United States Patent

Misevich

[15] **3,675,926**

[45] **July 11, 1972**

[54] SHEET TARGET WITH ATTACHABLE STABILIZING WINGS

[72] Inventor: **Kenneth W. Misevich,** Fairfield, Conn.

[73] Assignee: **Remington Arms Company, Inc.,** Bridgeport, Conn.

[22] Filed: **Oct. 16, 1970**

[21] Appl. No.: **81,258**

[52] **U.S. Cl.**.....**273/105.4,** 46/79, 273/106 B

[51] **Int. Cl.**.....**F41j 9/16**

[58] **Field of Search**.....273/105.4, 106 R, 106 B; 46/51, 53, 54, 74 R, 74 D, 79, 80; 340/6.5 P

[56] **References Cited**

UNITED STATES PATENTS

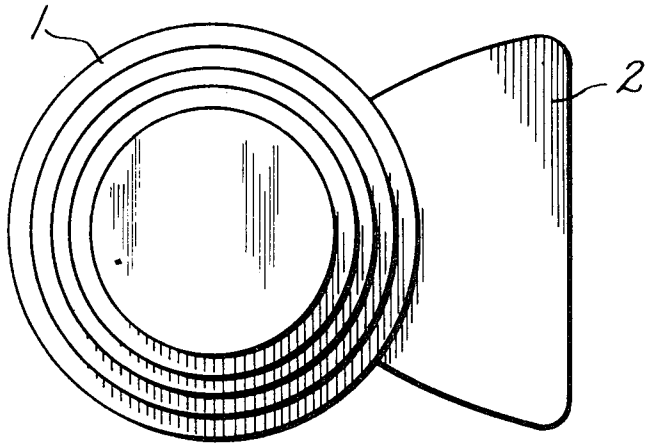
3,220,142	11/1965	Butterfield	273/106 R
2,490,031	12/1949	Core	273/106 R
3,207,516	9/1965	Kaluzny	273/105.4
3,359,000	12/1967	Schreiber	273/105.4
1,317,958	10/1919	Clark	273/105.4

Primary Examiner—Richard C. Pinkham
Assistant Examiner—Marvin Siskind
Attorney—John H. Lewis, Jr. and Nicholas Skovran

[57] **ABSTRACT**

The new form of aerial target which is disclosed consists of a frangible body portion, which may conveniently be a standard trap and skeet target, to which there has been attached a tail like appendage which controls the flight of the target when it is thrown without spin. The new target is capable of generally following a predictable trajectory with unexpected dives, climbs and even skips which more nearly simulate bird flight than the relatively straight trajectory of the usual clay target.

11 Claims, 13 Drawing Figures



PATENTED JUL 11 1972

3,675,926

SHEET 1 OF 3

Fig. 1.

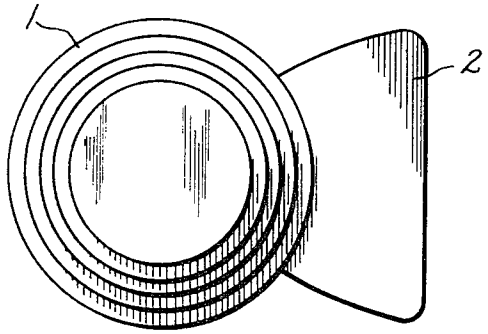


Fig. 2.

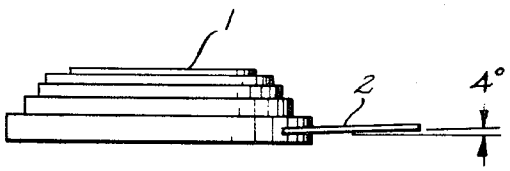


Fig. 4.

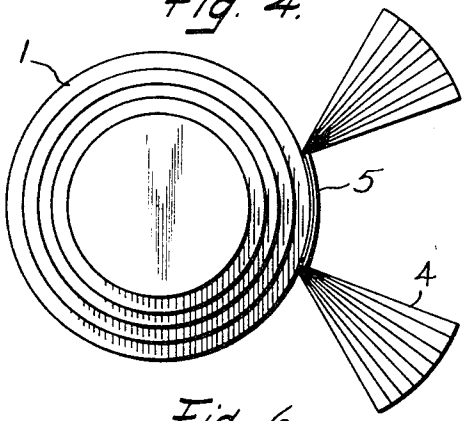


Fig. 5.

