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3,367,660

FIBROUS ARCHERY TARGET WITH LAMINATED REINFORCING MEANS

Filed July 21, 1964

4 Sheets-Sheet 1

Fig. 1.

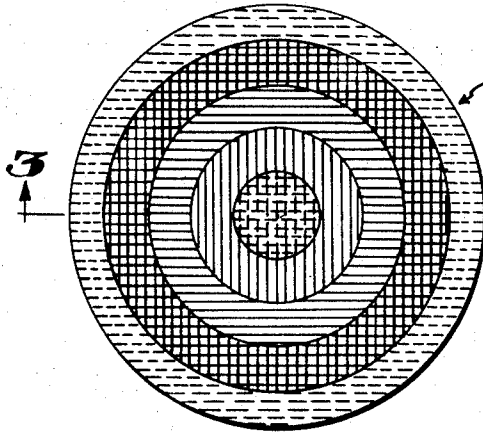


Fig. 2.

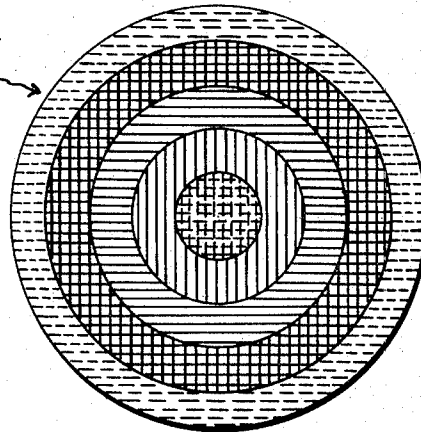


Fig. 3.

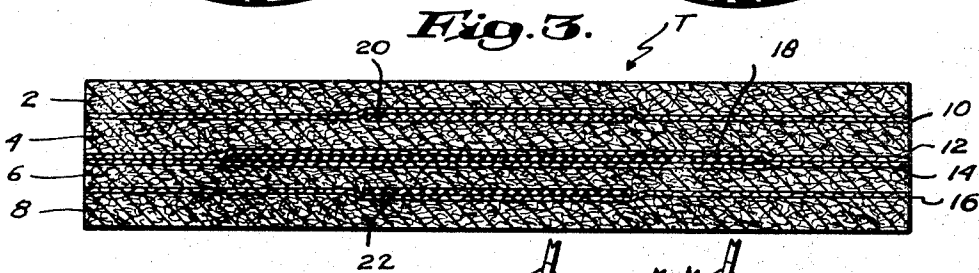
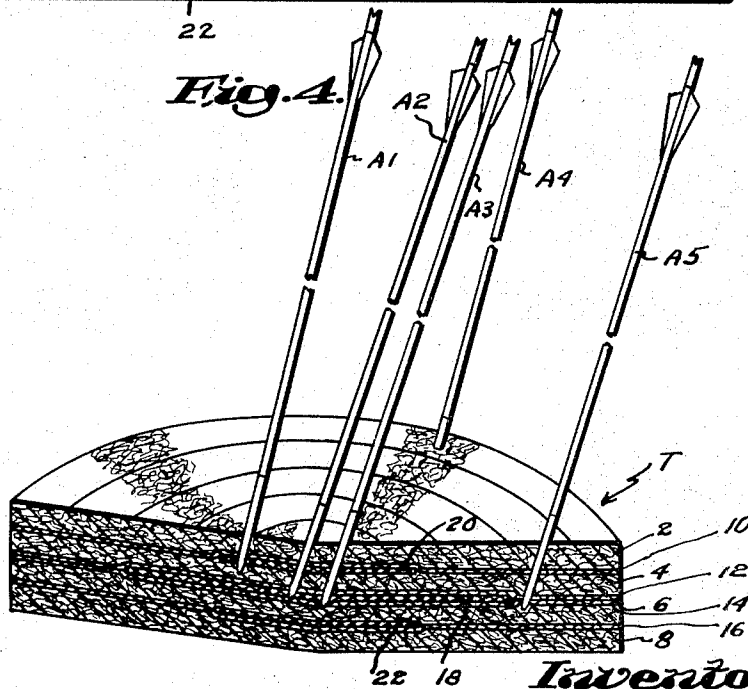


Fig. 4.



