



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.01.2020 Bulletin 2020/03

(51) Int Cl.:
B63H 9/06 (2020.01)

(21) Application number: **19179263.9**

(22) Date of filing: **10.06.2019**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Metalfilms S.r.l.**
55051 Barga (Lucca) (IT)

(72) Inventor: **BIMBI, Roberto**
I-55100 SAN LORENZO DI MORIANO (Lucca) (IT)

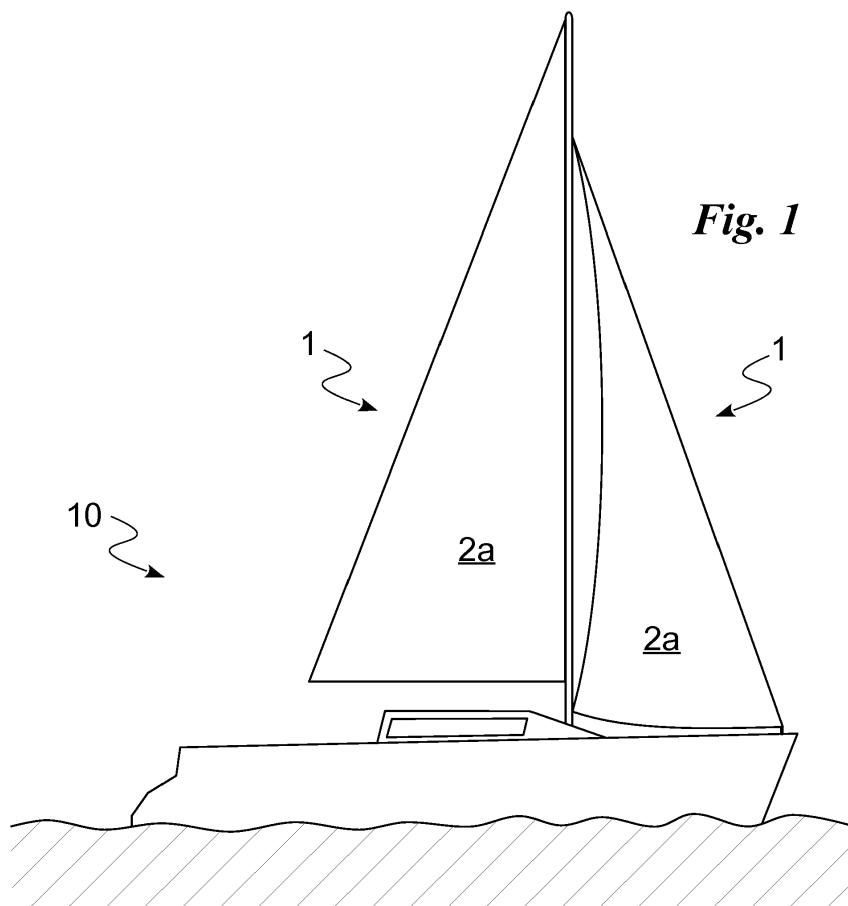
(74) Representative: **Lunati & Mazzoni S.r.L.**
Via Carlo Pisacane, 36
20129 Milano (IT)

(30) Priority: **10.07.2018 IT 201800007067**

(54) **IMPROVED SAILING AND BOAT**

(57) A sail (1) is provided comprising: a structural layer (2) of said sail (1); and an outer layer (3) integral with said structural layer (2) and comprising a radar-reflecting

under-layer (31) adapted to reflect radar waves, allowing the sail (1) to be visible on a radar.



Description

[0001] The present invention relates to a sail of the type as recited in the preamble of the first claim.

[0002] In detail, the invention relates to a sail usable in a vehicle exploiting the action, for example as a propulsion, of wind such as a hang glider, windsurf, kitesurf, hot air balloon, parachute or preferably a boat.

[0003] As is well known, sailing boats, whether single- or multi-hulls, have their propulsion mainly entrusted to the exploitation of wind and the engine has merely a supporting action.

