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Gothard, Jr. et al.

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[45] **Nov. 4, 1975**

[54] **RADIO CONTROLLED SURFACE TARGET**

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[21] Appl. No.: **520,786**

[52] **U.S. Cl.**..... **273/105.2**; 280/1.1 R; 296/31 R; 273/DIG. 7; 273/DIG. 8

[51] **Int. Cl.**[2]..... **F41J 9/02**

[58] **Field of Search**..... 273/85 R, 105.2, 105.6; 46/219, 223, 243 LV, 243 MV, 244 B; 280/1.1 R; 296/31 R, 31 A

[56] **References Cited**

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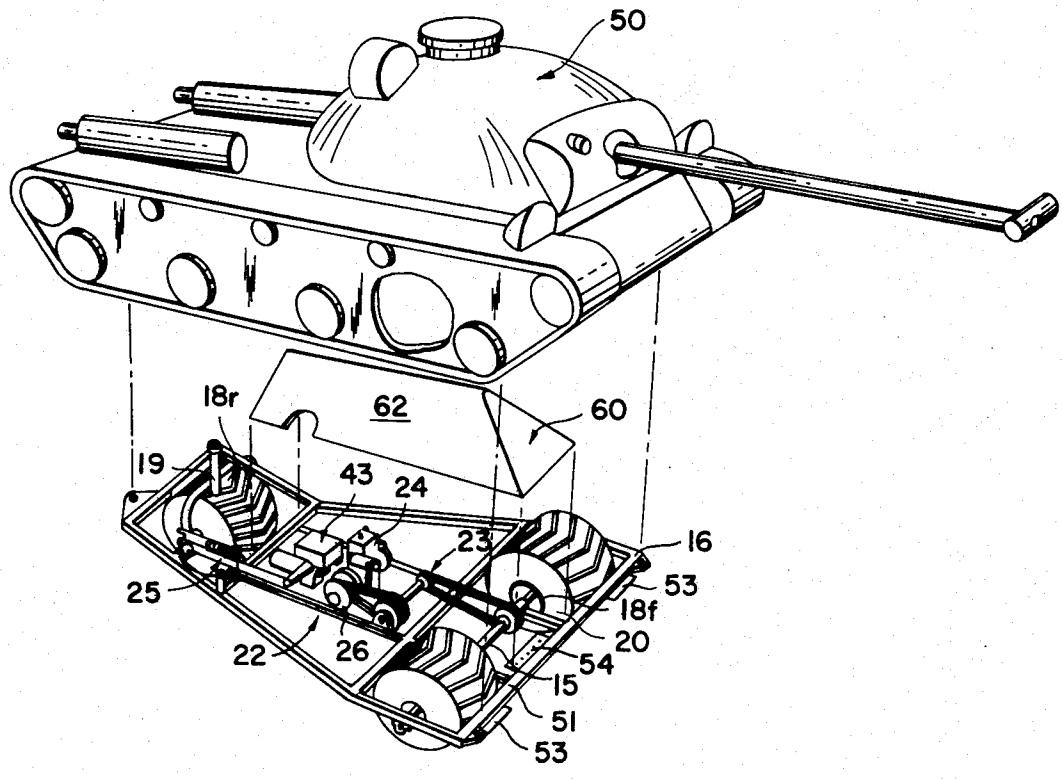
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[57] **ABSTRACT**

The application describes a ground target having replaceable or interchangeable envelopes or bodies for a single frame or chassis. These bodies are preferably made of a lightweight material such as polyurethane foam or foamed fiberglass, and upon being damaged or destroyed can be easily replaced. The target is remotely controlled by a radio link which permits evasive movement as well as a realistic simulation of actual ground vehicles. An armored shield is mounted on the frame under the envelope and protects the running gear and receiving and control means from damage by weapons. High flotation tires can be provided to enable operation of the target on soft surfaces.