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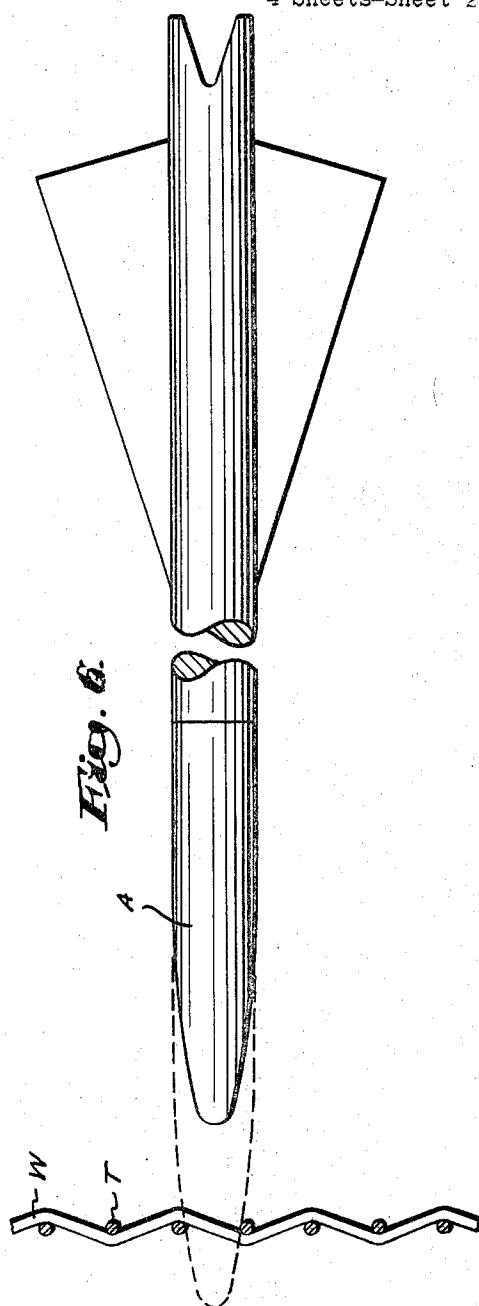
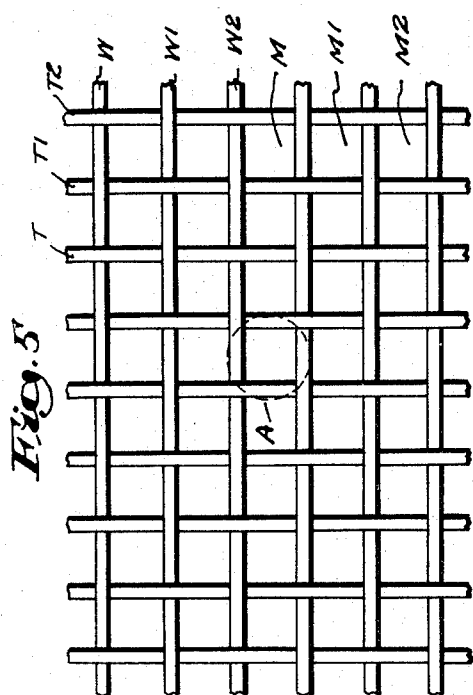
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FIBROUS ARCHERY TARGET WITH LAMINATED REINFORCING MEANS