[0004] These crafts are equipped with anti-boarding systems that allow to communicate particular navigation conditions or even merely their presence. These systems consist of lights and, in case of fog, a siren and optionally a gong.

[0005] Such anti-boarding systems are often inadequate and therefore a craft must be equipped with one or more radar reflectors.

[0006] Radar reflectors are devices designed to reflect the waves of a radar and thus increase the ability of a craft, otherwise too small, to be visible to a radar.

[0007] The radar reflectors on the market today consist of metal objects and can have various shapes such as tubular, octahedral, ovoid.

[0008] They are placed at the top of the mast.

[0009] It should be noted that the use of radar reflectors or other detection systems is sometimes also used on a hang-glider, hot air balloon, parachute or other means of transport exploiting the wind and for which it may be useful to identify the position in conditions of poor visibility.

[0010] The prior art described has several significant drawbacks.

[0011] In particular, despite the presence of radar reflectors, parachutes, hang gliders and hot air balloons are difficult to locate using radar.

[0012] In fact, radar reflectors have a limited extension and are therefore either not detected by radar or, if located, can be mistaken for other objects, not allowing the precise identification of the craft because of their small size.

[0013] Another drawback is that in crafts, where free space is limited, radar reflectors, although limited in size for their detection, take up a lot of space compared to the size of the craft and can be an obstacle to manoeuvring.

[0014] In this situation the technical purpose of the present invention is to devise a sail able to substantially overcome at least some of the drawbacks mentioned.

[0015] In the context of said technical purpose one important object of the invention is to obtain a vehicle equipped with a sail that is easily identifiable in any condition of visibility.

[0016] The technical purpose and specified aims are achieved by a sail as claimed in the appended Claim 1. Examples of preferred embodiments are described in the dependent claims.

[0017] The characteristics and advantages of the invention are clearly evident from the following detailed description of preferred embodiments thereof, with reference to the accompanying drawings, in which:

Fig. 1 shows a possible preferred application of the sail according to the invention; and

Fig. 2 shows an exploded view of the sail according to the invention. Herein the measures, values, shapes and geometric references (such as perpendicularity and parallelism), when used with words like "about" or other similar terms such as "approximately" or "substantially", are to be understood as except for measurement errors or inaccuracies due to production and/or manufacturing errors and, above all, except for a slight divergence from the value, measure, shape or geometric reference which it is associated with. For example, said terms, if associated with a value, preferably indicate a divergence of not more than 10% of said value.

[0018] In addition, where used terms such as "first", "second", "upper", "lower", "main" and "secondary" do not necessarily refer to an order, a priority relationship or relative position, but may simply be used to more clearly distinguish different components from each other.

[0019] The measurements and data presented herein are to be considered, unless otherwise indicated, as carried out in ICAO International Standard Atmosphere (ISO 2533).

[0020] With reference to the Figures, reference numeral **1** globally denotes the sail according to the invention.

[0021] The sail **1** is adapted to be used in any vehicle exploiting the action of wind, for example for propulsion. For example, it can be used in a hang glider, windsurf, kitesurf, hot air balloon or parachute.

[0022] Advantageously, the sail **1** is adapted to be used on a craft **10** (Fig. 1). It can be a mainsail, a jib (or Genoa), a storm jib, a spinnaker, a gennaker, a multi-purpose sail, a Code Zero.

[0023] The craft **10** may therefore comprise one or more sails **1**.

[0024] The sail **1** comprises a structural layer **2** of the sail.

[0025] The structural layer **2** defines the load-bearing part of the sail **1**, that is, adapted to support the action of the wind.

[0026] The structural layer **2** defines at least one load-bearing surface **2a** on which the wind acts during navigation.

[0027] It should be noted that the structural layer **2** defines two load-bearing surfaces **2a** adapted to position themselves one downwind and one upwind depending on the wind striking said sail **1** when in use.

[0028] The structural layer **2** may comprise at least one sheet extending along said load-bearing surface **2a** and in detail a single sheet or multiple sheets (laminate).

