Aug. 20, 1963 J. E. WILLIAMS 3,101,198

AUTOMATICALLY SCORING DART BOARD

Filed Oct. 4, 1961 2 Sheets-Sheet 1

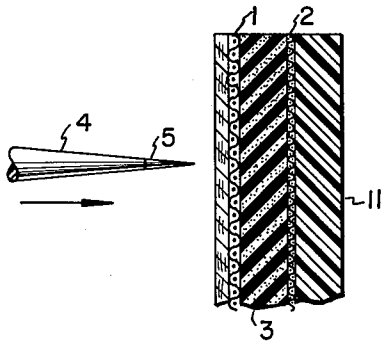


FIG. 1

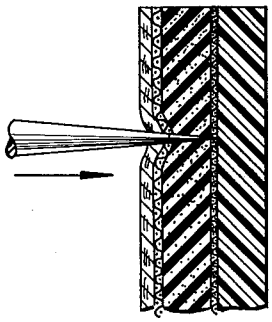


FIG. 2

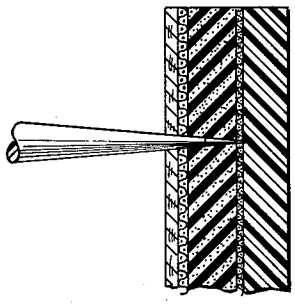


FIG. 3

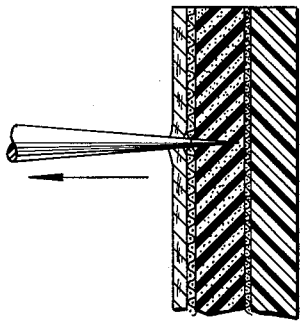


FIG. 4

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AUTOMATICALLY SCORING DART BOARD

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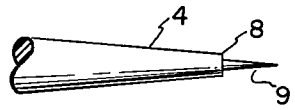


FIG. 5

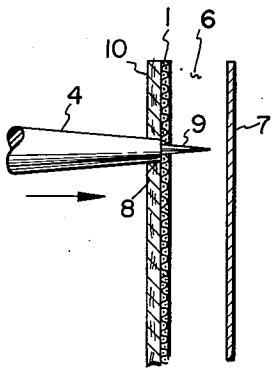


FIG. 6

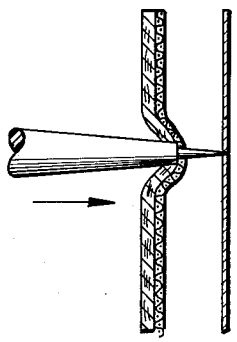


FIG. 7

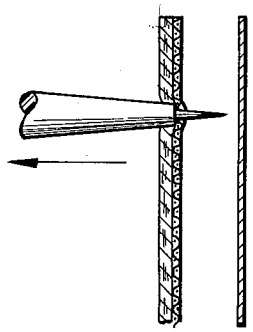


FIG. 8

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AUTOMATICALLY SCORING DART BOARD

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This invention relates to an automatic scoring target board for darts and similar missiles which do not penetrate entirely through the target.

The problem of an automatic scoring target presents several requirements. The first requirement is that there must be a reliable indication, usually electrical, when a missile strikes a target. The second requirement is that after a missile has struck the target the signal should be extinguished so that it can register again when the next missile strikes. The third requirement which applies only to targets in which the missile remains in the target is that there shall not be another indication when a missile is removed from a target.

The problem for targets which are to be used with fire arms and in which the bullet passes entirely through the target was solved a half century ago. Such a target is described in U.S. Patent 474,109. The target was provided with two spaced conducting surfaces with insulation between them. The spacing was less than the length of a bullet. Thus, when struck by a bullet as the bullet penetrated the target for a brief instant it was in contact with both conducting layers and an electrical signal was obtained permitting electrical indication or for any other purpose such as scoring for which an electrical signal may be used. The second requirement was, of course, automatically met because the bullet passed entirely through the target and so the electrical contact was immediately broken and the target was set for the next bullet. The third requirement of preventing a signal when a missile is removed from the target, of course, did not arise.

