arrow 424, impacts on the target segment 402, the headed sleeve member 412 moves against the insulating washer 410 as the entire bolt 406, nut 408, washer 410 and sleeve 412 move in the direction of the arrow 424 as the result of the momentum transfer thereto. Electrical contact to the target segment 402 is made by electrical connector 426 connected to wire lead 428. The insulating washer 410 insulates the electrical connector 426 from the base electrode 404. Electrical contact between the target segment 402 and the base electrode 404, as the result of the impact of the projectile 422, may be provided by any of the above-described arrangements such as the dimples 120 of FIG. 5, or the rims 132 shown in FIG. 6, lances in the base electrode 404, rivets or the like. It will be appreciated, of course, that electrical connection to the target segments of some of the embodiments of applicants' invention described herein, such as that shown in FIG. 6, may be provided in the manner shown in FIG. 11.

In the above-described embodiments of applicants' invention, each of the segments of the segmented target structure as well as the common plates were entirely electrically conductive. This is generally preferred since, to resist the impact energy without undue buckling or warping because of the impingement of the projectiles on the structure as well as the manufacturing and assembling techniques, and metals are generally electrically conductive, in some embodiments and applications of applicants' invention it may not be necessary to have highly rigid and strong members throughout. Thus, for example, there will be appreciated that since in the embodiments of applicants' invention shown in FIGS. 4 and 5, contact between the moving segment and the common plate is made at discrete locations. Only these portions involved in the contact need be electrically conductive.

FIG. 10 illustrates one embodiment generally designated 170 in which a target segment 172 is adapted to move under the influence of an impacting projectile such as the bb 174 in the direction indicated by the arrow 176 towards a common platelike means 178. The segment 172 is resiliently mounted on the common platelike means 178 and a spring means 180 provides a yielding resilient force to resist the motion of the segment 172 towards the common platelike means 178. In this

embodiment of applicants' invention, the segment 172 has a body member 173 that may be electrically insulating if desired and, therefore, could be fabricated from plastic or any other nonelectrically conductive material that in certain applications may prove more economical to utilize. Similarly, the common platelike means 178 may also be fabricated from a nonelectrically conductive type material such as a plastic or the like if desired. A contact strip 182 is embedded in the body member 173 of the segment 172 on the inner face 172a thereof.

A mounting screw 184 extends through the platelike means 178 and engages the electrically conductive strip 182 and, if desired, threadingly engages the body member 173 as indicated at 186. A sleeve means 188 which may be similar to the sleeve means 104 shown in FIG. 5 and a collar means 190 which, for example, may be similar to the collar means 112 shown in FIG. 5 are also provided and, therefore, the mounting arrangement shown for the embodiment of 170 shown in FIG. 10 is similar to the mounting arrangement shown for the embodiment 90 shown in FIG. 5. That is, when the segment 172 moves in the direction indicated by the arrow 176 the sleeve 188 and the screw 184 move therewith.

A projection means 192 which, in this embodiment of applicants' invention, may take the form of a rivetlike member similar to the rivetlike projection means 58 shown in FIG. 4, extends through the common platelike means 178 and has a projection portion 194 between the inner surface 178a of the common platelike means 178 and the electrically conductive strip 182. When the segment 172 is impacted by the projectile 174 the spring 180 compresses to provide yielding resistance until the electrically conductive strip 182 contacts the projection portion 194 of the rivetlike projection means 192. This provides a momentary electrical contact therebetween since the rivetlike member 192 is electrically conductive and the strip 182 is electrically conductive.

A first lead 196 is connected to an electrically conductive washer 198 between the outer surface 200 of the platelike means 178 and the rivetlike projection means 192 to conduct electrical energy thereto. Similarly, a second electrical lead 202 is connected to a washer 204, which also is electrically conductive, which is between the head 206 of the mounting screw 184 and the sleeve-like means 188 and the collar means 190. Since the mounting screw 184 engages the electrically conductive strip 182 electrical energy therefore is conducted through the electrically conductive mounting screw 184 to the electrically conductive strip 182 so that when the electrically conductive strip 182 contacts the projection portion 194 of the rivetlike projections means 192 a complete circuit is obtained.