[0029] Each of said sheets may be in a material nor-

mally used for a known sail such as nylon, dacron®, mylar®, pentex®, spectra®, vectran®, kevlar®, technora®, carbon (carbon fibre) or cuben fiber®.

[0030] The structural layer 2 may include pockets or other similar elements adapted to allow the sail 1 to be engaged to a craft 10.

[0031] The sail 1, as shown in Fig. 2, comprises at least one outer layer 3 integral with the structural layer 2.

[0032] In particular, the sail 1 may comprise a single outer layer 3.

[0033] Preferably the sail 1 comprises two outer layers 3 enclosing the structural layer 2 between them. Advantageously, the sail 1 of a craft 10 comprises two outer layers 3 enclosing the structural layer 2.

[0034] Each outer layer 3 covers at least in part, preferably almost entirely, the structural layer 2. It has a surface area of at least 50%, and in detail 75%, of the load-bearing surface 2a, i.e. of the sail 1. Preferably it has a surface extension substantially equal to the extension of the load-bearing surface 2a and therefore of the sail 1.

[0035] An outer layer 3 comprises at least one radar-reflecting under-layer 31, preferably only one, suitable to reflect radar waves allowing the sail to be visible on a radar. The radar-reflecting under-layer 31 has a surface extension substantially at least equal to the extension of the outer layer 3. It extends and therefore covers at least 50%, in particular 75%, of the load-bearing surface 2a, and preferably the entire load-bearing surface 2a.

[0036] Suitably the outer layer 3 comprises at least one radar-reflecting under-layer 31, preferably only one, adapted to reflect the radar waves and allowing the sail to be visible on a radar.

[0037] Preferably, the radar-reflecting under-layer 31 is reflective, in addition to radar waves, also to light and in particular infrared and/or UV rays.

[0038] The radar-reflecting under-layer 31 is metallic and in particular aluminium.

[0039] It may have a thickness of substantially less than 100 μm , in particular 10 μm , and more in particular than 1 μm and preferably than 0.1 μm . It may be substantially in the range of 0.01 μm to 0.04 μm .

[0040] The radar-reflecting under-layer 31 can be made by high vacuum deposition and, preferably, by the PVD process.

[0041] The expression high vacuum deposition identifies those coating processes carried out in vacuum chambers, namely, in environments with very low internal pressure and, more precisely, in high vacuum, that is, with internal pressure substantially between 10⁻¹ Pa and 10⁻⁵ Pa. Among the most important high vacuum processes is the aforementioned known PVD method. PVD, or "Physical Vapor Deposition" is an atomic deposition process in which the material to be deposited is evaporated from a solid phase and transported in the vapour phase to the pieces to be covered where it deposits to form a thin film.

[0042] To this end, the outer layer 3 may comprise a deposit under-layer 32 of the radar-reflecting under-layer

31.

[0043] The deposit under-layer 32 is non-woven or polymer fabric preferably selected from polyester, polypropylene or polyamide (such as nylon®).

[0044] The deposit under-layer 32 is placed between the radar-reflecting under-layer 31 and the structural layer 2. In detail, it is integrally bound to the structural layer 2, for example by gluing or by suitable thermal bonding.

[0045] It has a thickness substantially less than 1 mm and, in particular substantially between 0.1 μm and 100 μm , in particular between 1 μm and 50 μm and more in particular between 7 μm and 20 μm .

[0046] It should be noted that in some cases the outer layer 3 may be without the deposit under-layer 32 and the radar-reflecting under-layer 31 may be directly bound and in particular deposited on the structural layer 2.

[0047] The outer layer 3 may comprise a protective under-layer 33 of at least part and, in detail, of the totality of the radar-reflecting under-layer 31.

[0048] The protective under-layer 33 defines the outer surface of the sail 1. It is on the opposite side to the radar-reflecting under-layer 31 with respect to the structural layer 2 and in particular to the deposit under-layer 32.

[0049] Preferably the protective under-layer 33 is transparent to light.

[0050] The protective under-layer 33 may be made by lacquering.

[0051] The protective under-layer 33 is made of resin.

