

(19)



(11)

EP 3 890 534 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:

18.10.2023 Bulletin 2023/42

(21) Application number: **18829217.1**

(22) Date of filing: **06.12.2018**

(51) International Patent Classification (IPC):

A41D 13/005 ^(2006.01) **A41D 27/28** ^(2006.01)
A43B 1/00 ^(2006.01) **A43B 3/24** ^(2006.01)
A43B 23/02 ^(2006.01) **A41D 13/12** ^(2006.01)
A41D 13/00 ^(2006.01) **A43B 5/06** ^(2022.01)

(52) Cooperative Patent Classification (CPC):

A41D 13/0015; A41D 27/28; A43B 1/0027;
A43B 3/242; A43B 5/06; A43B 23/0205;
A41D 13/005; A41D 13/1281; A41D 2600/10

(86) International application number:

PCT/EP2018/083720

(87) International publication number:

WO 2020/114596 (11.06.2020 Gazette 2020/24)

(54) METHOD FOR MONITORING OR VISUALIZING THE RUNNING SPEED OF AN ATHLETE AND ATHLETIC GARMENT

VERFAHREN ZUR ÜBERWACHUNG ODER VISUALISIERUNG DER LAUFGESCHWINDIGKEIT EINES SPORTLERS UND SPORTBEKLEIDUNG

PROCÉDÉ DE SURVEILLANCE OU DE VISUALISATION DE LA VITESSE DE COURSE D'UN ATHLÈTE ET VÊTEMENT DE SPORT

(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

(43) Date of publication of application:

13.10.2021 Bulletin 2021/41

(73) Proprietor: **PUMA SE**

91074 Herzogenaurach (DE)

(72) Inventors:

- **MILES, Baljinder, Kaur**
91074 Herzogenaurach (DE)

- **CLARKE, Hugh**
91086 Aurachtal (DE)

(74) Representative: **Gosdin, Carstensen & Partner**

Patentanwälte Partnerschaftsgesellschaft mbB
Adam-Stegerwald-Straße 6
97422 Schweinfurt (DE)

(56) References cited:

EP-A1- 3 335 582 WO-A1-2016/086172
WO-A1-2018/141348 WO-A1-2018/196939
US-A1- 2013 263 352

EP 3 890 534 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The invention relates to a method for monitoring or visualizing the running speed of an athlete. Furthermore, the invention relates to an athletic garment or shoe.

[0002] During sporting activities it is often relevant to know the running speed of an athlete. This applies not only for the total time for carrying out a certain distance (e.g. a 100 m run) but also for the actual speed of the runner along his or her parkour.

[0003] WO 2018/196939 A1, which discloses the preamble of claim 6, and discloses sports garment which is provided with a Phase Change Material and a thermochromic dye. It is aimed here to better stabilize the body temperature of an athlete and to visually control the same. Similar and other solutions are known from WO 2016/086172 A1, from US 2013/0263352 A1 and from EP 3 335 582 A1.

[0004] It is an **object** of the present invention to propose a method and a respective garment, shoe or cover for a shoe which allow the determination or at least the estimation of the current running speed of an athlete along his or her course with easy means.

[0005] The **solution** of this object according to the invention is characterized in that the method comprises the steps:

a) Providing a piece of garment or a shoe, which are worn by the athlete during running, wherein the piece of garment or the shoe is provided with a coating applied at an outer surface of the piece of garment or the shoe, wherein the coating comprises at least one thermochromic dye or at least one liquid crystal, or wherein the piece of garment or the shoe is made at least partially of a material, especially by a yarn, which comprises at least one thermochromic dye or at least one liquid crystal;

b) Monitoring the color of the at least one thermochromic dye or liquid crystal during running of the athlete;

c) Evaluating the running speed of the athlete on the basis of the actual color of the at least one thermochromic dye or liquid crystal,

wherein the piece of garment or the shoe also comprises at least one region where elements are provided to influence the aerodynamic drag of the piece of garment or the shoe, such that the aerodynamic effects are reduced and a more relevant part of the airstream effects the cooling of the piece of garment or the shoe and thus effects the appearing color of the thermochromic dye or liquid crystal.

[0006] As the material which changes its color all known kinds of thermochromic dye, leuco dye or liquid crystal can be used. All suitable materials are referred herein as being a thermochromic dye. Specifically and

preferably, the at least one thermochromic dye comprises a liquid crystal.

[0007] The piece of garment can be a jacket or shirt, wherein the at least one thermochromic dye is applied on a chest region of the jacket or shirt. Also, the at least one thermochromic dye can be applied (additionally or alternatively) on a front sleeve region of the jacket or shirt.

[0008] The at least one thermochromic dye can also be applied on a forefoot region of the shoe. A further kind of garment according to the invention can be a cover or overcoat for a shoe (detachable slip as shoe cover) which is worn at some kinds of sports.

