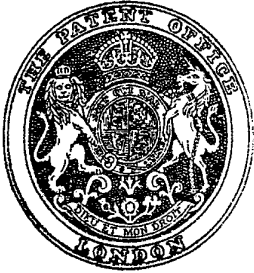


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PATENT SPECIFICATION

670,147

Inventors :—WILLIAM CHARLES CARLTON and DAVID RAMSAY MILNE.



Date of filing Complete Specification : Feb. 22, 1950.

Application Date : Nov. 30, 1949. No. 30702/49.

Complete Specification Published : April 16, 1952.

Index at Acceptance :—Class 132(iii), 828.

COMPLETE SPECIFICATION.

PATENTS ACT, 1949

SPECIFICATION NO. 670,147

In accordance with the Order of the High Court made the twenty-seventh day of April, 1959, together with the Order in the Court of Appeal made the twenty-ninth day of January, 1960, affirming the same, this Specification has been amended under Section 30 in the following manner:—

Page 1, line 59,) after "means". insert "The combination being such that a
) free passage of air through the upper skirt is combined with
Page 2, line 91,) lightness and considerable drag in the lower skirt."

Page 2, line 53, after "Gaps" insert "D"

Page 2, line 81, after "to" delete "it," and insert "the base,"

THE PATENT OFFICE,
9th January, 1961

DS 84453/1(6)/8542 200 1/61 DL

30 pair of stiffeners or equivalent means in the lower skirt have been combined with larger holes in the upper skirt. The presently proposed type results in a shuttlecock which has flight characteristics which approximate closely to that of feather shuttlecocks
35 commonly used by badminton players.

It should be pointed out that badminton players, particularly indoor badminton players, require that a shuttlecock should come off the racket in a certain manner, that
40 manner being the one to which they have become accustomed by constant playing with a feather shuttlecock.

According to the present invention a shuttlecock has been provided of the type in
45 which holes are made in the skirt and com-

[Price 5/—]

of the area of the upper skirt must be available for the passage of air. The use of a porous material such as paper, however light it may be, if not pierced or made with holes in the upper skirt, would not meet the requirements of our invention. 75

The holes pierced or made in the lower skirt should preferably be .05"—.1" in diameter or alternatively gaps or slots may be used having the length of their shortest edge .1" or less. The longest edges of such gaps or slots should be offered to the air stream. These holes, gaps or slots serve two purposes—they make the lower skirt much lighter and they create smooth drag. 80

The formed edges start from the holes or gaps made in the material. 90

Inventors:—WILLIAM CHARLES CARLTON and DAVID RAMSAY MILNE.



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Index at Acceptance:—Class 132(iii), S28.

COMPLETE SPECIFICATION.

An Improved Shuttlecock.

- We, THE CARLTON TYRE SAVING COMPANY LIMITED, of Parkstone Works, Wingletye Lane, Hornchurch, Essex, England, a British Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—
- This invention relates to shuttlecocks.
- The object of the invention is to enable a satisfactory shuttlecock to be made of a manufactured material.
- We have examined the flight characteristics of a shuttlecock and find that to enable a manufactured material to be used a very free passage of air through the upper skirt of a shuttlecock must be combined with lightness and considerable drag in the lower skirt.
- Shuttlecocks with holes in the skirt and shuttlecocks having vane members of stiffened seamless tubular fabric provided with large spaces between the strands towards the larger end of the cone and smaller spaces between the strands near the smaller end of the cone, are known, but the present invention differs from these prior constructions in that a plurality of small holes between each pair of stiffeners or equivalent means in the lower skirt have been combined with larger holes in the upper skirt. The presently proposed type results in a shuttlecock which has flight characteristics which approximate closely to that of feather shuttlecocks commonly used by badminton players.
- It should be pointed out that badminton players, particularly indoor badminton players, require that a shuttlecock should come off the racket in a certain manner, that manner being the one to which they have become accustomed by constant playing with a feather shuttlecock.
- According to the present invention a shuttlecock has been provided of the type in which holes are made in the skirt and comprising a base with a one piece flared skirt incorporating spaced stiffeners or equivalent means fixed to it, that part of the skirt adjacent the base being referred to as the upper skirt and that part remote from the base being referred to as the lower skirt, the skirt being made of an inherently resilient material, and the skirt being characterised in that holes are made both in the upper and lower skirt, those in the upper skirt being bigger in area than the holes in the lower skirt, and there being in the lower skirt, a plurality of small holes between each pair of stiffeners or equivalent means.
- The invention is developed so that quadrilateral holes with their longer edges offered to the air stream are made in the lower skirt and still further developed so that material forming the trailing edge of some of the holes is lipped outwards so as to intercept airflow when the shuttlecock is travelling forwards.
- Because the upper skirt must support the lower skirt as well as permit a free passage of air therethrough it is important that strength must be provided in this area by means of stiffeners, increased thickness of material, or corrugations or by equivalent methods.
- From our experience, at least one quarter of the area of the upper skirt must be available for the passage of air. The use of a porous material such as paper, however light it may be, if not pierced or made with holes in the upper skirt, would not meet the requirements of our invention.
- The holes pierced or made in the lower skirt should preferably be .05"—.1" in diameter or alternatively gaps or slots may be used having the length of their shortest edge .1" or less. The longest edges of such gaps or slots should be offered to the air stream. These holes, gaps or slots serve two purposes—they make the lower skirt much lighter and they create smooth drag.
- The formed edges start from the holes or gaps made in the material.

