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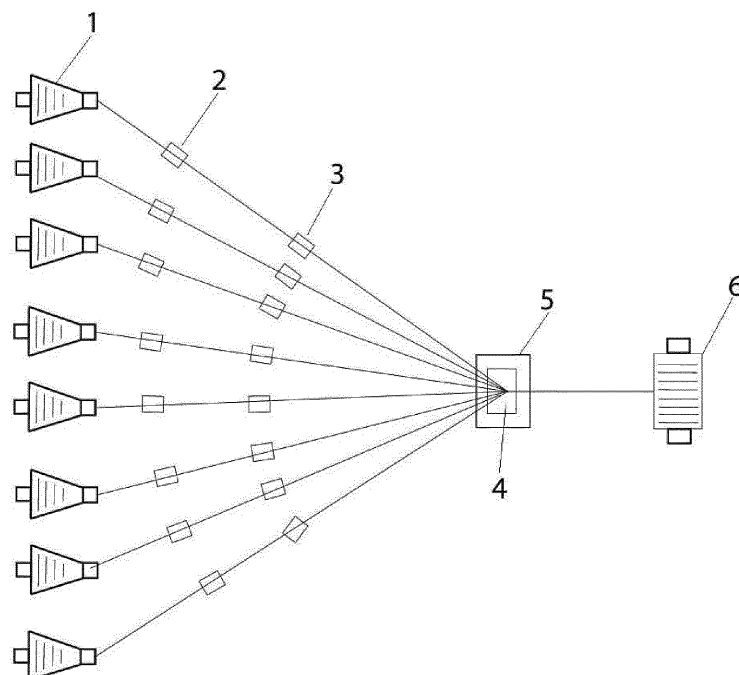
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(54) **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**

(57) The present invention refers to the production process of mixed yarns and mixed yarns (6) obtained from ecological, sustainable, biodegradable, and compostable textiles within any textile industry, or adapted in the machines within the spinning mills, adding a new de-

mand for sustainable textile products. Biodegradable, compostable, sustainable filament yarns (1) are combined with biodegradable, compostable, sustainable spun yarns (1) by interlacing with compressed air (4).

Figure 1/1



Description

[0001] The present invention refers to a production process of mixed yarns and mixed yarns obtained from ecological and/or sustainable and or biodegradable and or compostable textiles within textile industries and/or adapted in the machines inside spinning mills. This invention allows a very large combination of different types of mixed yarn mixtures and an amplitude in weights of mixed sustainable and or biodegradable and or compostable yarns, to meet and create new demands for sustainable textile products.

[0002] This sustainable and or ecological process and product uses in its mixture ecological and or biodegradable and or sustainable spun yarn and a sustainable and a sustainable filament biodegradable in water and or compostable on land, from the interlacing of the threads mentioned in the claims, based on the injection of compressed air, adding improvements to the production of a sustainable and or ecological mixed yarn in great demand, with greater durability, resulting in clothing and or knits and or fabrics with extreme quality, durability, and dimensional structure, making it possible to bring advanced technology from filaments to spun yarns, thus meeting the new technical need of the sustainability textile market, helping an exponential financial economy, and protecting and taking care of the environment, waters, oceans and all animals on planet Earth. This process is called the evolution of the intimate mixture.

[0003] As is already known, biodegradable and/or compostable, sustainable and ecological fabric and clothing are essential materials in the current moment of the modern textile industry.

[0004] The need and duty to protect the environment from the flow of polluting raw materials within the complex textile chain. As the second most polluting industry on the planet, the textile industry has a duty to find, execute and put into practice solutions in processes, and sustainable, ecological, biodegradable and compostable products, to be integrated in their production and in the global textile market.