[0009] The athletic garment or shoe comprises a section which covers a part of the body of the athlete. According to the invention an outer surface of the section is provided with a coating which comprises at least one thermochromic dye or at least one liquid crystal or that the piece of garment or the shoe is made at least partially of a material, especially by a yarn, which comprises at least one thermochromic dye or at least one liquid crystal, wherein the garment or shoe also comprises regions where elements are provided to influence the aerodynamic drag of the garment or shoe, such that the aerodynamic effects are reduced and a more relevant part of the airstream effects the cooling of the piece of garment or shoe and thus effects the appearing color of the thermochromic dye or liquid crystal.

[0010] By the combination of the elements for influencing the aerodynamic drag and the use of thermochromic ink the desired effect, i. e. to achieve a correlation between the running speed of the athlete and the color of the thermochromic dye during running, is stabilized because the aerodynamic effects are reduced and a more relevant part of the airstream effects the cooling of (e. g) the chest region of the garment and thus effects the appearing color of the thermochromic dye.

[0011] The thermochromic dye comprises again preferably a liquid crystal. According to a preferred embodiment the liquid crystal is contained in a mixture which is applied to the garment, wherein the percentage of the liquid crystal in the mixture is between 30 weight-% and 65 weight-%, preferably between 40 weight-% and 55 weight-%.

[0012] Preferably, the mixture further contains polyether, wherein the percentage of polyether in the mixture is between 20 weight-% and 50 weight-%, preferably between 25 weight-% and 40 weight-%.

[0013] Furthermore, the mixture can further contain glycerol, wherein the percentage of glycerol in the mixture is between 3 weight-% and 9 weight-%, preferably between 5 weight-% and 7 weight-%.

[0014] All components of the mixture have 100 weight-%.

[0015] By this composition the desired effect is optimized.

[0016] Again, the athletic garment can be a jacket or shirt, wherein the section which is provided with the coating is a chest region of the jacket or shirt. Also, the athletic

garment can be a jacket or shirt, wherein the section which is provided with the coating is a front sleeve region of the jacket or shirt. The athletic garment can also be trunks, wherein the section which is provided with the coating is a front leg region of the trunks.

[0017] The elements which influence the aerodynamic drag of the garment are preferably pads, specifically with a round circumference, which are arranged on the outer surface of the piece of garment. A specifically preferred embodiment suggests that a plurality of substantially rod-shaped sticks is arranged on the pads or are forming the pads which sticks extend normal (perpendicular) on the outer surface of the piece of garment.

[0018] To improve the wearing comfort of the garment it can be provided that the garment has at least one further section which is provided with venting elements. Those venting elements are preferably arranged at the spine side of the garment. The venting elements can be designed as a pattern of openings, especially of holes, which are machined into the material of the piece of garment or which are produced at the production (e. g. knitting) process of the garment.

[0019] The coating can be applied to the piece of garment by means of a printing process, by means of a spraying process or by means of a painting process. Also other methods can be used for applying the coating, like for example heat transfer applications, but also conventional methods.

[0020] The piece of garment can have or can be a textile substrate which comprises synthetic fibers, especially of polyester, polyamide or elastane; also natural fibers, especially of cotton, are possible.

[0021] Thermochromic dyes are well known in the art. Generally, thermochromism is the property of substances to change their color due to a change in temperature. A thermochromic dye (also called thermochromic ink) is a temperature sensitive compound which temporarily changes its color with exposure to heat.

[0022] It is available in the form of liquid crystals and leuco dyes. Explicitly reference is made to AU 2014201839 B1 which describes details with respect to the mentioned material.

[0023] Furthermore, thermochromic dyes are disclosed in other publication to which reference is made explicitly: In DE 20 2013 104 519 U1 the use of thermochromic ink is used at garments. Similar solutions are known from EP 1 631 161 B1, US 2004/0237164 A1, GB 2 469 745 A, MX 2009/007299 A and US 5,376,699 A. Specifically liquid crystal in connection with a thermochromic dye is disclosed in EP 2 924 494 A1, EP 2 924 495 A, EP 2 927 736 A1, EP 2 927 737 A1 and EP 2 933 675 A1. The same applies with respect to US 4,642,250.

[0024] In the drawings embodiments of the invention are shown.

Fig. 1 shows an athlete wearing a piece of garment,

Fig. 2 shows the upper part of the body of the athlete

and the piece of garment,

5 Fig. 3 shows the athlete who is running with a certain running speed and who is observed by an observer,

10 Fig. 4 shows a region of the garment where elements are provided to influence the aerodynamic drag of the garment,

15 Fig. 5 shows an alternative embodiment of the elements to influence the aerodynamic drag of the garment and

20 Fig. 6 shows another section of the garment which is provided with venting elements.

[0025] In figure 1 an athlete 1 is depicted who wears a piece of garment 2 and sports shoes 2'. The garment 2 has a chest region 5 which covers the chest of the athlete 1 during intended use of the garment 2. Furthermore, the garment 2 has regions in the lateral area of the same which are provided with elements to influence the aerodynamic drag during running.