In the embodiment 170 shown in FIG. 10, it will be appreciated, only selected portions of the common electrode and the second electrode are electrically conductive and, therefore, each of the embodiments of applicants' invention shown herein, if desired, only preselected portions of either or both the first and second electrodes may be electrically conductive to provide the momentary contact necessary for operation of applicants' target structure as hereinafter set forth. Thus, in any of the embodiments of applicants' invention, electrical energy may be conducted to the second electrode by utilizing electrical contact to an electrically conductive mounting screw or a mounting bolt, as may be desired, since they are electrically insulated from the electrically conductive portions of the common platelike means. Similarly, electrical energy may be conducted to the common platelike means in any of the embodiments hereof in a manner similar to that shown on FIG. 10. It will be appreciated that in the embodiment 170 shown on FIG. 10, the spring means 180, sleeve means 188 and collar means 190 may, if desired, be either electrically conductive or electrically insulating since the common platelike means 178 is electrically insulating in this embodiment of applicants' invention and therefore there is no inadvertent short circuit between the electrically conductive strip 182 of the segment 172 and the platelike common means 178.

As indicated above, in addition to the segmented target 14 shown in the embodiment of applicants' invention illustrated in FIGS. 1, 2, 3, and 4, applicants also provide a moving target figure 16. FIGS. 3, 7 and 8 illustrate the details of a preferred form of applicants' moving target figure 16. The moving target figure 16 is mounted in an electrically conductive clip means 220, that is rotatably mounted in a carrier member 222. The carrier member 222 has a tab 224 that clampingly engages the moving belt 28 so that the carrier member 222 is carried along with the moving belt 28 in the direction indicated by the arrow 26.

The carrier member 222 has a base 226 from which the tab 224 depends and a pair of vertically spaced-apart support portions 228 and 230 each of which have an aperture 232 and 234, respectively, therethrough.

The clip means 220 has a pair of arm means 236 (only one of which is shown in FIG. 8) and the arm means 236 are rotatably mounted in the aperture 232 and 234 so that the clip means 220 together with the moving target figure 16 may pivot on the carrier 222 in the direction indicated by the arrow 238.

Adjacent to the moving belt 28 there is provided a first electrode which, in this embodiment of applicants' invention, may be considered a strip electrode 240 and, as described below, the strip electrode 240 is at the same electrical potential as the platelike member or first electrode 36 and therefore the strip electrode 224 may be considered a part of the first electrode.

The clip member 220 has a contact portion 242 that is positioned to contact the strip electrode 240 when the target figure 16 has been impacted by a projectile such as the projectile 244 moving in the direction indicated by the arrow 246 and knocked thereover. Thus, the impact by the projectile 244 moves the target figure and the clip means 220 in the direction indicated by the arrow 238 until the contact portion 242 engages the strip electrode 240. The center of gravity of the combined mass of the target figure 16 and the clip means 220 is such that when the target figure 16 is in the upright position as indicated in FIGS. 3 and 8, it will remain in this position until impacted by the projectile and, when impacted by the projectile tilts over in the direction indicated by the arrow 238 and the center of gravity then shifts to be on the opposite side of the arms 236 so that it will remain in the tipped position until righted.

Automatic righting means such as the righting finger 250 are provided on applicants' improved target structure and when a target figure 16 is in the tipped over position and the contact portion 242 is contacting the strip electrode 240 as the moving target figure 16 moves in the direction indicated by the arrow 26 on the endless belt 28 the finger 250 engages the target figure 16 and flips it right side up to the vertical position shown in FIG. 8.

The endless belt 28 may be carried on roller means such as the roller 252 or, if desired, it may ride on the upper surface 256 of the case means 12. As shown on FIG. 3, the endless belt 28 enters a cavity 258 in the case means 12 and there is provided therein a pulley 260 rotated by an electric motor 262 which drives the endless belt 28. In the cavity 258 there is also provided electrical circuitry generally designated 264 that provides the visual signal, the audio signal and the electrical energy for driving the motor 262 to rotate the belt 28 to provide movement to the moving target figure 16.

The belt 28 may be an electrically conductive belt so that electrical contact to the clip means 220 and thus the contact portion 242 is provided through the carrier member 222 to the clip means 220. Electrical energy is supplied to the electrically conductive belt means 28 by sliding engagement with electrical contact 266 which, as shown on FIG. 3, receives energy from the electrical circuitry 264. It will be appreciated that many forms of mounting arrangements for the moving target figure 16 as well as arrangements for providing electrical energy thereto may be achieved by those skilled in the art.

FIG. 13 illustrates another embodiment of applicants' invention generally designated 600, and more particularly another structural arrangement for supporting a moving target

such as a moving target 16', which, for example, may be similar to the moving figure 16 described above. In this embodiment of applicants' invention, an endless belt means 602 is driven by an electric motor (not shown) to move the moving target figure 16', which is attached to clip means 220', which, for example, may be similar to the clip means 220 described above mounted on a carrier member 222', which, for example, may be similar to the carrier member 222, described above. The carrier member 222' is coupled to the endless belt means 602 so that the target figure 16' is moved in the direction into and out of the plane of the paper shown on FIG. 13, as the endless belt means 602 is rotated in a manner similar to that described above.

