

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **80301065.1**

51 Int. Cl.³: **A 63 B 67/18**

22 Date of filing: **03.04.80**

30 Priority: **06.04.79 GB 7912134**
17.08.79 GB 7928818

43 Date of publication of application:
15.10.80 Bulletin 80/21

84 Designated Contracting States:
GB NL SE

71 Applicant: **REINFORCED SHUTTLECOCKS LIMITED**
6/9 CHARTERHOUSE SQUARE
London, EC1M 6ES(GB)

72 Inventor: **Maconachie, Ian Christy**
2 The Gate House
Sandwich Kent(GB)

72 Inventor: **Maxton, David Murray**
6 Coombe Bank Coombe Lane West
Kingston upon Thames Surrey(GB)

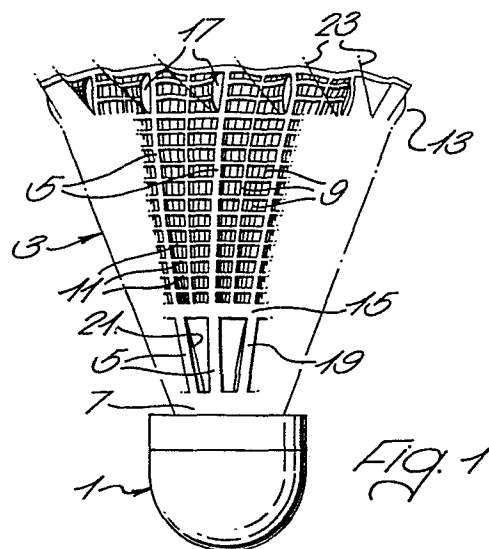
74 Representative: **Carpmael, John William Maurice**
CARPMAELS & RANSFORD 43 Bloomsbury Square
London, WC1A 2RA(GB)

64 **Shuttlecocks.**

57 A shuttlecock comprising a cap portion and a plastics skirt in the form of a truncated conical lattice structure having main stems interconnected by ribs with further intermediate stems located between the main stems, the lattice structure in the vicinity of the wide end of the skirt being convoluted with the flutings extending at an acute angle, preferably 45° to the longitudinal axis of the shuttlecock, and being so orientated as to make the shuttlecock spin and otherwise behave as a feathered shuttlecock.

Preferably, slots or slits are provided in the skirt at its wide end and the convolutions extend approximately from one end of one slot to the opposite end of an adjacent slot. The convolutions are formed by deforming the skirt material inwardly and this has the effect of slightly widening the slits in the shuttlecock.

Although preferred, the ribs, at least at the wide end of the skirt, need not be provided, and could be replaced by plastics flumes.



"SHUTTLECOCKS"

This invention relates to shuttlecocks made of plastics material.

Most commercially acceptable plastics shuttlecocks comprise a skirt portion attached to a cap portion, e.g. of cork or rubber, the skirt portion comprising a truncated conical plastics lattice structure made up of main stems extending axially and radially outwardly from a circular base at the narrow end of the skirt, the main stems being connected together by circumferentially extending ribs and in some cases being separated by one or more subsidiary stems.

Although feathered shuttlecocks are still preferred to plastics shuttlecocks because of their flight characteristics, they are extremely expensive, and hence, plastics shuttlecocks are now often used. In order to obtain a flight as true as possible to that of a feather shuttlecock, one of the essential features is that the plastics shuttlecock, when in flight, spins.

One way in which we have achieved spinning of plastics shuttlecocks is to stop the lattice structure short of the base and provide main stems only between the base and the lattice structure, these main stems having blades or flanges on their inner faces which are preferably non-radial and are so orientated that they produce spinning of the shuttlecock as it passes through the air. The presence of these blades or flanges give the main stems either a T-shaped or L-shaped or inverted L-shaped cross-section. What is more, the blade or flange of the L or T may extend obliquely relative to the base of the L or to the cross member of the T to assist with spinning.

Another feature which we have introduced into plastics shuttlecocks to assist with spinning is to make the main stems, at least where they form part of the lattice structure, slightly curved in the form of a helix, the helical stems standing slightly proud of the remainder of the lattice structure internally and/or externally.

A further feature which we have introduced into our plastics shuttlecocks to assist with stability and/or spinning of the shuttlecocks during flight is to provide slots or slits at the wide end of the skirt or lattice structure, said slots or slits extending parallel to the main stems and being located adjacent the main stems.

It is vital for all the features of a plastics shuttlecock which impart spin to the shuttlecock to act in a complementary fashion, and a shuttlecock having the above features is disclosed in our British Patent No. 1,429,713.