25 **[0026]** In figure 2 an upper part of the garment 2 is shown which covers the upper part of the body of the athlete 2. Here, it can be seen that the outer surface 4 of the garment 2 is provided with a coating 3 (having a dot pattern in the case of the shown embodiment). The coating 3 consists of a mixture which is or which contains a thermochromic dye.

30 **[0027]** The coating 3 and the thermochromic dye respectively are sensitive with respect to the temperature. Depending on the temperature the color of the thermochromic dye changes.

35 **[0028]** In the present case the thermochromic dye comprises a liquid crystal, wherein the liquid crystal is contained in the mixture which is applied onto the outer surface 4 of the garment 2. The percentage of the liquid crystal in the mixture is here about 45 weight-% of the mixture.

40 **[0029]** The applied coating 3 is thus an optically active mixture of organic chemicals that is highly temperature sensitive and changes the color accordingly. In the present case it starts with the color black at a low temperature (for example below 10 °C) and takes the colors of a rainbow (from red to blue) with rising temperatures until the color black is given again at high temperatures (for example above 45 °C). The color change is reversible.

45 **[0030]** This effect is used to determine the running speed v of the athlete 1 as depicted in figure 3.

50 **[0031]** Here, the chest region 5 is exposed to the airflow which is produced during running. Thus, the cooling effect especially of the chest region 5 is increasing and thus the temperature of the coating 3 in the chest region 5 is decreasing the faster the athlete 1 runs. Accordingly, depending on the running speed v of the athlete 1 the color of the coating 3 changes from C_1 to C_2 and C_3 .

[0032] An observer 11 can observe the chest region 5 of the runner and can thus determine the (approximate) actual running speed of the athlete 1.

[0033] The mentioned effect is improved and stabilized respectively if elements 7 to influence the aerodynamic drag are used. Those elements 7 can be applied in the (lateral) regions 6 of the garment 2. A first embodiment of the elements 7 are depicted in figure 4. Here a plurality of pads 8 are arranged on the outer surface 4 of the garment 2. The pads 8 have a substantially circular outer circumference. Thereby, the diameter of the pads 8 varies.

[0034] Each pad is established by a plurality of substantially rod-shaped sticks 9 which extend perpendicular outwards from the outer surface 4 of the garment. The diameter of the substantially rod-shaped sticks 9 are preferably between 0.25 to 1.0 mm. The length (measures in the direction perpendicular to the outer surface 4) is preferably between 1.0 mm and 4.0 mm. The specifically preferred height is 2.0 mm.

[0035] An alternative embodiment of the elements 7 is shown in figure 5. Here the pads 8 have also a circular circumference. In this embodiment the pad 8 is a cylindrical element with a height between 1.0 mm and 4.0 mm. The upper plateau of each pad 8 is flat (in distinction to the pads according to figure 4).

[0036] The pads 8 consist preferably of silicon or rubber.

[0037] The wearing comfort of the garment 2 is improved by supplying the same with venting elements 10 as shown in figure 6. Those venting element 10 are arranged in the spine region of the garment and the athlete respectively. As can be seen the venting element 10 is established by a plurality of openings which are machined into the base substrate of the garment 2.

[0038] Holes of different diameter, which can be arranged in groups as depicted in figure 6, have been proven to supply a good venting effect to the spine region of the athlete. The openings can be produced by a knitting process (warp knit holes), i. e. during the production process of the base material of the piece of garment 2.

[0039] The garment 2 is preferably designed as a seamless textile part.

[0040] If instead a seam is used the same is arranged preferably in the rear side of the garment so that it has no influence on the above described effect. In the case that the garment is not seamless it is preferred that the seams are produced by ultrasonic bonding.

[0041] The proposed garment and respective method allows a visual observation of the actual running speed of the athlete 1 by an eye-catching color change effect. It is the result of the convection cooling effect during the sprint of the athlete 1.

[0042] For example, according to the mixture which is applied as coating 3 the following effect can be obtained: During a 100 m running competition (by a warmed-up athlete) the appearance of the chest region of the garment is blue (color C₁) at a running speed of 30 km/h

(8.33 m/s), becomes green (color C₂) at a running speed of 34 km/h (9.44 m/s) and becomes finally yellow (color C₃) at a speed of 38 km/h (10.56 m/s). So, an observer 11 can see which performance is currently achieved by the athlete already during the competition.

[0043] The application of the coating 3 is preferably done by a printing process which allows an economical production.