The mounting of the clip means 220' on the carrier member 222' is similar to that described above.

However, in this embodiment of applicants' invention, the carrier member 222' slides along in electrical contact with angle plate means 604 during the rotation of the endless belt means 602. Electrical energy is supplied to angle plate means 604 by electrical connector 606 held against angle plate 604 by an electrically insulating screw 608. The screw 608 may be fabricated from nylon or any other desired electrically insulating material. A strip electrode 240', which may be similar in electrical connection to the strip electrode 240 described above, is electrically part of the platelike member or first electrode 36 of the embodiment shown on FIG. 1, and is electrically energized by electrical connector 608. Connector 608 is insulated from support arm 610 by electrically insulating washer 612. Nut 614 threadingly engages the insulating screw 608 to clamp the assembly on the support arm 610, which, for example, may be connected to the case means 12', which may be similar to the case means 12 described above.

The strip electrode 240' is insulated from the angle 604 by an electrically insulating washer 616, which, for example, may be similar to the electrically insulating washer 612.

When the moving target figure 16' is impacted by a projectile 618 moving in the direction indicated by the arrow 620, it is tipped over and the contact portion 242', which, for example, may be similar to the contact portion 242 described above, engages the strip electrode 240' and thus completes the circuit between the angle arm 604 and the strip electrode 240' to provide the appropriate signal for generation of an audio signal, as described below, or, if desired, a visual signal or a combination thereof.

As noted above, it is desirable in applicants' invention herein to provide a visual signal and/or an audio signal when different portions of applicants' target are impacted by the projectile. Thus, if desired, the disc 22, inner annular ring 20 and outer annular ring 18 may, when impacted by a projectile, momentarily contact the projections 42, 42' or 42'' depending upon which segment of the segmented bull's-eye target 14 is struck by the projectile, to initiate the circuitry to provide the visual signal and/or a particularly audio signal. In the embodiment of applicants' invention shown in FIGS. 1, 2, 3 and 4, both a unique visual signal and a unique audio signal is provided corresponding to impact of the projectile on a particular segment of the segmented bull's-eye target 14. While, it will be appreciated, the same audio signal may be provided for impact on each of the segments, it will be appreciated that greater versatility is provided if a different audio tone or frequency as well as a different visual signal is provided corresponding to that particular segment. Similarly, as described below in greater detail, if the projectile should strike in the annular space 62 between the outer annular 18 and inner annular ring 20 or in the annular space 64 between the inner annular ring 20 and disc 22, then both adjacent segments of the segmented bull's-eye target 14 may contact the appropriate projections to complete the circuitry to the common electrode 36 and therefore, the lights indicating strikes upon both segments will be lit and a tone that is different from the audio tone of either of the segments is produced.

Similarly, if desired a light may be provided for an indication of a strike upon the moving target figure 16 when the con-

tact portion 242 engages the strip electrode 240 or a unique sound may be produced or both. In the embodiment of applicants' invention described herein applicant does not provide a light to indicate he hit upon the moving target 16 but rather a very unique sound that is similar to the quack-quacking of a "dying duck" is provided when the moving target figure 16 is impacted. Thus, in the preferred form of applicants' invention herein, the moving target 16 is in the form of a duck. Thus, in the sequence of operation, when one of the segments 18, 20 or 22 is impacted, the electric circuitry provides a light such as the lights 32a, 32b and 32c depending upon which segment is impacted and a particular sound is emitted from the target. Both the sound and the lights persist for a predetermined time period and then are automatically terminated so the target may be reused for another shot. Since the duck provides such a unique sound it may be considered a prime target source in this embodiment of applicants' invention and, as described below, the electric circuitry is such that if the duck is hit the distinctive duck sound is emitted and any sound associated with one of the segments 18, 20 or 22 is terminated. If however, the duck is hit first and then one of the segments 18, 20 or 22 is impacted, then only the duck sound will be provided and only the light signal from the particular ring or rings impacted. Conversely, if first one of the segments is impacted and then the duck, the light corresponding to the particular segment is first illuminated and the sound for that particular segment is generated. Then, when the duck is impacted, the sound of the duck cuts out the corresponding sound from the impacted target ring and only the duck sound is heard.

