

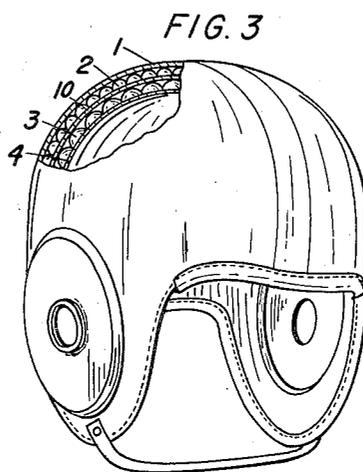
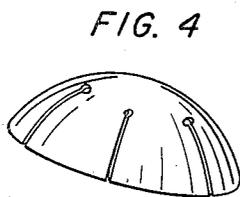
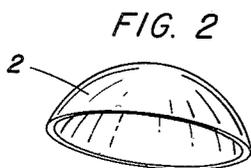
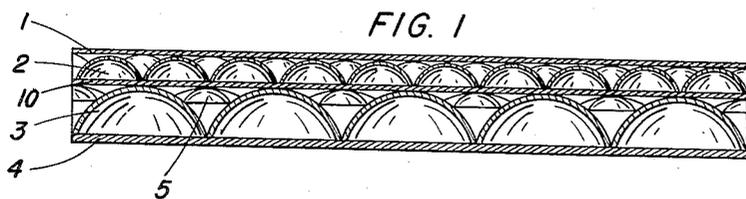
Oct. 30, 1956

J. BJORKSTEN ET AL

2,768,919

ARMOR MATERIAL

Filed Aug. 10, 1953



INVENTORS
JOHAN BJORKSTEN

Johan Bjorksten
HARRY O. RENNAT

Harry O. Rennat

1

2,768,919

ARMOR MATERIAL

Johan Bjorksten and Harry O. Rennat, Madison, Wis.,
assignors to Bjorksten Research Laboratories, Inc.,
Madison, Wis., a corporation of Illinois

Application August 10, 1953, Serial No. 373,414

7 Claims. (Cl. 154—52.5)

This invention relates to an armor material, and more specifically to a crash- or football helmet designed to combine light weight with a high degree of protection against relatively slow non-ballistic impact.

Heretofore, impact protection has been provided largely by heavy padding, or in the case of armor, by the use of steel or fiberglass. However, in all such devices of prior art, the direction of the blow has been substantially unchanged and no attempt has been made to deflect this blow so that it will dissipate its force in a direction parallel with the surface.

An object of this invention is a new type of armor.

Another object is a new type of crash- or football helmet.

A further object is an armor, in which the force of impact is dissipated in a direction parallel to the surface and distributed substantially over the entire area of the armor.

A further object is a protective helmet being exceptionally light in weight in relation to its efficiency.

Further objects will become apparent as the following detailed description proceeds.

The invention is further illustrated by the drawings, of which Figure 1 is a cross-section of an armor embodying the principles in view. Figure 2 is a perspective view of one of the spherical calottes which comprise a principal component in this armor. Figure 3 represents a perspective partly sectional view of a football helmet embodying this protective principle. Figure 4 is a perspective view of the slotted spherical calotte of an alternate embodiment of the invention.

Referring now to Figure 1, the invention comprises a front layer 1, which is smooth and flexible and which may consist, for example, of a thin sheet of resilient plastic material, or of about 3-5 mil metal foil. This is followed by a layer 2, which is composed of a large number of small spherical calottes, made of a material permitting elastic recovery, such as, for example, a fiberglass plastic laminate, steel, hard aluminum, titanium, ceramic reinforced magnesium or aluminum, or the like. Layer 3 is composed of a layer essentially similar to layer 2 except that the spherical calottes are larger. Layer 4 is a smooth layer, similar to layer 1, but thicker and more resistant. A smooth resilient layer 10 may be positioned between the layer of calottes, to support the outer layer more evenly, though this layer is not necessary for the invention.

Small calottes 5 may be placed between the large calottes of layer 3, in order to provide a smoother overall layer.

When a blow hits the surface of this armor, on layer 1, the force will tend to flatten the calottes, and in this fashion the shock will be dissipated parallel to the surface propagating by edge to edge pressure from calotte to calotte, so that waves through these surfaces are generated parallel to the surface. This leads to absorption of the shock. Accordingly, by this deflection of the force of the shock to a direction parallel with the surface, the

2

entire surface of the armor will be made to react. Highly effective dampening is thus achieved.

The small component of the shock which remains directed inwardly, is then distributed by the subsequent layer of calottes, which can flatten and recover in contact with the smooth layer 4.

Figure 4 represents a modification in which the calottes have been provided with radial slots, in order to further increase the springiness and the ease of expansion sideways when a shock impinges on the apex of a calotte. The form or width of these slots are immaterial, and are adjusted for the optimum balance between springiness and rigidity for each embodiment of the invention.

We may incorporate further in the assembly, a grease-type material, to provide for easier slippage of the edges of the calottes, or an adhesive to bond the system together more firmly. In such case, I prefer to use a resilient adhesive, which may be, for example, a polyvinyl butyral, a rubber-type composition, a silicon acrylate-type elastomeric material, or the like.

It is thus seen that the invention is broad in scope, and is not to be limited excepting by the claims in which it is our intention to cover all novelty inherent in this invention as broadly as possible in view of prior art.

Having thus disclosed our invention, we claim:

1. Armor material adapted to protect a portion of a human from a projectile, comprising a supporting sheet, a first layer of calottes positioned edge to edge and attached by their edges to and supported by said sheet, a second supporting sheet attached to peaks of calottes in said first layer, and a second layer of calottes, positioned edge to edge and supported by and attached by their edges to said second sheet.

2. Armor material adapted to protect a portion of a human from a projectile, comprising at least two layers of calottes characterized by the calottes in each layer being positioned with edges abutting, the edges of the calottes in each layer being attached to a supporting sheet and the supporting sheet for one of the layers being attached to the peaks of calottes in the other layer.

3. Armor material adapted to protect a portion of a human body from a projectile, consisting essentially of at least two layers of spherical calottes characterized by the calottes in each layer being positioned with edges abutting, the edges of the calottes in each layer being attached to supporting means and said supporting means for one of the layers being attached to the peaks of the calottes in the other layer.

4. Armor material adapted to protect a portion of a human from a projectile, comprising at least two layers of calottes and supporting means therefor, comprising sheets of elastic material attached to the edges of calottes, characterized by the calottes in each layer being positioned with edges abutting and by the calottes in one layer being supported by peaks of calottes in another layer.

5. The armor material of claim 4 wherein said calottes are steel.

6. The armor material of claim 4 wherein said calottes are glass fiber reinforced organic synthetic resin.

7. The armor material of claim 4 wherein said calottes are titanium.

References Cited in the file of this patent

UNITED STATES PATENTS

1,510,133	Breguet	Sept. 30, 1924
1,918,149	Sullivan	July 11, 1933
2,129,488	Bomberger	Sept. 6, 1938
2,316,055	Davey	Apr. 6, 1943
2,562,951	Rose et al.	Aug. 7, 1951
2,585,515	Talboys	Feb. 12, 1952
2,618,780	Cushman	Nov. 25, 1952