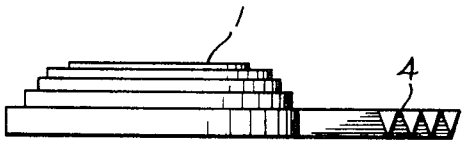


Fig. 6.

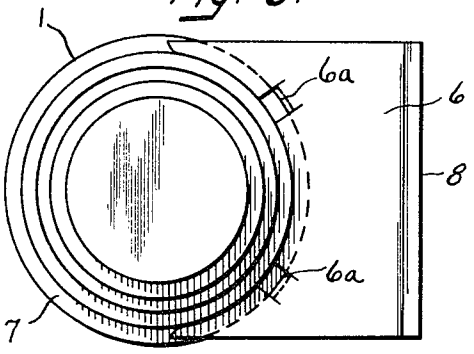


Fig. 7.

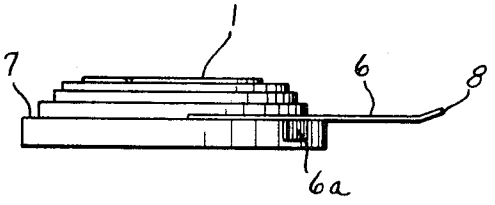
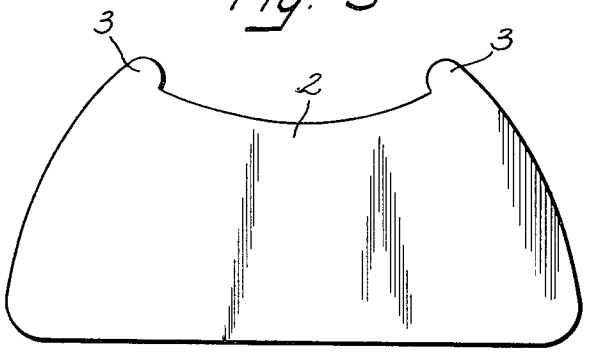


Fig. 3



Inventor:
Kenneth W. Misevich
by
John H Lewis Jr.
Nicholas Shoreman

Attorneys.

Fig. 8.

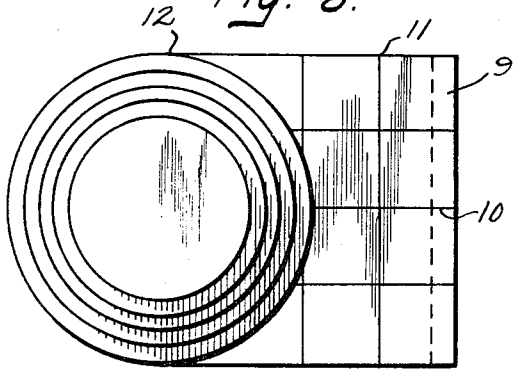


Fig. 9.

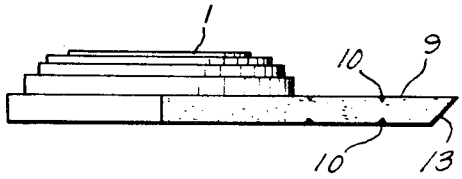


Fig. 11.