The present invention deals with targets for missiles which remain in the target such as darts, arrows and the like. It will be described more specifically in connection with the use of darts for which targets the invention is very well suited. Essentially in the present invention there are two conductive surfaces as in the old targets but they are of quite a different nature. The first surface is a resilient mesh with sufficiently large meshes so that the tip of the dart or arrow can pass through them. As more of the dart penetrates and its cross-section increases the mesh is moved inwardly. Finally the metallic tip strikes a second conducting layer which may also be of mesh although this is not essential in all modifications of the invention. What is essential, in addition to the obvious limitation that the meshes of the first conducting layer must be sufficiently small so that at some point the tip of the dart can no longer pass, is that the first conducting mesh must be resiliently mounted. This may be the resilience of the mesh itself or both conducting layers may be mounted in a suitable elastic substance such as a foamed elastomer. The second essential is that the projectile must have a metallic section at its tip shorter than the spacing between the conducting layers but sufficiently long so that when the first mesh is bent inwardly as the dart strikes, the target contact is made. While before use the darts or other projectiles on the target are separate, they combine and coact when the missile strikes the target. In other words, the present invention is not useful with a dart which is all metallic or with a dart which does not have a long enough metallic section at its tip to make contact when the first mesh is sprung momentarily inward.

The present invention makes signals whenever the target is struck momentarily with a proper kind of missile. The signal ceases immediately as the first mesh springs

out and, of course, when the dart or other missile is withdrawn, no signal is produced.

It should be understood that the present invention is useful in all designs of targets. Thus, for example, in certain targets where it is desired to signal any hit on the target the two conductive surfaces extend over the whole of the target and the signal produced when a dart strikes does not tell what part of a target is struck. Other targets are in the form of bull's-eyes with concentric rings. The present invention is suitable for this type of target also but, of course, the conductive surfaces must then be broken up into annular pieces with separate electric circuits so that a signal is given which will tell what part of the target is struck. Obviously, of course, the features of the present invention are not concerned with the shape of the target and perform equally well with all shapes.

The invention will be described in greater detail in conjunction with the drawings in which:

FIGS. 1 to 4 are cross-sections of a target at various stages as a dart strikes the target, penetrates, comes to rest and is withdrawn;

FIG. 5 is a section through a different form of dart, and

FIGS. 6 to 8 represent cross-sections of a target as it is struck by the dart of FIG. 5, immediately thereafter and as the dart is removed.

In the modifications shown in FIGS. 1 to 4 a portion of a target is shown in cross-section with relatively wide mesh conductive layer **1**, a second conductive layer or mesh **2** which may preferably be of finer mesh, both imbedded in an elastic material **3** and supported by a backing **11** of plastic, cork board or other strong firm material. This material may be a foamed elastomer which gives readily under pressure but which is sufficiently strong to retain its general form and shape. The dart has a body portion **4** and a metallic or other conducting tip **5**. In FIG. 1 the dart is shown just before it strikes the target, arrows of course indicating direction of motion. The metallic tip **5** is shorter than the normal spacing between the wire meshes **1** and **2**. The body of the dart is, of course, a nonconductor or it may be a conductor with an insulated section between it and the conductive tip. While it is essential that the metal tip **5** be shorter than the normal distance between the two wire meshes it should not be a great deal shorter. This will become apparent in FIG. 2 where the dart is shown as it penetrates into the target. It will be seen that it bends inwardly the wire mesh **1** because the meshes are sufficiently small so that there is a considerable amount of friction as the tip passes through the mesh. When so bent it will be seen in FIG. 2 that the spacing between the two meshes becomes less than the length of the metallic tip **5** and a momentary contact is made between the two conductive layers. An electrical signal is produced which actuates the desired elements such as scorer and the like. Since the signal is treated in exactly the same way as the signal in other indicating targets for bullets and is not in any way changed by the present invention the processing circuits are not shown.

After the dart has completely penetrated the target as is shown in FIG. 3 the first mesh moves to its original position. Now there is no longer any contact between the two meshes and so the signal does not continue. At the end of a game the darts have to be removed which is shown in FIG. 4. Now the movement of the dart is outward and to the extent that mesh **1** is moved at all is moved away from the other mesh and so no contact results and there are no false signals or false scoring as the darts are removed.