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4 Sheets-Sheet 2



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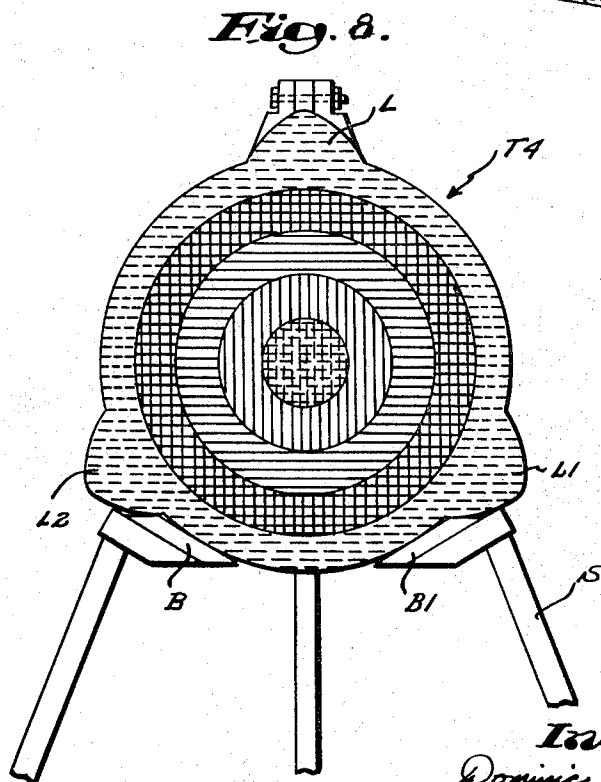
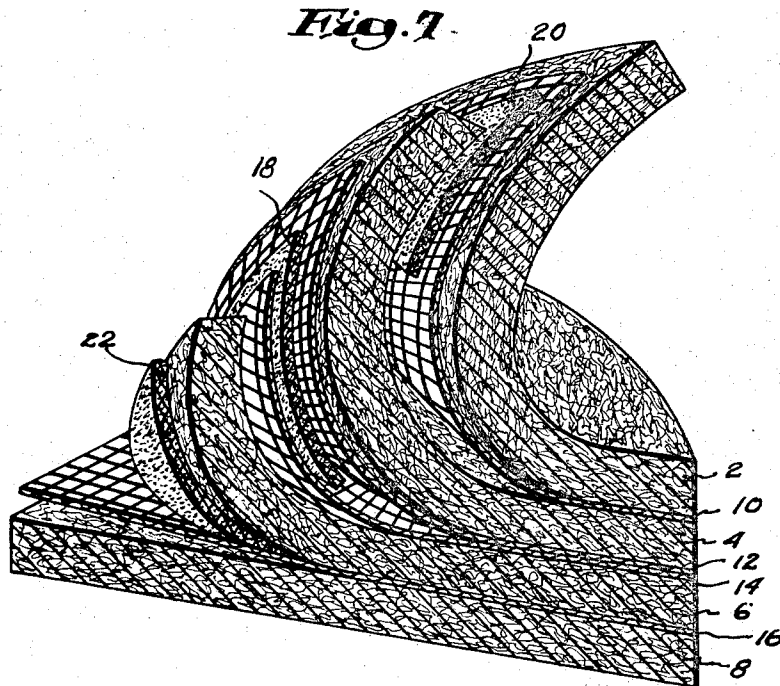
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FIBROUS ARCHERY TARGET WITH LAMINATED REINFORCING MEANS

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4 Sheets-Sheet 3



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FIBROUS ARCHERY TARGET WITH LAMINATED REINFORCING MEANS

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Fig. 9.

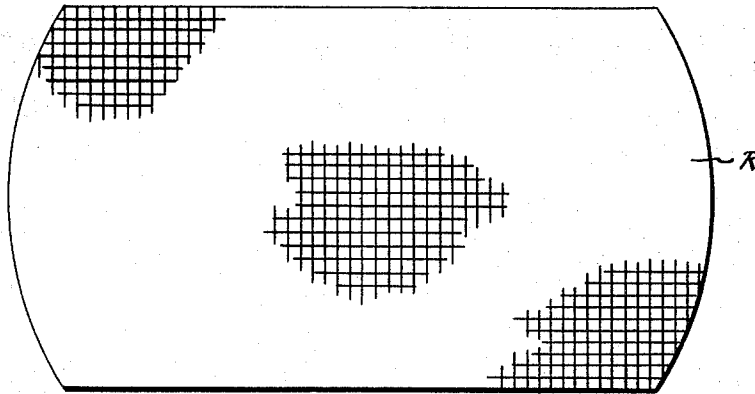
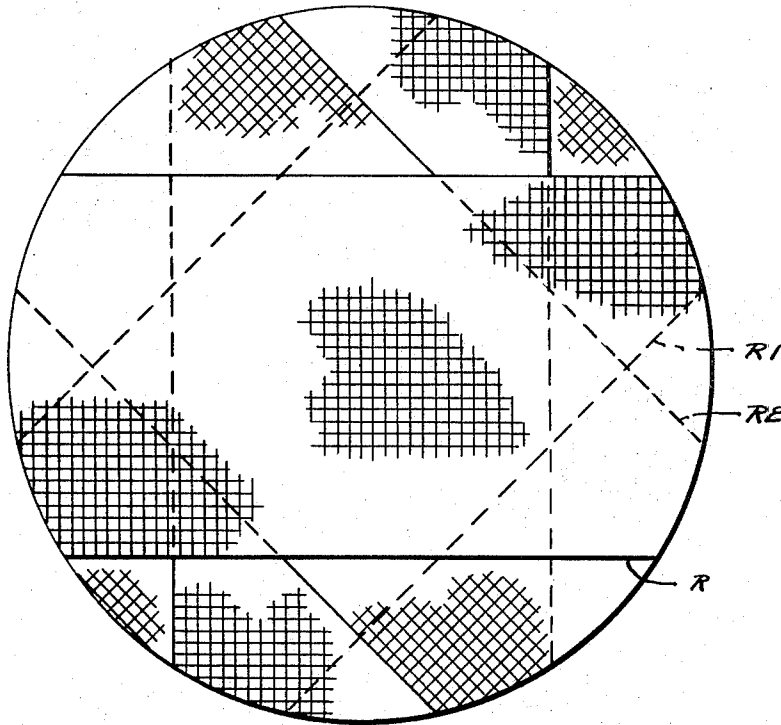


