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(71) Applicant: **Pafasystem S.r.l.**  
**59100 Prato Prato (IT)**

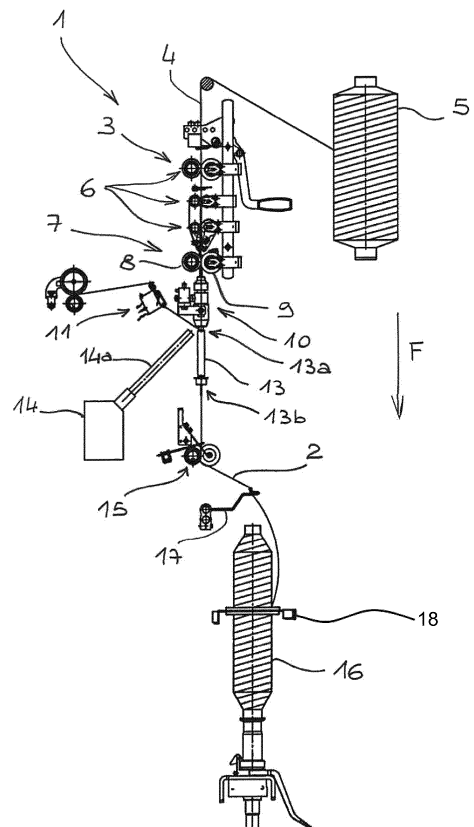
(72) Inventor: **FANI, Mario**  
**59100 Prato (IT)**

(74) Representative: **Firmati, Leonardo**  
**IXNEA S.r.l.**  
**Via Traversa Fiorentina, 6**  
**59100 Prato (IT)**

(54) **APPARATUS FOR MAKING A YARN**

(57) Described is an apparatus for making a yarn (2), comprising a unit (3) for feeding and stretching a sliver (4) of textile fibres, a unit (7) for treating the sliver (4) of textile fibres, configured for tearing and crumbling textile fibres from it, a suction and blowing unit (10) designed to suck the crumbled textile fibres and transport them downstream, a unit (11) for feeding two core threads (12), a false-twisting unit (13).

FIG. 1



## Description

**[0001]** This invention relates to an apparatus for making a yarn. In particular, the invention relates to an apparatus for making a voluminous yarn starting from loose fibres and core threads.

**[0002]** A type of yarn made from loose fibres and core threads is, for example, the so-called voluminous type yarn. For making the above-mentioned voluminous yarns, the prior art teaches the use of apparatuses which comprise a carding machine superposed on a binding device.

**[0003]** A sliver of textile fibres is fed to the above-mentioned carding machine and this pulls textile fibres out from the sliver which are then conveyed, using a flow of air generated by the same rotation as the carding machine, to an underlying binding chamber.

**[0004]** At the binding chamber, which is for example configured for twisting a tubular braid supporting the fibres, the textile fibres pulled by the carding machine engage with the braid and contribute to generating the above-mentioned voluminous type yarn.

**[0005]** Although the prior art apparatuses of the type described above sometimes have a certain practicality, they are not, however, free from drawbacks.

**[0006]** A first drawback is due, for example, to the need to provide regular machine stoppages for cleaning the carding machine.

**[0007]** The carding machine has a cylindrical surface on which is distributed a plurality of needles, and these needles, normally designed to pull the fibres from the sliver, end up entrapping a sort of mat of fibres. This mat of fibres, distributed on the cylindrical surface of the carding machine must be removed so as not to adversely affect the main action the needles, that is to say, as mentioned, pulling the fibres from the sliver.

**[0008]** An operator must therefore, at predetermined time intervals, check for the presence of the fibre mat described above and remove it after stopping the apparatus.

**[0009]** Another drawback linked to the prior art apparatuses relates to the overall dimensions of the tubular braid which is often excessive, especially when the desired size of the yarn is reduced.

**[0010]** In other words, the presence of the braid forces the production of considerable sized yarns.

**[0011]** The aim of the invention is to provide an apparatus for making a yarn which is able to overcome the drawbacks of the prior art and which is at the same time practical to use and simple and inexpensive to make.