TYPICAL SKIPPING ACTION

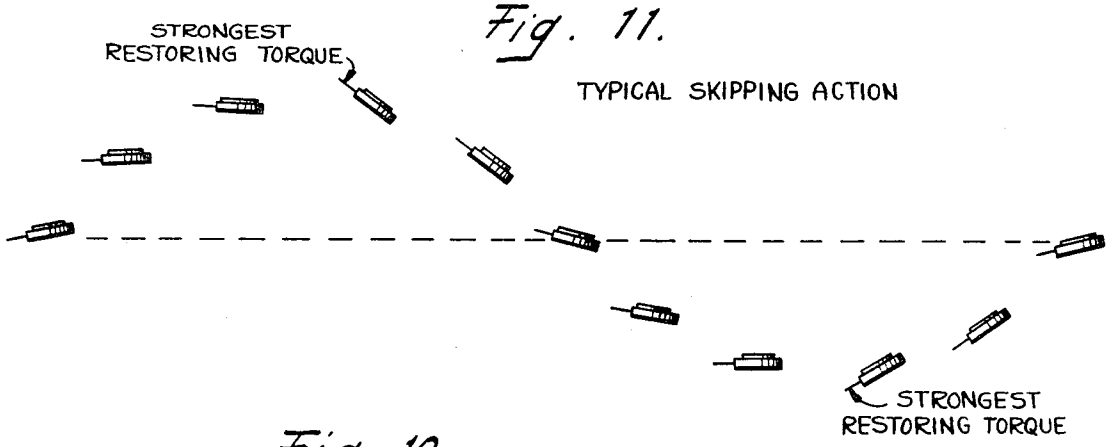
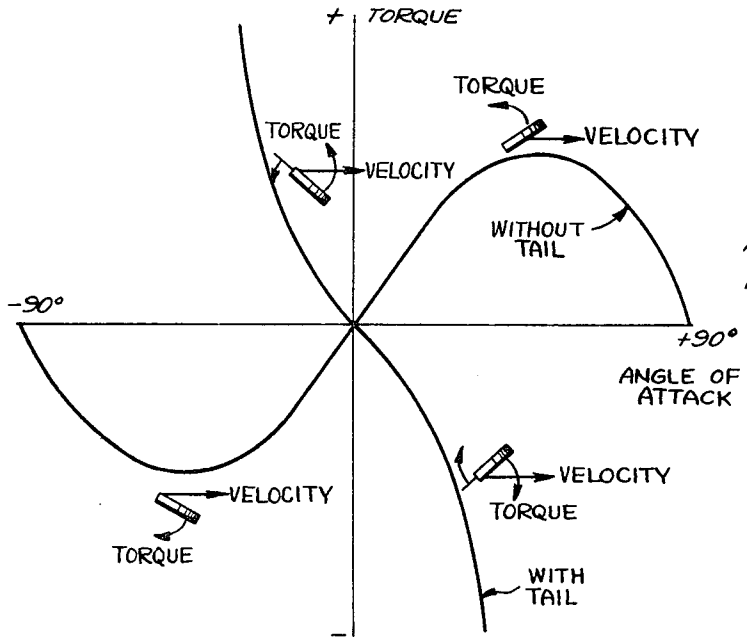


Fig. 10.

TORQUE ON A PLAIN DISC.
WITH & WITHOUT TAIL



Inventor:
Kenneth W. Misevich
by
John H Lewis Jr.
Nicholas Skovran

Attorneys

Fig. 12.