It is the aim of the majority of manufacturers of shuttlecocks utilizing plastics skirt to simulate exactly the flight characteristics of a feathered shuttlecock and with this in mind, we have now developed an improved shuttlecock.

According to the present invention, we provide a shuttlecock comprising a cap portion and a plastics skirt, wherein the plastics skirt, adjacent its widest end, is of fluted construction, the flutings extending at an acute angle to the longitudinal axis of the shuttlecock and being orientated so as to complement the spinning characteristics of the shuttlecock. By fluted, we mean that the skirt is distorted or deformed; an identical result would be obtained by crimping. Normally the skirt will be formed by a truncated conical lattice structure made up of main stems joined by ribs.

Preferably, the flutings extend at an angle of approximately 45° to the longitudinal axis. It will be appreciated, however, that the angle of inclination could vary from about 25° to about 65° , depending upon the required spin characteristics. It will of course be appreciated that the temperature and pressure of the atmosphere can influence the spin characteristics, but 45°

is the preferred angle in the Southern Hemisphere at N.T.P.

In a preferred construction, the main stems, when viewed externally of the shuttlecock, with the wide end of the skirt located vertically above the cap portion of the shuttlecock, are inclined from a bottom left position to top right position and are preferably slightly curved in the form of a helix from a bottom left to a top right position.

Preferably also, slots or slits are provided in the wide end portion of the skirt extending inwardly from an external rib of the skirt to a depth of approximately $1/4'' - 3/8''$, the slots or slits being located immediately adjacent to the main stems on their left hand sides, and extending down to about the fourth rib, which is preferably strengthened to prevent tearing.

Preferably, the flutings extend approximately from the lower edge of each slit or slot across the portion of the skirt between the slit or slot and the next adjacent main stem to a location on the periphery of the skirt at its wide end where said periphery is intersected by the next main stem, the flutings being so formed that the skirt is deformed inwardly at the bottom of the flutings, with the result that the slits or slots are slightly deformed, i.e. widened.

Preferably, the lattice structure terminates short of the cap portion, the main stems only being connected to the cap portion and being spaced apart so as to define air passages therebetween and these portions of the main stems have a generally L, inverted L or T shaped cross-section, the generally radially directed blade or flange portion being inclined to the longitudinal axis of the main stems and extending, when viewed exteriorally of the shuttlecock, from a bottom right position to a top left position, relative to said axis.

A preferred embodiment of the present invention is now described by way of example with reference to the accompanying drawings, in which:-

FIGURE 1 is a side elevation of a shuttlecock showing only a part of the skirt at its wide end in detail, and

FIGURE 2 is a plan view looking down into the shuttlecock, again with only a portion of the skirt shown in detail.

Referring to the drawings, the shuttlecock shown therein has a cap portion 1 of standard construction and a skirt portion 3. The skirt portion 3 has a plurality of main stems 5 (there are normally sixteen) extending radially and longitudinally from a base 7 which is secured to the cap portion 1, each of the main stems being separated by a plurality of intermediate stems 9, a central one of which is larger than the remainder and being connected together by a plurality of parallel ribs 11. The lattice structure extends from the wide end 13 of the skirt approximately $\frac{2}{3}$ of the depth of the skirt and terminates in a large rib 15. As can be seen from Figure 1, each of the main and intermediate stems 5 and 9, when viewed externally, extends from a bottom left to a top right position in the form of a shallow helix.

Adjacent the wide end of the skirt 13, slots 17 are provided immediately adjacent (and the left of) the main stems as viewed in Figure 1. The presence of these slots means that some of the ribs 11 adjacent the wide end of the skirt terminate at the slot rather than at the main stem. The slots are between $\frac{1}{4}$ " and $\frac{3}{8}$ " long, and extend from the rib at the wide end of the skirt down to the fourth rib, which is strengthened to resist tearing.

The main stems 5, adjacent the cap portion 1, are spaced apart a sufficient distance to provide a plurality of passages for air to pass into the interior of the skirt during flight of the shuttlecock. As can be seen from Figure 2, these main stems, in the region of the air passages, have a cross-section in the form of an L, an inverted L, T or inverted T and are formed by a peripheral cap or base portion 19 and blade or flange portions 21 extending substantially radially inwardly from the portion

19. (They can be slightly inclined from the radial to assist spin). These blade or flange portions do not extend completely parallel to the longitudinal axes of the main stems, but, as can be seen from Figure 2, they extend slightly obliquely to the longitudinal axes from a bottom left to a top right position (if one views the uppermost main stems in Figure 2). Of course, if one views the two central main stem portions externally as in Figure 1, the blade or flange portions 21 will extend from a bottom right to a top left position. The combination of helical main stems, main stem portions having special cross-sections in the vicinity of the air passages, and the slits or slots 17 have the effect of causing the shuttlecock to spin in an anti-clockwise direction (when the shuttlecock is viewed as shown in Figure 2) and the three items effecting spin are all complementary to each other. In other words, if the slots 17 are placed on the opposite side of the main stems from that illustrated and/or stems are twisted in a different sense and/or the flanges 21 on the main stem portions in the vicinity of the air passages extend at a different angle to the longitudinal axis of the main stem portions, then this will be counter-productive to the spinning direction of the shuttlecock.

