PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: WILLIAM CHARLES CARLTON

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COMPLETE SPECIFICATION

Shuttlecock, and Methods of Making it

We, CARLTON GENERAL DISTRIBUTORS (SHUTTLECOCKS) 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 shuttlecocks having skirts made of materials other than natural feathers and a method of making them with particular reference to a means of achieving a light and strong construction in the skirt.

With the improvement in badminton rackets and the technique of "smashing", it has become increasingly difficult to design and manufacture shuttlecocks which do not collapse in the smash and give a good "turnover" in net play at the same time. When the shuttlecock skirt is sufficiently stiffened by known means to prevent collapsing it becomes either too brittle and so breaks, on impact with the racket, or too heavy, and so cannot be properly controlled in short net play. The quality of being controllable in short net play is referred to in this specification as "turnover", and this "turnover" could be defined as the ability of the shuttlecock to turn after being struck so that it travels cap forward without excessive oscillation.

In this specification the cap of the shuttlecock is that part of the shuttlecock adapted to take the main blow of the racket and is the forward one third of the shuttlecock; it will be noticed that in this specification the cap may include what is generally regarded as the extreme inner part of the skirt; the third of the shuttlecock remote from the cap is referred to as the outer skirt and the third of the shuttlecock between the cap and the outer skirt is referred to as the inner skirt.

The tendency in the last 25 years, by manufacturers skilled in the art of making shuttlecocks has been to increase the weight of the inner skirt, not because they desired to do so but because this has been the inevitable result of providing increasing stiffness which in turn is essential to resist the severe blows struck by the rackets of players of international class.

Weight plays a most important part in the value of this invention.

In the early 1930's, a typical section of inner skirt by a well known manufacturer weighed about 1 gramme. By 1957 the weight of the corresponding section of a typical shuttlecock manufactured for international standard of play weighed 1.14 grammes. Moreover, once these shuttlecocks had been "collapsed" they became useless for first class play because the materials of which they were made—natural feathers and string were not resilient enough.

Once the quill of a feather has been bent sharply it will not recover its initial condition.

The manufacturers of plastic shuttlecocks had used more resilient materials so that much longer playing life was obtained, but were faced with the same problem with regard to initial "collapsing" i.e. the closing up of the shuttlecock skirt when the shuttlecock is struck hard in play. To prevent initial collapsing more strength is required but with the materials available to-day this automatically involved more weight in the skirt.

The object of this invention is to provide an inner skirt of a shuttlecock made of material other than natural feathers which is as light or lighter than the corresponding inner skirt in shuttlecocks used in international competition at the present time and more

resistant to "collapsing" in the smash, by giving a quicker recovery to normal shape after initial impact with the racket.

The difficulty is that there is no economically suitable solid material which has a low enough specific gravity. Three likely groups are the polyethylenes—specific gravity of about .9, the polyamides—specific gravity about 1.1 and polyvinyl chloride—specific gravity about 1.3.

These figures are too high, bearing in mind the strength of the material.

We have observed that the elapsed time of "collapsing" is important—if the skirt springs back very quickly to its normal position the result is almost as satisfactory as if the collapsing were prevented.

Gas is resilient, and gas trapped in such a way that it's escape is retarded can give considerable resistance to collapsing and it is also much lighter than solid substances, it can also be used to reduce the concentration of a material. We use these facts in our present invention.

This invention is that in a shuttlecock consisting of a flared skirt made of material other than natural feathers and a cap, and the flared skirt being made up of inner and outer parts, the outer part being the one third of the shuttlecock of the remote from third of the shuttlecock remote from the cap, and the inner part being the one third of the shuttlecock between the outer skirt and the cap, the shuttlecock is characterised in that the skirt incorporates a one piece container in which a volume of gas is trapped and this one piece container contributes to the support of the shape of at least the inner skirt of the shuttlecock and the said container and shuttlecock skirt being made so that in a shuttlecock weighing 5.2 grammes and having an overall length of 8.57 centimetres the weight of the skirt including the container does not exceed 1.85 grammes and proportionately for other shuttlecock weights and sizes.