[0005] Organic cotton or, from the Better Cotton Initiative (BCI), a non-profit organization, created in 2005, based in Geneva, Switzerland, which works to improve world cotton production for those who produce it, is a very questioned product by environmentalists for requiring large farming spaces, but on the other hand it is a sustainable natural thread, consumes little water, requires none or little pesticides, has re-management of cultivated area, is a comfortable product, and have more workers involved and its cultivation, having a very important role in the socioeconomic view.

[0006] Viscose, lyocell, bamboo and rayon are synthetic spun yarns and filaments produced in a closed production chain of their fiber, making them a highly ecological, sustainable and biodegradable product, excellent comfortable yarns for modern textile use, preferably where its raw material was made in a closed chain where

all the waste from the process is captured and transformed into a by-product to be reused, creating a sustainable and ecological cycle.

[0007] The linen yarn comes from a natural fiber that brings comfort, versatility and durability. Since its planting, through the preparation of the fiber and the final finish of the fabric, the impacts on the environment are minimal. Its cultivation requires up to twenty times less water than cotton and minimal amounts of fertilizer, in addition, flax does not harm the soil, being easily incorporated into the rotation cycle of other crops, the processing of its fibers is done with low use of electricity and relies on with the help of natural agents, such as rain and sun, and practically all residues from its production are used by other industries, such as cosmetics, food and paper.

[0008] Modern high-tech filaments have their molecules with nanotechnology for protection from ultraviolet rays, among others, and also now biodegradable, ecological and or sustainable from their initial process to the final cycle. Preferably used in the mixtures of mixed yarns combining cutting-edge technology with the oldest industry in the world, spun yarn spinning and textile industries.

[0009] The lactic polyacid plastic filament, which is a continuous filament made from maize leaves, is a raw material that consumes very little water, grows along with the maize and does not cause cultivation competition, meeting food and clothing needs in a single space of cultivation, characteristics and trends very important for our future. An excellent attraction is that lactic polyacid plastic can be molecularly mixed with another raw material, the polyethylene terephthalate or polyester, in its composition, thus making semi-sustainable, semi-recycled yarns as the multi-component yarn in which different polymers are brought together in a single filament (50% recycled polyethylene terephthalate + 18% lactic polyacid plastic + 32% polyethylene terephthalate); the polyester filament can be used in this situation as a middle ground of the economic textile market, somewhere between yarn of petroleum raw material and yarn of natural raw material, to transform the market, depending on the mixture of polyester with natural raw materials and thus forming a semi-sustainable combined polyester yarn, a natural process product of economic market.

[0010] When mentioned in the present application, the items below mean: spun yarn: any natural fiber or synthetic cut or artificial fiber, grouped fiber by fiber by various means of process, such as: conventional, by rotor, by air vortex, etc., to form a yarn of grouped and twisted fibers, like for example: cotton, viscose, polyester, acrylic, aramid, among others; continuous filament yarn: any synthetic or artificial yarn that, from a chemical mass, undergoes an extrusion that forms a continuous yarn (polyester type, lactic polyacid plastic, polyamide); mixed yarns: yarns with welding points (tangling) resulting from the compressed air entanglement process between one or more spun yarns with one or more continuous filament yarns; textile industries: refers to industries that contain the entire textile chain process (vertical) (conventional

