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F. L. FLEMING
GUNNERY TARGET

2,490,793

Filed Oct. 25, 1945

3 Sheets-Sheet 1

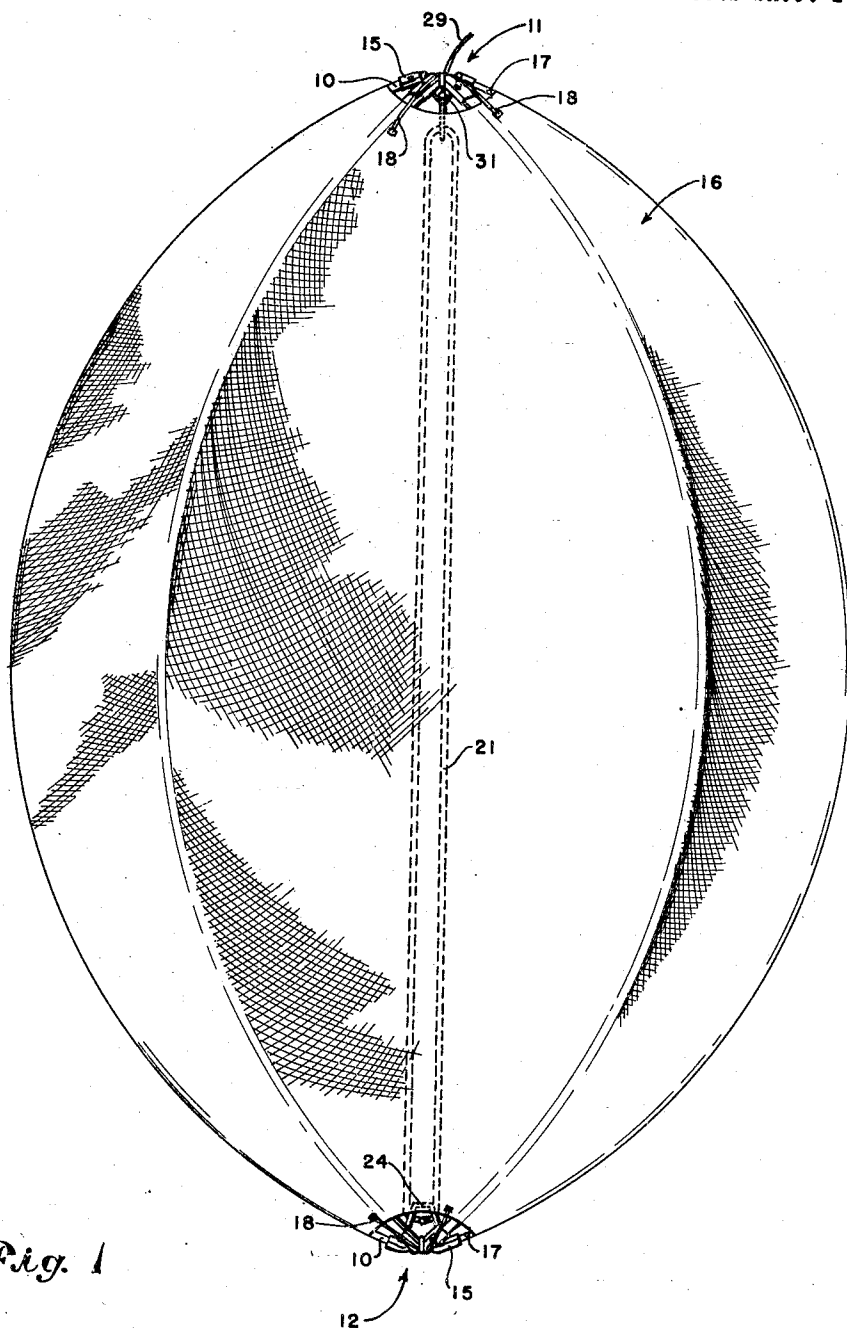


Fig. 1

INVENTOR.
FLOYD L. FLEMING

BY
Ralph L. Chappel
ATTORNEY

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3 Sheets-Sheet 2