Fig. 10.



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FIBROUS ARCHERY TARGET WITH LAMINATED REINFORCING MEANS**Dominic P. Di Maggio, 74 Albion Road,
Wellesley, Mass. 02181****Filed July 21, 1964, Ser. No. 384,072
7 Claims. (Cl. 273-102)**

This invention relates to archery equipment and, more particularly, to an improved archery target construction of a special laminated form which may be employed in receiving arrows released from an archer's bow in target practice.

A common form of archery target now employed in most archery ranges is comprised of a relatively heavy circular target body of coarse fibre such as rye straw or similar material. The rye straw, processed and pressed into a dense mass, is relatively heavy and is designed to absorb the impact of an archer's arrow driven at high speed and to resist penetration as much as possible by reason of its substantial thickness. The outer surface of the target body is ordinarily covered with a fabric facing sheet of circular form having imprinted thereon the usual concentric target circles in varying colors.

An important consideration in choosing a correct target thickness is, of course, to provide a target body in which an arrow will always be stopped and held to thus meet with safety requirements. It is also desirable to provide a target body into which an arrow may be driven without damaging the arrow and from which the arrow may be withdrawn without risk of breaking the arrow. In addition, the target should withstand wear and be convenient to handle.

These requirements are not satisfactorily met in conventional straw targets now supplied to archers, either from the standpoint of wear resistance, handling or resistance to arrow penetration. The straw target referred to above is constructed as a relatively thick bulky mass which is heavy and cumbersome to handle. Both the fabric facing and the straw itself is subject to rapid wear from being pierced by repeated arrow penetration.

It is a chief object of the invention to provide an improved form of archery target and to devise a laminated fibrous body in which a plurality of target components are combined to form a unique target structure which is light, highly portable and convenient to set up and use as well as being exceedingly resistant to arrow impact penetration and wear.

Another more specific object of the invention is to provide a target structure which is comprised by a plurality of different barrier members arranged in laminated relationship with respect to one another whereby progressive stages of resistance will be encountered by an arrow driven into the target structure.

Still another object of the invention is to devise a combination of barrier laminations with arrow trapping screen mesh elements interposed therebetween whereby a reduction in the overall target thickness may be realized and yet arrows moving at high velocities may be safely received and held.

Another object of the invention is to combine a plurality of barrier laminations with impregnated color regions arranged in a manner such that both sides of the laminated target body may be used equally satisfactorily.

Still a further object of the invention is to provide a network of specially formed interconnected resilient fibres which are protectively coated and joined together to yieldably restrain penetration of an arrow in a highly effective manner.

Still a further object is a network of coated and curled fibres which are molded in a desired form and supported in such close proximity to one another as to constitute

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outer printing surfaces over which colored circles of coloring material may be applied and impregnated into the body of the target as a printed design.

And still another object is to devise a reinforced target structure in which novel screen mesh elements and barrier means are employed.