In order to improve the spin of the shuttlecock even more, the shuttlecock is crimped or fluted between each adjacent pair of main stems at the wide end of the skirt. The crimping or fluting extends at approximately 45° to the longitudinal axis of the shuttlecock and to the ribs 11 and the base of the crimping or flutings is represented by chain dotted lines 23 in Figure 1. As can be seen from this Figure, the crimping is such as to deform the lattice work between the base of a slit or slot 17 (i.e. from the fourth, strengthened rib) and a main stem 5 at the periphery of the skirt inwardly by an amount equal to approximately half the length of the slots 17, e.g. between about 2 and 5 mm. This also has the effect of slightly widening the slots 17.

It will be appreciated that the depth of the crimping and its angle of inclination may be altered, e.g. its inclination to between about 25° and 65° , so that the spinning characteristics of the shuttlecock can be changed. This may be necessary for special situations. For the shuttlecock shown in the drawing however, it is important that the fluting extends from a bottom right to a top left position as shown in Figure 1, otherwise its effect on the spinning characteristics of the shuttlecock will be counter-productive. 45° inclination is the required one to give the shuttlecock as near identical spin characteristics as are achieved with a feathered shuttlecock in normal conditions of use in the U.K.

It will be appreciated that the inclined crimping described above can also be provided on shuttlecocks with different types of main stems, e.g. straight stems, and regardless of whether slots and/or special sectioned main stem portions are provided adjacent the base of the shuttlecock.

Although the skirt would normally be in the form of a lattice (stems intersected by ribs), it will be appreciated that the ribs, or some of them, at least could be omitted, especially in the vicinity of the fluting. However, ribs alone would be insufficient to make the shuttlecock fly, and plastics or other flumes would also have to be provided, resulting effectively, in a plurality of plastics feathers, having plastics quills (main stems) and flumes (members transverse to the stems).

It will be appreciated that the depths of the flutings or crimping will effect the diameter of the skirt and its widest end. For example, the deeper the crimp, the narrower the skirt will become, and hence, the longer the flight of the shuttlecock will be, and vice-versa.

CLAIMS

1. A shuttlecock comprising a cap portion and a plastics skirt wherein the plastics skirt, adjacent its widest end, is of fluted construction, the flutings extending at an acute angle to the longitudinal axis of the shuttlecock and being orientated so as to complement the spinning characteristics of the shuttlecock.
2. A shuttlecock according to claim 1 wherein the skirt is provided by a truncated conical lattice structure made up of main stems and intermediate stems joined by ribs.
3. A shuttlecock according to claim 1 or 2 wherein the flutings extend at an angle of between 25° and 65° to the longitudinal axis of the shuttlecock.
4. A shuttlecock according to claim 1, 2 or 3 wherein the flutings extend at an angle of 45° to the longitudinal axis of the shuttlecock.
5. A shuttlecock according to claim 2, or 3 or 4 when dependent on claim 2, wherein the main stems, when viewed externally of the shuttlecock, with the wide end of the skirt located vertically above the cap portion of the shuttlecock, are inclined from a bottom left position to top right position.
6. A shuttlecock according to claim 5 wherein slots or slits are provided in the wide end portion of the skirt, the slots or slits being located immediately adjacent to the main stems on their left hand side when the shuttlecock is viewed externally with its skirt uppermost.
7. A shuttlecock according to claim 6 wherein the slots or slits extend inwardly from the outermost rib of the skirt to about the fourth rib which is strengthened.
8. A shuttlecock according to claim 7 wherein the flutings extend from the fourth rib of the skirt outwardly from adjacent the lower edge of a slit across the portion of the skirt joining the slit to an adjacent slit, to the main stem and to a location on the periphery of the skirt at its wide end.

9. A shuttlecock according to claim 8 wherein the flutings are so formed that the skirt is deformed inwardly at the bottom of the flutings with the result that the slits or slots are slightly widened.

5 10. A shuttlecock according to any one of claims 6-9 wherein the depth of the flutings is approximately equal to half the length of a slot.