[0044] As an alternative to the coating of the thermochromic dye it is for example also possible to use a fiber or yarn for the garment or shoe which already contains the dye. A fiber or yarn can for example be covered or coated with the thermochromic dye. For doing so an extrusion process can be employed. Then, the piece of garment is produced (for example knitted or weaved) by using the respective prepared yarn or fiber.

Reference Numerals:

[0045]

1	Athlete
2	Piece of garment / Athletic garment
2'	Shoe
3	Coating
4	Outer surface of the piece of garment
5	Chest region
6	Region with elements to influence the drag
7	Element to influence the aerodynamic drag
8	Pad
9	Rod-shaped stick
10	Venting element
11	Observer
v	Running speed
C ₁	Color 1
C ₂	Color 2
C ₃	Color 3

Claims

1. Method for monitoring or visualizing the speed (v), especially the running speed, of an athlete (1), comprising the steps:

a) Providing a piece of garment (2) or a shoe (2'), which are worn by the athlete (1) during a sporting activity, especially during running,

wherein the piece of garment (2) or the shoe (2') is provided with a coating (3) applied at an outer surface (4) of the piece of garment (2) or the shoe, wherein the coating (3) comprises at least one thermochromic dye or at least one liquid crystal, or wherein the piece of garment (2) or the shoe

(2') is made at least partially of a material, especially by a yarn, which comprises at least one thermochromic dye or at least one liquid crystal;

b) Monitoring the color (C_1, C_2, C_3) of the at least one thermochromic dye or liquid crystal during the sporting activity of the athlete (1), especially during running;

c) Evaluating the speed (v), especially the running speed, of the athlete (1) on the basis of the actual color (C_1, C_2, C_3) of the at least one thermochromic dye or liquid crystal,

wherein the piece of garment (2) or the shoe (2') also comprises at least one region (6) where elements (7) are provided to influence the aerodynamic drag of the piece of garment (2) or the shoe (2'), such that the aerodynamic effects are reduced and a more relevant part of the airstream effects the cooling of the piece of garment (2) or the shoe (2') and thus effects the appearing color of the thermochromic dye or liquid crystal.

2. Method according to claim 1, **characterized in that** the at least one thermochromic dye comprises a liquid crystal.
3. Method according to claim 1 or 2, **characterized in that** the piece of garment (2) is a jacket or shirt and that the at least one thermochromic dye is applied on a chest region (5) of the jacket or shirt.
4. Method according to one of claims 1 to 3, **characterized in that** the piece of garment (2) is a jacket or shirt and that the at least one thermochromic dye is applied on a front sleeve region of the jacket or shirt.
5. Method according to one of claims 1 or 2, **characterized in that** the at least one thermochromic dye is applied on a forefoot region of the shoe (2').
6. Athletic garment (2) or shoe (2') comprising a section which covers a part of the body of the athlete (1),

wherein an outer surface (4) of the section is provided with a coating (3) which comprises at least one thermochromic dye or at least one liquid crystal or that the piece of garment (2) or shoe (2') is made at least partially of a material, especially by a yarn, which comprises at least one thermochromic dye or at least one liquid crystal, **characterized in that** the garment (2) or shoe (2') also comprises at least one region (6) where elements (7) are provided to influence the aerodynamic drag of the garment (2) or shoe (2'), such that the aerody-

amic effects are reduced and a more relevant part of the airstream effects the cooling of the piece of garment (2) or shoe (2') and thus effects the appearing color of the thermochromic dye or liquid crystal.

5

10

15

20

25

30

35

40

45

50

55

7. Athletic garment or shoe according to claim 6, **characterized in that** the thermochromic dye comprises a liquid crystal.
8. Athletic garment or shoe according to claim 7, **characterized in that** the liquid crystal is contained in a mixture which is applied to the garment (2) or shoe (2'), wherein the percentage of the liquid crystal in the mixture is between 30 weight-% and 65 weight-%, preferably between 40 weight-% and 55 weight-%.
9. Athletic garment or shoe according to claim 7 or 8, **characterized in that** the mixture further contains polyether, wherein the percentage of polyether in the mixture is between 20 weight-% and 50 weight-%, preferably between 25 weight-% and 40 weight-%.
10. Athletic garment or shoe according to one of claims 7 to 9, **characterized in that** the mixture further contains glycerol, wherein the percentage of glycerol in the mixture is between 3 weight-% and 9 weight-%, preferably between 5 weight-% and 7 weight-%.
11. Athletic garment according to one of claims 6 to 10, **characterized in that** the athletic garment (2) is a jacket or shirt and that the section which is provided with the coating (3) is a chest region (5) of the jacket or shirt.
12. Athletic garment according to one of claims 6 to 11, **characterized in that** the athletic garment (2) is a jacket or shirt and that the section which is provided with the coating (3) is a front sleeve region of the jacket or shirt.
13. Athletic garment according to one of claims 6 to 10, **characterized in that** the athletic garment (2) are trunks and that the section which is provided with the coating (3) is a front leg region of the trunks.
14. Athletic garment or shoe according to one of claims 6 to 13, **characterized in that** the elements (7) which influence the aerodynamic drag of the garment (2) are pads (8), preferably with a round circumference, which are arranged on the outer surface (4) of the piece of garment (2).
15. Athletic garment or shoe according to claim 14, **characterized in that** a plurality of substantially rod-shaped sticks (9) are arranged on the pads (8) or forming the pads (8) which rod-shaped sticks (9) ex-

tend normal on the outer surface (4) of the piece of garment (2).