**[0012]** A further aim of the invention is to provide an apparatus for making a yarn which allows yarns to be made even of limited dimensions in terms of thread count (a metric number even close to 1).

**[0013]** Yet another aim of the invention is to provide an apparatus for making a yarn which requires limited maintenance operations by the operator.

**[0014]** According to the invention, these aims and others

are achieved by a multilayer laminate comprising the technical features described in the accompanying claims. The technical features of the invention, with reference to the above-mentioned aims, are clearly described in the appended claims and its advantages are apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a nonlimiting example embodiment of the invention and in which:

- Figure 1 is a schematic front elevation view of a preferred embodiment of an apparatus for making a yarn according to the invention;
- Figure 2 is a schematic side elevation view of a detail of the apparatus of Figure 1.

**[0015]** As illustrated in Figure 1, the numeral 1 denotes in its entirety an apparatus for making yarn 2 made in accordance with the invention.

**[0016]** As illustrated in Figure 1, the apparatus 1 for making a yarn 2, hereinafter referred to for brevity also merely as the apparatus 1, comprises a unit 3 for feeding and stretching a sliver 4 of textile fibres.

**[0017]** The sliver 4 of textile fibres is unwound from a feed reel 5.

**[0018]** From the feed reel 5 the sliver 4 passes through the above-mentioned feed and stretching unit 3 where it receives a sort of elongation, engaging with different pairs of cylinders 6 arranged one after another.

**[0019]** At the outfeed from the feed and stretching unit 3, the apparatus 1 comprises a unit 7 for treating the sliver 4 of textile fibres.

**[0020]** The treatment unit 7 is configured for tearing and crumbling textile fibres from the sliver 4 at the outfeed from the feeding and stretching unit 3.

**[0021]** Advantageously, the treatment unit 7 comprises two counter-rotating rollers 8, 9 of which one has a cylindrical surface with a grooved profile.

**[0022]** The grooves of the grooved profile, not illustrated, formed on the roller 9 determine, in the contact with the sliver 4, due also to the high speed of rotation of the roller 9, the breakage of portions of the textile fibres present in the sliver 4.

**[0023]** In other words, the above-mentioned and not illustrated grooves, thanks also to their high rotation speed, act on the sliver 4 as a sort of blade, tearing and crumbling into fragments the textile fibres which make up the sliver 4.

**[0024]** Again with reference to Figure 1, the apparatus 1 comprises a suction and blowing unit 10 which is positioned immediately downstream of the treatment unit 7.

**[0025]** The suction and blow-moulding unit 10 is configured to suck the textile fibres crumbled by the treatment unit 7 and transport them downstream, in the direction indicated by the arrow F.

**[0026]** The suction and blowing unit 10 is advantageously made by means of a Venturi tube to which air under pressure is fed.

**[0027]** As illustrated in detail in Figure 2, the suction and blowing unit 10 has an upper opening 10a through which the crumbled fibres of the sliver 4 are sucked, and an outlet 10b, located close to its lower end, through which outlet 10b the above-mentioned crumbled fibres are expelled from the unit 10.

**[0028]** Again with reference to Figure 2, in the proximity of the suction and blowing unit 10, the apparatus 1 comprises a unit 11 for feeding core threads 12. The unit 11 comprises two bodies 11a, each designed to feed a respective core thread 12.

**[0029]** The core threads 12 are threads designed to form a load-bearing structure of the yarn 2 being formed, to which the crumbled fibres are connected, made starting from the sliver 4.

**[0030]** Advantageously, there are two core threads 12. According to embodiments not illustrated, there are three or more core threads 12.

**[0031]** Downstream of the suction and blowing unit 10, again in the direction of the arrow F, the apparatus 1 comprises a false-twisting unit 13 designed to simultaneously receive both the above-mentioned core threads 12 supplied by the feeding unit 11 and the crumbled textile fibres blown by the suction and blowing unit 10.

