

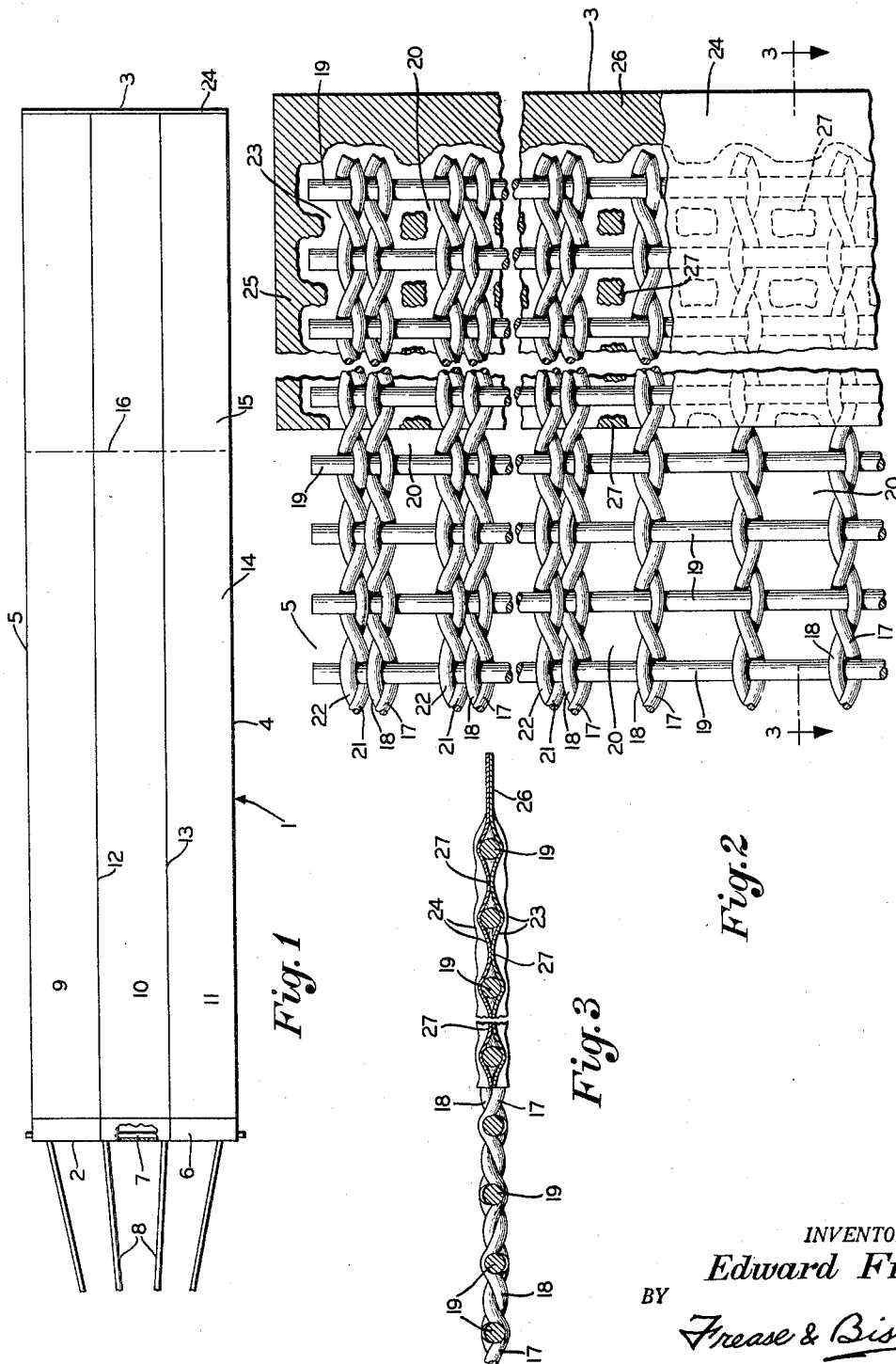
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TOW TARGET CONSTRUCTION

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TOW TARGET CONSTRUCTION

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1 Claim. (Cl. 28—80)

This invention relates to minimized drag tow target construction of the banner type and constitutes improvements in construction of the rear or trailing end thereof.

Generally, this invention relates to open mesh type tow targets made of flexible fabric material and useful for training armed service personnel in marksmanship. A tow target for such purpose is connected to a towing aircraft by a tow line of required length. The marksman trainee operates from another aircraft.