10 Claims, 6 Drawing Figures



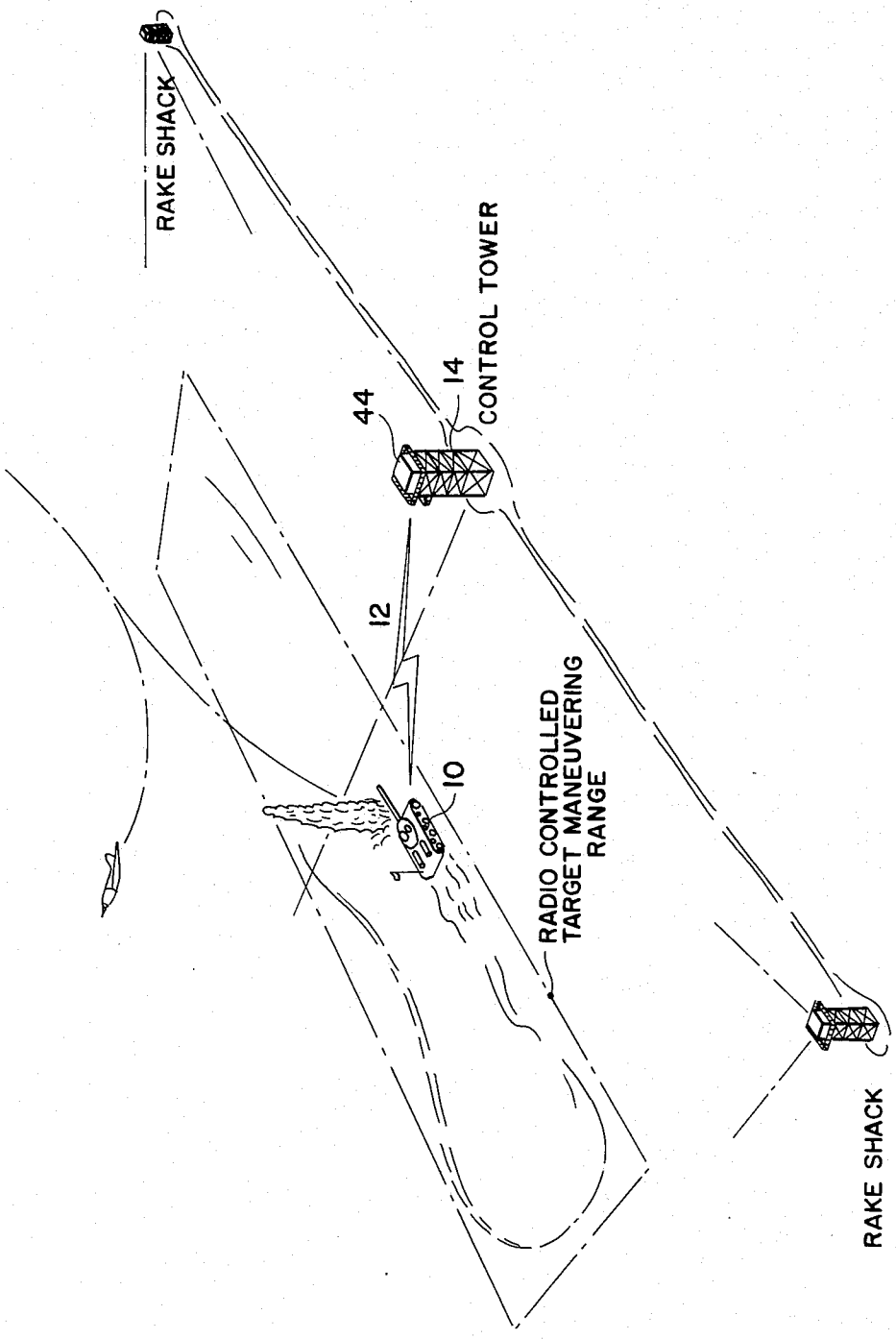

RAKE SHACK
CONTROL TOWER
14
44