The darts used on the targets of FIGS. 1 to 4 are quite cheap and for many uses the target presents economic

advantages. However, it does not have an indefinite life. After long use the meshes or circumference of the meshes of the first wire mesh 1 may gradually enlarge to the point where there will not be sufficient friction as the dart passes through to bend the mesh sufficiently to make contact. When this occurs the target is worn out. It has a satisfactory life but the life is not indefinite. FIGURES 5 to 8 illustrate a different modification in which the life of the target is much longer, almost indefinite, but the dart construction is somewhat more elaborate which adds to the cost. It will be seen that the first mesh which is shown in FIGS. 6 to 8 which bears the same reference numeral as in the earlier figures is no different. However, instead of relying on the enlarging cross-section of the dart as it passes through the dart 4 is provided with a shoulder 8 and metallic tip 9, the conducting tip extending over the shoulder. The shoulder is large enough so that it cannot pass through the meshes of mesh 1. As a result the mesh 1 is bent in when the dart first strikes as is shown in FIG. 6 but the shoulder does not pass through the mesh. The second conducting layer 7 need not be a mesh. It can be any conducting material, for example, an elastomer with conducting property such as conducting rubber. The space between the two meshes may be air as is shown in FIGS. 6 to 8 at 6 or, of course, a foamed elastomer may be used as in FIGS. 1 to 4.

After the energy of the dart is spent the resilience of the mesh 1 causes it to resume its original position pulling the dart slightly back. This is shown in FIG. 8, again with the arrow indicating the direction of motion. The tip now no longer makes contact with the second surface 7 and the signal is extinguished. It is self-evident from a consideration of FIG. 8 that when the dart is removed no signal can be produced.

In order to protect the target from darts falling out, as they might if the surface of the target were the mesh itself, there is preferably a layer of rubber or other elastomer 10 so that the dart will be held in the target even after its force is spent as shown in FIG. 8. This elastic material closes up the hole when a dart is removed as is usual with soft elastomers. Since the shoulder 8 strikes the meshes on their wires there is no tendency to enlarge the meshes as is in the case with the modification shown in FIGS. 1 to 4. Therefore, there is no possibility of the meshes being enlarged to the point where a dart will go completely through them.

Use of the modification of dart form in FIGS. 5 to 8 also permits somewhat wider choice of the first conductive surface. Mesh is still desirable as it is the cheapest and simplest form but the very fine tip of the target shown in FIG. 6 makes it possible also to use a conductive rubber layer which is punctured, the shoulder having sufficient bearing surface to push in the conductive layer.

Reference has been made above to the fact that the present invention does not change the nature of the indication which is produced when a missile strikes the target. In this respect the indicating, recording or scoring means which have been used in the past are usable without any change. When a cumulative scoring indication is employed the short duration of the electrical signal makes no difference. However, in certain simpler targets where only an indication is employed it has sometimes been found desirable in the past, particularly with

targets for bullets where the contact is even shorter, to provide some kind of a delay mechanism so that a signal will remain on sufficiently long to be readily perceived. It is obvious, of course, that a similar instrumentality may be included in recorders or scorers which utilize the features of the present invention. It is an advantage of the invention that the signal produced is suitable for any of the known types of indicators and scorers.

I claim:

1. A target and missile game in which the missiles do not pass through the target comprising in combination,

(*a*) a target having two spaced conductive layers the first being resiliently mounted and capable of being bent in momentarily when struck by a missile, and

(*b*) missiles provided with conductive tips, the adjacent portion thereto being nonconductive, the entire length of the conductive tip being less than the normal spacing between the conductive layers of the target, means to prevent the nonconductive adjacent portion from passing through the target whereby contact is made between the layers through the conductive tip when the missile bends in the first layer on striking and contact is broken when the first layer returns to its normal position.

2. A target and missile game according to claim 1 in which the first conductive layer is separated from the second conductive layer by an air space.

3. A missile and target game according to claim 1 in which the first conductive layer is separated from the second conductive layer by a layer of resilient elastomer capable of deforming readily under the force of the striking missile to move the first conductive surface nearer to the second conductive layer.

4. A missile and target game according to claim 3 in which the elastomer layer is foamed elastomer.

5. A missile and target game according to claim 1 in which the first conductive layer is wire mesh embedded in an elastomer.

6. A missile and target game according to claim 5 in which the missiles have a conducting tip and body of increasing cross-section and the normal mesh of the first conductive layer is less than the maximum cross-section of the conductive tip of the missile whereby as the missile penetrates the mesh there is sufficient friction to carry the mesh with the missile a sufficient distance to effect momentary contact of the missile tip with the second conductive layer.

7. A missile and target game according to claim 1 in which the missiles have a conductive tip and a shoulder of much greater cross-section than the tip and the first conductive layer is penetrable by the tip but not penetrable by the shoulder.

8. A missile and target game according to claim 7 in which the first conductive layer is wire mesh with meshes of greater cross-section than the missile tip but less cross-section than the shoulder.

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