Referring now to FIG. 9 there is shown an electrical schematic diagram for the electrical circuit 264 useful in the practice of applicants' invention herein. As shown on FIG. 9 the momentary contact between the segments 18, 20 and 22 and the common electrode 34 and 240 by the segments 18, 20 and 22 of the segmented bull's-eye target 14 and the moving target figure 16 as represented by the contact portion 242 are indicated schematically by the momentary contact switches 270, 272, 274 and 276, respectively. A 9-volt battery 278 is provided to supply the electrical energy for the electrical circuit 264 as well as the power to the motor 262. When one of the segments, such as the disc 18, is impacted by a projectile, it is moved to contact the common first electrode 34 thus indicating a closure of the momentary contact switch 270. Closure of the switch 270 triggers the gate 280 of a first silicon controlled rectifier 282. The trigger voltage due to the momentary contact and, consequently, the gate current are developed through resistor 284, resistor 286, the momentarily closed switch 270, resistor 288 and the cold resistance of lamp 290 comprising the source of visual electromagnetic radiation for the visual signal means 32a. In this embodiment of applicants' invention, applicant has found that the lamp 290 may be a 6-volt 150-milliamp lamp. The silicon controlled rectifier 282 requires a minimum holding current of 5 milliamps and, therefore, the current load of the lamp 290 is more than enough to sustain the silicon controlled rectifier 282 in conduction and, therefore, keep lamp 290 illuminated. The 150-milliamp current consumed by lamp 290 is supplied through resistor 284 and the silicon controlled rectifier 282 each developing a 1½-volt drop thus providing the full 9 volts comprises of the two 1½-volt drops and the 6-volt lamp drop to be equivalent to the 9-volt supply source from the battery 278.

In the preferred embodiment of applicants' invention the lamp 290 will remain illuminated for a predetermined time period after the momentary closing of the switch 270. In order to terminate the illumination of lamp 290 at this predetermined time period, applicants utilized the voltage drop of 1½-volts across resistor 284 as a reference for a timing circuit. The voltage drop across resistor 284 forward biases the emitter-base junction of transistor 292. This provides an 8.5-volt source at the collector electrode 294 thereof. Resistor 296 is utilized to protect transistor 292 emitter-base junction in event of a, for example, shorted lamp 290 or an incorrect higher current drain lamp replacement, or if one or more of

the silicon controlled rectifiers, as hereinafter described, are simultaneously triggered into conduction. Thus, transistor 292 becomes a voltage current source at any time that one or more of the silicon controlled rectifiers are triggered.

It will be appreciated that silicon controlled rectifiers 282' and 282'', provide the same function as silicon controlled rectifier 282 for momentary contact of the switch 272 and 274, respectively. Similarly, if resistors 288' and 288'' are similar to resistor 288 and provide the similar function thereof. Lamps 290' and 290'' are similar to lamps 290 and, in conjunction with different colored lenses 293, 293' and 293'', as shown on FIG. 1, can provide a different colored visual signal depending upon which of the momentary contact switches are closed. The following description of the operation of the automatic extinguishment of the lamp 290 also applies to automatic extinguishment of the lamp 290' and 290'' depending upon which of the segments 18, 20 or 22 are impacted by the projectile.

The voltage current source of transistor 292 is utilized to charge capacitor 298 through resistor 300 at RC time constant and voltage level commensurate with the intrinsic standoff ratio established by unijunction transistor 302.

In the preferred embodiment of applicants' invention, the intrinsic standoff ratio of unijunction transistor 302 is about 70 percent to 85 percent of the voltage level present at base 304 of unijunction transistor 302. For the values in the circuit 264 described above, this voltage level is about 8½-volt value, unijunction transistor 302 will conduct starting the discharge of capacitor 298 through emitter-base junction 306 and resistor 308. The voltage developed across the resistor 308 forward biases transistor 310 into a condition of saturation. The instantaneous condition of saturation causes the collector 312 of the transistor 310 to decrease the voltage source to the anodes 314, 314', 314'' of the silicon controlled rectifier 282, 282', and 282'' to about 600 millivolts thus starving out any of the silicon controlled rectifier 282, 282' or 282'' which may have been conducting to thereby terminate the conduction therethrough. With terminated conduction of a silicon controlled rectifier, the voltage across resistor 284 is eliminated.