spinning, weaving, chemical finishing of fabrics or yarn and/or confection); conventional process: refers to the process used in conventional spinning (carded yarns and combed yarns); unconventional process: refers to the process used in unconventional spinning (by rotor, by air vortex); intimate mixing: any spun yarn that has an intimate mixing process to mix synthetic or artificial and or natural fibers with each other, using a large amount of water and energy, and limited to the manufacture of a large amount of yarn; continuous filament spinning: any and all spinning that has a vertical process with the introduction of chemicals, until the manufacture of the final yarn, using a large amount of water and energy, and limited to the manufacture of yarn in large quantity; knitted fabric: type of knitwear fabric produced on a large scale using circular looms; chemical finishing of fabrics: process to fix and size the fabric and give it a more pleasant touch; injector nozzle: compressed air equipment that performs the function of interlacing the yarns; porcelain shoe: (insert), inserted in the injector nozzle, with several types to be chosen for a specific technical function, depending on the characteristics needed for the ready mixed yarn, having various sizes and orifice shapes, creating the tangle of the yarns with welding points; oligomer: polyester molecules of continuous filaments that have not settle in their manufacturing process, usually low and medium quality yarns; protector and collector of oligomers: box that surrounds the air nozzles protecting employees and collecting oligomer residues; durable: high quality yarns, fabrics and clothing for a longer life cycle; mixed blend: mixture of spun yarn with a filament, each of a different color, giving a blend effect to the fabric; barriness: existing defect in knits and fabric due to a yarn problem, usually in blends; plastic micro particles: small fibers of synthetic or artificial cut fiber threads, which come out of fabrics or clothes during washing and pollute the oceans; sustainable: product with a clean production chain and a complete life cycle, without damaging the environment and with a good socio-economic cycle; biodegradable: product or raw material that disintegrates in nature without contamination; compostable: product or raw material that gives energy to other living beings to transform the material; ecological: any product that does not interfere or harm the health and well-being of the environment; lactic polyacid plastic is a continuous filament made from maize leaves, which is a raw material that consumes very little water; semi recycled polyethylene terephthalate: polyethylene terephthalate yarn, original raw material polyethylene terephthalate and also lactic polyacid plastic raw material, mixed with raw material from polyethylene terephthalate bottles; recycled polyethylene terephthalate: all recycled polyethylene terephthalate bottle yarn.

[0011] Currently, several types of yarn production - yarn spinning - are available on the market. The textile yarn is the final product of the spinning stage, its main characteristic being the diameter or thickness (technically called the yarn title); the textile yarn can be manufac-

tured from natural, artificial and synthetic fibers, which is currently the raw material used.

[0012] The production process of ecological and or sustainable and or biodegradable and or compostable mixed yarns aims to place a differentiated product on the market, with a high added value in sustainability, since the process referred to here is not polluting, as a collector and protector of oligomers and other molecules and fibers that come off the process was developed.

[0013] The productive capacity of a spinning mill is determined by the types of processes used. There are three basic types, distinguished by the speed of production, limited yarn titles and plaster, in some processes there is a lower yarn resistance and wide variation in levels of automation reached and the quality and thickness of the yarn produced, which are: the conventional process (ring spinning machine) and the unconventional process by air vortex and rotor.

[0014] The patent PI0704157-8 deals with a process of manufacturing mixed yarns at a low production scale, a polluting process in oligomers and other diverse molecules and fibers with different machine speeds, compressed air pressures, and with little amplitude, thus hampering the manufacture of new mixed yarns and utilizing a lot of energy in compressed air with the mentioned high pressures. The process does not produce large volumes, making it impossible to substitute the intimate mixture, as it does not reach the spinning mills producing the intimate fiber, preventing a global change of sustainable consciousness, while the patent application described here allows for a large volume of different types of mixtures and diversified titles without altering the initial spinning process, in addition to providing a wide variety of biodegradable and/or ecological and/or sustainable filament yarns combined with biodegradable and or ecological and or sustainable spun yarns, providing greater durability, comfort, and structural dimensioning of the manufactured piece, thus enabling the replacement of the intimate mixture coupled in spinning machines or produced in textile industry winding machines.

[0015] The sustainable product and process, described here, coupled in spinning machines or produced in textile industry winding machines, does not contain synthetic and artificial cut fiber of polyester and polyamide in the mixed yarn, one of the biggest causes of ocean contamination by plastic microparticles, which currently triggers an unprecedented contamination affecting the entire human food chain. Instead, it uses biodegradable and or compostable and or ecological and or sustainable and or synthetic filament, replacing the synthetic and artificial cut fiber of polyester and polyamide, creating, protecting and giving more comfort to people with an ecological and or sustainable mixed yarn.