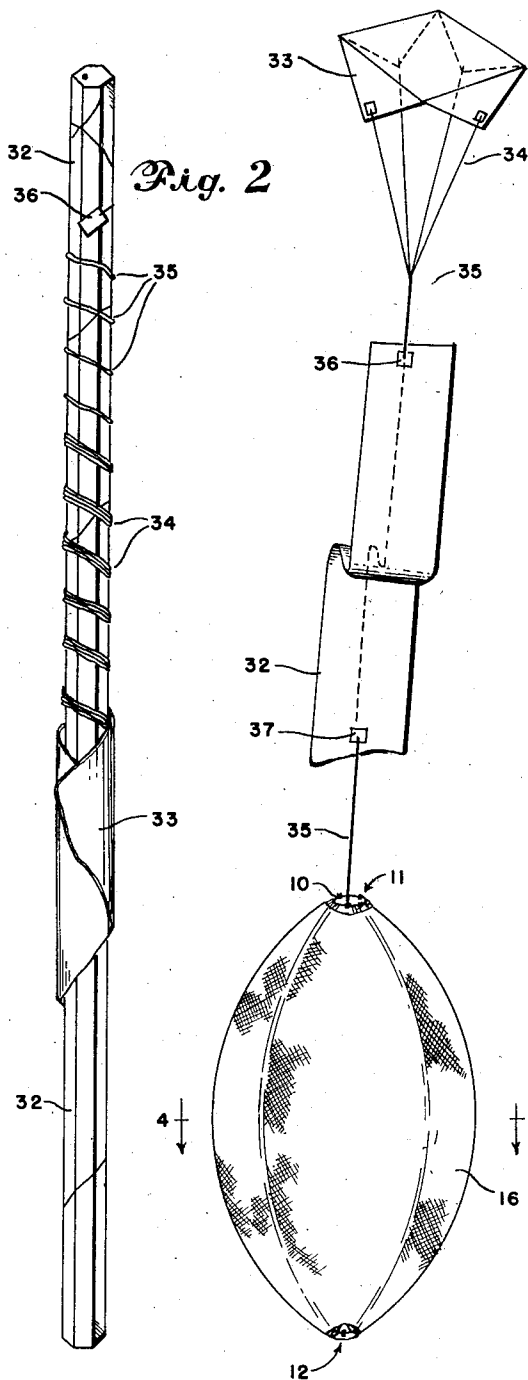


Fig. 3

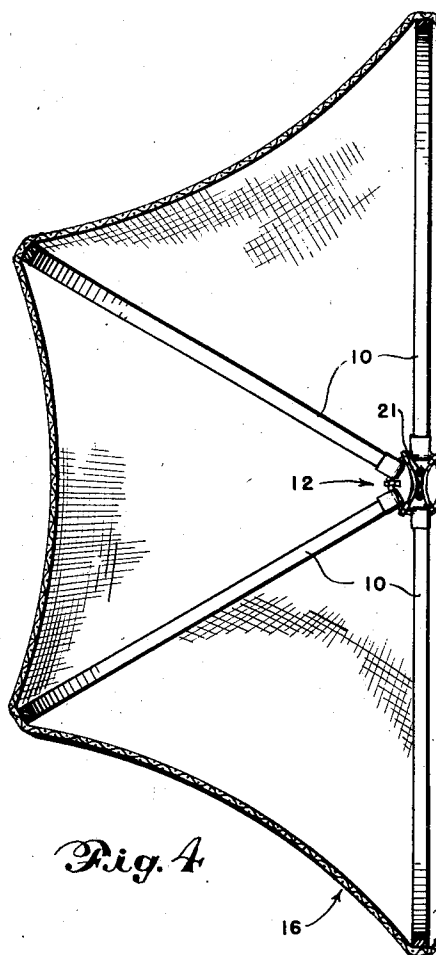


Fig. 4

INVENTOR.
FLOYD L. FLEMING

BY
Ralph L. Chappell
ATTORNEY

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F. L. FLEMING
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3 Sheets-Sheet 3