In most prior constructions the rear or tail end portion of the target has been folded over and sewn to the next adjacent portion thereof in a manner similar to a hem on hemmed cloth material. Such constructions for tow targets have been unsatisfactory for various reasons. First, the sewn end is less flexible than the balance of the target. The difference in flexibility between the body and the tail causes the tail end of the target to whip out and fray at the ends during flight. Second, the sewn construction with the folded-over (hemmed) end portion gives an uneven weight distribution throughout the target, thereby also increasing the tendency of the tail end to whip out and fray at the ends during flight.

Moreover, the differences in the flexibility and the weight distribution between the tail end and the body of the target cause an increased drag on the towing airplane. This problem is particularly acute at air speeds of greater than 300 m.p.h. and at altitudes of about 30,000 feet where airplane target practice is currently performed. When in flight, air currents act upon the target causing it to assume a rippling configuration of undulating waves extending transversely of the direction of flight. The waves move rearwardly of the target causing incessant whipping or flapping of the tail portion, which is very damaging to the target fabric, as well as being detrimental to the speed of the towing airplane.

The device of the present invention includes an alternative construction adapted to overcome the problems created by the prior sewn constructions. By providing more uniform flexibility and more uniform weight distribution between the body and tail portions of the tow target the excessive terminal tail whipping action may be minimized and thereby decrease the total target drag on the towing airplane.

Accordingly, it is a general object of this invention to provide a tow target for a towing airplane having minimum drag characteristics.

It is another object of this invention to provide a tow target having uniform weight distribution in the body and tail portions thereof.

It is another object of this invention to provide a tow target having uniform flexibility throughout its length.

Another object of this invention is to provide a tow target having a minimum of terminal tail whipping action.

Still another object of this invention is to provide a tow target having a minimum tendency to fray at its ends.

Finally, it is an object of this invention to provide an improved tow target which incorporates the foregoing desiderata in an inexpensive manner.

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These and other objects and advantages apparent to those skilled in the art from the following description and claims may be obtained, the stated results achieved and described difficulties overcome by the discoveries, principles, apparatus, parts, combinations, subcombinations and elements which comprise the present invention, the nature of which is set forth in the following statement, a preferred embodiment of which, illustrative of the best mode in which applicant has contemplated applying the principles, is set forth in the following description, and which is particularly and distinctly pointed out and set forth in the appended claim forming part hereof.

The tow target of the present invention may be stated generally as including a target of meshlike material of woven fabric having a forward or leading end and a rear or trailing end, adjacent longitudinal flexible panel portions between the ends and coextensive of the target, each panel including longitudinally extending laterally spaced warp strands and laterally extending longitudinally spaced filling strands continuously woven with the warp strands, a strip of pressure sensitive adhesive tape on each side of the tail end portion of the target, the strip of tape on one side of the target extending through the openings in the fabric and adhering to the adhesive side of the other strip of tape, and the tape on both sides also overextending the edges and ends of the strands of the target and adhering to the adhesive side of the tape on the other side of the target.

By way of example, the improved tow target construction is shown in the accompanying drawings, in which:

Fig. 1 is a plan view of a banner type tow target including the improved trailing end construction of the present invention;

Fig. 2 is an enlarged fragmentary plan view, partly in section and broken away, showing a corner portion of the tail section of the tow target; and

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 2.

Similar numerals refer to similar parts throughout the several views of the drawings.

A tow target is generally indicated at 1 in Fig. 1. It is composed of a single ply, flexible, open mesh fabric and is preferably an elongated rectangle having a width of six (6) feet and a length of thirty (30) feet.

The tow target 1 includes a leading end 2, a tail or trailing end 3, and longitudinal edges 4 and 5. The leading end 2 is provided with a sleeve or hemlike border 6 through which a rod or rigid member 7 extends. A hitch 8 is connected to the rod 7 in usual manner and to the trailing end of a tow line (not shown) which extends for about a mile from a towing aircraft (not shown).

The tow target 1 includes three integral longitudinal panels including outer panel 9, intermediate panel 10, and outer panel 11. The panels 9 and 10 have an inside connecting seam 12 and the panels 10 and 11 have an inside connecting seam 13, which seams extend throughout the length of the target. However, the number of panels depends upon the desired width of the target and the size of the loom for weaving the desired width. Moreover, the target is divided into a leading target section or portion 14 and a trailing target section or portion 15 by a transverse junction indicated by a dot-dash line 16. This construction is more particularly set forth and described in my copending application for U.S. Letters Patent, Serial No. 582,749.