The nature of the invention and its other objects and novel features will be more fully understood and appreciated from the following description of a preferred embodiment of the invention selected for purposes of illustration and shown in the accompanying drawings, in which:

FIGURE 1 is a front elevational view of the target structure of the invention;

FIGURE 2 is a rear elevational view of the target of FIGURE 1;

FIGURE 3 is a cross section taken on the line 3-3 of FIGURE 1;

FIGURE 4 is a perspective view partly in cross section illustrating arrow penetration retarded by the target construction of the invention;

FIGURE 5 is a detail view of a screen element;

FIGURE 6 is a detail view illustrating diagrammatically an arrow in a position to be retained by a screen mesh;

FIGURE 7 is a perspective view of a segment of the target material of the invention with constituent layers thereof folded back upon one another;

FIGURE 8 is a modified form of target; and

FIGURES 9 and 10 illustrate still another modified form.

In general, the improved target construction of the invention comprises a laminated fibrous body which embodies the novel concept of combining a number of fibrous target layers and supporting components in such a manner that each layer and component cooperates with other layers and components in receiving and holding a driven arrow in a highly effective manner utilizing a minimum of material. The laminated structure is characterized by extreme lightness combined with a high degree of resistance to impact and wear. Each layer is made up of a base material consisting of a mass of vulcanized rubber coated vegetable fibres. A number of reinforcing elements are associated with the layers and are designed to exert progressive zones of resistance to passage of an arrow therethrough. The resulting laminated structure provides an unusually high resistance and excellent recovery from arrow penetration.

Considering these parts in further detail, attention is directed to FIGURES 1 to 3 inclusive in which arrow T denotes the target which is in a preferred form composed of a plurality of layers of fibre as, for example, 2, 4, 6 and 8. The layers are formed of a specially prepared vegetable type fibre which has been twisted into a rope-like form and subjected to steam heating at temperatures in the neighborhood of 345° F. The effect of the twisting and heating described is to produce resiliently curled crimped fibres which resist straightening to a very great extent. The crimped fibres are further covered with a spray or coating of vulcanized rubber latex which tends to increase the resiliency of the fibres in their compressed and curled form. Fibres of the class noted includeistle fibres, sisal, and the like. In one preferred embodiment of the invention, the layers may have a thickness of approximately one inch although other thicknesses may, of course, be employed.

In accordance with the invention, I combine with the layers of vulcanized fibres a plurality of reinforcing target components including screen mesh elements which are arranged between the layers 2, 4, 6 and 8 in bonded relationship therewith. I also provide special barrier sheets including a central barrier sheet and additional barrier sheets located at either side of the central barrier sheet

and adhesively secured to both the screen mesh elements and fibres of the layers. Numerals 10, 12, 14 and 16, denote the screen mesh elements. Numeral 18 indicates the central barrier sheet and numerals 20 and 22 refer to the outer spaced barrier sheets.

The screen mesh elements 10, 12, 14 and 16 are composed of threads or yarns interwoven to form a relatively open mesh fabric and each of the threads or yarns bear a vulcanized latex coating which imparts resiliency to each of the mesh sides. In FIGURE 5, I have illustrated a portion of screen mesh formed from threads T, T1, T2, etc. which are interwoven with other threads as W, W1, W2, etc. to form mesh openings as M, M1, M2.

I further arrange for the threads being interwoven so as to provide a mesh size which is appreciably smaller than the cross sectional dimension of a standard size arrow head as commonly employed in most archery equipment. A typical arrow head dimension ranges from three-sixteenths of an inch to one-quarter of an inch in most cases. Accordingly, I provide a screen mesh size of from five and one-half to six meshes per inch, for example, so that each mesh will tend to resist passing of an arrow head therethrough. This is indicated diagrammatically in FIGURE 5 by arrow outline A and it is pointed out that a very substantial restraining force may be exerted by any one of these screen mesh openings M, M1, M2 as is further indicated by the position of arrow A in FIGURE 6. By using a plurality of screen mesh elements, it will be apparent that progressive zones of resistance are created in the target body.

The central barrier sheet 18 is designed to provide still another type of resistance zone which is combined with the fibrous layers and screen mesh elements already described in order to further slow up and hold an arrow head driven into the target at high speed. In one preferred form of barrier sheet, I employ a nylon fabric or batt 18 which is secured to the screen mesh element 12 and 14 as shown in FIGURE 3 of the drawings. The nylon barrier 18 is produced from a highly needled nylon fabric material especially worked to provide a maximum of density in the fabric so as to exert a very strong holding force with respect to an arrow head which is being driven therethrough. A needled padding of nylon, for example, produced by one hundred fifty-seven penetrations per square inch and showing a tensile characteristic of one hundred five and nine-tenths pounds per square inch, was found to provide excellent results in the target body described. Attention is also drawn to the fact that the barrier 18 also serves to create a reinforced wear resistant central section in the area where most arrow penetration is likely to occur.