[Price

If a reasonable life of true flight is required from the shuttlecock we recommend for the material of the upper and lower skirt a suitable plastic material. Examples of such a material are suitable celluloids, styrenes and ethylene compounds. It will be understood that a long life cannot be expected, and it may be that in some cases the use of stiffened paper or porous materials made to conform to this specification would be satisfactory.

When selecting materials it will be observed that strength and lightness are important. Materials having a specific gravity of about 1.2" and a thickness in the lower skirt of .004" were used in making the examples which follow. The closer the holes in the lower skirt the lighter the skirt but it must be remembered that strength suffers when the holes get too close.

It will be understood that variations may be made according to the use to which the shuttlecock is being put but attention is drawn to the fact that if compliance with the performance required by the laws of indoor badminton is aimed at then an extremely delicate construction must be made.

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

Fig. 1 shows a side elevation of a shuttlecock of one form of the proposed design.

Fig. 2 shows a side elevation of a shuttlecock of another form of the proposed design.

Fig. 3 shows a sectional view of a formed edge.

Fig. 1 shows a side elevation of one form of the invention comprising a base A, an upper skirt B fixed to A and a lower skirt C, the dotted line giving an approximate position for the division of upper and lower skirt.

The base A is made of cork and kid or other materials known to be suitable for shuttlecock bases and in this instance is recessed to take the upper edge of the upper skirt.

The upper and lower skirts are made from celluloid or other suitable plastic which is gapped and, in this instance, stiffened so that ribs F are made.

Gaps are made in the lower skirt preferably .05"—.1" in diameter and approximately .15" apart and gaps E are made in the upper

skirt to suit the taper approximately as illustrated. The stiffeners may be further reinforced if desired. The gaps are continued spaced with stiffeners all around the shuttlecock but to prevent confusion only the gaps in the centre panel are shown.

Fig. 2 shows an alternative design. In this case A¹ is the base as before; B¹ is the upper skirt and C¹ the lower skirt. In this example the gaps are of different shape and stiffeners F¹ are made by sticking further thicknesses to the skirt material.

Fig. 3 shows a sectional fragment about gaps D³ of a typical lower skirt made to the above designs as regards gaps, but, in this instance, the material at one edge of the gap has been formed (H) so as to intercept air flow when the shuttlecock is travelling forward in a more pronounced manner than with a plain gap.

What we claim is :—

(1) A shuttlecock of the type in which holes are made in the skirt and comprising a base with a one piece flared skirt incorporating spaced stiffeners or equivalent means fixed to it, that part of the skirt adjacent the base being referred to as the upper skirt and that part remote from the base being referred to as the lower skirt, the skirt being made of an inherently resilient material and being characterised in that holes are made both in the upper and lower skirt, holes in the upper skirt being bigger in area than holes in the lower skirt, and there being in the lower skirt a plurality of small holes between each pair of stiffeners or equivalent means.

(2) A shuttlecock as in Claim 1, and characterised in that there are holes in the lower skirt which are quadri-lateral, and which have their longer edges offered to the air stream.

(3) A shuttlecock as in Claim 1 or 2, and characterised in that material forming the trailing edge of some of the holes is lipped outwards so as to intercept air-flow when the shuttlecock is travelling forwards.

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

Dated this 21st day of February, 1950.

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

PROVISIONAL SPECIFICATION.

An Improved Shuttlecock.

105 We, THE CARLTON TYRE SAVING COMPANY LIMITED, of Parkstone Works, Wingletye Lane, Hornchurch, Essex, a British Company, do hereby declare the nature of this invention to be as follows :—

This invention relates to shuttlecocks. 110
The object of the present invention is to reduce the number of different parts in a shuttlecock and also to enable the shuttlecock to be made of a consistent material.

The first object is achieved by replacing the feathers and binding means by a cone of thin material suitably perforated and assembled as appears hereafter and the second object is achieved by using a manufactured material as distinct from one in its natural state to replace the feathers. It will be appreciated that although feathers appear much alike a good deal of sorting and trimming is necessary before they are suitable for use in a shuttlecock. The manufactured material must be resistant to tearing and splintering.