When capacitor 298 has discharged to about 2 volts, the amount of current to the base 316 of the transistor 310 will have diminished to where the transistor 310 ceases to conduct thereby offering no additional load through resistor 284 with no voltage across resistor 284, transistor 292 is no longer forward biased. Thus transistor 292 ceases conducting, this decreases the voltage at the base 304 of unijunction transistor 302 and allows capacitor 298 to discharge the balance of its charge through the emitter-base junction 306 and resistor 308. The voltage developed across resistor 308 is less than the required voltage at the emitter-base junction of transistor 310 and therefore transistor 310 will not turn on. However, capacitor 298 has sufficiently discharged so that it is in a condition to be reactivated upon the next impact of a projectile upon any of the particular target segments.

The portion of the electrical circuit 264 described above illustrates the automatic lighting and termination of the lighting of the lamp 290, 290' and 290'' to provide the visual signals and termination thereof as desired. Applicants' electrical circuit 264 also provides a unique audio tone depending upon which of the portions of the segmented target 14 are impacted by the projectile. For this condition, with the voltage current source provided by the transistor 292 conducting specifically as a result of the activation of one or more of the silicon controlled rectifiers 282, 282' and 282'', the 8½ volts available at the collector 294 are utilized through a conventional Darlington connected emitter follower as provided by transistors 320 and 322 to provide approximately 7 volts for a current source to the blocking oscillator circuit comprising the primary 324 of a transformer 326, transistor 328, resistor 330 and capacitor 334. Resistor 336 and capacitor 332 provide regenerative decoupling from the current source. This allows the blocking oscillator to operate with minimum distortion and produce a clear audible tone. Resistor 330 and capacitor 334 determine

the particular pitch or tone of the audible sound. Maximum sound is determined by the minimum value of decoupling resistor 336 without distortion. Value changes of resistor 336 will also affect the tone or pitch of the audible signal. The secondary 338 of the transformer 326 is impedance-matched to a permanent magnet speaker 340 from which the sound is emitted. If it is desired to provide different sounds corresponding to each of the segments 18, 20 or 22, it will be appreciated that resistors 342 and 344 where the value of the resistor 342 does not equal the value of resistor 344 may be provided in the circuitry, for example, of lamp 290' and 290''. By providing the resistors 342 and 344, different tones will be provided for each of the segments 18, 20 and 22 impacted by the projectile since there will be a different current demand for each combination of the lamp 290' and resistor 342 or lamp 290'' and resistor 344 and therefore varying the voltage developed across resistor 284 causing the transistor 292 to conduct less or more and thereby provide slight voltage variations to the blocking oscillator circuit for tone changes. These voltage changes at the collector 294 of transistor 292 affect the timing circuit only slightly. The values of resistors 342 and 344 affect the illumination of lamps 290 and 290'' only slightly.

It will be appreciated that the tone signal is automatically terminated at the same time that the visual signal is terminated as described above.

The moving target 16 and its contact portion 242 will the electrode strip 240 is indicated by the switch 276. It will be appreciated that since there is no resilient mounting between the electrode strip 240 and the contact portion 242, the moving target remains in contact with the electrode strip 240 until it is righted by the righting finger 250 as described above and therefore is in contact longer than the momentary contact provided at switches 270, 272 or 274. However, when the contact portion 242 contacts the electrode strip 240 the gate 350 of a silicon controlled rectifier 352 which, for example, may be similar to silicon controlled rectifier 282 and be provided with an anode 354. The trigger voltage and gate current to the gate 350 are developed through the resistor 284, the resistor 286, the closed switch 276, the resistor 356 and the resistance of resistor 358 which replaces the equivalent hot resistance of the lit lamp such as the lamp 290. Since the value of the equivalent resistor 358 is larger than the cold resistance of an unlighted lamp, capacitor 393 shunted across resistor 358 provides an instantaneous lesser impedance load to the silicon controlled rectifier 352 to insure its conduction every time its gate is triggered by the closure of switch 276. For this condition of silicon controlled rectifier 352 conducting, the 6 volts developed across the resistor 358 forward biases transistor 360 into saturation through current limiting resistor 394. The collector 362 of the transistor 360 pulls the base 364 of the transistor 320 down through diode 366 thus rendering the Darlington connected emitter follower comprised of transistor 320 and transistor 322 inoperative negating the voltage current source to the blocking oscillator. The value of resistor 368 is sufficient so that there is insufficient current drawn from the voltage current source provided by transistor 292 to affect the established timing circuit.

