P.G. DIPLOMA IN PATENT LAWS
NALSAR PROXIMATE EDUCATION
NALSAR UNIVERSITY OF LAW
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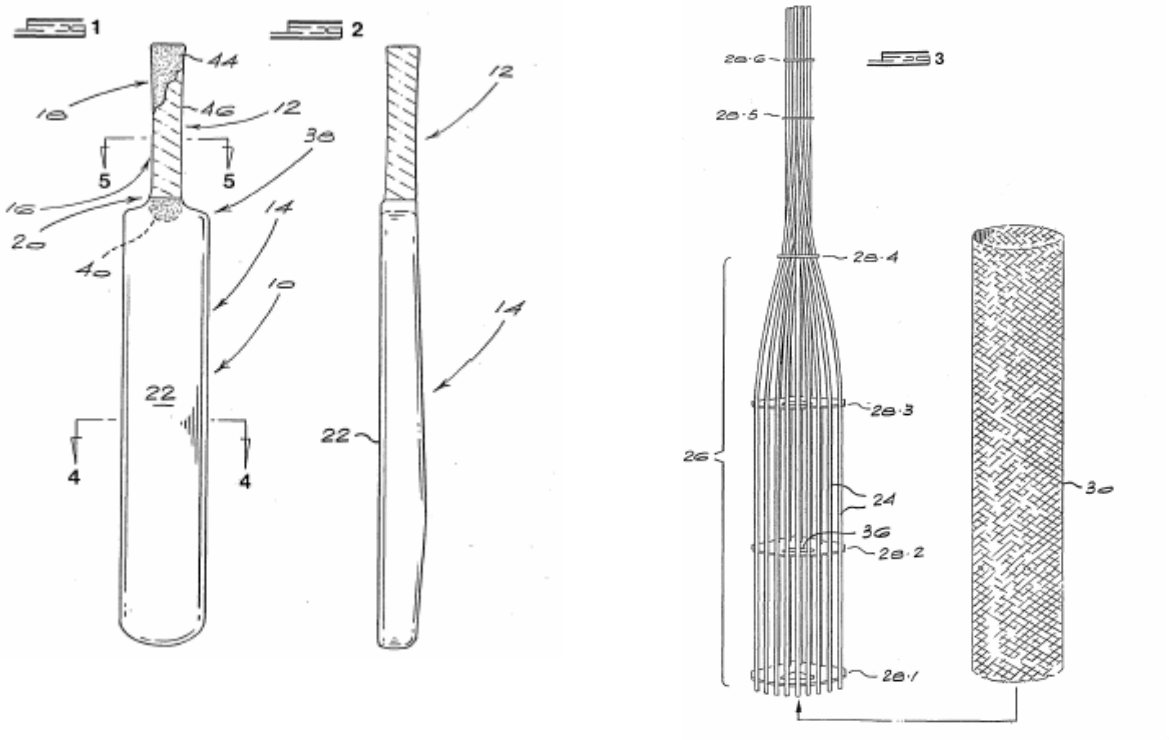
Paper II - Practical
(Exploitation of Patents – Drafting, Specification & Patent Writing)

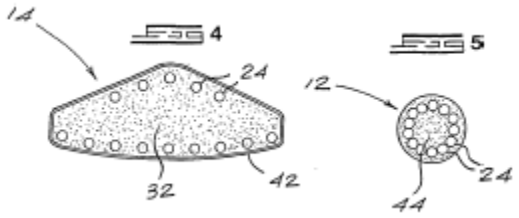
Time: 2 hours. **Full marks: 60**

Peter Nelson Turner from Johannesburg, South Africa and Colin Groom from Kingston, Australia believes that they have jointly invented a bat, which is patentable; and call the invention cricket bat 10. They have sent you the following write-up to describe their invention. With the help of their disclosure and with other information that may be with you (if any), write a patent specification for Mr. Turner and Mr. Groom to be filed as a PCT application.

According to our invention there is a ball-striking bat comprising a handle portion and a ball striking portion connected to the handle portion, a plurality of flexible rods extending lengthwise and continuously through the handle and ball striking portions, the rods being spaced apart from one another to form an open skeletal structure in the ball striking portion, a reinforcing, porous sleeve located about the skeletal structure in the ball striking portion, and a moulded polymeric body filling and embedding the skeletal structure and sleeve in the ball striking portion. Similarly the handle portion of the bat is of a molded polymeric body in which the rods in the handle portion are embedded.