12
10
RADIO CONTROLLED
TARGET MANEUVERING
RANGE
RAKE SHACK

FIG. 1

FIG. 2

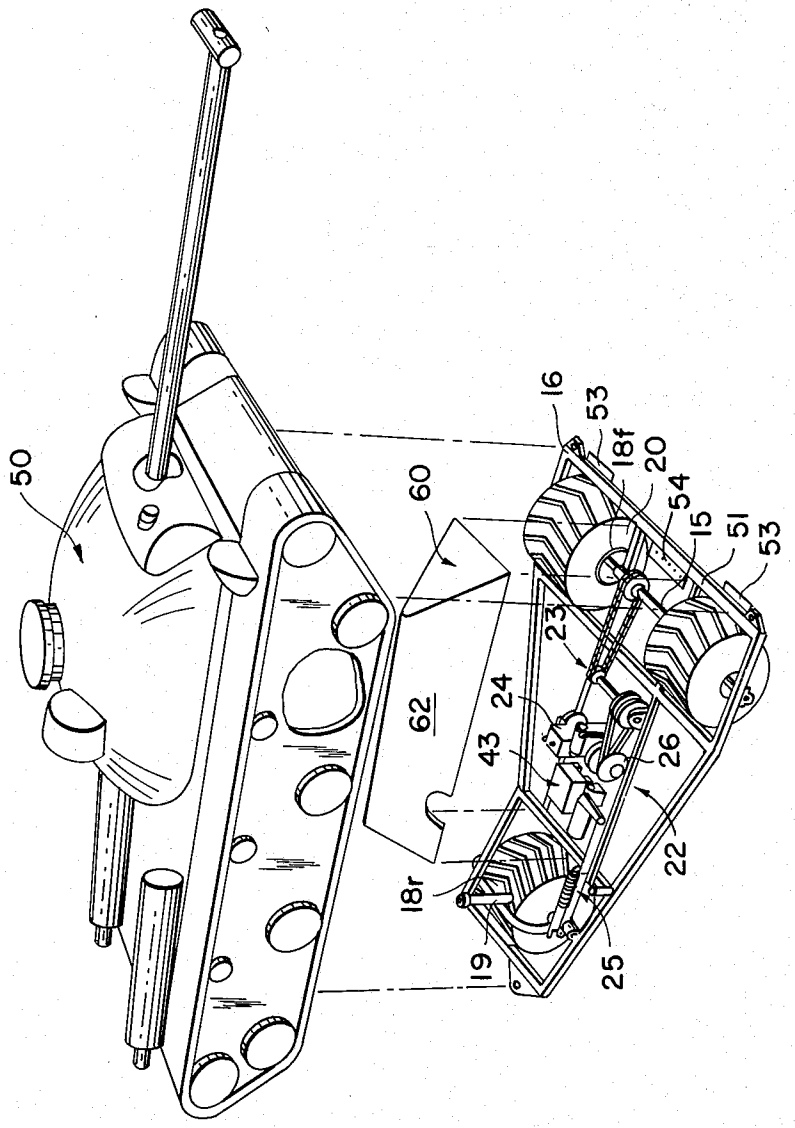