In order that this invention should be clearly understood and readily carried into effect examples will now be described with reference to the following drawings, in which:—

Figure 1 is a part sectional side elevation of a mould suitable for forming the gas container for a shuttlecock skirt.

Figure 2 is a plan view of the same mould.

Figure 3 is side elevation of a shuttlecock with skirt container in part section.

Figure 4 is a side elevation of another form of the invention with skirt in part section.

Referring now to Figures 1 and 2, a mould is made of aluminium as shown in Figures 1 and 2 having a flared cone-like portion between 1 and 2 and being hollowed out in the middle as at 3. Angled slots are provided as at 4 to create spin or reduce spinning by the shuttlecock when in flight. The mould is used by dipping the flared portion in a latex dip up to the line 5—5 and allowing the latex coat which results, to solidify thus forming a rubber bag. The thickness of the coat may be increased by repeated dippings. The mould may be made in sections so that it will collapse to facilitate removal of the coat. When completely dried and cured the latex coat is removed and is then assembled to a shuttlecock cap and forms a container into which a gas is pumped.

Referring now to Figure 3, the just mentioned container 6 is assembled to a cap 7 by means of a band 8 which forms an airtight joint between the cap 7 and the container 6. A non-return valve 9 is provided in the cap 7 and through this the container 6 is expanded to the correct rigidity by means of air. Thus a complete shuttlecock is made.

Referring now to Figure 4, a suitable grade of polyvinyl chloride paste is mixed with a blowing agent which gives off nitrogen on decomposition.

A small mould is filled with the polyvinyl chloride mix and sealed and heated in the known manner; after the mix has set it is removed from the mould and the whole shuttlecock expanded to full size by plunging it into water at about 90° C. This causes the "blowing" of the nitrogen gas which forms a very large number of tiny cells 10 with very thin walls and which in this instance form the entire shuttlecock skirt 11 only some of the cells being shown by way of indication in the broken away section shown in Fig. 4. The skirt incorporates the stems 12 which are made at the same time and in the same way. Care must be taken, in designing the mould to control the heat flow to the material to be expanded to prevent under and over cooking.

By adjusting the mix and the thickness of the skirt it is possible to produce a shuttlecock in which the total weight is 5.2 grammes and the total weight of the skirt does not exceed 1.85 grammes.

In Fig. 4, by way of indication, the length between the lines A—C represents the total length of the shuttlecock, which in the specific case mentioned would be 8.57 centimetres, the distance between the lines B—C represents the skirt which is two thirds of the total length of the shuttlecock, and the skirt weighs not more than 1.85 grammes, and the total weight of the shuttlecock weighs 5.2 grammes.

It will be understood that the aim is to reduce the proportionate weight of the skirt.

At the present time expanded polyvinyl chloride is available to achieve the above results, but the invention is not limited to polyvinyl chloride.

WHAT WE CLAIM IS:—

1. A shuttlecock consisting of a flared skirt made of material other than natural feathers and a cap, and the flared skirt being made up of inner and outer parts, and the outer part being the one third of the shuttlecock remote from the cap, and the inner part being the one third of the shuttlecock between the outer skirt and the cap, and the shuttlecock being characterised in that the skirt incorporates a one-piece container in which a volume of gas is trapped and this one-piece container contributes to the support of the shape of at least the inner skirt of the shuttlecock and the said container and shuttlecock skirt being made so that in a shuttlecock weighing 5.2 grammes and having an overall length of 8.57 centimetres the weight of the skirt including the container does not exceed 1.85 grammes and proportionately for other shuttlecock weights and sizes.

2. A shuttlecock as in Claim 1 and characterised in that the gas is trapped within a single main container such as a rubber bag.

3. A shuttlecock as in Claim 1 and characterised in that the gas is trapped within many tiny containers or cells the walls of which are integral with each other.

4. A shuttlecock substantially as described in the accompanying specification and illustrated in the accompanying drawings.