The collector 362 of transistor 360 also serves to provide a current path through resistors 370 and 372 establishing them, therefore, as a voltage divider circuit. The voltage developed across resistor 370 forward biases transistor 375 into conduction establishing it as another voltage current source. However, in this event, transistor 375 serves in conjunction with the emitter follower provided by transistor 374 to provide an 8-volt current source to the duck sound simulating circuit described below. The duck sound simulating circuit is comprised of a unijunction relaxation oscillator whose sawtoothed signal at the emitter 376 of the unijunction transistor 378 is supplied to the above-described blocking oscillator circuit through a second Darlington connected emitter follower provided by transistors 380 and 382. This Darlington current amplifier comprised of transistor 380 and 382 provides sufficient decoupling to drive the blocking oscillator circuit

without detracting from the functions of the relaxation oscillator provided by unijunction transistor 376. To insure that capacitor 384 discharges completely and, also, to simulate a slight pause between each "quack," each time capacitor 384 discharges through unijunction transistor 376 and resistor 386, transistor 388 is forward biased into conduction thus causing its collector electrode 390 to provide a discharge path for the balance of the charge on capacitor 384. Capacitor 392 holds transistor 388 in conduction a little longer in order to prevent capacitor 384 from immediately recharging and thus the oscillator recycling. Capacitor 395 provides regenerative decoupling from the 8-volt current source provided by transistor 374.

FIG. 12 illustrates, in schematic diagram form, another electrical circuit useful in the practice of applicants' invention herein. Electrical circuit 500 shown in FIG. 12 is similar to the circuit 264 shown in FIG. 9 with differences as hereinafter set forth. In the circuit 500, which, for convenience will be described as applicable to the embodiment of applicants' invention as shown in FIG. 1, the momentary contact between the segments 18, 20 and 22 of the segmented bull's-eye target 14, and the moving target 16, as represented by the contact portion 242, are indicated schematically on FIG. 12 by the momentary contacts which are 502, 504, 506 and 508, respectively, to indicate contact with the base electrode 34 and 240.

A 9-volt battery 510 is provided to supply the electrical energy for the electrical circuit 500, as well as to power the motor 262. When one of the segments, such as the disc 18, is impacted by a projectile, it is moved to contact the common first electrode 34, thus indicating the closure of the momentary contact switch 502. Closure of the switch 502 triggers the gate 512 of a first silicon controlled rectifier 514. The trigger voltage due to the momentary contact and, consequently, the gate current, are developed through resistor 516 and 518, the cold resistance of lamp 520, comprising the source of visual electromagnetic radiation for the visual signal means 32a. The lamp 520 may be similar to the lamp 290 described above and thus be a 6-volt, 150-milliamper lamp. Thus, the silicon controlled rectifier 514 requires a minimum of 5 milliamperes to remain conductive, the load of the respective lamp 520 is more than adequate to maintain a silicon controlled rectifier 514 in a conducting condition.

In order to turn off the lamp 520, it is necessary to have the silicon controlled rectifier 514 revert to a nonconducting state. This is achieved automatically after a predetermined time period according to applicants' invention herein. This is achieved by utilizing the 1½-volt drop across resistor 516 to forward bias transistor 522 to a conducting condition, thereby providing a current and voltage source at its collector to approximately 8.5 volts. This voltage beings to charge capacitor 524 through resistor 526. When the voltage across capacitor 524 reached the intrinsic standoff ratio rating of unijunction transistor 530, unijunction transistor 530 will begin to conduct discharging capacitor 524 through the emitter-base junction of unijunction transistor 530 and resistor 532. The voltage down from 7.5 volts to 0.6 volts. This instantaneous interruption of voltage to the turned on silicon controlled rectifier 514 will exceed its minimum holding current requirement and, therefore, it will turn off, thereby extinguishing lamp 520. Resistor 521 provides current limiting protection for the base-emitter junction of transistor 522 should, for example, lamp 520 or lamps 520' and 520'' associated with target segments 20 and 22, respectively, become shorted, or be replaced, mistakenly, by a lamp with a larger current rating.

Operation, for contact of the projectile with target segment 20 or 22 to operate visual signal lamp 520' or 520'' is similar to that described above for operation of the lamp 520.

If two silicon controlled rectifiers such as 514 and 514' or 514'' or any dual combination thereof be conducting simultaneously, the voltage drop across resistor 516 increases to approximately 3 volts, thereby leaving 6 volts available to the silicon controlled rectifiers 514, 514' and 514''. The 1.5-volt drop across each of the two conducting silicon controlled

rectifiers 514 and 514', for example, will leave 4.5 volts across each of their respective lamps 520, 520' and 520''. This is sufficient voltage for each lamp to provide reasonable illumination for indication purposes. If all three of the silicon controlled rectifiers 514, 514' and 514'' should be triggered simultaneously, the voltage across each lamp would become 3 volts. It is unlikely that this condition would occur for the intended application or circuit 500.