FIG. 4

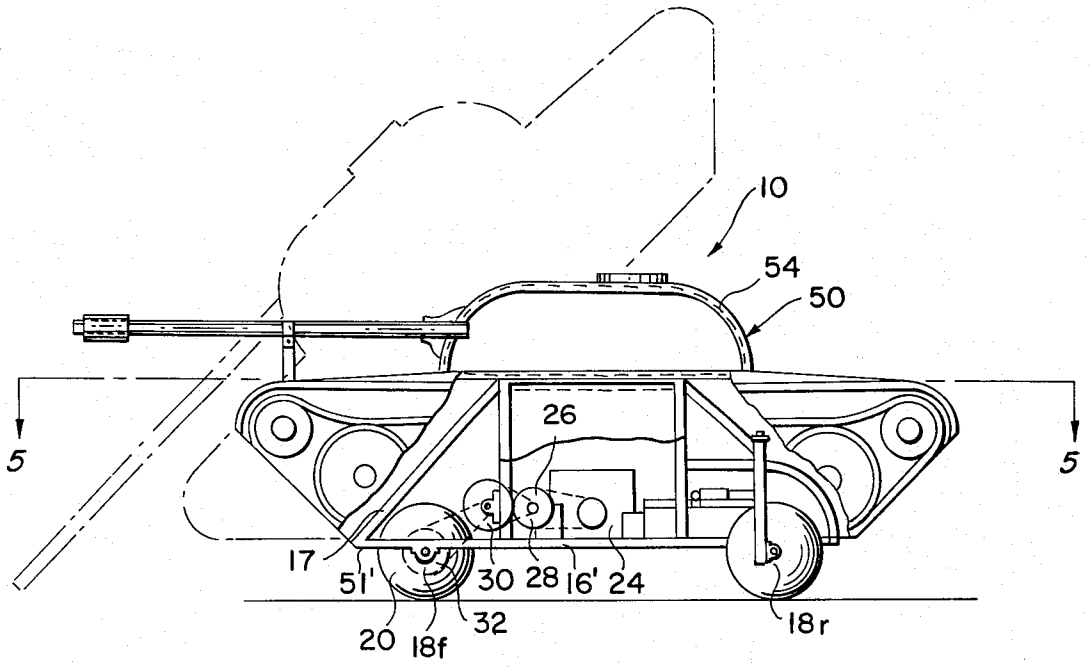
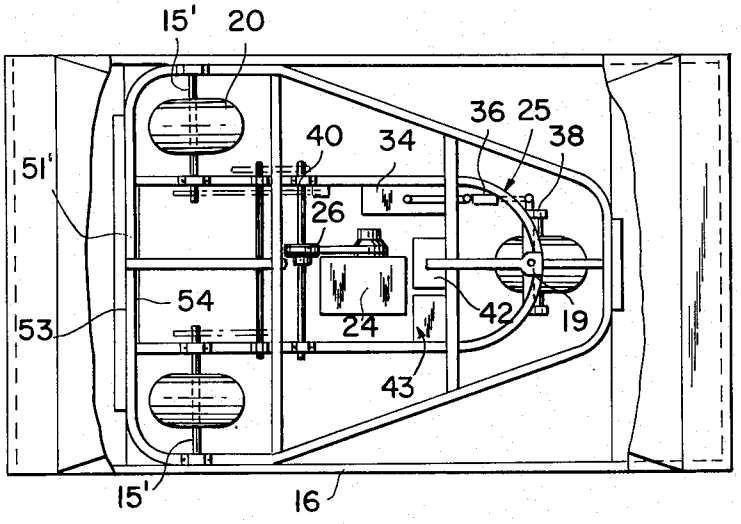