[0052] It has a thickness substantially less than 1 mm and, in particular substantially between 0.1 μm and 100 μm , in particular between 1 μm and 50 μm and more in particular between 7 μm and 20 μm .

[0053] The functioning of the sail 1 described above in structural terms, is as follows. The functioning refers to the preferred non-limiting example of a craft 10.

[0054] The sail 1, when opened, defines a wide-ranging radar-reflecting surface.

[0055] Thus, when the craft 10 is sailing, it has a particularly large reflecting radar surface and is therefore readily identifiable by a radar of a second craft approaching the craft 10.

[0056] The invention comprises a new method of making a sail.

[0057] The method comprises a step of forming the structural layer 2.

[0058] The forming step may be of a known type.

[0059] Once the forming step has been completed, the method involves a step of binding at least one outer layer 3 integrally to the structural layer 2 and comprising at least one radar-reflecting under-layer 31.

[0060] In the binding step two outer layers 3 can be integrally constrained to the structural layer 2 which is thus enclosed between the two layers 3.

[0061] The deposition step comprises a deposition sub-step, preferably in high vacuum, of the radar-reflecting under-layer 31.

[0062] The high vacuum deposition sub-step can be realized directly on the structural layer 2. The radar-re-

flecting under-layer 31 is thus directly constrained to the structural layer 2.

[0063] Alternatively, the high vacuum deposition sub-step may be realized on a deposit under-layer 32 described above. In this case, the deposition step may comprise a sub-step of constraining the deposit under-layer 32 to the structural layer 2.

[0064] The deposition step may comprise a sub-step of coating the radar-reflecting under-layer 31.

[0065] In the coating sub-step a protective under-layer 33 preferably transparent to light is made on the radar-reflecting under-layer 31.

[0066] The coating sub-step may be a lacquer.

[0067] The sail 1 according to the invention achieves important advantages.

[0068] In fact, the radar-reflecting under-layer 31, especially if made of aluminium, reflects radar waves from, for example, other crafts 10, thus making the craft 10 very visible, increasing its safety. It is to be noted that the sail 1, when closed, still has a greater extension than the known radar reflectors, thus making the craft 10 easy to locate. This advantage can be seen even if the sail is used in another vehicle (hang glider, windsurf, kitesurf, hot air balloon, or parachute) making it extremely easy to locate the position of the vehicle by radar and therefore facilitate boarding in an emergency and/or avoiding an accident with such a vehicle.

[0069] Another advantage is that the outer layer 3, as described above, is reflective of infrared rays, so that the sail 1 does not heat by irradiation and consequently remains at a lower temperature than normal sails. Consequently, the sail 1 makes it more comfortable to shelter from the light beneath it.

[0070] An important advantage is that the outer layer 3 does not absorb UV rays, thus protecting the structural layer 2.

[0071] A no lesser advantage is that in a craft 10 the use of the sail 1 makes the adoption of other radar reflectors unnecessary, thereby improving the use of space on board. Moreover, the sail 1, thanks to the reduced thickness of the outer layer 3, has substantially the same weight and equal dimensions as a known sail.

[0072] Variations may be made to the invention described herein without departing from the scope of the inventive concept defined in the claims. In said context all the details may be replaced with equivalent elements and the materials, shapes and dimensions may be as desired.

Claims

1. A sail (1) comprising:

- a structural layer (2) of said sail (1) defining at least one load-bearing surface (2a) of said sail (1);
- and characterised in that it comprises

- at least one outer layer (3) which is external to said structural layer (2) and comprising at least one radar-reflecting under-layer (31) covering at least part of said load-bearing surface (2a) and adapted to reflect the radar waves, allowing said sail (1) to be detectable by a radar.

2. The sail (1) according to claim 1, wherein said radar-reflecting under-layer (31) covers at least 50% of said load-bearing surface (2a).

3. The sail (1) according to claim 2, wherein said radar-reflecting under-layer (31) covers said load-bearing surface (2a) entirely.

4. The sail (1) according to at least one preceding claim, wherein said radar-reflecting under-layer (31) is formed by high vacuum deposition.

