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PATENT SPECIFICATION

DRAWINGS ATTACHED

L103.364

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COMPLETE SPECIFICATION

Improvements in or relating to Shuttlecocks

We, THE CARLTON TYRE SAVING COMPANY LIMITED of Shire Hill, Saffron Walden, 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 invention relates to shuttlecocks and skirt structures therefor, of the kind in which the skirt is a one piece flared moulding of artificial material, arranged to be secured at its narrower end to a striking cap.

In designing shuttlecocks having skirts of moulded artificial material, usually a plastics material, efforts are continuously being made to improve their flight characteristics. One desirable flight characteristic is that the shuttlecock should spin in flight at a suitable speed, for which purpose it is desirable to incorporate in the shuttlecock skirt means for imparting such spin to the shuttlecock and which will also reduce spin if the shuttlecock is spinning too quickly. By way of example one measure which has been proposed for this purpose is the incorporation of blades substantially longitudinally of the skirt structure which blades project inwardly of the skirt and are non-radially disposed, as described with reference to Figures 4 to 12 of Patent Specification No. 908,684. Whilst this construction can be made to impart good spin characteristics to a shuttlecock the necessary depth and/or length of the blades involves a substantial quantity of the artificial material which adds to the weight of the skirt structure. Lightness in weight of a shuttlecock skirt is, however, extremely important for good quality shuttlecocks.

It is an object of this invention to provide a moulded skirt structure for a shuttlecock which includes means for imparting required spin characteristics to the shuttlecock, but with a view to achieving a suitably light weight skirt structure.

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According to one feature of the invention there is provided a moulded flared skirt structure for a shuttlecock in which the wider end of the skirt is formed with an undulating outline in planes perpendicular to the axis of the skirt, each undulation having respectively first and second surfaces inclined in opposite senses with respect to said axis, characterised in that the first surface of each undulation contains a greater area of moulded material than the second surface thereof.

According to another feature of the invention there is provided a shuttlecock comprising a striking cap coupled to the narrower end of the moulded flared skirt structure, in which the wider end of the skirt is formed with an undulating outline in planes perpendicular to the axis of the shuttlecock, each undulation having respectively first and second surfaces inclined in opposite senses with respect to said axis, characterised in that the first surface of each undulation contains a greater area of moulded material than the second surface thereof.

In this specification by an "undulating outline" is meant either a wavy outline or a peaked or zig zag outline.

It has been proposed to construct a moulded flared shuttlecock skirt with a plurality of stems extending outwardly from an end ring to which a shuttlecock cap can be secured. The stems at their ends remote from the end ring, i.e. at the wider end of the skirt, are interconnected by ribs and bars constituting the vane area of the skirt, and herein termed the "lower skirt." At the narrower end of the skirt, herein termed the "upper skirt," the stems are not interconnected by thin vane material but are sufficiently deep to impart the desired rigidity to the skirt and may or may not be interconnected by one or more annular bands for strengthening purposes. In accordance with one embodiment of this invention such a shuttlecock is formed with the thin vane material, i.e. ribs and bars, between

each pair of adjacent stems in the lower skirt unevenly distributed. Thus, in one example, when viewing the shuttlecock skirt from the exterior, a greater area of thin vane material is incorporated closer to the right hand than to the left hand one of each pair of adjacent stems, at least at the wider end of the lower skirt. By way of example some of the bars and/or ribs closer to said left hand stem adjacent to said wider end may be omitted. Moreover the wider end of said lower skirt is formed with an undulating outline as viewed in a plane perpendicular to the axis of the skirt. The depth of the undulations is greatest at the wider end of the lower skirt; the undulations degenerating to a substantially true circular outline at the narrower end of said lower skirt. Moreover the undulations are arranged so that the stems lie at the outermost extremities of the respective undulations. Thus between two adjacent stems the thin vane material with the greater area, which is closer to the right hand stem, lies on a surface within the perimeter bounded by the stems and inclined in one sense to the axis of the shuttlecock skirt whilst the thin vane material close to the left hand stem lies on a surface inclined in the opposite sense to said axis. This arrangement causes the shuttlecock to spin anticlockwise when proceeding from a striker, and the degree of spin is dependent upon the depth of the undulations and the relative quantities of thin vane material in the two oppositely inclined surfaces of each undulation. Conventionally shuttlecocks are arranged to spin anticlockwise when proceeding from a striker; however, a shuttlecock in accordance with the above described embodiment of the invention may be modified to cause it to spin clockwise when proceeding from a striker if desired. The modification involved will be the provision of a greater area of thin vane material closer to the left hand than to the right hand one of each pair of adjacent stems when viewed from the exterior of the skirt, or of forming the skirt with the stems at the innermost extremities of the respective undulations.

