IMPROVED DESIGN OF JOINT ASSEMBLY AND THEIR PARTS FOR CRICKET BAT WITH DETACHABLE HANDLE

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ABSTRACT

The improved design of joint assembly & their parts, made up of non wood material are presented. After finding out volume of non-wood material from a referenced handle based on constraint measurement, from which joint assembly would be prepared, with the help of this joint assembly the handle would be attached or detached. The design and manufacturing process of the joint assembly with their parts has been presented in this paper as per the Law 5-the bat of MCC, 2017 which quantify the use of non-wood materials up to only one-tenth part from the total volume of the handle.

Key words: Designing, Joint Assembly, Referenced Handle, Modified Handle, Non-wood Material, Cane wood (Calamus manan).


1. INTRODUCTION

This is predominantly marked within the tennis racket design and developments, even though, much of these improvements only make marginal improvement to the performance [1]. However as with many sports, the increasing demand among consumers for the latest high performance sport equipments, now a day’s research is fuelling scientifically and engineered by sports manufacturers particularly for golf club, baseball bats, tennis rackets and
hockey sticks, researcher together with the use of stiff, lightweight composite materials has spawned many novel features & design, in comparison to cricketing equipment which has seen no such development despite the sport’s popularity.

It was noted that now a day’s performance rather than cost that is the overriding consideration in the design and manufacture of modern sporting equipment. The extensive development and modernisation of equipment as with tennis rackets has not been so apparent in cricket bats, which often make cricket bats seem antiquated. Modern sports equipment, for games such as cricket, baseball and golf is the subject of increasing amount of research [2]. Equipment design has proved a particularly useful tool with utmost work to date concerning on the performance of the equipment. Material selection, design processing and craftsmanship are a critical parameter to choose assembly design and methodology.

Cricket bats have seen relatively little technical development. The lack of development is due to the rules restricting on the use of non-wood material in the cricket bat [3]. It is suggested that the handle offers the most scope for improvements in bat performance [4]. However, improvements to the handle remain relatively unexplored [5]. Considerable research has been undertaken in the attempt to improve the design of Joint Assembly and their parts to enhance the performance of sporting equipment. The researcher derive a maximum benefit from the available resources to aid in the creation, modification, analysis, or optimization of a structural design of a joint assembly and their parts for a cricket bat with detachable handle in cricketing equipment [6].

The aim of this study was to design & develop a joint assembly and their parts from a known amount of volume (i.e. 21.49 cm$^3$) of a referenced handle [7] which was constraint on its geometrical parameters [8] for a modified handle. This study is conducted in order to further the researcher work would be employed to an applied research work which is going on to examine the performance & reliability of non-wood material used into cricket bat handle that mainly focuses on the use of non-wood material from which the joint assembly was made. The ultimate goal of adopting this procedure is to relating the results to a particular situation on the above mentioned invention.

2. METHODOLOGY

The geometry of joint assembly was prepared to improve the quality of design in Auto CAD (2018) software to increase the productivity. And the advanced & novel (CNC) machining processing methods and techniques presented here and were applied to the design that enabled the development of joint assembly to produce new types of equipment with enhanced properties, as well as improving the overall design of sporting goods.

2.1. Constraint of Joint Assembly and their Parts

The joint assembly and their parts are made to be constraint accordingly from the one-tenth part of the total volume of the referenced handle [8], and for constraining the volume of non-wood material from which Joint Assembly and their Parts were prepared by using the procedure [7].