**[0032]** The false-twisting unit 13 is configured to impart to the above-mentioned core threads 12 a temporary winding designed to stably retain the crumbled textile fibres. In other words, inside the false-twisting unit 13 the core threads 12 are moved relative to each other so that the crumbled fibres of the sliver 4 which are fed inside the unit 13 by the suction and blowing unit 10 remain held between them.

**[0033]** As illustrated in Figure 2, the false-twisting unit 13 has an inlet 13a at which the core threads 12 enter into it.

**[0034]** From the inlet 13a also enter the crumbled fibres from the sliver 4 fed out of the outlet 10b of the suction and blowing unit 10.

**[0035]** As illustrated in Figure 1, the apparatus 1 comprises a suction unit 14 designed for sucking the crumbled fibres which, at the outlet 10b of the suction and blowing unit 10, are not collected by the false-twisting unit 13 and would therefore be dispersed and unused.

**[0036]** The suction unit 14 comprise a suction pipe 14a designed to be positioned close to the above-mentioned inlet 13a of the false-twisting unit 13.

**[0037]** As shown in Figure 2, the inlet 13a of the false-twisting unit 13 faces the above-mentioned opening 10a of the suction and blowing unit 10.

**[0038]** Advantageously, the inlet 13a and the outlet 10b are spaced at a distance of between 0.2 mm and 50 mm.

**[0039]** Still more advantageously, the inlet 13a and the outlet opening 10b are spaced at a distance of between 2 mm and 10 mm.

**[0040]** The actual distance between the inlet 13a and the outlet 10b is also selected as a function of the particular fibres processed as well as the dimensions and material of the core threads 12.

**[0041]** The inlet 13a of the false-twisting unit 13 advantageously has a cylindrical tubular shape.

**[0042]** The internal diameter of the inlet 13a is advantageously between 2 mm and 20 mm.

**[0043]** Still more advantageously, the inlet 13a has an internal diameter of between 4 mm and 10 mm.

**[0044]** Experimental tests have shown that optimum results are obtained with an internal diameter of the inlet 13a of between 6 mm and 8 mm.

**[0045]** The false-twisting unit 13 extends longitudinally along the direction indicated by the arrow F and has, longitudinally opposite the above-mentioned inlet 13a, an outlet end 13b from which a yarn 2 made from loose fibres and core threads 12 escapes.

**[0046]** Again with reference to Figure 2, the false-twisting unit 13 comprises a rotary hook G positioned at its above-mentioned outlet end 13b.

**[0047]** The hook G rotates, in known manner, using rotation means not illustrated.

**[0048]** The yarn 2 is advantageously a voluminous yarn.

**[0049]** With reference to Figure 1, the apparatus 1 according to the invention comprises a so-called production roller 15, comprising two counter-rotating rollers designed to pull the yarn 2 exiting the false-twisting unit 13 and to send it towards a collection spindle 16. Interposed between the production roller 15 and the collection spindle 16, the apparatus 1 comprises a guide ring 17 designed to direct the yarn 2 towards a collection spindle 16, which allows a regular winding of the yarn 2 on the relative collection spindle 16.

**[0050]** The apparatus 1 advantageously comprises a collection spindle 16, instead of a more common spool, and a relative ring-shaped guide device 18 since, thanks to this combination, it is possible to impart a positive twisting to the yarn being formed which, in combination with the previous false-twisting imparted by the unit 13 guarantees a stable retaining of the crumbled fibres on the core threads 12.

**[0051]** The ring-shaped guide device 18 is in effect designed to allow a regular winding of the yarn 2 on the relative collection spindle 16.

**[0052]** The use of a spool, although normally focussed on productivity requirements, because it allows a faster winding of the yarn, is not applicable in the apparatus 1 according to the invention because, as it does not apply a positive twisting to the yarn being formed, there would be the loss of crumbled fibres. In accordance with embodiments not illustrated of the apparatus 1 according to the invention, the apparatus 1 comprises, interposed between the suction and blowing unit 10 and the false-twisting unit 13, a conveyor configured for conveying the crumbled fibres from the sliver 4 to the false-twisting unit 13.