In order that the invention may be clearly understood and readily carried into effect it will now be more fully described with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation of a moulded flared skirt structure for a shuttlecock according to one embodiment of the invention,

Figure 2 is a plan view of the skirt structure of Figure 1, and

Figure 3 is a longitudinal section through a part of the skirt structure of Figures 1 and 2.

Figure 4 is a plan view of the further embodiment of the invention.

In the embodiment shown in the drawing the skirt structure comprises a plurality of stems 1, in this case sixteen, extending out-

wardly from an end ring 2. The end ring 2 is in the form of a short cylinder of lesser diameter than that of the skirt at the root end of the stems 1, and around which a striking cap 3 is arranged to be secured as shown in dotted outline in Figure 1. By way of example, and as indicated in Figures 1 and 3, the end of the end ring 2 remote from the stems 1 may be formed to provide a rim 4 of greater diameter than the rest of the end ring 2. The striking cap 3 may, in this event, be made of expanded polyvinylchloride, which is applied over the end ring 2 and allowed to shrink to secure it to said end ring, as described in Patent Specification No. 1046708. The root ends of the stems 1 are also integral with a narrow tube 5 which is arranged to lie within the end ring 2 and is closed at its end remote from said stems 1. This is shown in greatest detail in Figure 3, and is provided for a purpose which will be described hereinafter. The ends of the stems 1 adjacent the end ring 2 are interconnected by an annular band 6 of moulded material which is provided to impart a desired rigidity to the narrower end of the shuttlecock skirt.

The ends of the stems 1 remote from the end ring 2 support the vane area of the skirt, herein called the lower skirt 7, the thin vane material forming said vane area being provided in the form of ribs and bars interconnecting adjacent stems 1. The part of the skirt between said lower skirt 7 and the end ring 2 is the upper skirt 8 and apart from the annular band 6 said upper skirt 8 is formed only by the stems 1, there being air spaces between said stems 1.

The arrangement of ribs and bars forming the thin vane material of the lower skirt 7 is shown in Figures 1 and 2. In this particular embodiment substantially centrally disposed between each pair of adjacent stems 1 is a mid-stem 9 which extends throughout the length of said lower skirt 7. The mid-stem 9 is coupled to the respective adjacent pair of stems 1 by a plurality of transverse ribs 10 spaced apart throughout the length of the lower skirt. Over approximately 60% to 70% of the narrower end of the lower skirt the spaces defined by adjacent ribs 10 and an adjacent mid-stem 9 and stem 1 are provided with further mid-stems and ribs substantially uniformly distributed throughout this part of the lower skirt. This can be seen most clearly in Figure 1 in which the length of the lower skirt containing a substantially uniform distribution of thin vane material is identified by the bracket A. Over the remainder, or wider end of the lower skirt, identified in Figure 1 by bracket B, however, the distribution of thin vane material is not uniform within the space between each pair of adjacent stems 1. More particularly, when viewed from the exterior of the shuttlecock skirt in the region B the space to the left of each mid-stem 9

contains only the transverse ribs 10 but no additional interconnecting mid-stems and ribs, whereas the space to the right of each mid-stem 9 contains both the transverse ribs 10 and subsidiary stems 11 between said ribs 10. Thus between each pair of adjacent stems 1 there is a greater area of thin vane material closer to the right hand than to the left hand stem of the pair when viewed from the exterior of the shuttlecock. Moreover in this particular embodiment the lower skirt is extended at its wider end as shown most clearly in Figure 1, on the right hand side of each mid-stem 9 only, and the extending part 12 also contains thin vane material in the form of ribs and subsidiary stems interconnecting the respective mid-stem 9 to the stem 1 to the right of said mid-stem 9 as viewed from the exterior of the skirt. Thus the thin vane material in said extending part 12 further increases the area of such material to the right of each mid-stem 9 relative to the area of thin vane material to the left of each mid-stem 9.

The wider end of the lower skirt 7 is formed with an undulating outline, as can be seen in Figures 1 and 2, as viewed in a plane perpendicular to the axis of the skirt. The depths of the undulations are at their greatest at the wider end of said lower skirt 7 and the undulations degenerate in depth to a substantially true circular outline at or near the narrower end of said lower skirt. The undulations are located so that the stems 1 are each disposed at the outermost extremities of the respective undulations, with the mid-stems 9 at the innermost extremities of said undulations. In the region B of the lower skirt, where the depths of the undulations are at their greatest, each undulation has first and second surfaces inclined in opposite senses with respect to the axis of the skirt. It will be appreciated that the first and second surfaces are respectively the area to the right of each mid-stem 9 and the area to the left of each mid-stem 9. Thus the first surface of each undulation contains a greater area of moulded thin vane material than the second surface thereof which, due to the opposite inclinations of said first and second surfaces with respect to the axis of the skirt, causes the shuttlecock to spin. The depth of the undulations in the region B of the lower skirt 7 and the relative quantities of thin vane material in the first and second surfaces may be varied to vary the degree of spin of the shuttlecock. With the arrangement shown in the drawings in Fig. 1 and 2 and herein described the shuttlecock will spin anti-clockwise when proceeding from a striker, as is conventional. However, if desired a shuttlecock can be made to spin in the reverse direction, i.e. clockwise when proceeding from a striker, by interchanging the aforesaid first and second surfaces.