For and on behalf of
CARLTON GENERAL DISTRIBUTORS (SHUTTLECOCKS) LTD.,
W. C. CARLTON,
Director.

PROVISIONAL SPECIFICATION

Shuttlecock, and Methods of Making it

We, CARLTON GENERAL DISTRIBUTORS (SHUTTLECOCKS) LIMITED, of Parkstone Works, Wingletye Lane, Hornchurch, Essex, a British Company, do hereby declare this invention to be described in the following statement:—

This specification relates to shuttlecocks and a method of making them with particular reference to a means of achieving a light and strong construction in the skirt. It is not the intention of the invention to lay down methods of achieving satisfactory air flow excepting where novel methods are available to the new construction, it being understood that some known methods are also available.

With the improvement in badminton rackets and the technique of "smashing": it has become increasingly difficult to design and manufacture shuttlecocks which do not collapse in the smash and give good "turnover" in net play at the same time. When the shuttlecock skirt is sufficiently stiffened by known means to prevent collapsing it becomes either too brittle and so breaks, on impact with the racket, or too heavy, and so cannot be properly controlled in short net play. The quality of being controllable in short net play is referred to in this specification as "turnover".

In this specification the cap of the shuttlecock is that part of the shuttlecock adapted to take the main blow of the racket (less any cap covering desired), and in a shuttlecock 8.5 centimetres overall the cap is the forward 3.18 centimetres. It will be noticed that in this specification the cap includes what is generally regarded as the bottom part of the skirt.

The skirt of the shuttlecock is the flared portion. That part of the skirt remote from the cap is referred to as the outer skirt, and that part between the cap and the outer skirt is referred to as the inner skirt. The dividing line between the inner and outer skirt may, by way of indication, and not limitation be considered at 2.54 centimetres from the position marking the beginning of the cap, in a shuttlecock 8.57 centimetres long and proportionate in other lengths of shuttlecock.

The tendency in the last 25 years, by manufacturers skilled in the art of making shuttlecocks has been to increase the weight of the inner skirt, not because they desired to do so but because this has been the inevitable result of providing increasing stiffness which in turn is essential to resist the severe blows struck by the rackets of players of international class.

As weight plays a most important part in the value of this invention it must be pointed out that the figures involved are extremely small and critical.

In the early 1930's, a typical section of inner skirt by a well known manufacturer weighed about 1 gramme. By 1957 the weight of the corresponding section of a typical shuttlecock manufactured for international standard of play weighed 1.14 grammes. Moreover, once these shuttlecocks had been "collapsed" they became useless for first class play because the materials of which they were made—natural feathers and string were not resilient enough.

Once the quill of a feather has been bent sharply it will not recover its initial condition.

The manufacturers of plastic shuttlecocks had used more resilient materials so that much longer playing life was obtained, but were faced with the same problem with regard

to initial "collapsing". To prevent initial collapsing more strength was required but with the materials available to-day this automatically involved more weight.

The object of this invention is to provide an inner skirt of a shuttlecock which is as light or lighter than the corresponding inner skirt in shuttlecocks used in international competition at the present time (March 1957) and more resistant to "collapsing" in the smash.

The difficulty is that there is no economically suitable solid material which has a low enough specific gravity. Three likely groups are the polyethylenes—specific gravity of about .9, the polyamides—specific gravity about 1.1 and polyvinyl chloride—specific gravity about 1.3.

These figures are too high, bearing in mind the strength of the material.

We have observed that the elapsed time of "collapsing" is important—if the skirt springs back very quickly to its normal position the result is almost as satisfactory as if the collapsing were prevented.

Gas is resilient, and gas trapped in such a way that its escape is retarded can give considerable resistance to collapsing and it is also much lighter that solid substances, it can also be used to reduce the concentration of a material. We use these facts in our present invention.