**[0053]** Advantageously, the above-mentioned and not illustrated conveyor has an inner surface which is conical or in any case converging towards the inlet 13a of the false-twisting unit 13, in such a way as to collect the fibres

at the outlet from the suction and blowing unit 10 and direct them precisely to the false-twisting unit 13. The apparatus 1 for making yarn according to the invention achieves the preset aims and brings important advantages.

**[0054]** A first advantage linked to the invention is due to the fact of being able to have an apparatus which is easy to make, and which is able to make voluminous yarns even with a thread reduced count. Experimental evidence has in fact shown the possibility of obtaining with the apparatus 1 according to the invention yarns with a thread count included in metric number (Nm) from 1 to 20.

**[0055]** A further advantage linked to the apparatus according to the invention is due to the fact that it does not require particular attention by the operator nor periodic stops in its operation.

## Claims

### 1. Apparatus for making a yarn (2), comprising:

- a feeding and stretching unit (3) for feeding and stretching a sliver (4) of textile fibres,
- a treatment unit (7) for treating said sliver (4) of textile fibres, configured to tear and crumble textile fibres from said sliver (4) of textile fibres, said treatment unit (7) comprising two counter-rotating rollers (8, 9) at least one of which has a cylindrical surface with a grooved profile,
- a suction and blowing unit (10) configured to suck said crumbled textile fibres into said treatment unit (7) and transport them downstream,
- a feeding unit (11) for feeding at least two core threads (12),
- a false-twisting unit (13) designed to receive said least two binding threads (12) and said crumbled textile fibres blown by said suction and blowing unit (10), said false-twisting unit (13) being configured to give said binding threads (12) a temporary winding designed to hold firmly said crumbled textile fibres;
- a spindle (16) for collecting the yarn (2) obtained;
- a thread-guide device (18) designed to allow a regular winding of the yarn (2) on said collection spindle (16), said thread-guide device (18) and spindle collecting device (16) being configured for imparting to said yarn (2) a positive twisting designed to stably retain said crumbled textile fibres.

### 2. The apparatus according to claim 1, wherein said suction and blowing unit (10) has an outlet (10b) for discharging said crumbled textile fibres and said false-twisting unit (13) has an inlet (13a) facing said outlet (10b), **characterised in that** said outlet (10b)

and inlet (13a) are arranged at a distance of between 0.2 mm and 50 mm.

3. The apparatus according to claim 2, **characterised in that** said outlet (10b) and inlet (13a) are arranged at a distance of between 2 mm and 10 mm.
4. The apparatus according claim 2 or 3, wherein said inlet (13a) has a cylindrical tubular shape, **characterised in that** said inlet (13a) has an internal diameter of between 2 mm and 20 mm.
5. The apparatus according to claim 4, **characterised in that** said inlet (13a) has an internal diameter of between 4 mm and 10 mm.
6. The apparatus according to claim 4, **characterised in that** said inlet (13a) has an internal diameter of between 6 mm and 8 mm.
7. The apparatus according to any one of the preceding claims, **characterised in that** said suction and blowing unit (10) comprises a Venturi tube supplied with pressurised air.
8. The apparatus according to any one of the preceding claims, **characterised in that** it comprises, interposed between said suction and blowing unit (10) and false-twisting unit (13), a conveyor configured to convey said crumbled fibres from said sliver (4) to said false-twisting unit (13).
9. The apparatus according to claim 8, **characterised in that** said conveyor has a surface at least approximately conical.