As shown in Figure 4, the undulations may be re-arranged so that the stems 1¹ are at

the innermost and the mid-stems 9¹ at the outermost extremities of the undulations. With this arrangement the shuttlecock would rotate clockwise when proceeding from the striker.

In alternative embodiments the troughs or innermost extremities of the undulations in the example shown in Figure 2 or the apices or outermost extremities of the undulations in the example shown in Figure 4, may be arranged to be off-centre in relation to the stems 1 and 1¹ respectively.

It is found that a shuttlecock skirt of extremely light weight, suitable rigidity and having desired characteristics of spin can be made in accordance with the invention, and the economy in weight which can be achieved may be such that additional weighting means can be incorporated at the cap end of the shuttlecock where it is desirable that the centre of gravity should lie. By way of example a weighting pellet 13, shown in Figure 3, may be inserted in the tube 5.

In manufacturing a shuttlecock skirt as described the skirt can be moulded from a suitable plastics material with a true circular section throughout. The undulations can then be formed by the application of a suitable tool.

Although the invention has been described with particular reference to specific embodiments thereof as illustrated in the accompanying drawings, various modifications of these embodiments may be made without departing from the scope of the invention as set out in the appendant claims. By way of example the distribution of thin vane material may be uniform throughout the lower skirt apart from the extending parts 12. Moreover, if desired, the first surface of each undulation may comprise partially or wholly continuous thin vane material rather than perforate thin vane material as provided by the ribs and bars of the embodiments described.

WHAT WE CLAIM IS:—

1. A moulded flared skirt structure for a shuttlecock in which the wider end of the skirt is formed with an undulating outline in planes perpendicular to the axis of the skirt, each undulation having respectively first and second surfaces inclined in opposite senses with respect to said axis, characterised in that the first surface of each undulation contains a greater area of moulded material than the second surface thereof.

2. A shuttlecock comprising a striking cap coupled to the narrower end of the moulded flared skirt structure according to Claim 1.

3. A structure according to Claim 1 or a shuttlecock according to Claim 2 in which said skirt structure comprises a plurality of stems extending outwardly from an end ring, and thin vane material interconnecting said stems at the wider end of said skirt structure, characterised in that said undulations are arranged so that said stems lie at the respective outermost extremities of said undulations.



contains only the transverse ribs 10 but no additional interconnecting mid-stems and ribs, whereas the space to the right of each mid-stem 9 contains both the transverse ribs 10 and subsidiary stems 11 between said ribs 10. Thus between each pair of adjacent stems 1 there is a greater area of thin vane material closer to the right hand than to the left hand stem of the pair when viewed from the exterior of the shuttlecock. Moreover in this particular embodiment the lower skirt is extended at its wider end as shown most clearly in Figure 1, on the right hand side of each mid-stem 9 only, and the extending part 12 also contains thin vane material in the form of ribs and subsidiary stems interconnecting the respective mid-stem 9 to the stem 1 to the right of said mid-stem 9 as viewed from the exterior of the skirt. Thus the thin vane material in said extending part 12 further increases the area of such material to the right of each mid-stem 9 relative to the area of thin vane material to the left of each mid-stem 9.

The wider end of the lower skirt 7 is formed with an undulating outline, as can be seen in Figures 1 and 2, as viewed in a plane perpendicular to the axis of the skirt. The depths of the undulations are at their greatest at the wider end of said lower skirt 7 and the undulations degenerate in depth to a substantially true circular outline at or near the narrower end of said lower skirt. The undulations are located so that the stems 1 are each disposed at the outermost extremities of the respective undulations, with the mid-stems 9 at the innermost extremities of said undulations. In the region B of the lower skirt, where the depths of the undulations are at their greatest, each undulation has first and second surfaces inclined in opposite senses with respect to the axis of the skirt. It will be appreciated that the first and second surfaces are respectively the area to the right of each mid-stem 9 and the area to the left of each mid-stem 9. Thus the first surface of each undulation contains a greater area of moulded thin vane material than the second surface thereof which, due to the opposite inclinations of said first and second surfaces with respect to the axis of the skirt, causes the shuttlecock to spin. The depth of the undulations in the region B of the lower skirt 7 and the relative quantities of thin vane material in the first and second surfaces may be varied to vary the degree of spin of the shuttlecock. With the arrangement shown in the drawings in Fig. 1 and 2 and herein described the shuttlecock will spin anti-clockwise when proceeding from a striker, as is conventional. However, if desired a shuttlecock can be made to spin in the reverse direction, i.e. clockwise when proceeding from a striker, by interchanging the aforesaid first and second surfaces.