An audible tone is also produced each time silicon controller rectifier 514, 514' or 514'' is triggered. The current voltage source at the collector of transistor 522 is also applied to a blocking oscillator 550 through resistor 536, emitter-follower transistor 538 and resistor 540. The blocking oscillator 550 is comprised of transformer 542, transistor 544, resistor 546 and capacitor 548. A permanent magnet speaker 552 matched to the secondary impedance of transformer 542 produces the audible sound. Resistor 540 and capacitor 554 provide sufficient regenerative decoupling for a clear tone emitted by speaker 552.

The triggering of silicon controlled rectifier 515, which is associated with the moving target figure 16, produces a ramp-type pulsating sound from the speaker 552. This sound is developed by contact of the electrical contact 242 with the strip 240 to cause silicon controlled rectifier 515 to turn on in a manner as described above. This develops approximately 6 volts across load resistor 560. The voltage developed across load resistor 560 forward biases transistor 562 into saturation through decoupling resistor 564. The collector of transistor 562 pulls the base of emitter-follower transistor 538 down, thus eliminating it as a voltage source to the blocking oscillator 550. The negating of this voltage source provided by transistor 538 allows the 6 volts that is generated across resistor 560 to also operate the relaxation oscillator as a pulsating voltage source to the blocking oscillator 550. The relaxation oscillator is comprised of resistor 570, capacitor 572 and unijunction transistor 574. The ramp-type voltage developed across capacitor 572 is fed to the blocking oscillator 550 through the Darlington connected emitter-follower transistors 576 and 578. The Darlington arrangement provides sufficient decoupling from the demand of the blocking oscillator 550 to allow the voltage developed across capacitor 572 to reach the intrinsic standoff ratio of unijunction transistor 574. Resistor 573 insures that this condition is satisfied.

Since the resistance value of resistor 560 simulates the hot resistance of the lamp, such as lamps 520, 520' and 520'', it is a comparatively high value to insure that the silicon controlled rectifier 515 is triggered on. Therefore, capacitor 580 connected across resistor 560 provides an instantaneous low impedance to insure 515 is turned on when the moving target figure 16 is impacted.

From the above it can be seen that applicant has provided a unique visual and audio signal-emitting target structure for preselected projectiles. Those skilled in the art may find many variations and adaptations thereof and the following claims are intended to cover all such variations and adaptations falling within the true scope and spirit.

We claim:

1. An indicating target arrangement of the type emitting predetermined signals upon impact by preselected projectiles comprising, in combination:

- a substantially flat, platelike means having a substantially flat inner surface, and an outer surface;
- a segmented target comprising a first segmented member mounted on said platelike means for movement relative thereto and having an inside face adjacent to and spaced a preselected distance from and electrically insulated from said inner surface of said platelike means in a first position, and an outside surface for impact by the preselected projectiles, and said first segmented target moving from said first position toward said platelike means to a second position for the condition of impact of the preselected projectile on said outer face of said segmented target;

resilient mounting means coupled to said first segmented target and said platelike means for resiliently mounting said segmented target on said platelike means for yieldingly, resiliently resisting said relative movement of said segmented target toward said platelike means from said first position to said second position, and for resiliently restoring said segmented target to said first position from said second position;

electrically conductive projection means intermediate said inner surface of said platelike means and said inside face of said segmented target and coupled to one of said platelike means and said segmented target, and positioned to engage a predetermined portion of the other of said platelike means and said segmented target in said second position, and to be spaced therefrom in said first position;

electrically conductive contact means coupled to said preselected portion of the other of said platelike means and said segmented target means for providing electrical continuity with said electrically conductive projection means in said second position;

a plurality of moving target figures for movement in a preselected direction at a predetermined velocity and spaced from said outside face of said segmented target, and having an electrically conductive contact member, and movable for the condition of said moving target figure impacted by said preselected projectile from a first or upright position to a second or down position;

an electrically conductive strip means intermediate said outside face of said segmented target and said plurality of moving target figures, and spaced from said electrically conductive contact member of said plurality of moving targets and electrically insulated therefrom for said moving target figures in said first position, and said electrically conductive strip means in contact with said electrically conductive contact member of said plurality of moving target figures for said moving target figures in said second position;

means for moving said plurality of moving target figures in said preselected direction of said predetermined rate; and means for restoring said moving target figures from said second position to said first position; and a source of electrical energy;

first information signal generating means for generating a first information signal for said first segmented member of said segmented target in said second position;

first indicating signal generating means for receiving said first information signal and generating a first indicating signal in response thereto; and

termination means for automatically terminating said first indicating signal a predetermined time interval after commencement thereof.