FIG. 1

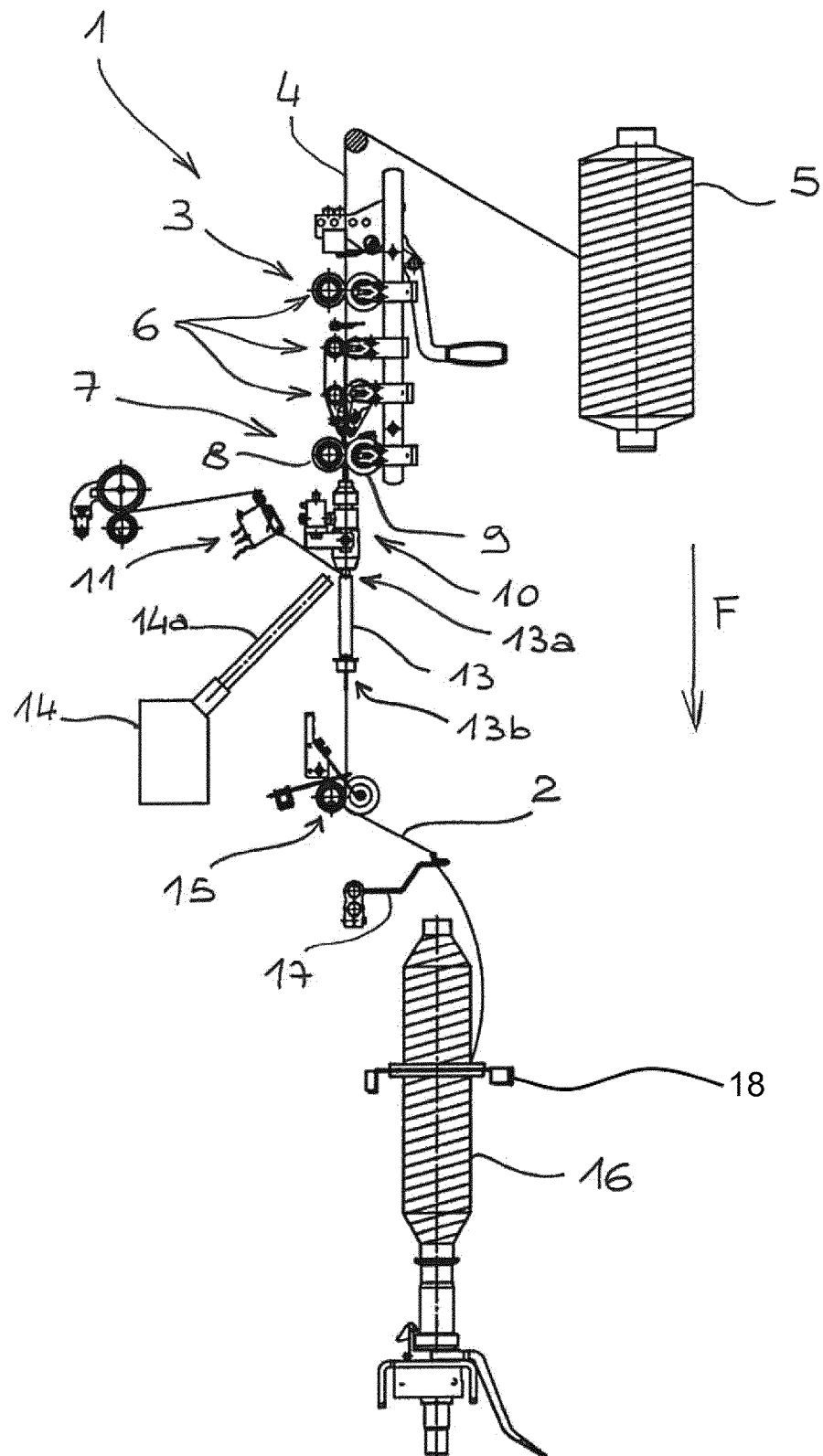
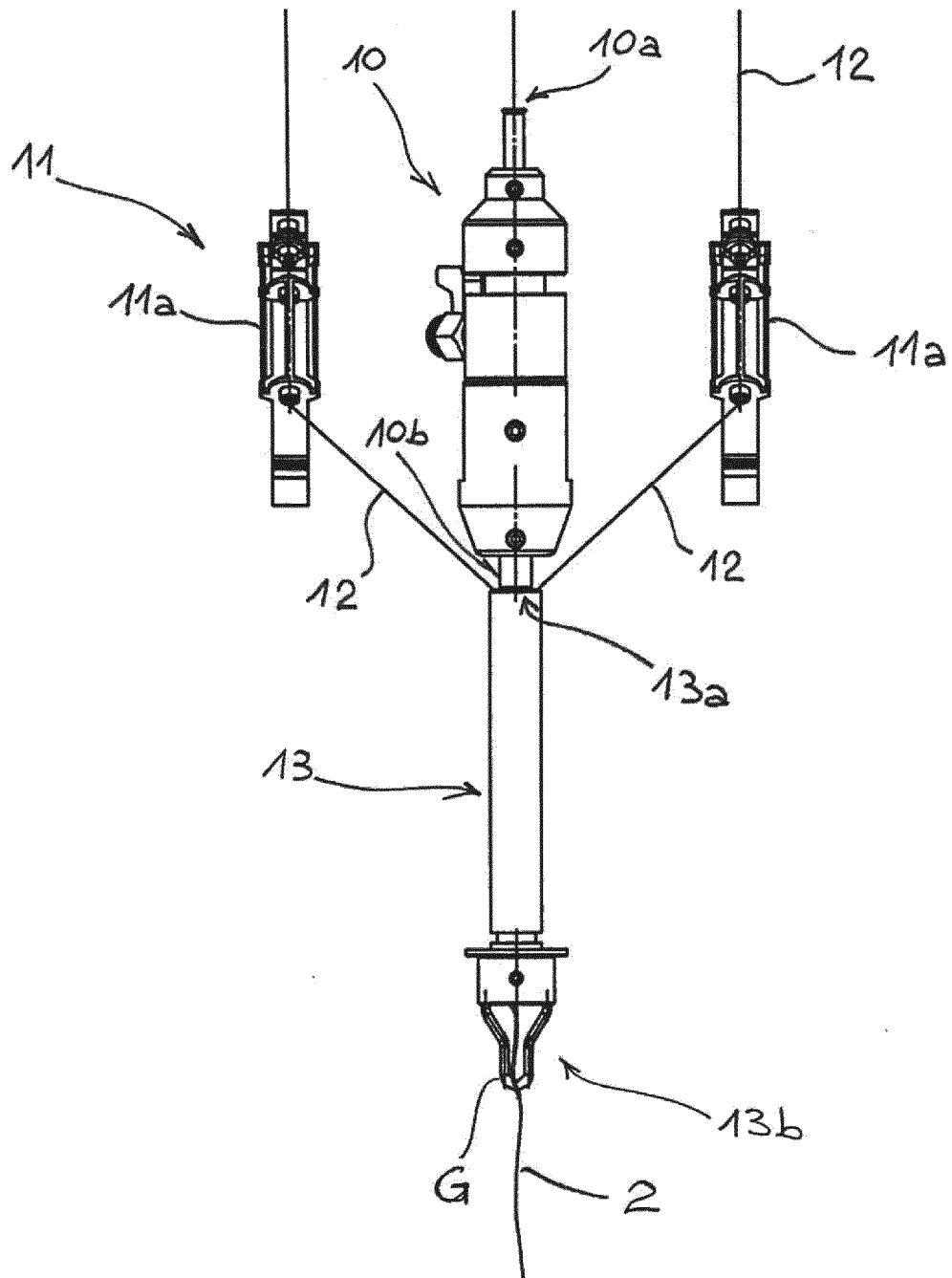


FIG. 2





## EUROPEAN SEARCH REPORT

Application Number  
EP 21 18 5672

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                              |                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                     | Relevant to claim                                                                                                                                                                                                                                                            | CLASSIFICATION OF THE APPLICATION (IPC)                              |
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| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                              |                                                                      |
| Place of search<br>The Hague                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                   | Date of completion of the search<br>29 November 2021                                                                                                                                                                                                                         | Examiner<br>Van Beurden-Hopkins                                      |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                                                                                                   | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                      |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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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.  
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