16. Athletic garment or shoe according to one of claims 6 to 15, **characterized in that** it has at least one further section which is provided with venting elements (10).

17. Athletic garment or shoe according to claim 16, **characterized in that** the venting elements (10) are designed as a pattern of openings, especially of holes, which are machined into the material of the piece of garment (2) or which are manufactured during the production of the piece of garment (2) or shoe (2').

18. Athletic garment or shoe according to one of claims 6 to 17, **characterized in that** the coating (3) is applied to the piece of garment (2) or shoe (2') by means of a printing process, by means of a spraying process or by means of a painting process.

19. Athletic garment or shoe according to one of claims 6 to 18, **characterized in that** the piece of garment (2) or shoe (2') has or is a textile substrate which comprises synthetic fibers, especially of polyester, polyamide or elastane, and/or which comprises natural fibers, especially of cotton.

Patentansprüche

1. Verfahren zur Überwachung oder Visualisierung der Geschwindigkeit (v), insbesondere der Laufgeschwindigkeit, eines Sportlers (1), umfassend die Schritte:

a) Bereitstellen eines Kleidungsstücks (2) oder eines Schuhs (2'), die von dem Sportler (1) während einer sportlichen Aktivität, insbesondere beim Laufen, getragen werden,

wobei das Kleidungsstück (2) oder der Schuh (2') mit einer auf einer Außenfläche (4) des Kleidungsstücks (2) oder des Schuhs aufgetragenen Beschichtung (3) versehen ist, wobei die Beschichtung (3) mindestens einen thermochromen Farbstoff oder mindestens einen Flüssigkristall umfasst, oder

wobei das Kleidungsstück (2) oder der Schuh (2') zumindest teilweise aus einem Material, insbesondere aus einem Garn, hergestellt ist, das mindestens einen thermochromen Farbstoff oder mindestens einen Flüssigkristall aufweist;

b) Überwachen der Farbe (C₁, C₂, C₃) des mindestens einen thermochromen Farbstoffs oder

Flüssigkristalls während der sportlichen Aktivität des Sportlers (1), insbesondere beim Laufen; c) Beurteilung der Geschwindigkeit (v), insbesondere der Laufgeschwindigkeit, des Sportlers (1) anhand der aktuellen Farbe (C₁, C₂, C₃) des mindestens einen thermochromen Farbstoffs oder Flüssigkristalls,

wobei das Kleidungsstück (2) oder der Schuh (2') auch mindestens einen Bereich (6) umfasst, in dem Elemente (7) vorgesehen sind, um den Luftwiderstand des Kleidungsstücks (2) oder des Schuhs (2') zu beeinflussen, so dass die aerodynamischen Effekte reduziert werden und ein relevanterer Teil des Luftstroms die Kühlung des Kleidungsstücks (2) oder des Schuhs (2') und somit die erscheinende Farbe des thermochromen Farbstoffs oder Flüssigkristalls beeinflusst.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der mindestens eine thermochrome Farbstoff einen Flüssigkristall umfasst.

3. Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das Kleidungsstück (2) eine Jacke oder ein Hemd ist und dass der mindestens eine thermochrome Farbstoff auf einen Brustbereich (5) der Jacke oder des Hemdes aufgebracht wird.

4. Verfahren nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** das Kleidungsstück (2) eine Jacke oder ein Hemd ist und dass der mindestens eine thermochrome Farbstoff auf einen vorderen Ärmelbereich der Jacke oder des Hemdes aufgebracht wird.

5. Verfahren nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** der mindestens eine thermochrome Farbstoff auf einen Vorfußbereich des Schuhs (2') aufgebracht wird.