10
54
50
26
5
5
17
51'
30
28
16'
24
32
20
18f
18r

FIG. 5


15'
20
36
25
38
40
34
51'
26
54
53
24
42
19
43
15'
16

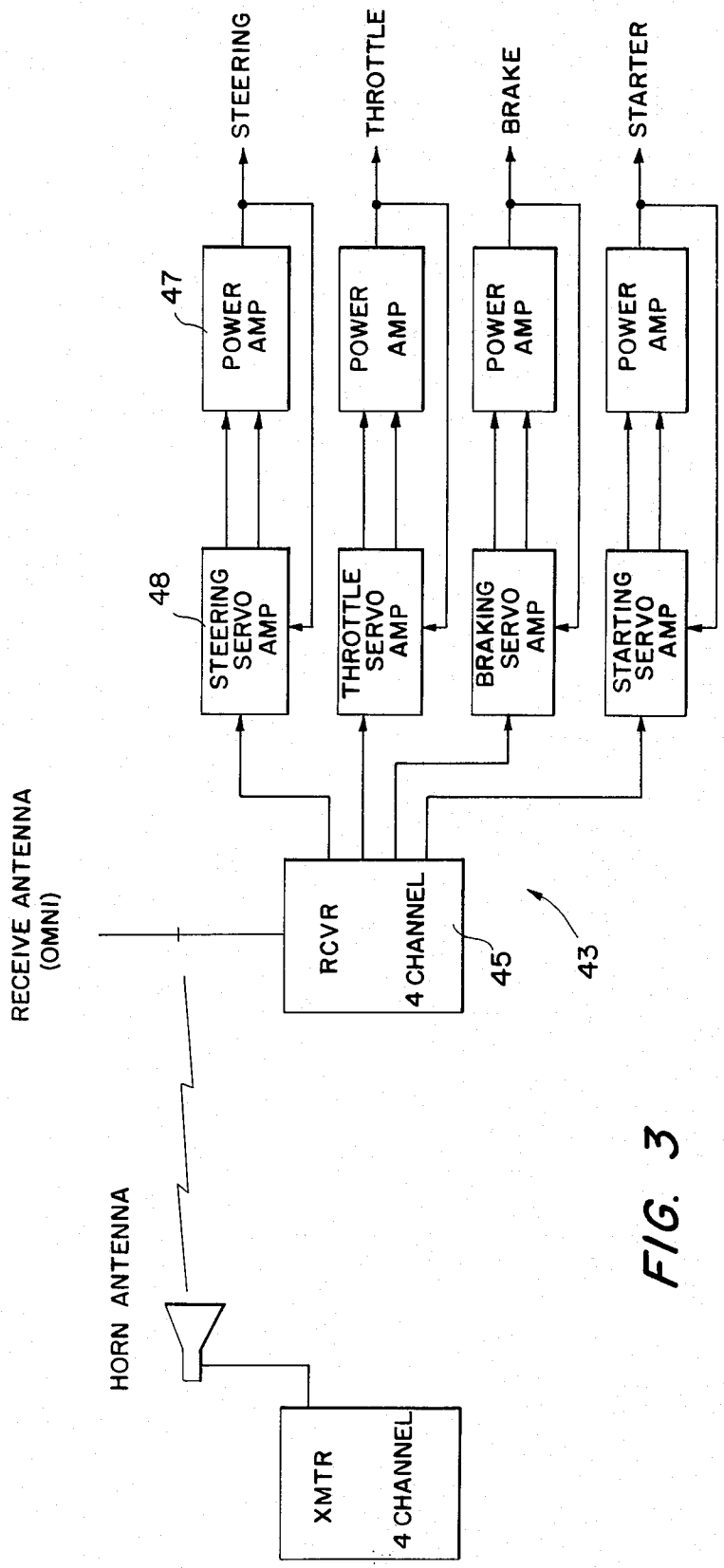

STEERING
THROTTLE
BRAKE
STARTER
47
POWER AMP
POWER AMP
POWER AMP
POWER AMP
48
STEERING SERVO AMP
THROTTLE SERVO AMP
BRAKING SERVO AMP
STARTING SERVO AMP
RECEIVE ANTENNA (OMNI)
RCVR
4 CHANNEL
45
43
HORN ANTENNA
XMTR
4 CHANNEL

FIG. 3

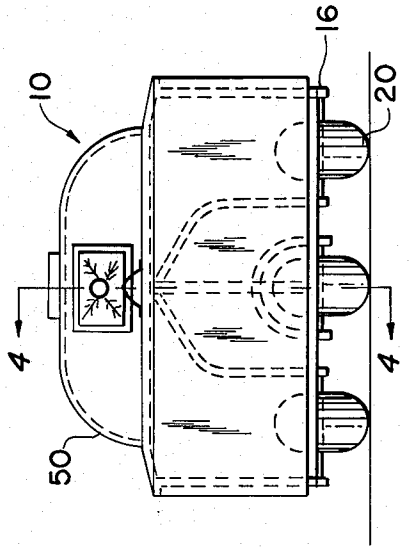

10
16
20
4
4
50

FIG. 6

RADIO CONTROLLED SURFACE TARGET

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a radio controlled surface target and more particularly to a remotely guided moving target meant to give a realistic simulation of various threats for air-to-ground and ground-to-ground weapons training and evaluation.

2. Prior Art

A requirement exists in the government inventory of training devices for a low-cost, realistic moving target for air-to-ground and ground-to-ground weapons delivery training. Typically prior art targets are surplus vehicles modified for remote control operation. Particular problems with these targets include the initial high cost, the difficulty in obtaining spare or replacement targets, the high labor maintenance cost, the heavy weight of the vehicles and poor fuel economy.

Further, where the armored targets are used it is difficult to score hits and misses satisfactorily and requires that a large number of people be employed on the weapons range to evaluate performance during training and testing missions.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of this invention to provide a new and improved target.

It is a further object to provide a new lightweight, low-cost, interchangeable, frangible moving target which can preferably be operated on any air-to-ground weapons range.