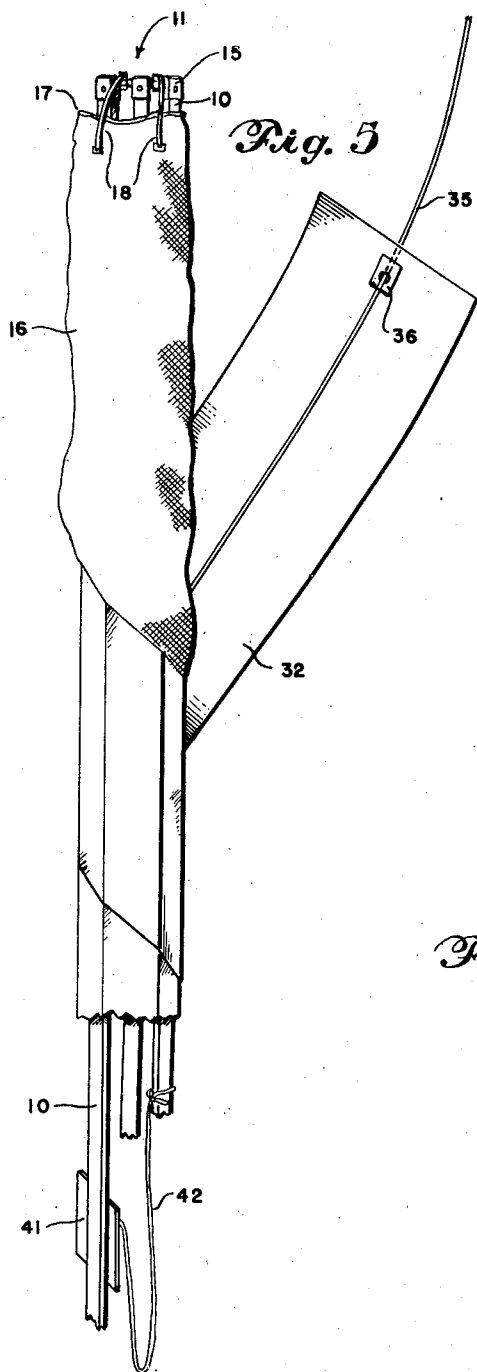


Fig. 5

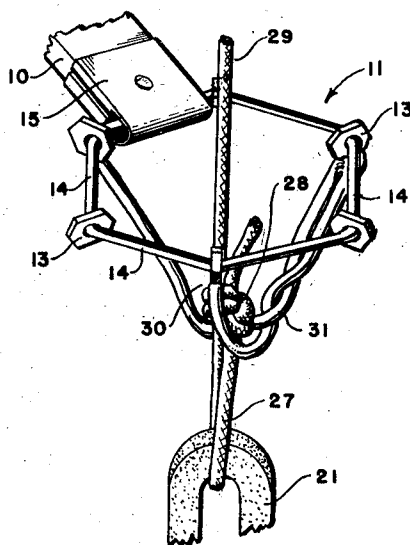


Fig. 6

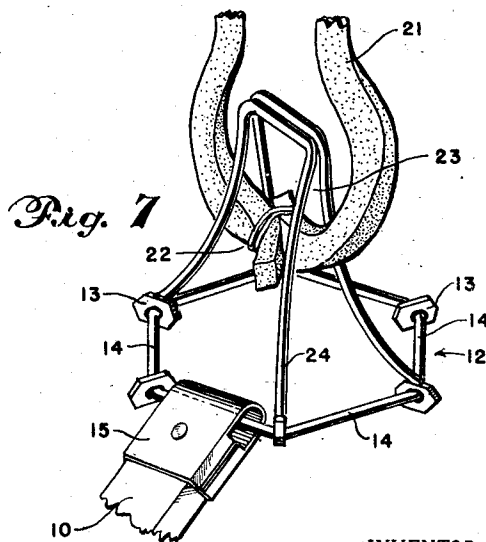


Fig. 7

INVENTOR.
FLOYD L. FLEMING

BY
Ralph L. Chappell
ATTORNEY.

