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(54) **SHUTTLECOCK ARTIFICIAL FEATHER AND BADMINTON SHUTTLECOCK**

(57) The present invention addresses the problem of providing: a shuttlecock artificial feather (1) including a rachis that is lightweight and that has a high rigidity; and a badminton shuttlecock (20) including the shuttlecock artificial feather. The shuttlecock artificial feather according to the present invention includes: a vane portion (3); and a rachis portion (5) fastened to the vane portion. The rachis portion includes: a core portion region (11) having pores; and an outer layer region (13) coating the core portion region and having a solid structure.

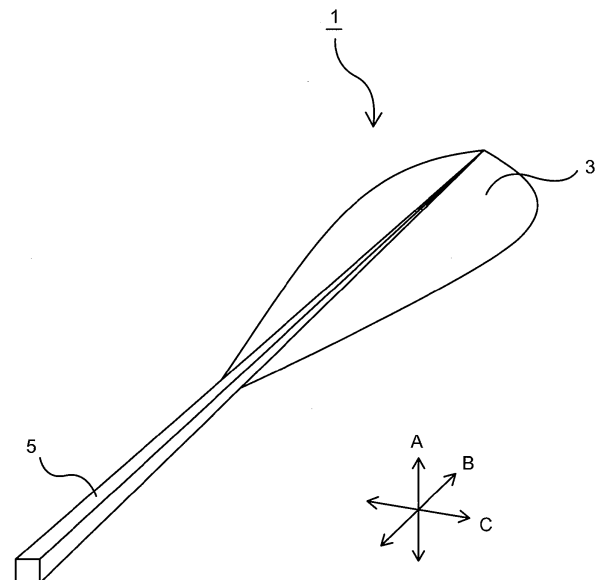


Fig. 1

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EUROPEAN SEARCH REPORT

Application Number

EP 21 20 0409

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 606 943 A1 (YONEX KK [JP]) 26 June 2013 (2013-06-26)	1, 2, 4-12	INV.
A	* pages 11-18; claims; figures *	3	A63B67/187 A63B102/04
X	TW 201 801 771 A (VICTOR RACKETS IND CORP [TW]) 16 January 2018 (2018-01-16) * paragraphs [0001] - [0035]; claims; figures *	1, 2, 4, 6, 10-12	
X,D	JP 2015 073782 A (TORAY INDUSTRIES) 20 April 2015 (2015-04-20) * claims; figures *	1, 2, 4, 7, 9, 12	
X,D	CN 101 491 730 A (WENGUANG ZHANG [CN]) 29 July 2009 (2009-07-29) * claims; figures *	1, 12	
			TECHNICAL FIELDS SEARCHED (IPC)
			A63B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		3 February 2022	Herry, Manuel
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-12

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION SHEET B

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-12

Independent claim 1 specifies that the porous material forms a core portion region, and that an outer layer coats the core portion region and has a solid structure, and claim 12 relates to a badminton shuttlecock comprising the shuttlecock artificial feather of claim 1. The use of a supercritical fluid is not mentioned. With these features an optimal balance between lightweight and rigidity is obtained (see paragraph 8 of the application).

2. claims: 13-15

Independent claim 13 relates to a method for manufacturing a shuttlecock artificial feather, the method comprising the steps of: melt-kneading a rachis resin composition; introducing a foaming agent as a supercritical fluid to the melted rachis resin composition, to make a melt-kneaded product; injecting the melt-kneaded product into a mold; reducing at least one of a pressure and a temperature of the foaming agent to be lower than a critical point of the foaming agent so that the resin composition is foamed, to make a rachis portion; and fastening the rachis portion and a vane portion to each other. Neither a core region, nor a coating outer layer are mentioned. These features make it possible to efficiently produce a foamed rachis, wherein the supercritical fluid can be uniformly dispersed in the melted resin (see par. 58 of the application).

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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03-02-2022

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