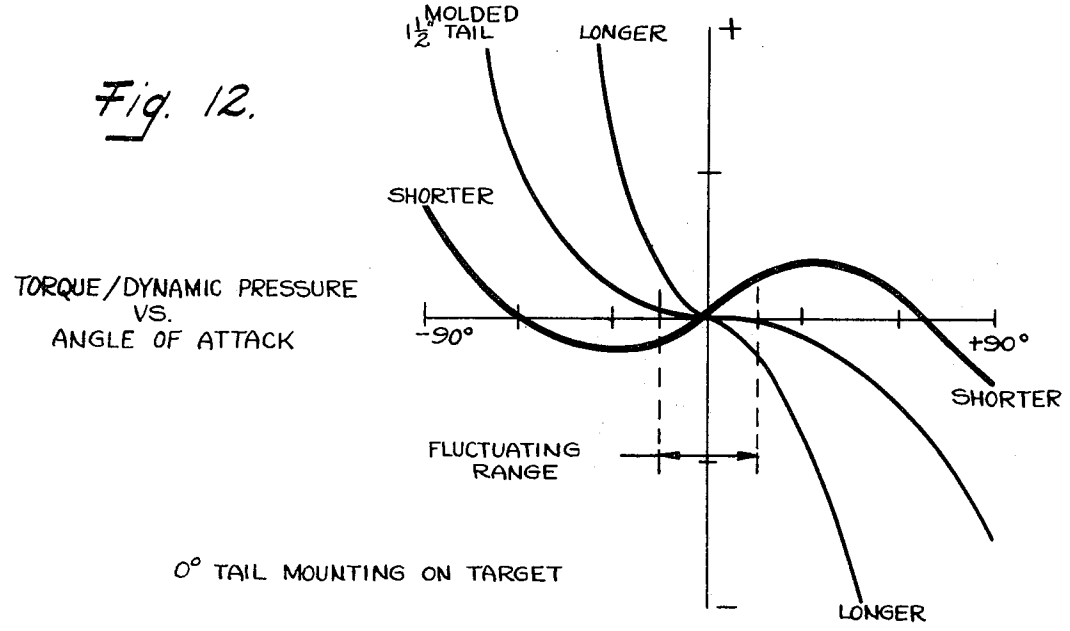
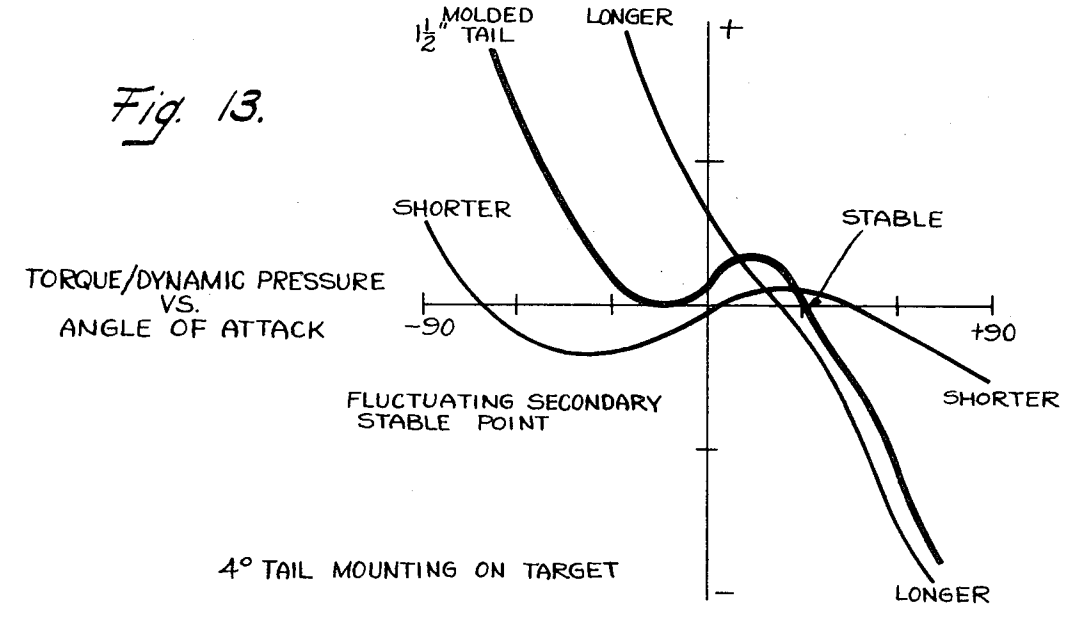


Fig. 13.



Inventor:
Kenneth W. Misevich
by John H. Lewis Jr.
Nicholas Shovran

Attorneys

SHEET TARGET WITH ATTACHABLE STABILIZING WINGS

RELATED APPLICATIONS

A copending application of Paul J. Donoski and Henry G. Tucker, Ser. No. 85,022, Filed Oct. 29, 1970 relates to a preferred form of target launching device for throwing the targets to which this application relates. Another copending application of Robert J. Tryon, Ser. No. 84,966, Filed Oct. 29, 1970, relates to a preferred method of attaching the preferred form of tail to such targets.

BACKGROUND OF THE INVENTION

Inanimate aerial targets have existed since the first shooter threw a bottle or soared a plate into the air. The brittle disk-shaped target or clay pigeon was documented in the 1880's by the earliest of United States Patents and has enjoyed popularity ever since. Over 50 patents have been issued to describe materials, design and novel ideas to make the launching and pronounced hitting of these targets cheap, reliable and entertaining. The standard trap and skeet target is thrown some 50 yards and is gyroscopically stabilized by the spin imparted to it at launching. It certainly is a simple flying target which has a predictable path to aid in shooter tracking.

Also from the earliest times, it has been recognized that the clay pigeon does not fly like many birds; therefore, there have been numerous solutions of bird-targets offered. However, none has endured in any popular shooting game. For examples, reference may be made to the U.S. Pats. to Barker, No. 312,604, Feb. 24, 1885; to Heikes and Clippinger, U.S. Pat. No. 801,867, Oct. 17, 1905; to Schmitt, U.S. Pat. No. 802,329, Oct. 17, 1905 and to Warren, U.S. Pat. No. 2,004,543, June 11, 1935.