6. Sportbekleidungsstück (2) oder Schuh (2') mit einem Abschnitt, der einen Teil des Körpers des Sportlers (1) bedeckt,

wobei eine äußere Oberfläche (4) des Abschnitts mit einer Beschichtung (3) versehen ist, die mindestens einen thermochromen Farbstoff oder mindestens einen Flüssigkristall umfasst, oder dass das Kleidungsstück (2) oder der Schuh (2') zumindest teilweise aus einem Material, insbesondere aus einem Garn, hergestellt ist, das mindestens einen thermochromen Farbstoff oder mindestens einen Flüssigkristall umfasst,

dadurch gekennzeichnet, dass das Kleidungsstück (2) oder der Schuh (2') auch mindestens einen Bereich (6) umfasst, in dem

- Elemente (7) vorgesehen sind, um den Luftwiderstand des Kleidungsstücks (2) oder des Schuhs (2') zu beeinflussen, so dass die aerodynamischen Effekte reduziert werden und ein relevanter Teil des Luftstroms die Kühlung des Kleidungsstücks (2) oder des Schuhs (2') und somit die erscheinende Farbe des thermochromen Farbstoffs oder Flüssigkristalls beeinflusst.
7. Sportbekleidungsstück oder Schuh nach Anspruch 6, **dadurch gekennzeichnet, dass** der thermochrome Farbstoff einen Flüssigkristall umfasst.
8. Sportbekleidungsstück oder Schuh nach Anspruch 7, **dadurch gekennzeichnet, dass** der Flüssigkristall in einer Mischung enthalten ist, die auf das Kleidungsstück (2) oder den Schuh (2') aufgebracht wird, wobei der Prozentsatz des Flüssigkristalls in der Mischung zwischen 30 Gew.-% und 65 Gew.-%, vorzugsweise zwischen 40 Gew.-% und 55 Gew.-% liegt.
9. Sportbekleidungsstück oder Schuh nach Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** die Mischung weiterhin Polyether enthält, wobei der Prozentsatz an Polyether in der Mischung zwischen 20 Gew.-% und 50 Gew.-%, vorzugsweise zwischen 25 Gew.-% und 40 Gew.-% liegt.
10. Sportbekleidungsstück oder Schuh nach einem der Ansprüche 7 bis 9, **dadurch gekennzeichnet, dass** die Mischung weiterhin Glycerol enthält, wobei der Prozentsatz an Glycerin in der Mischung zwischen 3 Gew.-% und 9 Gew.-%, vorzugsweise zwischen 5 Gew.-% und 7 Gew.-% liegt.
11. Sportbekleidungsstück nach einem der Ansprüche 6 bis 10, **dadurch gekennzeichnet, dass** das Sportbekleidungsstück (2) eine Jacke oder ein Hemd ist und dass der mit der Beschichtung (3) versehene Abschnitt ein Brustbereich (5) der Jacke oder des Hemdes ist.
12. Sportbekleidungsstück nach einem der Ansprüche 6 bis 11, **dadurch gekennzeichnet, dass** das Sportbekleidungsstück (2) eine Jacke oder ein Hemd ist und dass der mit der Beschichtung (3) versehene Abschnitt ein vorderer Ärmelbereich der Jacke oder des Hemdes ist.
13. Sportbekleidungsstück nach einem der Ansprüche 6 bis 10, **dadurch gekennzeichnet, dass** die Sportbekleidung (2) eine Sporthose ist und dass der mit der Beschichtung (3) versehene Abschnitt ein vorderer Beinbereich der Sporthose ist.
14. Sportbekleidungsstück oder Schuh nach einem der Ansprüche 6 bis 13, **dadurch gekennzeichnet, dass** die den Luftwiderstand des Bekleidungsstücks (2) beeinflussenden Elemente (7) Pads (8), vorzugsweise mit rundem Umfang, sind, die auf der Außenfläche (4) des Bekleidungsstücks (2) angeordnet sind.
15. Sportbekleidungsstück oder Schuh nach Anspruch 14, **dadurch gekennzeichnet, dass** auf den Pads (8) oder die Pads (8) bildend eine Vielzahl von im Wesentlichen stabförmigen Stäben (9) angeordnet sind, die sich senkrecht auf der Außenfläche (4) des Bekleidungsstücks (2) erstrecken.
16. Sportbekleidungsstück oder Schuh nach einem der Ansprüche 6 bis 15, **dadurch gekennzeichnet, dass** es oder er mindestens einen weiteren Abschnitt aufweist, der mit Belüftungselementen (10) versehen ist.
17. Sportbekleidungsstück oder Schuh nach Anspruch 16, **dadurch gekennzeichnet, dass** die Belüftungselemente (10) als ein Muster von Öffnungen, insbesondere von Löchern, ausgebildet sind, die in das Material des Bekleidungsstücks (2) eingearbeitet sind oder die bei der Herstellung des Bekleidungsstücks (2) oder Schuhs (2') hergestellt werden.
18. Sportbekleidungsstück oder Schuh nach einem der Ansprüche 6 bis 17, **dadurch gekennzeichnet, dass** die Beschichtung (3) mittels eines Druckverfahrens, mittels eines Sprühverfahrens oder mittels eines Lackierverfahrens auf das Bekleidungsstück (2) oder den Schuh (2') aufgebracht ist.
19. Sportbekleidungsstück oder Schuh nach einem der Ansprüche 6 bis 18, **dadurch gekennzeichnet, dass** das Bekleidungsstück (2) oder der Schuh (2') ein textiles Substrat aufweist oder ist, das synthetische Fasern, insbesondere aus Polyester, Polyamid oder Elastan, und/oder das natürliche Fasern, insbesondere aus Baumwolle, aufweist.
- Revendications**
1. Procédé destiné à surveiller ou visualiser la vitesse (v), en particulier la vitesse de course, d'un sportif (1), comprenant les étapes suivantes :
- a) obtention d'un vêtement (2) ou d'une chaussure (2'), qui sont portés par le sportif (1) pendant une activité sportive, en particulier pendant la course à pied,
- le vêtement (2) ou la chaussure (2') étant doté d'un revêtement (3) appliqué à une surface extérieure (4) du vêtement (2) ou de la