2. The arrangement defined in claim 1 wherein said electrical circuit further comprises:

second signal generating means for receiving said first information signal and generating a second indicating signal, different from said first indicating signal in response thereto; and

said terminating means further comprising means for automatically terminating said second indicating signal at said predetermined time interval after commencement thereof.

3. The arrangement defined in claim 2 wherein said first indicating signal is a visual signal and said second indicating signal is an audio signal.

4. The arrangement defined in claim 3 wherein said electrical circuit further comprises:

second information signal generating means for generating a second information signal for at least one of said plurality of moving target figures in said second position;

third indicating signal generating means for receiving said second information signal and generating a third indicating signal in response thereto and said third indicating

signal different from said first and said second indicating signals; and

said terminating means further comprising means for automatically terminating said third indicating signal said preselected time interval after commencement thereof.

5. The arrangement defined in claim 4 wherein said plurality of moving target figures are in the form of ducks, and said third indicating signal is a cyclically repeating audio signal having a first frequency at the commencement thereof and a second frequency lower than said first frequency at the end thereof, and a silent period between repetitions thereof during said predetermined time interval.

6. The arrangement defined in claim 1 wherein:

said segmented target means further comprises:

said first segmented member comprising a circular disc having an outer peripheral edge portion;

a second segmented member comprising an inner annular ring member concentrically mounted with said disc and electrically insulated therefrom and having an inner peripheral edge portion spaced from said outer peripheral edge portion of said disc, and an outer edge portion; and

a third segmented member comprising an outer annular ring concentrically mounted with said disc member and said inner annular ring, and having an inner peripheral edge spaced from said outer peripheral edge of said inner annular ring, and an outer peripheral edge;

said electrical circuit further comprising:

said first information signal generating means comprising means for generating said first information signal for any of said first segmented member, second segmented member and said third segmented member in said second position;

said first indicating signal generating means comprising: means for generating a first visual signal for said disc in said second position;

means for generating a second visual signal different from said first visual signal for said second segmented member in said second position; and

means for generating a third visual signal different from said first visual signal and said second visual signal for said third segmented member in said second position;

second signal generating means for receiving said first information signal and generating an audio signal in response thereto, and said audio signal having a first frequency for the condition of said first segmented member in said second position, a second frequency for the condition of said second segmented member in said second position, and a third frequency for the condition of said third segmented member in said second position.

7. The arrangement defined in claim 6 wherein said first, said second and said third frequencies of said audio signal are different from each other.

8. The arrangement defined in claim 7 wherein:

said plurality of moving target figures are in the shape of ducks;

said electrical circuit further comprises:

second information signal generating means for generating a second information signal for at least one of said plurality of moving targets in said second position; and third indicating signal generating means for generating a third indicating signal different from said first and said second indicating signals; and

said third indicating signal is a cyclically repeating audio signal having a first frequency at the commencement thereof and a second frequency lower than said first frequency at the end thereof and a silent period between repetitions thereof; and

said termination means further comprises means for automatically terminating said third indicating signal at said preselected time interval after commencement thereof

and said third indicating signal having a plurality of repetitious cycles thereof during said predetermined time interval.

9. The arrangement defined in claim 6 wherein said projection means comprises rim means coupled to said outer peripheral edges of said first, said second and said third segmented members. 5

10. The arrangement defined in claim 6 wherein said projection means comprises a plurality of rivetlike members extending through said platelike means from said outer surface and having a contact portion intermediate said inner surface of said platelike means and said inside face of each of said first and said second and said third segmented members. 10

11. The arrangement defined in claim 6 wherein said projection means comprises a plurality of dimples in said platelike means. 15

12. The arrangement defined in claim 1 wherein said platelike means and said first segmented member are electrically conductive and said resilient mounting means comprises: a plurality of mounting members extending through said platelike means and coupled to said first segmented members for positioning said first segmented member, said 20

preselected distance from said platelike means; means for electrically insulating said mounting member from said platelike means; and

a resilient member intermediate said inner surface of said platelike means and said inside face of said first segmented member and adjacent said mounting member.

13. The arrangement defined in claim 12 wherein said resilient member comprises an electrically insulating pad means.

14. The arrangement defined in claim 12 wherein said resilient member comprises an electrically insulating spring means.

15. The arrangement defined in claim 12 wherein said mounting member comprises a screw and said screw threadingly engages said first segmented member.

16. The arrangement defined in claim 12 wherein said mounting member comprises a bolt having a head frictionally engaging said outside surface of said first segmented outer surface of said platelike means and electrically insulated therefrom.

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