The woven fabric construction of the trailing target section 15 is more particularly shown in Figs. 2 and 3. It includes a plurality of warp yarns or strands 17 and 18 extending longitudinally of the target. The fabric also includes a plurality of filling strands 19 extending transversely of the target and longitudinally spaced from each other to form openings 20 between strands 19 and

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spaced pairs of strands 17 and 18 which are interwoven together and around the strands 19.

The target portions extending along the edges 4 and 5 are provided with additional pairs of warp yarns or strands 21 and 22 similar to the strands 17 and 18 for reinforcing the ends of the filling strands 19 at the outer edges 4 and 5 of the target and thereby preventing said ends from whipping or fraying out due to the turbulent air action when the target is in flight.

All of the strands 17, 18, 19, 21 and 22 are composed of yarn having either one or more filaments or fibres. The yarn is preferably composed of synthetic material such as nylon, Orlon and the like. In addition, the entire target or the trailing portion 15 may be metallized to provide a radar reflecting tail portion and a nonradar reflecting leading portion 14.

To prevent the fabric from whipping out or fraying due to turbulent air currents when in flight, the trailing end 3 is reinforced. Part of the tail portion 15 of the target immediately adjacent the trailing end 3 is provided with strips of pressure sensitive adhesive tape. The tape may be composed of either a thermosetting polyester film, or a nonthermosetting pressure applied film having similar flexible properties. One side of the tail portion 15 is covered with a strip 23 of pressure sensitive adhesive tape and the other side is covered with a strip 24 of similar tape, as shown in Figs. 2 and 3.

The strips 23 and 24 of tape cover a plurality of the transverse filling strands 19, as well as the ends of the warp strands 17, 18, 21 and 22. In addition, the strips 23 and 24 overlap the ends of the strands 19 at the target edges 4 (not shown) and 5, as well as the end 3 of the target 1, forming overlapping edge portions 25 and overlapping end portion 26.

The strips 23 and 24 of tape are applied with sufficient pressure to cause the facing adhesive sides of the strips to protrude or extend into the openings 20 between the strands and adhere together at spaced islands or points 27 of contact, as shown in Figs. 2 and 3. In this manner the tape not only covers the end portion of the target by adhesively engaging the strands 17, 18, 19, 21 and 22 forming the fabric of the tow target, but also is interposed in the openings 20 between the strands to adhesively contact facing sides of the strips 23 and 24 in a permanent manner. By extending into the openings 20 for mutual contact and adherence to each other the adhesive sides of the strips 23 and 24 engage and stick to major portions of the surfaces of the strands 17, 18, 19, 21 and 22, thereby providing maximum contact at the interfaces of the strips and strands. Moreover, the strips 23 and 24 of adhesive tape overlap the end and edge portions of the target 1 to engage each other to form the continuous edge portion 25 and end portion 26.

In this manner the tightly fitting strips 23 and 24 of adhesive tape form a flexible cover of uneven thickness and wavy surfaces for preventing the end 3 of the target 1 from whipping out or fraying when the target is in flight. By applying thin strips 23 and 24 of adhesive tape to opposite sides of the end portion of the target 1

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and applying the strips 23 and 24 with sufficient pressure, the strips are forced to adhere together wherever possible in the openings between and around the surfaces, edges and ends of the strands 17, 18, 19, 21 and 22. The resulting structure provides a more uniformly flexible tow target end portion having a more uniform weight distribution over the entire target which decreases the excessive whip action in the tail. As a result of the decreased whipping action, the drag on the plane is also reduced, thereby resulting not only in a more durable tow target but also in a tow target having a minimum drag on the towing aircraft.

In the foregoing description certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction shown.

Having now described the features, constructions and principles of the invention, the characteristics of the new tow target construction, and the advantageous, new and useful results provided; the new and useful discoveries, principles, parts, elements, combinations, subcombinations, structures and arrangements, and mechanical equivalents obvious to those skilled in the art, are set forth in the appended claim.

I claim:

A tow target construction of the banner type having a leading end and a trailing end and having longitudinal edges therebetween, including a plurality of laterally spaced longitudinally extending warp strands, the strands being disposed in pairs, a plurality of longitudinally spaced laterally extending filling strands, the warp strands being disposed in pairs woven around the spaced filling strands, the warp strands and filling strands forming openings therebetween, at least a portion of the strands being composed of radar reflective material, a first strip of pressure sensitive adhesive tape on one side of the trailing end portion of the target, a second strip of pressure sensitive adhesive tape on the other side of the target, the strips of pressure sensitive adhesive tape overlapping the edges and end of the target and the adhesive surfaces of the strips forming an integral bond at the edges and end of the target, and the adhesive surfaces of the strips of tape being secured to each other through the openings between the strands.

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