PATENT SPECIFICATION

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751,577

Date of filing Complete Specification: Dec. 1, 1954.

Application Date: Sept. 8, 1954. *No. 26000/54.*

Complete Specification Published: June 27, 1956.

Index at acceptance:—Class 132(3), G28.

COMPLETE SPECIFICATION

A Method of Manufacturing a Shuttlecock

We, THE CARLTON TYRE SAVING COMPANY LIMITED, of Parkstone Works, Wingletye Lane, Hornchurch, Essex, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This specification relates to methods of manufacturing shuttlecocks having skirts made in one piece of plastic material by a moulding process. The invention and claims do not relate to shuttlecocks having skirts made of textile fabrics made up of fibres, threads or yarns, or strands, in which a genuine stretching process (as distinct from a straightening process) reduces the strength of the material. This invention is useful only when the material used can be stretched without loss of strength. Such a material would be nylon in solid form.

In this specification, the cap of the shuttlecock is that part normally struck by the racket and including any covering such as kid or sponge rubber, the upper or inner skirt is that part of the skirt of the shuttlecock adjacent the cap and the lower or outer skirt is that part of the skirt of the shuttlecock remote from the cap, which includes the tops of the stems and the vane area and is joined to the cap by the stems of the upper or inner skirt. The stems are longitudinal thickenings used to stiffen the skirt and preferably are thicker where they leave the cap than material between the stems in the lower skirt. The vane area is the material between the stems in the lower skirt, and any air spaces between that material. By the term "stretching" is meant a substantial extending of the length of the material without breaking down the attraction within the material of the molecules for each other.

An important quality in a shuttlecock is to possess as light a lower skirt as possible, and since a certain vane area is essential it follows that the thickness of the material of the vane area should be as small as possible. In moulded shuttlecocks the limiting factor can be the size of the gap between the male and female tools through which the material may be made to flow and still retain its strength characteristics. The object of this invention is to make a skirt of a shuttlecock lighter than it could normally be made by the use of a moulding process and at the same time maintain the vane area or even increase it.

A secondary object which may be achieved if desired is to flute the skirt without increasing the weight by means of the process; these flutes may be used as directional air passages which could be made to cause the shuttlecock to spin, or to decrease the speed of spinning. It is further believed that the stretching process referred to later may rearrange the molecules of the material so that the shuttlecock becomes more difficult to break. This invention is that in a method of manufacturing a shuttlecock of the type which consists of a cap and an upper and lower skirt, the skirt, incorporating stems and vane area, being in one piece and made by a moulding process of plastic material the method is characterised in that one operation in the method of manufacture is to stretch at least the vane area of the lower skirt after the initial forming process has been done.

The shuttlecock is of the type in which the stems are integral with each other and the material in the vane area is integral with the stems. Preferably also the lower skirt consists of a number of stems from each of which branch a plurality of ribs, these ribs together with the air spaces between them forming the vane area.

The upper and lower skirts, complete with stems, having been moulded, the skirt is then placed on a suitable tool and the material between the stems is stretched. The stretching can be achieved in a number of ways, for instance, by expanding the male tool or by locating the skirt on a male tool which has been grooved between the stem supports and then forcing both tool and shuttlecock into a fluted female.

The proud portion of the female will then

force the vane area between the stems into the grooved portion of the male and, since the stems are supported, stretching of the vane area will occur, and the length of the vane area between the stems is increased by the process; the weight of the vane area, however, cannot be increased so a greater vane area for a given weight is obtained. The additional length is used either to make a skirt having a wider flare or to form flutes between the stems or both. If these flutes are angled unequally to the airstream the shuttlecock may be made to spin if desired. A material which will not be unduly weakened by stretching is required; one such material is nylon but the invention is not limited to this material.

In order that this invention may be clearly understood and readily carried into effect, reference is directed to the accompanying drawings in which:—

Fig. 1 is a side elevation of one stage of production after the moulding operation and before the stretching.