Some figures to illustrate:





The cricket bat 10 seen in Figures 1 and 2 has a conventional external shape. It has a slender handle portion 12 where it is gripped by a batsman and a ball striking portion or blade 14. The handle portion 12 has a round cross-section and the central region 16 thereof has a slightly smaller diameter than the end regions 18 and 20 thereof. The ball striking portion 14 has a generally triangular cross-section with a front, slightly curved ball striking surface 22. As conventional and as illustrated in Figure 2 the thickness of the ball striking portion, measured in a direction normal to the ball striking surface 22, varies over the length of the ball striking region.

The internal reinforcing structure of the bat is illustrated in Figure 3. It includes a plurality of pultruded, glass fiber reinforced polymeric rods 24, in this case of 4mm diameter. In the ball striking portion of the bat, the rods 24 are generally parallel to one another and are spaced apart to form an open skeletal structure designated by the numeral 26. In this portion of the bat, the rods are held in their spaced relationship by spacer members 28.1,28.2 and 28.3 located at a distance from one another. The spacer members may be provided by thin metal or plastics plates, serve to maintain the required spacing of the rods at different positions along the length of the ball striking portion. In some cases, the rods 24 pass through holes in the spacer members and in other cases are located in cut-outs at the edges of the spacer members.

The spacing and location of the holes and cut-outs in the spacer members in the handle portion 14 varies from one member to the next to vary the positioning and spacing of the rods. At a position towards the upper end of the ball striking portion 14, a spacer member 28.4 causes the rods 24 to converge towards one another. In a region between the spacer member 28.4 and a further spacer member 28. 5 some rods are twisted relative to others as illustrated. Thereafter, between the spacer member 28.5 and the final spacer member 28.6, which are similar to one another, the rods are generally parallel to one another and lie in a compact circular array as will be apparent from Figure 5.

The numeral 30 indicates a porous reinforcing sleeve which is slipped over the skeletal structure 26 in the ball striking portion 14 of the bat. In this embodiment, the sleeve 30 is a composite, braided biaxial sleeve of Kevlar and carbon fibres. Sleeves of this type are produced by A & P Technology Inc of Covington, Kentucky, USA, a suitable example being that marketed under the designation Cobrasox V81 L58L200X. The diameter of the sleeve is selected such that it can be slipped as a snug fit over the structure 26.

The assembly of skeletal structure 26 and sleeve 30 is placed in a mould where it is encapsulated, in a moulding operation, in a body 32 of low density, rigid structural polyurethane foam, typically one having a density in the range 200kg~3 to 400kgm-3, preferably about 300kg~3. The body 32 entirely fills the central region between the rods 24 and embeds the sleeve 30 to some depth. It will be noted that the spacer members have central apertures 36 to facilitate the formation of a continuous moulded

body. In addition, the porosity of the sleeve 30 permits the formation of a continuous moulded body. The moulded body 32 extends lengthwise past the ends of the rods 24 to the toe of the bat.

The mould is such that the moulded body 32 does not encapsulate the rods 24 in the handle portion 12. It terminates at the shoulder 38 of the bat and is formed with an arcuate rebate 40 as indicated by the dotted line in Figure 1.

A skin 42 of a polyurethane foam which is less rigid than that of the body 32 is then moulded over the body to provide the final surface of the ball striking portion of the bat. The skin 42 will typically have a thickness in the range 3mm to 4mm and will be of an elastomeric grade polyurethane foam, typically one having a density in the range 400kgm-3 to 600kg-3.

In some cases where a lower cost bat is required, it is possible to omit the skin 42. In such cases, the body 32 will itself form the final surface of the ball striking portion of the bat.

The handle portion 12 of the bat is separately moulded. In this case, the projecting portions of the rods 24, in their close circular array, are placed in a mould and are encapsulated in a moulded body 44 of elastomeric polyurethane. The polyurethane which is used typically produces a body 44 having a Shore A hardness of about 70. At its lower end the body 44 fills the rebate 40 and blends smoothly with the body 32.