chaussure, le revêtement (3) comprenant au moins un colorant thermochromique ou au moins un cristal liquide, ou le vêtement (2) ou la chaussure (2') étant constitué au moins partiellement d'un ma-

5

b) surveillance de la couleur (C_1 , C_2 , C_3) de l'au moins un colorant thermochromique ou cristal liquide pendant l'activité sportive du sportif (1), en particulier pendant la course à pied ;

10

c) évaluation de la vitesse (v), en particulier de la vitesse de course, du sportif (1) sur la base de la couleur réelle (C_1 , C_2 , C_3) de l'au moins un colorant thermochromique ou cristal liquide,

15

dans lequel le vêtement (2) ou la chaussure (2') comprend également au moins une région (6) où des éléments (7) sont disposés pour influencer la traînée aérodynamique du vêtement (2) ou de la chaussure (2'), de telle sorte que les effets aérodynamiques sont réduits et une partie plus significative du courant d'air assure le refroidissement du vêtement (2) ou de la chaussure (2') et provoque ainsi l'apparition de la couleur du colorant thermochromique ou cristal liquide.

20

25

2. Procédé selon la revendication 1, **caractérisé en ce que** l'au moins un colorant thermochromique comprend un cristal liquide.

30

3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** le vêtement (2) est une veste ou un maillot et **en ce que** l'au moins un colorant thermochromique est appliqué sur une région de la poitrine (5) de la veste ou du maillot.

35

4. Procédé selon une des revendications 1 à 3, **caractérisé en ce que** le vêtement (2) est une veste ou un maillot et **en ce que** l'au moins un colorant thermochromique est appliqué sur une région avant de la manche de la veste ou du maillot.

40

5. Procédé selon une des revendications 1 et 2, **caractérisé en ce que** l'au moins un colorant thermochromique est appliqué sur une région de l'avant-pied de la chaussure (2').

45

6. Vêtement (2) ou chaussure (2') de sport comprenant une section qui couvre une partie du corps du sportif (1),

50

dans lequel une surface extérieure (4) de la section est dotée d'un revêtement (3) qui comprend au moins un colorant thermochromique ou au moins un cristal liquide ou en ce que le vêtement

55

(2) ou la chaussure (2') est constitué au moins partiellement d'un matériau, en particulier d'un fil, qui comprend au moins un colorant thermochromique ou au moins un cristal liquide, **caractérisé en ce que**

le vêtement (2) ou la chaussure (2') comprend également au moins une région (6) où des éléments (7) sont disposés pour influencer la traînée aérodynamique du vêtement (2) ou de la chaussure (2'), de telle sorte que les effets aérodynamiques sont réduits et une partie plus significative du courant d'air assure le refroidissement du vêtement (2) ou de la chaussure (2') et provoque ainsi l'apparition de la couleur du colorant thermochromique ou cristal liquide.

7. Vêtement ou chaussure de sport selon la revendication 6, **caractérisé en ce que** le colorant thermochromique comprend un cristal liquide.

8. Vêtement ou chaussure de sport selon la revendication 7, **caractérisé en ce que** le cristal liquide est contenu dans un mélange qui est appliqué au vêtement (2) ou à la chaussure (2'), dans lequel le pourcentage du cristal liquide dans le mélange se situe entre 30 % en poids et 65 % en poids, de préférence entre 40 % en poids et 55 % en poids.

9. Vêtement ou chaussure de sport selon la revendication 7 ou 8, **caractérisé en ce que** le mélange contient en outre du polyéther, dans lequel le pourcentage de polyéther dans le mélange se situe entre 20 % en poids et 50 % en poids, de préférence entre 25 % en poids et 40 % en poids.

10. Vêtement ou chaussure de sport selon une des revendications 7 à 9, **caractérisé en ce que** le mélange contient en outre du glycérol, dans lequel le pourcentage de glycérol dans le mélange se situe entre 3 % en poids et 9 % en poids, de préférence entre 5 % en poids et 7 % en poids.