UNITED STATES PATENT OFFICE

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GUNNERY TARGET

Floyd L. Fleming, United States Navy

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention concerns aerial gunnery targets and is embodied in a balloon-type target for aerial gunnery or anti-aircraft practice.

Heretofore, most aerial gunnery practice has been conducted with sleeve targets attached to an airplane by tow cables, so that the sleeve will be drawn across the sky behind the plane. These targets are useful but have inherent limitations and disadvantages that the present invention overcomes.

The target disclosed in this specification has performance characteristics entirely different from those of a sleeve target, since the path of this target may be in an almost vertical downward direction, and will thus simulate the flight of a dive bomber or suicide plane in a much more realistic manner than is practicable with a sleeve.

It is, therefore, the general aim of the present invention to provide a novel and improved target adapted for anti-aircraft and aerial gunnery practice. More specifically, it is one of the principal objects of the invention to provide a free balloon-type target, compactly packaged and arranged to expand when launched, so that a large number of the targets can be carried aboard any conventional type of aircraft. The targets are of such design and construction that they can be thrown from the aircraft individually or in groups and will automatically open to their full expanded size and drift slowly downwardly. A further object is a free balloon-type aerial target having flammable material incorporated into the target structure, so that the target will burst into flame if struck by a tracer bullet.

This feature provides an immediate indication of the effectiveness of the gunner's marksmanship and lends realism to practice.

A further object resides in the provision of a target having the characteristics noted above, yet simple in construction, inexpensive in manufacture, and having dependable characteristics of performance.

A preferred embodiment of the invention is illustrated in the drawings, in which

Figure 1 is an elevation of the target balloon in expanded condition,

Figure 2 is a perspective of a target embodying the invention in packaged condition ready to be launched,

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Figure 3 is a view of the target of Figure 2 after it has been launched,

Figure 4 is a cross-sectional plan partly broken away, taken on line 4—4 of Figure 3,

5 Figure 5 is an elevation with parts broken away of the target of Figure 2, with its wrapping partially unwound,

Figure 6 is a perspective of the fitting at one end of the target balloon, and

10 Figure 7 is a perspective of the fitting at the opposite end.

The target balloon of the present invention comprises the envelope 16, and a supporting frame therefore which resiliently holds the envelope expanded. The frame comprises a plurality of longitudinal ribs 10 extending between a fitting 11 at its upper end and a similar fitting 12 at its lower end. See Figures 6 and 7. Each fitting 11 and 12 comprises a closed hoop preferably in the form of a polygon to provide bearings 14. A slug 13 is attached to the hoop at each of its corners. Ribs 10 are formed of thin, flexible wooden slats having sheet metal reinforcements 15 at each end. The sheet-material reinforcements are riveted to the slats and surround the bearing portions of the end fittings to provide a hinged connection between these fittings and the individual ribs.

The outside covering of the balloon is formed of a fabric envelope 16. This envelope can be constructed of various types of fabrics or other material, but highly satisfactory results are obtained by the use of an open mesh fabric such as cheesecloth. The envelope is shaped in a more or less spherical form and includes openings 17 at the positions of the end fittings 11 and 12. Each of the openings 17 is crossed by a pair of flexible rubber bands 18 secured to the fabric 16 on opposite sides of the opening 17, so that when the balloon is collapsed for packaging the rubber bands stretch sufficiently to prevent tearing the fabric of the envelope.