As shown partially in Figure 1, a soft tubular grip 46 of rubber or the like may be located over the handle portion to improve the integrity of a batsman's grip on the handle portion.

Initial testing has shown that the bat 10 has a large "sweet spot". It is believed that this is primarily attributable to the use of the interior skeletal structure 26 which leads to an efficient transfer of energy from the bat to a ball which is struck thereby, even if the ball should be struck at a position away from the centre of gravity of the ball striking portion. Particularly when the skin 42 is included, it has been found that the bat gives a soft feel when a ball is struck.

The initial tests have also shown that the bat 10 can have a reduced tendency, compared to conventional wooden bats, to transmit shock forces to the hands of a batsman. It is believed that this can be attributed both to the use of the structure 26 and to the fact that the body 44 is moulded separately from the body 32 and is of an elastomeric grade of polyurethane.

In a modified bat intended for use in training, the body 44 may be moulded such that its outer surface has a shape which will encourage the batsman to take up a proper grip on the bat. There may, for instance, be finger and/or hand indentations corresponding to recommended hand and finger positions.

The moulding procedure is then similar to that described above, with the central region of the wrapped structure initially being filled and the sleeve slightly embedded with low density, rigid structural polyurethane foam and a less rigid, elastomeric grade polyurethane skin subsequently being moulded externally to provide the final surface.

It is also within the scope of the invention for the handle portion 12 to moulded at the same time as the ball striking portion 14, so that the entire bat is of one-piece construction. In this case, a two stage

moulding procedure may again be used to create a relatively rigid core region with an external, elastomeric skin, as described previously.

Figure 4 illustrates an array of reinforcing rods 24, in the ball striking region, in which there are nine rods close to the ball striking surface of the bat and five rods close to the rear surface of the bat. In another arrangement, there may be an equal number of rods at the ball striking surface and at the rear surface, with the rods at the ball striking and rear surfaces being in opposing pairs, i. e. with each rod at the ball striking surface being directly opposite a rod at the rear surface. There may for instance be five rods at each surface. Experimentation has shown that this configuration leads to a particularly strong bat structure.

Apart from the large"sweet"spot and reduction in shock transmission, bats according to the invention are found to be extremely strong and resistant to breakage.

On searching in this context, we found the following documents in the INTERNET:

1) US 4032143: - Discloses a composite molded baseball bat using a tubular, high yield strength aluminum core surrounded by a foam plastic body having a density of from 30-50 pounds per cubic foot and an integral outer skin. The tubular aluminum core has an outside diameter of from three-quarters to 1 inch and a wall thickness of from 0.062 to 0.125 inch.
2) GB 2008414: - Discloses a playing implement comprises a handle and a blade, which has face intended to hit a ball or the like, the face having situated behind it one or more resilient elements which are so disposed and arranged as to increase the driving force of the implement used.
3) WO 00/35540: - Discloses a composite baseball bat having a core wherein the core in wound at various angles with continuous fibers. The fibers are impregnated with a resin such as an epoxy resin. The baseball bat includes a core having a barrel portion, handle portion and a longitudinal axis extending through core barrel and handle portions, the handle portion being narrower than the barrel portion; continuous first fibers wound around the core barrel portion at an angle of about 0 to 90^{o} relative to a first plane normal to the longitudinal axis to provide at least one layer of first fibers around the core barrel portion; continuous second fibers wound around the core handle portion at an angle of about 35 to 55^{o} relative to the first plane normal to the longitudinal axis to provide at least one layer of second fibers around the core handle portion; and a resin impregnated on the first and second fibers.
4) US 4025377: - Discloses a method of producing a baseball bat in which the barrel or hitting portion of the bat is molded from synthetic resin and is affixed to a wooden grip or handle portion. An apertured metal tube is fitted over the barrel portion and synthetic resins are foamed through the apertures to bind the metal tube to the barrel portion. The synthetic resin is further smoothed over the entire metal tube and barrel portion. Then, a winding of glass fibers or a stocking of knitted glass fibers may be wound or fitted over the metal tube and barrel portion and painted with a synthetic resin paint which is allowed to permeate the fibers. The synthetic resin may be urethane foam, and the metal duralumin, and the windings or knitted stocking may have a textured surface, which will enhance the ability of the bat to prevent foul balls.