This invention is that in a shuttlecock consisting of a cap, and a flared skirt the shuttlecock is characterised in that the skirt incorporates a one-piece container in which a volume of gas is enclosed and which supports the shape of at least the inner skirt of the shuttlecock, and the container and shuttlecock skirt being made so that in a shuttlecock weighing 5.2 grammes and having an overall length of 8.57 cms. the weight of 5.7 cms. of skirt does not exceed 1.85 grammes, and proportionately for other shuttlecock weights and sizes.

The invention may be applied in several different ways based on two main divisions —(a) in which the gas is within a single main envelope and (b) in which the gas is within many tiny envelopes which are integral with each other. The second is the preferred method at present—March 1957. According to division (a), a shuttlecock skirt is made by dipping as many times as necessary a flared split former of, for instance, aluminium into a suitable solution of latex, a mouth being formed at the cap end of the skirt. The envelope having been moulded, the envelope is expanded by introducing air, and sealed by the cap of the shuttlecock. The shape of the shuttlecock skirt is then maintained by air pressure acting on the walls of the envelope, and recovery after deflection is very rapid. It is understood that materials other than rubber may be used if suitable.

According to the second method a suitable mix of polyvinyl chloride is prepared, and this mix is expanded by a known method by the introduction of an expanding agent or agents. The shape of the shuttlecock skirt, either, inner or outer or both is obtained by "setting" the material in a mould or series of moulds and it is preferable that the final expansion of the product should take place in a "final size" mould to give regularity and balance.

For and on behalf of
CARLTON GENERAL DISTRIBUTORS
(SHUTTLECOCKS) LTD.,
W. C. CARLTON,
Director.

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869,881 COMPLETE SPECIFICATION
1 SHEET

FIG. 1.

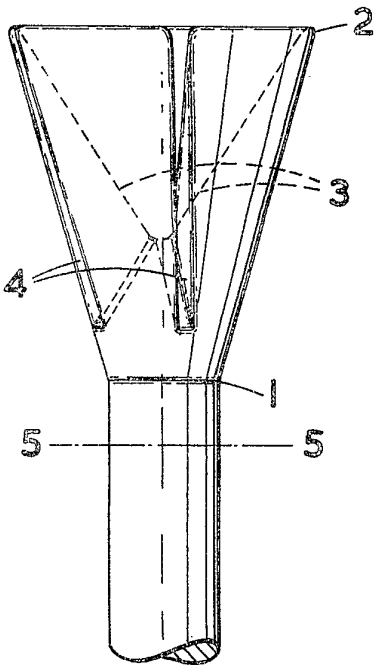

FIG. 3.

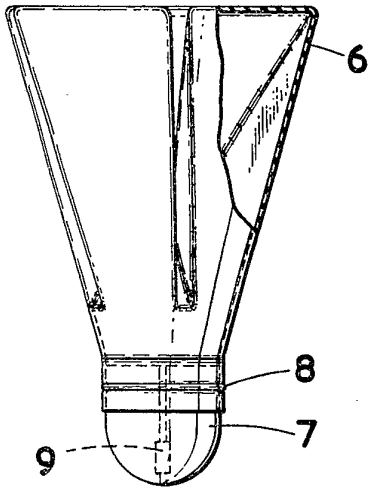

FIG. 4.

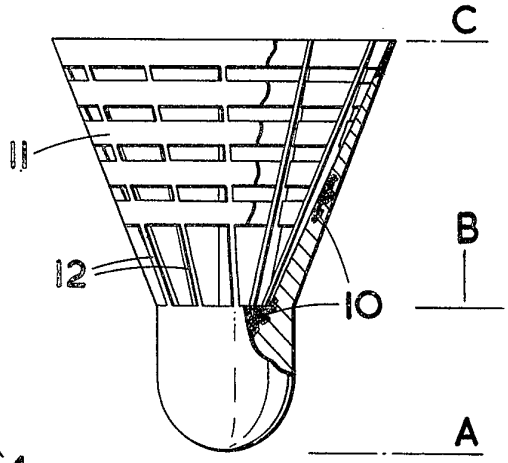

FIG. 2.