Another object of this invention is to provide a realistic remote control moving target.

A still further object of this invention is to provide a remote control target having replaceable bodies made of a lightweight destructible material.

Yet another object of this invention is to provide a target having an armored shield positioned under the body which is designed to protect the frangible target components from damage caused by weapon impact or explosion.

Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part, will be obvious from the description or may be learned from practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

To achieve the foregoing objects and in accordance with the purpose of the invention as embodied and broadly described herein, there is provided a ground target for simulating moving ground vehicles which includes a frame having wheels disposed thereon, running gear affixed to said frame for operating and maneuvering said target, and means disposed on said target for receiving radio signals and controlling said running gear, in which an improvement comprises a lightweight, interchangeable, frangible target envelope formed in the shape of a ground vehicle affixed to said frame, and an armored shield positioned on said frame under said target envelope and defined to cover said running gear and said receiving and controlling means, thereby protecting said running gear and said receiving and controlling means from damage by weapons.

Further, there is provided a ground target for simulating moving ground vehicles which includes a frame having wheels disposed thereon, running gear affixed to said frame for operating and maneuvering said target, and means disposed on said target for receiving radio signals and controlling said running gear, in which an improvement comprises an armored shield positioned on said frame and designed to cover said running gear and said receiving and controlling means, thereby protecting said running gear and said receiving and controlling means from damage by weapons, and a series of lightweight, interchangeable, frangible target envelopes formed in the shapes of ground vehicles, each of said envelopes being designed to be affixed to said frame and cover said armored shield.

Preferably, the target envelope includes means for making the target envelope radar reflective.

It is also preferred that the target envelope is selected from the group of materials consisting of polyurethane foam and foamed fiberglass.

The invention consists in the novel parts, constructions, arrangements, combinations, and improvements shown and described. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one embodiment of the invention, and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing the use of the present invention for air-to-ground weapons delivery training;

FIG. **2** is an exploded, perspective view of the present invention;

FIG. **3** is a front view of another embodiment of the present invention;

FIG. **4** is a cross-sectional view taken along lines **4—4** of FIG. **3**;

FIG. **5** is a cross-sectional view taken along lines **5—5** of FIG. **4**; and

FIG. **6** is a block diagram of the means for receiving radio signals and controlling said running gear.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the present preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings.

Referring now to FIG. **1**, it may be seen that a target **10** is desirably moved above a range, here shown as an open flat space so as to provide a realistic training device. Target **10** is radio controlled on the target range by radio signals **12** transmitted by a control tower **14.**

As shown in FIGS. **2–5,** the target **10** for simulating moving ground vehicles in its preferred embodiment comprises a frame or chassis **16** having wheels **18** disposed thereon, running gear **22** affixed to said frame **16** for operating and maneuvering the target **10,** and means for receiving radio signals and controlling the running gear **43.** The frame **16** utilizes a solid axle **15** to mount the front wheels **18***f* and a wishbone fork **19** to mount the rear steering wheel **18***r*. Although a three-wheel target vehicle is illustrated, a four-wheel vehicle or the like may also readily be used to accomplish the objects and advantages of the present invention.

Referring now to FIGS. **3–5,** a modified frame **16'** has a raised rigid cage **17** to provide additional struc-

tural support and rigidity. The modified frame **16'** includes split axles **15'** to mount the front wheels **18***f* and the wishbone fork **19'** is used to mount the rear steering wheel **18***r*. Other minor structural variations appear between the frames **16** and **16'** of FIG. **2** and FIGS. **3–5,** respectively, however, these variations are not important in accomplishing the objects and advantages of the present invention.