It will be appreciated that the flight of the proposed shuttlecock must approximate closely to the flight of known shuttlecocks and for this purpose an examination has been made of the main characteristics of a shuttlecock.

The laws of Badminton lay down certain requirements with regard to the distance that a shuttlecock may be hit but to be practical for use in the game a shuttlecock must have other characteristics which are given below :—

1. When dropped from the upside down position a shuttlecock must speedily turn and fall sharp end foremost.

2. When hit gently with a racket it must quickly take up a straight line of flight and not wobble in flight.

3. It must not continue to turn end about end in flight even when hit in an irregular manner.

4. It must come within certain weight requirements and its speed within those weight requirements must approximate closely to that of the known shuttle.

5. It is desirable that it be of a similar size to the normally used shuttlecock.

6. It must be easily visible in flight.

It has been found that these qualities can be obtained by making the skirt from sheet plastic material so that when it is rolled into a cone and secured to a cork of the known type it has a similar appearance in outline to a shuttlecock of the known type.

Prior to folding the sheet and securing it to the cone the sheet is perforated with small holes over its surface starting from the large perimeter (which when folded would be the base of the cone) and extending towards the smaller end. It would appear that the best

results are obtained when the sheet is perforated all over, but in practice it appears desirable to stop the perforations short of the area which is exposed to the most load when the shuttlecock is hit hard with the racket. When the holes are pierced at least half of them should be pierced so that when the sheet is rolled into a cone the raw edges from the piercing operation are exposed to the air stream and the combination of the small holes and the edges of these small holes and the rough edges caused by the piercing operation act to reduce the speed of the shuttlecock without causing any turbulence over the trailing edge and result in the shuttlecock making a steady flight.

So far, plastic such as a fairly stiff mix of Polyvinyl Chloride has been used as the material of which the cone is made but it will be understood that the invention is not limited to this material.

A suitable thickness for the material is .005" or .006" and a shuttle having the desirable characteristics have been made with a material as thick as .008". Thin sticking tape has been used to make the joint at the edge of the cone and to secure the cone to the chamois leather covered cork, but continuous welding of the material by electrical methods may be used to join the seam provided, of course, that the material selected to make the cone lends itself to this system.

It may be possible to mould the shuttlecock in one operation and this would be a still better method of manufacturing it. Alternatively, the cork may be replaced by a moulding which is adapted to join neatly with the sheet cone.

The sheet cone may also be reinforced at the end nearest the cork or cork replacing moulding by a further thickness of sheet, the object being to increase the strength at the point where the collapsing loads appear to be heaviest. Stiffeners may also be introduced in this area.

Dated this 29th day of November, 1949.

WILLIAM CHARLES CARLTON,
Director.

for the

CARLTON TYRE SAVING COMPANY LIMITED.

This Drawing is a reproduction of the Original on a reduced scale

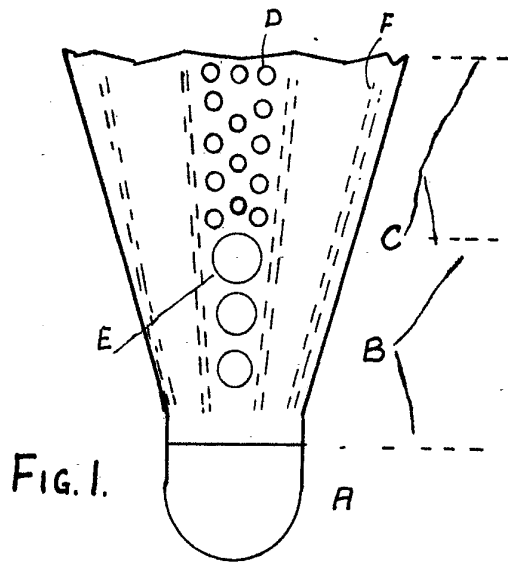


FIG. 3.

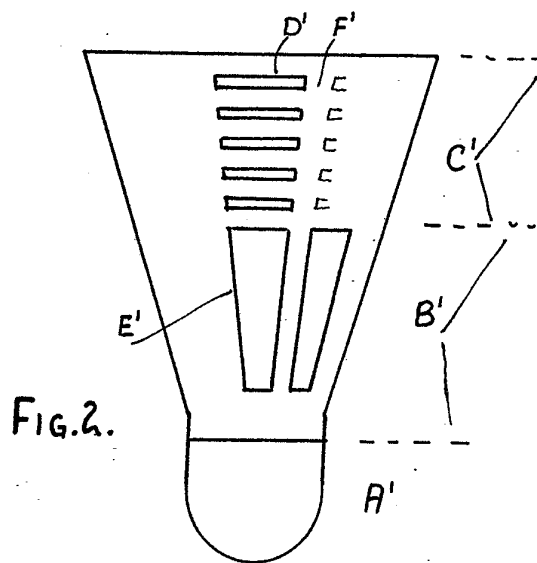


FIG. 2.