[0016] Another objective was to provide a mixed yarn production process that preferably uses biodegradable filaments and/or sustainable filaments and/or filaments that can be dyed in their mass, eliminating water bath dyeing, making it less polluting and using much less water

in the dyeing process of the fabrics, in addition, the mixed yarn leaves the process ready, without the need for bath dyeing, only finishing.

[0017] Another objective of providing a mixed yarn production process is to enable a range of weights (yarn title) of sustainable and or biodegradable and or compostable mixed yarns, with more than eight yarns simultaneously entering the process forming a single mixed yarn.

[0018] Another objective was to provide a process for the production of biodegradable and sustainable mixed yarns.

[0019] Another objective was to provide a yarn production process that makes it possible to combine spun yarns of 100% organic cotton with biodegradable, ecological and or sustainable and or technological filaments, and or polyester, in the percentage of local federal law and thus defined as an organic product.

[0020] Another objective of providing a mixed yarn production process is that the production process for mixed, ecological and or sustainable yarns is a sustainable process, in combining mixed yarns by compressed air, ensuring the adequate removal and disposal of existing oligomer molecules, other molecules and other fibers during the process, thus avoiding soil and environmental contamination and risk to respiratory health.

[0021] Another objective was to provide a production process for mixed yarns that enables easy adaptation of the process in the spinning mills or textile industries. Mixed biodegradable and or sustainable yarns are used in conventional and unconventional process machinery connected to other machines or in winding machines for textile industries.

[0022] The objectives and advantages of the present process are achieved through new pressures of compressed air, being able to utilize the minimum pressure of compressed air, saving energy exerted on and around the spun yarns, at the moment of passing through the injector nozzle, creating a tangle of filaments around it and placing "welding" points on them. The new porcelain inserts have a different size and shape of the orifice that is fitted in the nozzle injector, meaning that there is no need to change the nozzle, obtaining a wide effect of mixed blends in ecological and or sustainable yarns, with superior physical and chemical characteristics of a new technological and ecological and or biodegradable and or compostable yarn.

[0023] The inventive process that can be coupled and or produced in winders in the production of textile industries, mentioned above, will be represented by drawing, through **Figure 1**.

[0024] According to **Figure 1**, the process is characterized by comprising the following steps: placement of spun yarns and continuous filaments in the conical supports (1), in the passage inside tensioners (2), wire guides (3), injector nozzle (4), collector and protector (5), conical for preparing the mixed yarn reel (6).

[0025] The spun yarns of step (1) are preferably or-

ganic cotton and or cotton from the Better Cotton Initiative (BCI) and or biodegradable viscose and or biodegradable lyocell and or biodegradable linen or any other type of existing spun yarn and or biodegradable and or ecological and or sustainable.

[0026] The continuous filaments of step (1) are preferably recycled and/or semi-recycled polyethylene terephthalate, polyester, biodegradable and compostable lactic polyacid plastic and or biodegradable and compostable polyamide and or biodegradable and compostable lyocell and or biodegradable and compostable rayon and any other biodegradable and compostable and sustainable filament.

[0027] In step (2) the yarns pass through the tensioners and each thread receives a specific regulation tension due to the elongation characteristic of each one.

[0028] In step (3) the wire guides guide each thread, in parallel, to enter the injection nozzle in step (4).

[0029] In step (4) the continuous filaments create points of physical (welding) connection with the yarn spun by consequence of the whirlwind of compressed air, preferably from 0.3 to 6 Bar, inside the nozzle. The inserts, which are made of porcelain, may vary from more open or closed or oval or round orifice, to be placed in the injector nozzle, thus allowing different welding points on the yarn, keeping the points firm, durable, and with mixed blend variations, with these properties remaining even after fabric and garment manufacturing.