The two additional barrier sheets 20 and 22, may be comprised, for example, by needled fibres of a material such as rayon. These sheets are supported against adjacent screen mesh sheets as 10 and 16 so that an arrow driven into the target must also pierce the rayon barrier sheet before reaching the nylon barrier sheet 18. A needled padding of rayon fabric, for example, produced by three hundred twelve penetrations per square inch and showing a tensile characteristic of fifty-nine and four-tenths pounds per square inch was found to provide desirable results in the target body in combination with the nylon barrier already described.

Thus it will be apparent that the arrangement of layers and screen mesh elements cooperate with one another and build up progressive laminated sections in which resistance to an arrow is very high. As a result of this resistance, in addition to the additional resistances of the barrier sheets, it becomes possible to provide a highly satisfactory target body having a relatively thin laminated thickness of, for example, four inches up to four and one-half or five inches, and in such a target body an arrow released from a conventional type of bow may be completely arrested and held. In a typical instance a target

arrow released under pull tension from a forty pound bow from a distance of twenty feet can be safely received and held by the construction above described. Assuming that an over-all target diameter of approximately two feet is selected, it will be apparent that an extremely lightweight body is produced and thus the target can be conveniently moved to any desired location with little difficulty. It should also be observed that the vulcanized coating of the fibres, as well as their open network arrangement, enables water to pass through the interstices very readily and therefore quick drying is realized.

In FIGURE 4 there is illustrated a series of arrows which are shown in embedded relationship with respect to the target and which were released from a bow of the forty pound pull noted above and at a distance of twenty feet. The depth of penetration shown in FIGURE 4 is a reproduction of depth penetration photographed from an actual target and it will be observed particularly that arrow A2, which is driven into the central part of target T, is firmly held by the barrier 18 and this is also the case with arrow A3. Still another arrow A1 released from a greater distance is shown held by barrier 20. Arrow A5 which is located outside the central target area comprised by barrier 18 is shown with a greater depth of penetration. This is intended to illustrate one instance of the excellent holding strength of the barrier sheets when combined with the screen mesh members and the fibrous layers.

In assembling the various components, I may employ a special molding process in which layers of fibre and reinforcing components are arranged in a mold of circular shape. I may also in some cases desire to employ circular dies for cutting out targets from layers of fibres and reinforcing components placed on one another. In using a molding process I may arrange in the mold several layers of fibre of, for example, one inch thickness, together with screen mesh and barrier sheets superimposed upon one another. I may then apply an additional quantity of loose fibres over the layers. The assembled mass is then sprayed with vulcanized latex and thereafter compressed in the mold and heated to provide a desired size and shape. In a typical target construction of the invention a diameter of twenty-four inches is suitable and the thickness may be from four and one-half inches up to five inches.

Coloring of the target to form a colored central section surrounded by differently colored outer sections occurring as annular areas as illustrated in FIGURES 1 and 2, may be accomplished by means of conventional paint spraying equipment utilizing well-known stencils or masking sheets customarily employed with paint spraying apparatus. These stencils or masked sheets may be located against a target surface while the target body is supported in the circular mold referred to above or, if desired, the stencil may be utilized in other positions ordinarily resorted to in conventional paint spraying with shields or screens. Application of sprayed colors thus carried out is preferably made at both sides of the target. Since the target in a thickness such as specified, i.e., four inches, constitutes a relatively thin body of highly porous character, and since paint spraying is carried out with an appreciable pressure, there necessarily takes place impregnation of the color beyond the surface fibers. Such impregnation is a common technique now in use in paint spraying fibrous products such as batts, pads and other filling materials manufactured and sold to the trade.

It may also be desired to employ other forms of reinforcing material as shown in FIGURES 9 and 10. As noted therein reinforcing components of mesh batts or other material may be shaped of substantially oblong form and arranged in staggered overlapping relationship as illustrated by the components R, R1, R2, etc. to provide a laminated type of reinforcement which is capable of furnishing increased resistance to arrow penetration all the way out to the peripheral edge of the target when

covered by layers of fibre of the type shown in FIGURES 1 and 3.