As shown in Figure 4, the undulations may be re-arranged so that the stems 1¹ are at

the innermost and the mid-stems 9¹ at the outermost extremities of the undulations. With this arrangement the shuttlecock would rotate clockwise when proceeding from the striker.

In alternative embodiments the troughs or innermost extremities of the undulations in the example shown in Figure 2 or the apices or outermost extremities of the undulations in the example shown in Figure 4, may be arranged to be off-centre in relation to the stems 1 and 1¹ respectively.

It is found that a shuttlecock skirt of extremely light weight, suitable rigidity and having desired characteristics of spin can be made in accordance with the invention, and the economy in weight which can be achieved may be such that additional weighting means can be incorporated at the cap end of the shuttlecock where it is desirable that the centre of gravity should lie. By way of example a weighting pellet 13, shown in Figure 3, may be inserted in the tube 5.

In manufacturing a shuttlecock skirt as described the skirt can be moulded from a suitable plastics material with a true circular section throughout. The undulations can then be formed by the application of a suitable tool.

Although the invention has been described with particular reference to specific embodiments thereof as illustrated in the accompanying drawings, various modifications of these embodiments may be made without departing from the scope of the invention as set out in the appendant claims. By way of example the distribution of thin vane material may be uniform throughout the lower skirt apart from the extending parts 12. Moreover, if desired, the first surface of each undulation may comprise partially or wholly continuous thin vane material rather than perforate thin vane material as provided by the ribs and bars of the embodiments described.

WHAT WE CLAIM IS:—

1. A moulded flared skirt structure for a shuttlecock in which the wider end of the skirt is formed with an undulating outline in planes perpendicular to the axis of the skirt, each undulation having respectively first and second surfaces inclined in opposite senses with respect to said axis, characterised in that the first surface of each undulation contains a greater area of moulded material than the second surface thereof.

2. A shuttlecock comprising a striking cap coupled to the narrower end of the moulded flared skirt structure according to Claim 1.

3. A structure according to Claim 1 or a shuttlecock according to Claim 2 in which said skirt structure comprises a plurality of stems extending outwardly from an end ring, and thin vane material interconnecting said stems at the wider end of said skirt structure, characterised in that said undulations are arranged so that said stems lie at the respective outermost extremities of said undulations.



4. A structure according to Claim 1 or a shuttlecock according to Claim 2 in which said skirt structure comprises a plurality of stems extending outwardly from an end ring, and thin vane material interconnecting said stems at the wider end of said skirt structure, characterised in that said undulations are arranged so that said stems lie at the respective innermost extremities of said undulations.
5. A structure or shuttlecock according to Claim 3 or 4, characterised in that the depth of said undulations is greatest at the widest extremity of said wider end of said skirt structure, and said undulations degenerate to a substantially true circular outline at the narrower extremity of said wider end of said skirt structure.
6. A structure or shuttlecock according to any Claim 3, 4 or 5 in which said thin vane material comprises ribs and bars interconnecting said stems, characterised in that fewer interconnecting ribs and/or bars are provided in said second surface than in said first surface of each undulation.
7. A structure or shuttlecock according to any of Claims 3, 4 or 5 in which said thin vane material comprises ribs and bars interconnecting said stems, characterised in that said thin vane material also comprises in said first surface of each undulation continuous thin vane material.
8. A structure or shuttlecock according to any of Claims 3, 4, 5, 6 or 7, characterised in that the first surface of each undulation projects beyond the second surface thereof at the wider end of the skirt structure.
9. A structure or shuttlecock according to Claim 8, characterised in that the distribution of thin vane material in said first and second surfaces is uniform apart from said projecting portion of said first surface.
10. A structure according to any of Claims 1, 3, 4, 5, 6, 7, 8 or 9 or a shuttlecock according to any one of Claims 2 to 9, characterised in that additional weighting means is incorporated at the narrow end of said skirt structure.
11. A shuttlecock according to Claim 10, characterised in that said additional weighting means is disposed to reside within the striking cap.
12. A structure or a shuttlecock according to Claim 3 in which said undulations are arranged so that their innermost extremities are off-centre in relation to said stems.
13. A structure or a shuttlecock according to Claim 4 in which said undulations are arranged so that their outermost extremities are off-centre in relation to said stems.
14. A moulded flared skirt structure for a shuttlecock substantially as described with reference to Figures 1, 2 and 3 or Figure 4 of the accompanying drawings, or modified as herein described.
15. A shuttlecock having a striking cap coupled to the narrower end of a moulded flared skirt structure according to Claim 14.

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