[0030] In step (5), the most important of this process, the collector filter is placed. Its function is to collect oligomer molecules, which are generally poorly fixed and poorly washed molecules in the process of dyeing polyester or polyethylene terephthalate or other continuous filament molecules, described in step (1) and the spun yarn fibers described in step (1).

[0031] In step (6), the winding machine interconnected or not to another machine, which can be automatic or manual, varies in speed according to its model, preparing the mixed yarn conical reel.

[0032] Based on the above and illustrated, the present invention dealt with mixed yarns mixed by compressed air, biodegradable and or compostable and or sustainable and or ecological, which are used in machinery of the conventional and unconventional spinning process, whether or not interconnected to other machines or produced in winding machines within the textile industries, with characteristics of novelty, inventive step and industrial application, fundamental for patenting, with claims described below.

Claims

- 1. PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, which will be used in textile industries and or adapted in machines within conventional and unconventional spinning, **characterized**

by comprising the following steps: placement of spun yarns and continuous filaments in the conical supports (1), in the passage inside tensioners (2), wire guides (3), injector nozzle (4), collector and protector (5), conical for preparing the mixed yarn reel (6).

2. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized in that** in the aforementioned step (2) the yarns pass through the tensioners and each thread receives a specific regulation tension due to the elongation characteristic of each one. 10
3. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized in that** in the aforementioned step (4), continuous filaments create points of physical (welding) connection with the yarn spun by consequence of the whirlwind of compressed air, preferably from 0.3 to 6 Bar, inside the nozzle. The inserts, which are made of porcelain, may vary from more open or closed or oval or round orifice, to be placed in the injector nozzle, thus allowing different welding points on the yarn, keeping the points firm, durable, and with mixed blend variations, with these properties remaining even after fabric and garment manufacturing. 20 25 30
4. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized in that** in the aforementioned step (5), the collector filter is placed, with the function of collecting oligomer molecules, which are generally poorly fixed and poorly washed molecules in the process of dyeing polyester or polyethylene terephthalate or other continuous filaments molecules, described in step (1) and the spun yarn fibers described in step (1). 35 40
5. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized in that** the spun yarns of step (1) are preferably cotton and or organic cotton and or biodegradable viscose and or biodegradable lyocell and or biodegradable linen or any other type of existing and or biodegradable spun yarn and or ecological and or sustainable and the continuous filaments of step (1) are preferably made of recycled and/or semi-recycled polyethylene terephthalate, polyester, biodegradable and compostable lactic polyacid plastic and or biodegradable and compostable polyamide and or biodegradable and compostable lyocell or biodegradable and compostable rayon and any other biodegradable and compostable and sustainable filament. 45 50 55

6. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (6) **characterized for** providing a mixed yarn production process that preferably uses biodegradable filaments and/or sustainable filaments, that can be dyed in their mass, eliminating water bath dyeing, making it less polluting and using much less water in the dyeing process of the fabrics, in addition, the mixed yarn leaves the process ready, without the need for bath dyeing, only finishing. 5
7. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized for** providing a yarn production process that allows the combination of spun yarn of 100% organic cotton with biodegradable, ecological and or sustainable and or technological and or polyester filaments, in the percentage of local federal law and thus defined as an organic product. 10
8. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized for** providing a mixed yarn production process is that the production process for mixed, ecological and or sustainable yarns is a sustainable process, in combining mixed yarns by compressed air, ensuring the adequate removal and disposal of existing oligomer molecules, other molecules and other fibers during the process, thus avoiding soil and environmental contamination and risk to respiratory health. 25 30 35
9. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized for** reaching new pressures of compressed air, being able to use the minimum pressure of compressed air, saving energy exerted on and around the spun yarns, obtaining a wide effect of mixed blends in ecological and or sustainable yarns, with superior physical and chemical characteristics of a new technological and ecological and or biodegradable and or compostable yarn. 40 45 50
10. **PRODUCTION PROCESS OF ECOLOGICAL, SUSTAINABLE MIXED YARNS AND MIXED YARNS OBTAINED**, according to claim (1) **characterized in that** the mixed yarn does not contain synthetic and artificial cut fiber of polyester and polyamide, one of the biggest causes of ocean contamination by plastic microparticles, which currently triggers an unprecedented contamination affecting the entire human food chain. Instead, this sustainable process and product uses biodegradable and or compostable and or ecological and or sustainable 55