Fig. 2 is a view of Fig. 1 in the direction of arrow X.

Fig. 3 is a side elevation of a further development of the invention.

Fig. 4 is a section across the bottom of the skirt of Fig. 3 at YY.

Fig. 5 is a section showing a further form of the invention.

Fig. 6 is a section showing a still further form of the invention.

Fig. 7 is a section showing a still further form of the invention.

Fig. 8 is a section showing a still further form of the invention.

A shuttlecock is moulded according to Fig. 1 consisting of a nose portion A, stems B and vane area C between the stems, consisting in this case of a plurality of ribs with air spaces between them which together comprise the vane area. The extent of the lower skirt is indicated by the bracket at C, which also indicates the extent of the vane area. The lower skirt comprises both vane area and stems in that portion of the shuttlecock indicated by the bracket. As far as this invention is concerned it is preferable but not essential that the vane area should be made up of ribs; it could be made up of plain vane unbroken by ribs, or the plain vane could be pierced with holes.

The subsidiary stems F are for strength purposes and are not connected with this invention.

A ribbed vane area is selected because it is the preferred method of construction and of itself makes a very light skirt and the use of the present invention enables it to be made still lighter.

A view of Fig. 1 in the direction of arrow X is shown in Fig. 2 and for the sake of clarity in the descriptions that follow only the top edge D of the vane area will be discussed, it being understood that whatever treatment is given to the top edge may be given in varying degree to the whole vane area.

Note should be taken of the size of the maximum perimeter in Fig. 2.

The shuttlecock moulded as in Fig. 1 is now expanded by forcing a steel cone into it until it assumes the shape of the shuttlecock shown in Fig. 3 and the size of the perimeter D has been increased until it reaches the size D^1 shown in Figs. 3 and 4 and reference to Figs. 2 and 4 will show that the perimeter of the bottom of the skirt of Fig. 4 is considerably greater than it was when originally moulded by reason of the stretching of D until it reaches the length of D^1 and the vane area of the shuttlecock has, therefore, been considerably increased. The sponge rubber cap E completes the shuttlecock.

If the known method of manufacture has been used the shuttlecock would have been moulded to its finished shape, that is, to the shape shown by Figures 3 and 4 and, assuming that the material in the vane area between the stems is moulded as thinly as possible, the vane area moulded by the known method could not be thinner than the vane area moulded to make the shuttlecock shown in Figs. 1 and 2 but since the perimeter shown in Figure 2 is smaller than the perimeter shown in Fig. 4 the shuttlecock skirt made by moulding to Figs. 1 and 2 must be lighter, other considerations being equal, than the shuttlecock skirt made by known methods to Figs. 3 and 4. Nevertheless, the shuttlecock moulded to Figs. 1 and 2 has, when expanded to the dimensions of Figs. 3 and 4 a similar profile to a shuttlecock originally moulded to Figs. 3 and 4 but being lighter in the skirt because the vane area is thinner has a better performance than the shuttlecock moulded in the first instance to Figs. 3 and 4.

This is the main object of the present invention. Many different variations of the same theme are possible and by way of indication and not of limitation further examples are given below.

A shuttlecock is moulded according to Figs. 1 and 2 and then placed between a male and female cone in such a way that the vane area between the stems is held by a number of fingers. Intermediate fingers, bearing on the stems B are then caused to expand outwards so that the shuttlecock skirt takes the form shown in Fig. 5. The stems B now take up new positions and become B^2. The stretching in this case causes flutes D^2 between the stems B^2.

This form of the invention has three further advantages beyond lightness of the skirt, (1) for the same size in side elevation as a shuttlecock made by known methods the shuttlecock has a smaller head on area and this allows more filling in the skirt thus making the shuttlecock easier to see and (2) the fluting

may be made off set in relation to the stems as shown at flutes D^3 off set in relation to stems B^3 in Fig. 6, thus causing the air to impart a rotary motion to the shuttlecock or, if the shuttlecock is already spinning in the opposite direction, to cause the shuttlecock spin to be retarded, and (3) when the shuttlecock is hit by the racket the vane area is protected by the stems.