As here embodied, and best seen in FIGS. **2–6,** running gear **22** operates and maneuvers the target **10** and includes the conventional elements of a drive train **23** having an engine **24** for driving the wheels **18** at variable speeds, a steering mechanism **25,** a disc brake **40** for stopping the target **10** and a battery **42** for starting the drive train engine **24.** Typically, the drive train **23** uses a small industrial internal combustion engine **24** which is chain-connected to a transmission **26** and to a series of sprockets **28, 30,** and **32** so as to provide power to the wheels **18.** A suitable engine **24** is a Tecumseh **10** horsepower engine which provides sufficient power to propel the target in excess of speeds of 20 miles per hour and provides economy better than 50 miles per gallon. A battery driven electric motor may also be used as the prime mover in the drive train **23.**

The transmission **26** is preferably a torque sensitive variable speed automatic transmission to provide great flexibility in range and speeds of the target. The steering mechanism **25** is a "tiller" type device and comprises an actuator **34** which is connected through a shock absorber **36** to rear wheel shaft **38.** Displacement of actuator **34** correspondingly rotates the rear wheel in the appropriate direction. The battery **42** is electrically connected to a motor starter (not shown) to provide engine starting. The hardware and components of the running gear **22** are well known in the art of "golf cart" technology, and are not considered a part of this invention.

As may be seen in FIG. **6,** the means **43** for receiving radio signals and controlling the running gear preferably uses conventional, commercial electronics. A transmitter **44** is located at radio control tower **14** and a receiver **45** is mounted on the frame **16** of the target vehicle. Both the transmitter **44** and receiver **45** can be commercially available remote control units routinely used by hobbyists and the like in controlling model airplanes, boats and cars. This relatively inexpensive remote-control equipment, coupled with a high gain horn antenna at the transmitter **44** can provide a sufficient gain for operation of targets over a mile away.

As embodied herein means **43** provides the function of remote steering, remote throttling, remote starting and remote braking. As illustrated in more detail in FIG. **6,** each remote control function of steering, throttling, starting and braking preferably includes receiver **45,** power amplifier **47,** servo amplifier **48** and prime mover (not shown). Typically, the prime mover actuates a mechanical actuator (not shown) or the like, the position of which is controlled by a position feedback pot situated between an upper and lower range adjustment device. In this manner, the running gear **22** for operating and maneuvering the target **10** is remotely controlled by radio signals. The components of the receiving and controlling means **43** are well known in the electronics art, and are not considered to be a part of this invention.

In accordance with the invention and turning once again to FIG. **2,** a lightweight, interchangeable, frangible target envelope **50** is formed in the shape of a ground vehicle and an armored shield **50** is positioned under the envelope **50** which is designed to protect running gear **22** and means **43** from damage caused by weapon impact or explosion. The envelope **50** and shield **60** are both affixed to a cross brace **51** of frame **16** by suitable mechanical means as hinges or the like. The envelope **50** which is replaceable, is expected to become damaged or destroyed during target practice and is preferably an inexpensive component of the target **10.** The rest of the target **10,** however, in particular, apparatus such as the engine **24,** transmission **26,** drive train **23,** steering mechanism **25,** controlling and receiving means and the like are relatively expensive and are protected from damage by use of the armored shield **68.**

In accordance with the invention, a series of interchangeable, frangible target envelopes **50** may be formed in the shapes of ground vehicles. Each of the envelopes are designed to be affixed to the frame **16** and cover the armored shield **60.** This series of envelopes provides a readily accessible source of replaceable envelopes to replace those envelopes damaged or destroyed by weapons.

In the preferred construction, the material for the target envelope **50** is selected from the group of materials consisting of polyurethane foam and foamed fiberglass. Other suitable materials also may be utilized, provided they are low cost, lightweight, and frangible in that the material can absorb multiple weapons projectile penetrations with a minimal loss of structural strength. Further, the materials should be easily repairable, simple to fabricate, and have the ability to be fabricated with tools having a low initial cost.

A suitable material with which to construct the envelope **50** is a 4 lb. per cubic foot polyurethane foam which is "blown" into a mold. Preferably, the envelope will be constructed in two symmetrical halves. The envelope structure **50** may also be scaled to size so as to be larger or smaller than the actual target which is simulated. In this manner, the target **10** may be constructed to a preferred size in order to provide realistic range training as well as facilitate storage and transportation of the target **10.** The target envelope shapes include, without limitation, tanks, armored cars, trucks, missile carriers, and armored personnel carriers.