and or synthetic filament, replacing the synthetic and artificial cut fiber, an evolution of the intimate mixture of fibers, protecting the oceans and human beings and giving more comfort and technology to people with mixed ecological and or sustainable or biodegradable and or composable and technological yarns.

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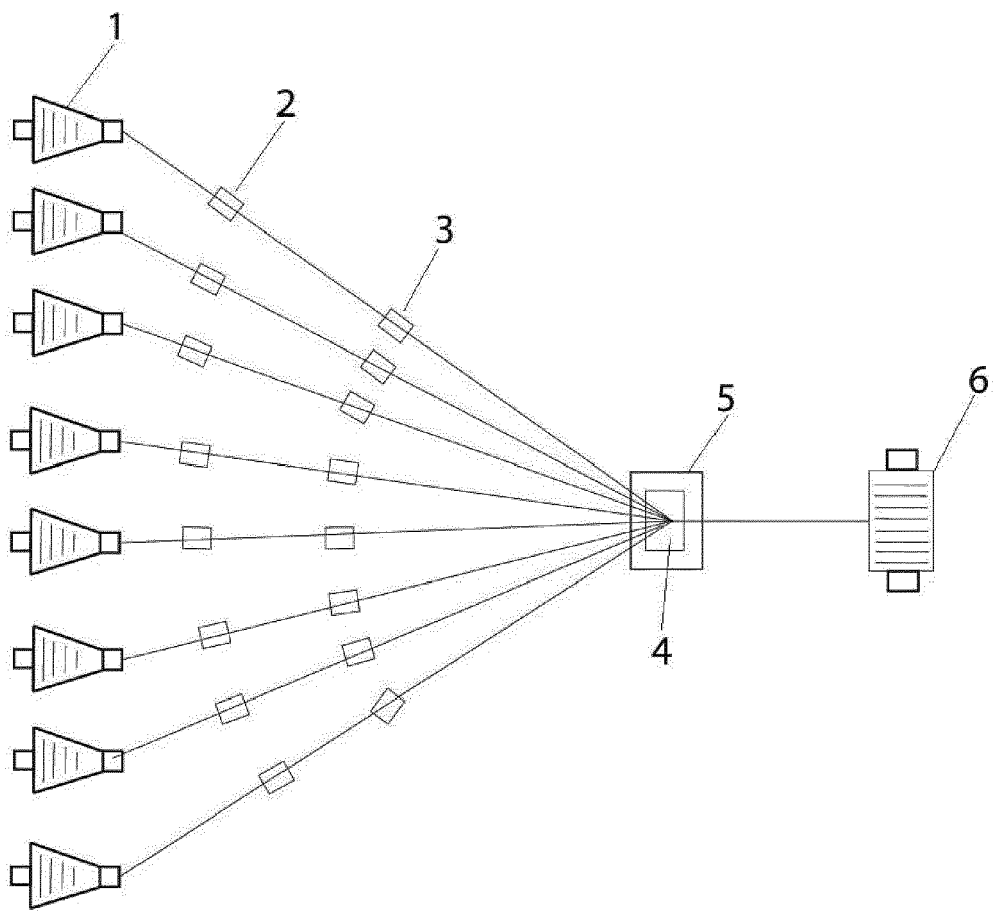
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Figure 1/1





EUROPEAN SEARCH REPORT

Application Number
EP 20 17 7639

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 November 2020	Examiner Pollet, Didier
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
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EP 20 17 7639

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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