5. The sail (1) according to at least one preceding claim, wherein said radar-reflecting under-layer (31) has a thickness substantially less than 10 μm .

6. The sail (1) according to claim 4, wherein said outer layer (3) comprises a deposit under-layer (32) of said radar-reflecting under-layer (31).

7. The sail (1) according to at least one of the preceding claims, wherein said outer layer (3) comprises a protective under-layer (33) of said radar-reflecting under-layer (31).

8. The sail (1) according to claim 4, wherein said protective under-layer (33) is made by lacquering.

9. A craft (10) comprising at least one sail (1) according to one or more of the preceding claims.

10. A method of constructing a sail (1) comprising

- a step of forming a structural layer (2) defining at least one load-bearing surface (2a) of said sail (1);
- a step of bonding at least one outer layer (3) to said structural layer (2); said at least one outer layer (3) comprising at least one radar-reflecting under-layer (31) covering at least part of said load-bearing surface (2a) and adapted to reflect the radar waves, allowing said sail (1) to be detectable by a radar.

11. The method of constructing a sail (1) according to the preceding claim, wherein said depositing step comprises a sub-step of high-vacuum deposition wherein said radar-reflecting under-layer (31) is deposited by high vacuum deposition with a thickness substantially less than 10 μm .

12. The method of constructing a sail (1) according to the preceding claim, wherein said high-vacuum deposition sub-step in which said radar-reflecting under-layer (31) is deposited on a deposit under-layer (32); and a sub-step of bonding said deposit under-layer (32) to said structural layer (2).