SUMMARY OF THE INVENTION

Whereas a standard trap and skeet target cannot be thrown without spin to produce any bird-like flight, this invention proposes that a minimum of aerodynamic stability be added to the target by affixing a tail on the rear of the target. This tail overcomes a natural tendency of the spinless standard target to tumble end over end and further provides a simple repeatable means of controlling the general flight trajectory of the target so as to produce swooping, soaring and skipping type flights which resemble bird flight. Further, the size, shape, and angle of attachment of the tail coupled with control over launch direction, initial velocity and sidewise roll angle permit variation in the "difficulty" of the target from the easy to the impossible shot. This appendage allows almost any type of flight to be selected and maintained with reasonable repeatability and therefore allows fundamental design of new shooting games.

The dimensional requirements of the tail are minimum. Once the sufficient stabilizing torque is provided any further geometrical specification will simply add an aerodynamic force which influences the flight trajectory. The possibilities are innumerable.

The composition of the tail also is largely unrestricted. However, the new flights will in general require more versatility in tracking by the shooter than the skeet or trap games and therefore it may be advantageous to effectively increase total target area by making the tail exhibit a hit in a pronounced way. The degree and kind of effect is arbitrary and can be produced in a number of ways. For example, brittleness coupled with surface geometry can result in disintegration. Sectionalized weaknesses cause large piece break off and an impenetrable tail will likely be separated from the clay target proper.

The only constraint on the method of affixing the tail to the target is that the unit remain intact throughout the launching and flight until struck by shot pellets. Of course, ease of attachment enhances the practical utilization of this invention.

In summary, the tail appendage for a standard trap and skeet target offers the possibility of a simple low cost means of creating new shooting games that can simulate the flights of various birds. Only small alterations in the basic design need be made.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a plan view of a preferred embodiment of the target;

FIG. **2** is a side view of the target shown in FIG. **1**;

FIG. **3** is plan view of the tail section for the target shown in FIG. **1** to a somewhat larger scale;

FIG. **4** is a plan view of another embodiment of the target;

FIG. **5** is a side view of the embodiment shown in FIG. **4**;

FIG. **6** is a plan view of another embodiment of the target;

FIG. **7** is a side view of the embodiment shown in FIG. **6**;

FIG. **8** is a plan view of another embodiment of the target;

FIG. **9** is a side view of the embodiment shown in FIG. **8**;

FIG. **10** is a diagrammatic representation of torque on a disk with and without tail as a function of angle of attack;

FIG. **11** is a diagrammatic representation of the flight path of an exemplary target on which the tail is mounted at 0° inclination to the plane of the target;

FIG. **12** is a graph of the typical torque acting to turn the target in the art as a function of the angle of attack for the case in FIG. **11**;

FIG. **13** is a plot corresponding to FIG. **12** for a target corresponding to that shown in FIGS. **1** and **2** with the tail inclined at an angle of 4° to the plane of the targets.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing by characters of reference it will be seen that the target illustrated in FIGS. **1** and **2** comprises a standard trap and skeet target **1** which is the usual frangible saucer shaped body which has been hot molded from coal tar pitch or petroleum base pitch with a filler of either ground clay or ground limestone. To the body **1** there is secured a flat tail member **2** which gives the composite target the capability of soaring and erratic flights. Conveniently the tail is formed by injection molding a frangible polystyrene plastic which has been colored with a red fluorescent pigment. The tail may be about one-sixteenth inch in thickness and in an exemplary version may be about 1½ inch in a direction radial to the target and spans roughly 60° of the circumference of the standard trap and skeet target. The tail **2** is formed with one or more attaching tabs **3** which are secured to the target as by embedding them in locally melted spots in the rim of the target by the use of a method and apparatus disclosed in a copending application of Robert J. Tryon, above referred to. The tail may be secured in a plane parallel to the base of the target or at a slight inclination thereto as indicated by the 4° angle shown in FIG. **2**.

Other functionally similar tail units are shown in FIGS. **4** through **9**. In FIGS. **4** and **5** a tail unit **4** formed of pleated paper, plastic or thin sheet metal or foil is squeezed together as at 5 and cemented or otherwise secured to the body of the target.

In FIGS. **6** and **7** a tail unit is formed of heavy paper, fiber board or metal conforming to the first inner periphery of clay target **1** and resting or secured on the target rim **7**, or cemented or otherwise secured to the sides through tabs **6***a* for extra rigidity. The tail may be bent upwardly to a slight degree as shown at **8** to give the target a tendency to climb in flight.