One of the objects of the invention is to provide a balloon-type target that may be carried and launched as a compact package, and will thereafter automatically expand to full size and drift slowly toward the earth. To this end, the balloon target is provided with a mechanism operable to expand the target which, in the disclosed embodiment, comprises a heavy rubber band 21 extending between the lower end fitting 12 and upper end fitting 11. In the preferred structure illustrated in the drawings the rubber band 21 includes a double strand of rubber with 55 the opposite ends tied together at their lower end

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by a cord 22. The lower end of each strand is also positioned in a V type slot 23 between the anchor wires 24, so that as the band is stretched the individual rubber strands work upwardly in the slot and wedge themselves in, so that the strain on the tied joint between them is partly relieved.

The upper end of the rubber band 21 passes through a loop of cord 27 having a knot 28 at its one end, and extending to include a leader 29, which is operable to set the balloon expanding mechanism for operation by drawing the cord 29 out to stretch the rubber band 21 and secure it in taut condition between the end fittings 11 and 12. The fitting 11 has a V-shaped notch 30 formed between the wires 31, the notch 30 being adapted to engage the knot 28 to secure it to the fitting 11. The band 21 is stretched by holding the balloon in collapsed condition with the ribs 10 extending straight between the end fittings 11 and 12, and then, with the knot 28 positioned in and engaged by the notch 30, pulling outwardly on the leader cord 29 to stretch the rubber band 21. The balloon is maintained in collapsed condition by a spiral paper wrapping 32. The target assembly includes a pilot parachute 33, which may be made of a square of heavy paper with shroud lines 34 attached to reenforcing patches on its four corners. The shroud lines 34 extend to a parachute line 35 running from the parachute to a reenforcing patch 36 on one end of the spiral wrapping of the package and thence to the reenforcing patch 37 at the opposite end of the wrapping and to the balloon. The cord 35 is permanently connected with the frame of the target balloon in any conventional manner. Conveniently, this may be done by tying the cord to one of the end fittings of the balloon. Thus the line from the parachute forms a cord reenforcement through the length of the paper wrapping, and provides a permanent connection between the parachute, the wrapper, and the target balloon; so that all of these parts will remain together after the balloon is launched.

In preparing the target for use, the ribs 10 of the balloon are collapsed by detaching the upper end of the rubber band 21 from the upper fitting 11. With the ribs in collapsed condition, the wrapping 32 is wound around the fabric envelope 16 of the balloon. The rubber band 21 is then stretched by pulling the leader 29 and engaging the knot 28 in wedging engagement with the anchor wires 31. The parachute line 35 is wound around the package, as are the shroud lines of the parachute, and the body portion of the parachute is loosely folded around the package. Thus the entire assembly provides a long and slender package that can be easily carried in an airplane and manually launched by simply throwing the entire package into the air.

As the package begins to fall, the parachute 33 will open and unwind the spiral wrapping from the balloon. As soon as the balloon is unconfined, the mechanism for expanding the balloon is released to operate. The tension of the rubber band 21 operates to draw the end fittings 11 and 12 toward each other to spring the ribs 10 outwardly and expand the fabric envelope 16 to its full dimensions. The balloon wrapping and parachute will then drift earthward as a unit, so that the wrapping and parachute will aid the pilot in spotting the target, and also so that if the balloon is not hit and

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destroyed, it can be picked up and used repeatedly.

One of the objects of this invention is the provision of an instant indication of a hit and that this is accomplished by providing a flammable substance in the balloon. This can be done in any conventional manner, as by forming the envelope 16 of highly flammable material or by providing flammable sheets inside of the envelope so that they will be ignited as a tracer bullet passes through the target. Another manner of rendering the balloon flammable is illustrated in Figure 5, which discloses a paper envelope 41 secured to one of the ribs 10 and having a rip cord 42 extending from the envelope to the opposite rib. With this arrangement, the expansion of the balloon will draw the cord 42 taut to rip the envelope 41 and allow highly flammable powder contained within the envelope to be spilled into the interior of the balloon. The motion of the balloon in falling and the passage of air through it distributes the powder sufficiently so that the balloon will be instantly ignited if hit by a tracer.

