

PATENT SPECIFICATION

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(54) SHUTTLECOCKS

(71) We, DUNLOP LIMITED, a British Company of Dunlop House, Ryder Street, St. James's, London, S.W.1., 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 invention relates to shuttlecocks for use in the game of badminton.

Shuttlecocks of plastics materials are in common use and have proved very acceptable to the general badminton playing public. However, they have been slow to supplant the traditional feathered shuttlecocks so far as first class players are concerned, who regard as unsatisfactory the sound and feel experienced when the racket strikes a shuttlecock of plastics material.

The present invention now provides a shuttlecock of plastics material which is very much more akin to feathered shuttlecocks in at least the respects referred to above. The present invention now provides a shuttlecock having a skirt of moulded plastics material defined by an array of divergent stems extending from a support member which carries a striking cap, said skirt comprising a perforate upper portion adjacent said support member, a perforate lower portion distant from said support member, and an imperforate intermediate portion connecting said upper and lower portions and having a length of 25%-65% of the sum of the lengths of the intermediate and lower skirt portions.

It is to be noted that the imperforate portion referred to above is separated from the wider end of the shuttlecock by the lower skirt portion. In general, in the present invention the intermediate and lower skirt portions together broadly correspond to the vane area of the feathers used in feathered shuttlecocks. Suitable proportions [Price 33p]

of the length of the intermediate and lower skirt portions within the specified limits is a matter which can be determined by simple experiment. In general, it is preferred that the intermediate skirt portion have a length of 40 to 50% of the sum of the lengths of the intermediate and lower skirt portions.

The shuttlecock can be of any suitable plastics material. A suitable thermoplastic material is, for example, a nylon or a polyethylene.

The shuttlecocks of this invention are conveniently obtained by injection moulding, and in that event the imperforate band can be provided by using a mould design such that the plastics material can "flash" so as to occupy the area between the stems and ribs in the intermediate skirt portion.

Although the present invention is not to be construed according to any particular theory, it is believed that the desirable properties of the shuttlecocks produced according to it can be explained as follows. It is believed that the sharp sound or 'crack' of impact produced when a feathered shuttlecock is struck with a racket moving against the direction of flight of the shuttlecock is caused largely by a volume of air being trapped inside the skirt of the shuttlecock immediately the shuttlecock contacts the racket and immediately prior to the shuttlecock "turning over". The shuttlecock is momentarily forced to move backwards and this backwards motion—with the open wider end of the skirt leading—causes a sharp sound to be emitted due to the reaction of the skirt on the trapped air. Shuttlecocks of plastics material known hitherto, in which the whole skirt has had a perforate structure have, by that fact, been incapable of producing the 'crack' referred to above.

However, the structure of the shuttlecock

of the present invention is such that the sound and sensation of feel experienced by the player is very similar to that of a feathered shuttlecock.

5 We have further found that the imperforate band of the intermediate skirt portion can result in reduced air turbulence when the shuttlecock is in flight, and an increase in the speed of the shuttlecock. As
10 this increase can in some instances be undesirable, a further optional feature of the invention is an increase in the angle between opposite sides of the skirt, for example, to an angle in the range 48° to 50°
15 compared with an angle of 45° which is typical of known plastics shuttlecocks.

A shuttlecock according to one embodiment of the present invention is illustrated in the accompanying drawings and is
20 of injection-moulded nylon and its striking cap is of cork or of expanded plastics material (e.g. expanded p.v.c.) having properties similar to those of cork.

Figures 1 and 2 of the drawings show
25 respectively a perspective view and a side elevation of the shuttlecock without its striking cap. Figures 3 and 4 show respectively a perspective view and side
30 elevation of the shuttlecock complete with striking cap. Figure 5 is an enlargement of part of the lower skirt of the shuttlecock showing the arrangements of the constituent stems, ribs and strands and the undulating contour of the skirt; and Figure 6
35 is a perspective view of the striking cap of the shuttlecock of Figures 3 and 4.

The shuttlecock has at its narrower end as a support member a collar 10 from one end of which extends an array of divergent
40 stems 11 which define the outline of a skirt 12 of general conical shape. The stems are of decreasing thickness between the collar and the lower skirt. The skirt 12 consists three portions: the upper skirt
45 portion 13 adjacent the collar 10, the lower skirt portion 14 in the region of the wider end of the shuttlecock and the intermediate skirt portion 15 which connects the upper and lower skirts. The lower skirt has a
50 series of ribs 16 connecting together adjacent stems, and strands 17 running substantially parallel to the stems and connecting together adjacent ribs, so as to form a network of plastics material
55 throughout the lower skirt (Figure 5).

In the intermediate skirt 15 the plastics material forms an imperforate band or foil, substantially impervious to air and having
60 a thickness between the ribs and stems of about 0.003 inch, for example 0.0025-0.0035 inch.

The upper skirt, in this embodiment, has no plastics material connecting adjacent
65 stems apart from in the area where the stems join the collar. Thus in the upper

skirt elongated apertures 18 separate adjacent stems.

The lower skirt and, to a lesser extent, the intermediate skirt has an undulating outline, each undulation being formed of
70 first and second surfaces (19, 20) inclined to each other, the first surface 19 of each undulation by reason of greater number and/or width of strands for example, having a greater proportion of its area occupied by moulded material than has the
75 second surface 20 thereof. This feature is to provide the desired rotation of the shuttlecock in flight, the amount of material in the respective surfaces of each undulation being in accordance with the
80 desired rate of rotation.