2.3. Material Constraint

For the making of joint assembly any advanced composite material would be used as per the new modified Rule 5 (the bat) of MCC, which allows only 10% of ‘non-wood’ material from the total volume of the handle. And for remaining 90% should be predominantly made up of cane wood i.e. Calamus manan with 3 rubbers springs [9].
2.4. Design and Description of Joint Assembly and their Parts

The cricket bat handle is shown in Figure 1 which is divided into two parts i.e. lower and upper part as shown in Figure 1(a) & 1(b) respectively. The joint assembly & their parts are shown in Figure 2. The joint assembly is made of Adaptor, Sleeve, locking screw & locking pin as shown in Figure 2(a), 2(b), 2(c) & 2(d) respectively. In order to change overall length of the cricket bat, upper parts of the handle having different lengths but same dimension of the adaptor are used.
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Adaptor has also a hole of 2 mm diameter and the center of this hole is 5 mm apart from its right end as shown in Figure 2(a). The one end of the detachable handle is driven into the hole of the adaptor and a lock pin is also inserted into a hole of 2 mm diameter for fastening the adaptor with the detachable handle, the adaptor has external threads on its left end; the length of threaded portion is 9.5 mm as shown in Figure 3.

The one end of the detachable handle is driven into the hole of the adaptor and a lock pin is also inserted into a hole of 2 mm diameter for fastening the adaptor with the detachable handle, the adaptor has external threads on its left end; the length of threaded portion is 9.5 mm as shown in Figure 3.

The sleeve remains attached to one end of the lower part of the handle and the adaptor remains attached to one end of the upper part of the handle. The sleeve has a hole of 2 mm diameter and center of this hole is 5 mm apart from its left end as shown in Figure 2(b). The wedge shaped end of the lower part of the handle is fixed with the blade of cricket bat, another end of the lower part of the handle is driven into the sleeve and locking pin is inserted into 2 mm hole for fastening the sleeve with this end as shown in Figure 4. The sleeve has internal threads on its right end; the length of threaded portion is 10 mm. A hole of 5 mm diameter is provided in the right end of the sleeve, the center of this hole is 6 mm apart from the right end of the sleeve.

The adaptor also has 32.5 mm diameter up to 23 mm from its right end and 33.5 mm diameter from 23 mm up to 25 mm in order to provide flanges on the adaptor and the sleeve has 32.5 mm diameter up to the length of 20 mm from its left end and 33.5 mm diameter from 20 mm up to its right end in order to keep the wrapped thread in its proper position.

To attach the upper part to the lower part of the handle, the threaded portion of adaptor is driven into the internal threaded portion of the sleeve and a lock screw is driven into the 5 mm diameter threaded holes provided into the both adaptor & sleeve to lock the assembly as shown in Figure 5.
Figure 3: Upper part of Handle with Adaptor and Locking Pin

Figure 4: Lower part of Handle with Sleeve and Locking Pin

Figure 5: Assembled Full Section of the Handle's Lower & Upper part by Using Joint Assembly
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Figure 6: Assembled Handle With of Lower & Upper part of Handle Using Joint Assembly
To detach the upper part of the handle from lower part of the handle, the lock screw is loosen and is drawn out from the 5 mm diameter holes of adaptor and the sleeve. After that adapter attached with the upper part of the handle is loosen and drawn out from the threaded portion of the sleeve.

In this way the overall length of the cricket bat can be changed by using upper part of the handle having different lengths. In figure 6 the front and side view of the assembled handle with the lower & upper part of handle by using Joint Assembly was showed.

3. CONCLUSIONS

The present method of designing and manufacturing of the joint assembly & their parts is based on 10% volume from the total volume of the cricket bat handle as only 10% volume of non wood material is permissible according to law 5-the bat [3]. The 21.49 cm³ volume of material was used to make the joint assembly and their parts [7]. The material used for making of handle would be Singapore cane with 3 rubber spring [9], and for joint assembly it should be made up of any advanced composite material that meet out the demands according to the mechanical & physical properties of cane wood, without changing the general playing properties of handle in relation to the referenced handle.

4. SUGGESTION FOR FUTURE WORK

The future aspect of this newly designed joint assembly, the materials to be used for manufacturing must have high strength to weight ratio, high stiffness, and flexibility. The advanced fiber composite materials compatible with the manufacturing processes may be used for manufacturing the joint assembly. Further the design would be modeled with different handle’s geometry and the placement of Joint Assembly may also be shifted as per the requirements or need of the days.

REFERENCES