Preferably, the target envelope includes means for making the target radar-reflective. As here embodied, and best seen in FIG. **4,** the target envelope includes a hardware mesh **54** such as one-quarter inch hardware mesh, which is embedded in the target envelope at time of manufacture. This mesh **54** also adds structural strength. Red pigment may also be added to the target material foam to provide a maintenance-free, highly visible target.

As best illustrated by the dotted line in FIG. **4,** the target envelope **50** is affixed to the cross brace **51'** of the frame **16'** by mechanical means such as piano hinges **53** to provide quick easy access to the running gear **22** and the receiving and controlling means **43.** Further, the symmetrical half structure of the envelope allows a simple two-man assembly or disassembly of the target envelope **50** in the field which may be easily accomplished by using standard hand tools.

In accordance with the invention and as best illustrated in FIG. **2,** the armored shield **60** is positioned under the target envelope and covers the running gear,

together with the receiving and controlling means **43.** This shield is of selected standard armored plate well known to those skilled in the art, and provides protection to the above components from damage by weapons. As embodied herein, the shield walls **62** are structured so as to define curved, slanted or inclined surfaces, thereby providing a surface which readily deflects weapon fragments and projectiles. Preferably, the shield **60** is positioned on frame cross bar **51** by hinges **54** so as to be easily raised from the frame **16** to allow quick access to the running gear **22** and the receiving and controlling means **43.** As illustrated in FIG. **4,** the rigid cage **17** is positioned to provide further support to the target envelope **50.**

Preferably, the wheels **18** include high flotation tires **20** which permits the operation of the target **10** on soft surfaces such as desert or swamp terrain.

As may be seen in FIG. **2,** the frame **16** is made of tube steel which is welded into the desired shape. A suitable steel is 1010 steel which is of a tubular or square cross section.

The present invention provides a low-cost remote controlled surface target which permits evasive movement, utilizes quick change, inexpensive target envelopes to realistically simulate different vehicle shapes, and includes an armored shield beneath the envelope to protect the expensive running gear and the receiving and controlling means.

Thus, it is apparent there has been provided in accordance with the invention a radio controlled surface target that fully satisfies the objects, aims, and advantages set forth above. While the invention has been described in conjunction with the specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in the light of such foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and scope of the appended claims.

What is claimed is:

1. In a ground target for simulating moving ground vehicles:

a. a frame having wheels disposed thereon;

b. running gear affixed to said frame for operating and maneuvering said target, and

c. means disposed on said target for receiving radio signals and controlling said running gear, wherein the improvement comprises:

d. a lightweight, interchangeable, frangible target envelope formed in the shape of a ground vehicle affixed to said frame, and

e. an armored shield positioned on said frame under said target envelope and defined to cover said running gear and said receiving and controlling means, thereby protecting said running gear and said receiving and controlling means from damage by weapons.

2. The target of claim **1,** wherein said target envelope includes means for making the target radar reflective.

3. The target of claim **2,** wherein said target envelope is made of a material selected from the group consisting of polyurethane foam and foamed fiberglass.

4. The target of claim **3,** wherein said means for making the target radar reflective includes steel mesh embedded in the target envelope.

5. The target of claim **4,** wherein said wheels include high flotation tires, thereby providing for the operation of the target on soft surfaces.

6. In a ground target for simulating moving ground vehicles including:

a. a frame having wheels disposed thereon;

b. running gear affixed to said frame for operating and maneuvering said target, and

c. means disposed on said target for receiving radio signals and controlling said running gear, wherein the improvement comprises:

d. an armored shield positioned on said frame and designed to cover said running gear and said receiving and controlling means thereby protecting said running gear and said receiving and controlling means from damage by weapons, and

e. a series of lightweight interchangeable, frangible target envelopes formed in the shapes of ground vehicles, each of said envelopes being designed to be affixed to said frame and cover said armored shield.

7. The target of claim **6,** wherein each target envelope includes means for making the target radar reflective.

8. The target of claim **7,** wherein said means for making the target radar reflective includes steel mesh embedded in the target envelope.

9. The target of claim **7,** wherein each target envelope is made of a material selected from the group consisting of polyurethane foam and foamed fiberglass.

10. The target of claim **9,** wherein said wheels include high flotation tires, thereby providing for the operation of the target on soft surfaces.

* * * * *