In FIGS. **8** and **9** a tail unit **9** is formed of a rigid board of bonded fiber, expanded foamed plastic or other light weight material. To provide built in lines of weakness predisposing the tail unit to break from shot impact, it may be scored in a waffle like pattern as indicated at **10**. An edge **11** of the tail conforms generally to the outer periphery of the target rim and may be secured thereto as by the use of a double faced adhesive tape **12**. If the tail unit is cut off at an angle as indicated by the bevel **13** the target will climb. Variations in the bevel produce other flight patterns.

Obviously, targets with tails of various designs may be intermixed or tails of the same design but of varying degrees of predisposition to climb, etc. may be intermixed in a pattern unknown to the shooter to provide a game of even more unpredictability.

The aerodynamic forces on relatively thin disks and similar bodies are strongly dependent on the angle between the body plane and the direction of gross motion, the angle of attack. A simple disk experiences only a small drag force when the angle of attack is zero but this is a point of unstable equilibrium. Any perturbation causes some angle of attack, positive (above) or negative (below) with respect to the velocity vector and then a torque will work to increase the angle. FIG. **10** shows how torque typically varies with angle of attack for a flat symmetrical body. Depending on the velocity, moment of inertia and strength of the initial perturbation the plane of the body will end perpendicular to the velocity or continue rotational motion by tumbling. Both situations result in large drag forces which slow and drop the body quickly.

Experiments with carefully launched 4 inch diameter wood disks prove that it is practically impossible to have flights without tumble. At velocities to 120 fps, almost twice as fast as skeet and trap targets, 25 yards is the approximate maximum range attainable. A torque exists in standard trap and skeet targets even at zero angle of attack so they are still more prone to tumble.

Since there are many reasons to stay with the established target, it was thought that the tendency to tumble might be eliminated by just affixing a tail appendage on the target to create a restoring torque. A collapsible tail (shown in FIGS. **4** and **5**) was made of folded paper and tested. The results, though unpredictable, were dramatic--steep climbs, sharp turns, corkscrews.

Repeatability and control of flight was greatly enhanced by making the tail more uniform in geometry (e.g. cardboard tail of FIGS. **6** and **7**). Literal "cut and try" experimentation in a wind tunnel defined a flat tail of the same breadth of the target (about 4 inches) and a minimum 1½ inch extension behind the target to insure the target would not tumble. But flight repeatability needed improvement by making the tail rigid. An example is shown in FIGS. **8** and **9** where a ½ inch thick piece of foam plastic is custom cut and affixed to the target by double faced adhesive tape. It was further found that appropriate shaping of the end of the tail would cause the target to climb, dive or bank.

Initial shooting tests showed quickly that the most dramatic flights with fast random turns or climbs were very difficult to hit consistently. These were foam tail targets with a 1½ inch length and square ends. By increasing the length slightly and tapering the back end to have 45° between the top and back face of the tail, the targets then climbed nicely in still air. Head or tail winds will accent or diminish the effect respectively.

If a tail is added to some disklike or similar body such that the torque is zero at zero angle of attack and as shown in FIG. **10** acts symmetrically to keep the angle of attack at zero then there exists a condition of stable equilibrium. A perturbation caused by the launching or wind then results in a skipping action typified in FIG. **11**. A large tail or moment of inertia will allow only small amplitudes of oscillation. As the tail is reduced in size the amplitude increases with less and less restoring torque. Of course, the flight of a tailless body is then approached with the inception of tumbling.

The preferred embodiment in the consideration of a new shooting game is the familiar and widely available clay target stabilized by a rigid flat tail (shown in FIGS. **1** and **2**). With the tail mounted in the middle of the outer rim of the target and parallel to its plane FIG. **12** shows that the preferred 1½ inch tail length has only a weak restoring torque near zero angle of attack. Skipping is predominant. A shorter tail clearly begins to exhibit the same torque characteristics as the tailless disk; a longer tail produces a straighter flight. The preferred length not only skips, it often makes large erratic turns if wind gusts are present. It is a very difficult target for the shooter to hit.

Giving the preferred form of tail a slight inclination of about 4° to the plane of the target creates stable equilibrium points near +30° and −10° angle of attack with the former being stronger and therefore predominant. This torque is shown in FIG. **13**. The +30° condition produces a lifting force which soars the target and the −10° position causes a slight dive. The target might stay in one or the other position or jump between them to produce a wide variety of motions about some mean flight path. Again the 1½ inch length is preferred and as the tail is made longer the positive angle of attack becomes predominant and the negative equilibrium angle ceases to exist. The target simply soars, moves less dramatically and is easier to hit. In this case also the shorter tail approaches the flight pattern of a tailless body.