I may also desire to provide other modified forms of target bodies as, for example, an arrangement such as shown in FIGURE 8 wherein is indicated a target T4 of the same general laminated construction, but formed with circumferentially spaced lugs as L, L1, L2. The lugs are designed to constitute means for quickly locating and turning the target T4 on a supporting stand S. The stand is constructed with target support blocks as B and B1 having angled surfaces for receiving and supporting the lugs. By means of this arrangement the target may be conveniently and securely held in an operating position and may also be shifted into varying positions of rotation to change the areas subjected to wear.

It will be evident from the foregoing description that I have disclosed a novel laminated target construction in which a combination of fibrous bodies of differing types are associated together to provide unusual density characteristics for resisting arrow penetration and yet holding the arrow in a satisfactory manner. The use of specially crimped and needled fibres when combined with a vulcanized rubber-like coating of latex or other binder affords an unusual recovery characteristic so that fibres separated by arrow penetration rapidly draw together when an arrow is pulled out of the target and the opening is closed. The colored cylindrical sections are capable of being sharply delineated on the fibrous faces of the target and thus provide a long wearing attractive target appearance.

The invention although disclosed in specific form may be modified in various ways in accordance with the scope of the appended claims.

I claim:

1. An archery target comprising a laminated body of elastically adhesively bonded fibres arranged in a plurality of layers and each of the adjacent layer surfaces being separated by a reinforcing screen mesh element which is bonded to the surfaces and arrow trapping barrier sheets secured between the said layers, said sheets consisting of a dense highly needled mass of intermingled fibres which are resistant to arrow penetration.

2. An archery target construction comprising a cylindrical laminated body of elastically adhesively coated fibres arranged in a plurality of layers located one upon another, a plurality of reinforcing screen mesh elements attached between the layers of fibre and spaced apart arrow trapping barrier sheets bonded to said screen mesh elements and said arrow trapping barrier sheets being of varying diameters to provide inner target areas of maximum resistance to wear.

3. An archery target comprising a laminated cylindrically formed body of elastically adhesively bonded fibres interconnected to one another to form an elastic network, said network being impregnated through a part of its thickness with multiple coloring agents arranged to define a central target section of one color and a plurality of additional colored sections occurring in concentric relationship to one another around the central target section, said laminated body including a plurality of layers of resilient fibre coated with a vulcanized rubber compound, circular screen mesh components extending between the layers

throughout all of the target area, a barrier sheet of a needled arrow resistant fibrous mass located centrally of the layers and extending throughout an intermediate portion of the target area, and additional barrier sheets of needled arrow resilient fibrous composition occurring in generally parallel spaced relation to the said first barrier sheet and extending throughout the said central target area only.

4. A structure according to claim 1 in which the target is formed along a peripheral surface with lug portions located in spaced apart relation to one another.

5. An improved target construction comprising layers of fibrous material, each of said layers being made up of elastically adhesively bonded fibres which are connected to one another to form an elastic network, said layers being separated by a plurality of oblong shaped fabric reinforcing strips which extend between opposite peripheral side portions of the target and which are arranged in staggered overlapping relationship to constitute a laminated reinforcing means extending at all points around the target periphery.

6. An archery target comprising a cylindrical body of elastically adhesively bonded fibers interconnected to one another to form an open relatively elastic network, said network of fibers being separated into a plurality of layers and intervening screen mesh elements disposed between said layers, each of said screen mesh elements being formed with interstices whose size is chosen of a dimension less than the cross sectional dimension of an arrowhead to provide for engagement of the interstice sides with arrowhead surfaces and to exert successive resistance forces against arrow penetration into the target, each of said layers and spaced screen mesh elements being elastic and cooperating with one another to constitute wear resistant arrow receiving portions whose recovery characteristics provide for fibers separated by arrow penetration closing in upon one another and assuming a substantially original orientation when an arrow is removed from the target.

7. An archery target comprising a cylindrical body of elastically adhesively bonded fibers interconnected to one another to form an open relatively elastic network, said network having disposed therein in transversely spaced apart relationship a plurality of arrow trapping fabric barrier means consisting of a central fabric barrier of a relatively larger diameter and two adjacent fabric barriers located at either side of the central barrier and being formed of a relatively smaller diameter than the said central barrier thereby to provide regions of graduated resistance to arrow penetration and wear.

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