Shuttlecocks having a skirt whose wider end has an undulating outline of which
85 each undulation has first and second surfaces inclined to each other, the first surface containing a greater area of moulded material than the second are the subject of Patent No. 1103364 to Carlton Sports
90 Company Limited.

In the particular embodiment illustrated the length of the skirt, that is from where it joins the collar to the lower edge of the
95 lower skirt is about $2\frac{1}{2}$ inches. Of this, the length of the upper skirt, that is from said junction with the collar to the boundary between the upper and intermediate skirts is about 1 inch, the length of the
100 intermediate skirt is about 0.6 to 0.7 inch and the length of the lower skirt is correspondingly about 0.9 to 0.8 inch. Thus, in this example the length of the intermediate skirt is about 40-47% of the sum of the length of the intermediate and lower skirt.
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The collar 10 at its end remote from its junction with the stems conveniently has a rim, flange, or other enlarged end portion
110 21 to assist retention of the cap 22 in place on the collar. The cap shown in Figure 6 has a cylindrical recess 23 which is a push-fit with the rim 21. The cap can contain if necessary, one or more pellets, for example of rubber or plastics material
115 chosen so as to give the shuttlecock the desired weight.

WHAT WE CLAIM IS:

1. A shuttlecock having a skirt of moulded plastics material defined by an
120 array of divergent stems extending from a support member which carries a striking cap, said skirt comprising a perforate upper portion adjacent said support member, a perforate lower portion distant from
125 said support member, and an imperforate intermediate portion connecting said upper and lower portions and having a length of 25%-65% of the sum of the lengths of the intermediate and lower skirt portions.
130

of the present invention is such that the sound and sensation of feel experienced by the player is very similar to that of a feathered shuttlecock.

- 5 We have further found that the imperforate band of the intermediate skirt portion can result in reduced air turbulence when the shuttlecock is in flight, and an increase in the speed of the shuttlecock. As
10 this increase can in some instances be undesirable, a further optional feature of the invention is an increase in the angle between opposite sides of the skirt, for example, to an angle in the range 48° to 50°
15 compared with an angle of 45° which is typical of known plastics shuttlecocks.

- A shuttlecock according to one embodiment of the present invention is illustrated in the accompanying drawings and is
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- The upper skirt, in this embodiment, has no plastics material connecting adjacent
65 stems apart from in the area where the stems join the collar. Thus in the upper

skirt elongated apertures 18 separate adjacent stems.

The lower skirt and, to a lesser extent, the intermediate skirt has an undulating outline, each undulation being formed of first and second surfaces (19, 20) inclined to each other, the first surface 19 of each undulation by reason of greater number and/or width of strands for example, having a greater proportion of its area occupied by moulded material than has the second surface 20 thereof. This feature is to provide the desired rotation of the shuttlecock in flight, the amount of material in the respective surfaces of each undulation being in accordance with the desired rate of rotation.

Shuttlecocks having a skirt whose wider end has an undulating outline of which each undulation has first and second surfaces inclined to each other, the first surface containing a greater area of moulded material than the second are the subject of Patent No. 1103364 to Carlton Sports Company Limited.

In the particular embodiment illustrated the length of the skirt, that is from where it joins the collar to the lower edge of the lower skirt is about $2\frac{1}{2}$ inches. Of this, the length of the upper skirt, that is from said junction with the collar to the boundary between the upper and intermediate skirts is about 1 inch, the length of the intermediate skirt is about 0.6 to 0.7 inch and the length of the lower skirt is correspondingly about 0.9 to 0.8 inch. Thus, in this example the length of the intermediate skirt is about 40-47% of the sum of the length of the intermediate and lower skirt.

The collar 10 at its end remote from its junction with the stems conveniently has a rim, flange, or other enlarged end portion 21 to assist retention of the cap 22 in place on the collar. The cap shown in Figure 6 has a cylindrical recess 23 which is a push-fit with the rim 21. The cap can contain if necessary, one or more pellets, for example of rubber or plastics material chosen so as to give the shuttlecock the desired weight.

WHAT WE CLAIM IS:

1. A shuttlecock having a skirt of moulded plastics material defined by an array of divergent stems extending from a support member which carries a striking cap, said skirt comprising a perforate upper portion adjacent said support member, a perforate lower portion distant from said support member, and an imperforate intermediate portion connecting said upper and lower portions and having a length of 25%-65% of the sum of the lengths of the intermediate and lower skirt portions.



2. A shuttlecock according to Claim 2 in which the length of the intermediate skirt portion is 40-50% of the sum of the lengths of the intermediate and lower skirt portions.
3. A shuttlecock according to Claim 1, 2 or 3 in which the angle between opposite sides of the skirt is in the range 48-50°.
4. A shuttlecock according to any of the preceding Claims in which the thickness of the plastics material constituting that part of the intermediate portion between the ribs and stems is 0.0025-0.0035 inch.
5. A shuttlecock according to any of the preceding Claims, in which the upper skirt has no plastics material between adjacent stems.
6. A shuttlecock according to any of the preceding claims, in which the lower skirt has an undulating contour each undulation being formed of first and second surfaces inclined to each other, the first surface of each undulation having a greater proportion of its area occupied by moulded material than has the second surface thereof.
7. A shuttlecock according to Claim 1, substantially as described herein with reference to the accompanying drawings.
8. A shuttlecock substantially as shown in the accompanying drawings.

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Agent for the Applicants.

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