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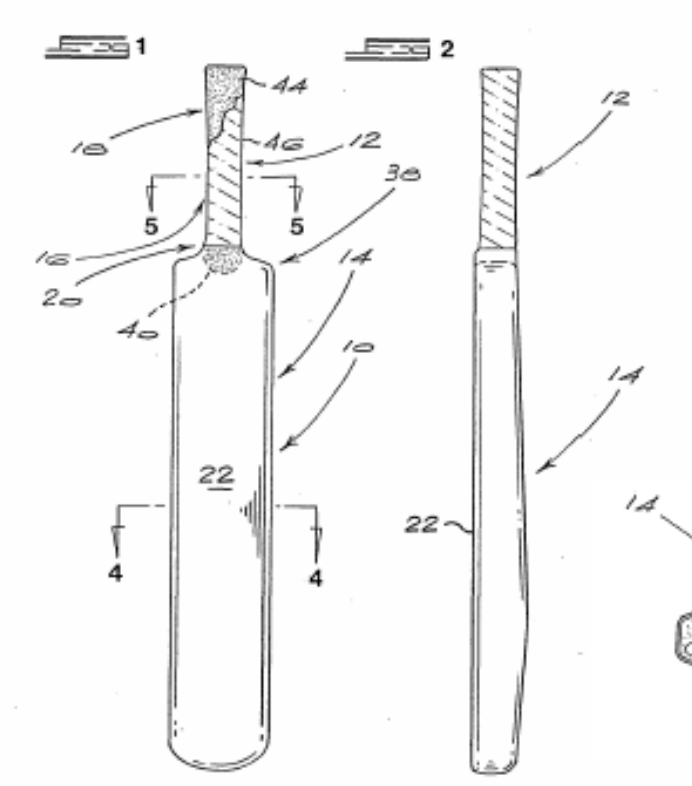
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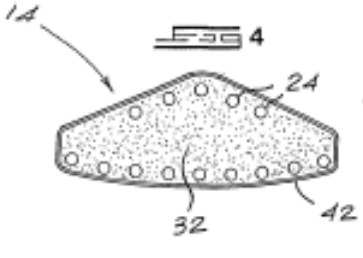
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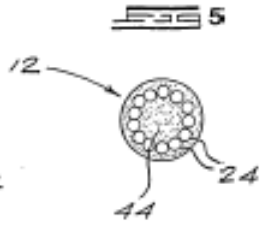
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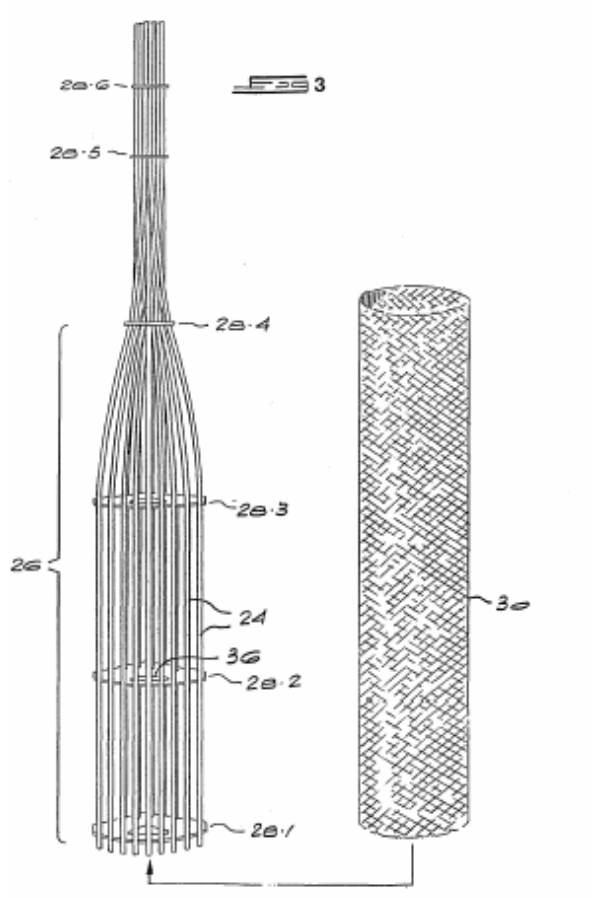
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