A suitable launching device for such targets should be capable of throwing the target in a straight line without imparting spin thereto. The launching device should not disturb the linearity of flight beyond the restoring ability of the stabilizing tail and should be capable of practically universal adjustment in azimuth and elevation. A suitable launcher is disclosed in the copending application of Donoski and Tucker referred to above.

The variables which influence the target flight are the launcher elevation, the tail angle, the velocity and the wind. The launcher direction may be changed either in a regular pattern, randomly or left constant to obtain whatever results are desired. The four major parameters affect the flight as follows:

LAUNCHER ELEVATION

The highest 40° setting will produce the easiest target to hit. Generally, the target will climb to a near stall and then circle or sail down in a direction whose randomness will be influenced by the wind. As the elevation is dropped, they will fly faster and, of course, lower with the possibility of some rather quick turns, climbs or dives. The lowest elevation is a very fast and difficult shot.

The elevation can be used to somewhat compensate for the variations in height between the shooter and trap and also compensate for strong winds.

TAIL ANGLE

A four degree setting has been found to be satisfactory in producing the good flights under widely varying wind conditions. The main adjustment would be to go to smaller angles to make the target fly faster and with more chance for quick and completely random jumps and turns. A greater angle may produce incidents of tail breakage by the carrier during launching.

VELOCITY

Generally, a velocity setting on the launcher to produce a velocity of about 70 fps is most satisfactory for the more desirable climbs and wide turns. We may even want to go slower in some cases. A higher velocity may be desirable if there is a strong head wind but generally even a relatively small increase in velocity up to 85 fps will produce a substantially harder target to hit. To the shooter who must already be very quick to hit the low flying "low velocity" targets, this increase in velocity drastically reduces the number of good hits.

WIND

A strong head wind will slow the target perceptibly and cause a larger number of high climbers and sharper turns. A tail wind, on the other hand, produces a faster and longer flight.

Elevation, velocity and launching direction can be changed to compensate for or utilize wind effects to the best advantages. The "best" settings must necessarily evolve with field experience.

Although the preferred embodiments have been specifically described, it will be realized that many variations are possible within the limits defined by the appended claims.

What is claimed is:

1. An aerial target adapted to be projected without spin or tumble comprising a main non-rotating frangible body having a shape substantially that of a disk and a tail-like appendage attached to said body and projecting from one edge thereof at an angle within about 4° of parallelism with the longest dimension of the disk-like body, to stabilize the same and provide for a skipping flight path.

2. An aerial target as defined in claim 1 wherein said tail-like appendage comprises a generally planar body protruding from the rear of the target.

3. An aerial target as defined in claim 2 wherein said tail-like appendage is a thin flat body of a frangible material.

4. An aerial target as defined in claim 3 wherein said tail-like appendage is formed of material selected from the group consisting of low molecular weight polystyrene and low molecular weight linear crystalline polyethylene.

5. An aerial target as defined in claim 4 wherein said tail-like appendage is formed with attaching tabs which are secured to the main body.

6. An aerial target as defined in claim 1 wherein said tail-like appendage has adequate tensile and shear strength to endure the launch and provide the torque control but sufficiently weak in shear so as to be substantially fragile when hit by a shot.

7. An aerial target as defined in claim 2 wherein said tail-like appendage is formed to define paths of weakness to assist in controlled fragmentation of the appendage on the impact of shot therewith.

8. An aerial target as defined in claim 2 wherein said tail-like appendage is formed of a substantially energy absorbing material and the means of attachment to the target exerts less retaining force than the force imparted to the appendage by shot impact therewith, with the tail breaking away for a visible "hit."

9. An aerial target as defined in claim 1 wherein the main body is a substantially standard frangible target of the type usually employed for trap and skeet shooting.

10. An aerial target as defined in claim 1 wherein the main body is of a saucer-like configuration formed of a frangible composition of thermoplastic pitch and an inert filler.

11. An aerial shooting game wherein there is provided a frangible main target body provided with a tail-like appendage as defined in claim 1 and a launching device designed to launch the target in a substantially straight line without imparting spin or tumble thereto, the tail-like appendage controlling the flight of the target to soar above and dip beneath a generally predictable path within predetermined limits.

* * * * *