The foregoing describes an efficient target for anti-aircraft or aerial gunnery practice; these targets can be easily and cheaply constructed, yet easy to use and having performance characteristics simulating the vertical or near-vertical downward movement of a dive-bombing plane. Moreover, the target is so constructed as to show any hit instantly, to add interest to practice and to provide an easy and efficient means of scoring a gunner's skill.

Although the specific structure of the invention disclosed in the drawings is most satisfactory for most purposes, modifications can be made thereof without departing from the inventive concept, as defined in the following claims.

Having thus described the invention, what I claim as new and desire to secure by United States Letters Patent is:

1. As a target, a flexible envelope and a collapsible frame within the envelope; the frame including a pair of end fittings spaced apart from each other and a plurality of long slender strips secured in circular relationship on each of said fittings and comprising spring ribs arranged to lie in closely nested parallel positions when the frame is collapsed and to bend outwardly and cause their center portions to move apart when the end fittings are moved toward each other, so that the several ribs coact to define a hollow form; means to expand the frame including an elastic band extending between the opposite end fittings to urge the ribs of the frame toward expanded position; restraining means comprising an exterior wrapper to secure the frame in collapsed position against the influence of the aforementioned means to expand; and means responsive to ambient air currents to remove the exterior wrapper.

2. As a target, a collapsible frame and a flexible covering; the frame including a pair of fittings spaced apart from each other and a plurality of long slender strips secured on each of said fittings and comprising ribs arranged to lie in closely nested parallel positions when the frame is collapsed and to move apart when the fittings are moved toward each other; means to expand the frame including an elastic band extending between the opposite end fittings to urge the ribs of the frame toward expanded position; restraining means to secure the frame in collapsed position against the influence of the aforementioned

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tioned means to expand; and means to render the restraining means inoperative.

3. As a target adapted to be launched in the air, a collapsible frame including a plurality of long slender ribs arranged to lie in closely nested parallel positions when the frame is collapsed, and to move apart when the frame is expanded; means to expand the frame comprising instrumentalities to urge the ribs of the frame toward expanded position; restraining means to secure the frame in collapsed position against the influence of the aforementioned means to expand; and a parachute operable when the target is launched to render the restraining means inoperative.

4. As a target adapted to be launched in the air, a collapsible envelope, a parachute, and a confined flammable material attached to the envelope, together with means operable when the target is launched responsive to the action of the parachute in ambient air currents to expand the envelope, and means operable by expansion of the envelope to release the flammable material and scatter it onto the envelope.

5. As a target, a flexible envelope and a collapsible frame for the envelope, the frame comprising a pair of end fittings spaced apart and a plurality of flexible strips arranged in a circle and attached at their opposite ends respectively to the fittings, mechanism to expand the envelope operable to pull the fittings toward each other, means operable to hold the strips disposed parallel to each other, and means operable to release the holding means and thereby enabling the envelope expanding mechanism to pull the fittings towards each other and expand the envelope.

6. As a target, a flexible envelope and a collapsible frame for the envelope, the frame compris-

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ing a pair of end fittings spaced apart and a plurality of flexible strips arranged in a circle and attached at their opposite ends respectively to the fittings, mechanism to expand the envelope operable to pull the fittings toward each other, means operable to hold the strips disposed parallel to each other, and means operable to release the holding means and thereby enabling the envelope expanding mechanism to pull the fittings toward each other and expand the envelope, a confined flammable material attached to the envelope, and means operable by expansion of the envelope to release the flammable material and scatter it onto the envelope.

7. As a target adapted to be launched in the air, a balloon comprising an envelope and a supporting frame therefor resiliently operable to hold the envelope expanded, a parachute and a cord connecting the parachute to the balloon, the cord being positionable wrapped around the balloon to hold it in collapsed condition opposed to the resiliency of its frame, the parachute being positionable exposed exteriorly of the wrappings of the cord in position for engagement by ambient air currents when the target is launched to unwrap the cord and enable the envelope to be expanded.

FLOYD L. FLEMING.

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