10

15

20

25

30

35

40

45

50

55

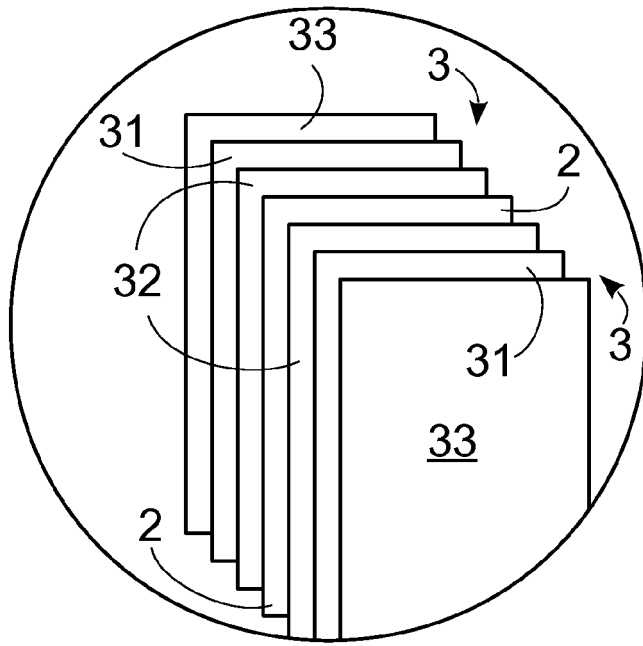


Fig. 2

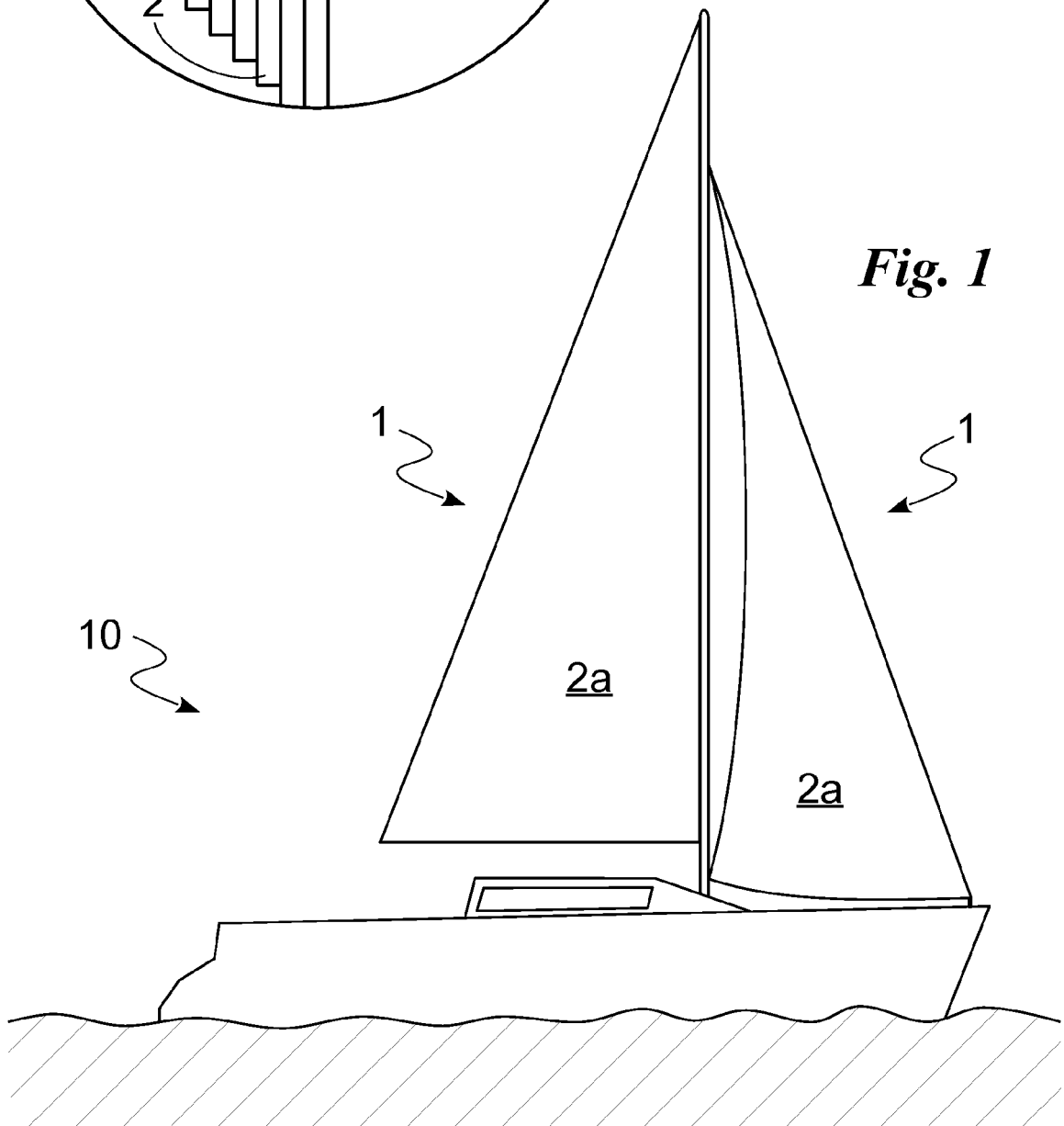


Fig. 1



EUROPEAN SEARCH REPORT

Application Number
EP 19 17 9263

5

10

15

20

25

30

35

40

45

50

55

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	US 4 677 010 A (SELWYN STEPHEN [US]) 30 June 1987 (1987-06-30) * figures 1-2 * * column 4, lines 8-11 * * column 2, lines 59-62 *	1-12	INV. B63H9/06
X	DE 80 19 502 U1 (WALTER MORITZ [DE]) 15 January 1981 (1981-01-15) * figures 8-11 *	1-12	
X	FR 2 741 200 A1 (AERAZUR [FR]) 16 May 1997 (1997-05-16) * figure 5 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			B63H B63J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 October 2019	Examiner Freire Gomez, Jon
CATEGORY OF CITED DOCUMENTS 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 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			

EPO FORM 1503 03/82 (P04C01)

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

EP 19 17 9263

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02-10-2019

10

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4677010	A	30-06-1987	NONE	
DE 8019502	U1	15-01-1981	NONE	
FR 2741200	A1	16-05-1997	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82