In Fig. 7 a similar tool to that used for Fig. 5 has been used but this time the stems B^4 have been held and the vane area between the stems B^4 has been stretched outwards by the expanding fingers. In Fig. 8 the fluting D^5 has been off set in relation to the stems B^5 and this again imparts a rotary force to the shuttlecock.

An alternative form of the invention would be to mould the shuttlecock according to Figs. 3 and 4 and then stretch the vane area inwards to form a perimeter as shown at Fig. 5.

This method would not make a lighter skirt but would increase the vane area and would permit fluting and stretching so that some of the benefits of the invention would be obtained.

It is to be understood that the vane area C shown in Fig. 1 refers to the overall dimensions of this area.

The fact that the individual ribs are narrowed by the stretching is a peculiarity of this method of manufacture and does not affect the principle involved.

What we claim is:—

1. A method of manufacturing a shuttlecock of the type which consists of a cap and an upper and lower skirt, the skirt, incorporating stems and vane area, being in one piece and made by a moulding process of plastic material and the method being characterised in that one operation in the method of manufacture is to stretch at least the vane area of the lower skirt after the initial forming process has been done.

2. A method of manufacturing a shuttlecock as in claim 1 and characterised in that the stretched vane area is made up of a plurality of ribs.

3. A method of manufacturing a shuttlecock as in claim 1 and characterised in that the stretching causes fluting in the shuttlecock skirt.

4. A method of manufacturing a shuttlecock as in claim 1 and characterised in that at least part of the fluting is off set in relation to the stems.

5. A method of manufacturing a shuttlecock as in claim 1 and characterised in that the vane area is inboard of the stems.

6. Methods of manufacturing a shuttlecock substantially as described in the accompanying specification and illustrated in the drawings herewith.

For and on behalf of,
THE CARLTON TYRE SAVING COMPANY LTD.
W. C. CARLTON, Director.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1956.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

751,577 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

FIG.1.

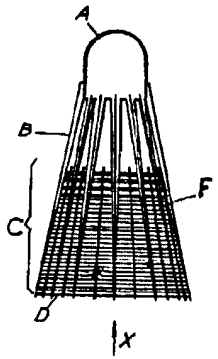

FIG.3.

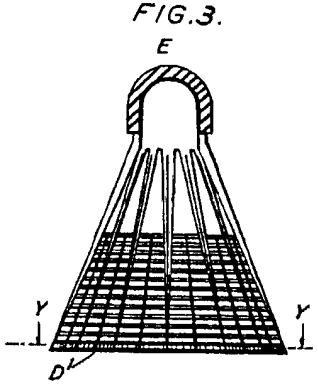

FIG 5.

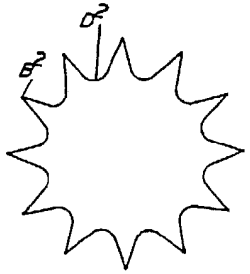

FIG.6.

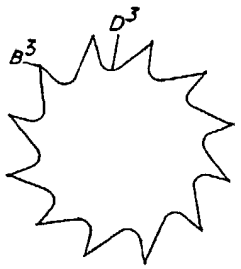

FIG.2.

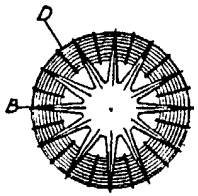

FIG.4.

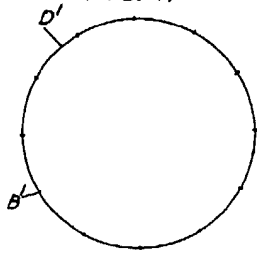

FIG.7.

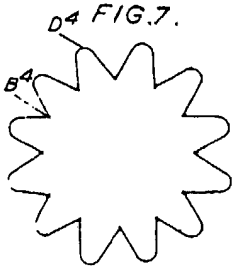

FIG.8.