11. Vêtement de sport selon une des revendications 6 à 10, **caractérisé en ce que** le vêtement de sport (2) est une veste ou un maillot et **en ce que** la section qui est dotée du revêtement (3) est une région de la poitrine (5) de la veste ou du maillot.

12. Vêtement de sport selon une des revendications 6 à 11, **caractérisé en ce que** le vêtement de sport (2) est une veste ou un maillot et **en ce que** la section qui est dotée du revêtement (3) est une région avant de la manche de la veste ou du maillot.

13. Vêtement de sport selon une des revendications 6 à 10, **caractérisé en ce que** le vêtement de sport (2) est un maillot de bain et **en ce que** la section qui est dotée du revêtement (3) est une région avant de

la jambe du maillot de bain.

14. Vêtement ou chaussure de sport selon une des revendications 6 à 13, **caractérisé en ce que** les éléments (7) qui influencent la traînée aérodynamique du vêtement (2) sont des pastilles (8), de préférence avec une circonférence ronde, qui sont disposées sur la surface extérieure (4) du vêtement (2). 5
15. Vêtement ou chaussure de sport selon la revendication 14, **caractérisé en ce qu'**une pluralité de bâtons sensiblement en forme de tige (9) sont disposés sur les pastilles (8) ou forment les pastilles (8), lesquels bâtons en forme de tige (9) s'étendent perpendiculairement sur la surface extérieure (4) du vêtement (2). 10
15
16. Vêtement ou chaussure de sport selon une des revendications 6 à 15, **caractérisé en ce qu'**il comporte au moins une autre section qui est dotée d'éléments d'aération (10). 20
17. Vêtement ou chaussure de sport selon la revendication 16, **caractérisé en ce que** les éléments d'aération (10) sont conçus comme un motif d'ouvertures, en particulier de trous, qui sont ménagés dans le matériau du vêtement (2) ou qui sont fabriqués pendant la production du vêtement (2) ou de la chaussure (2'). 25
30
18. Vêtement ou chaussure de sport selon une des revendications 6 à 17, **caractérisé en ce que** le revêtement (3) est appliqué au vêtement (2) ou à la chaussure (2') au moyen d'un procédé d'impression, au moyen d'un procédé de projection ou au moyen d'un procédé de peinture. 35
19. Vêtement ou chaussure de sport selon une des revendications 6 à 18, **caractérisé en ce que** le vêtement (2) ou la chaussure (2') comporte ou est un substrat textile qui comprend des fibres synthétiques, en particulier de polyester, polyamide ou élasthanne, et/ou qui comprend des fibres naturelles, en particulier de coton. 40
45

50

55

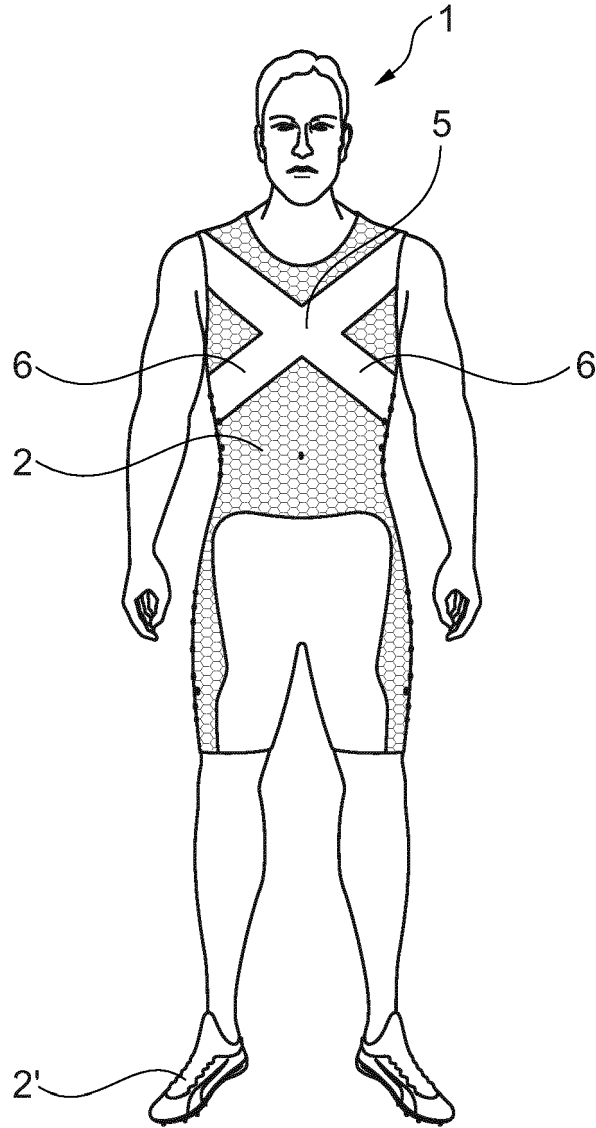


Fig. 1

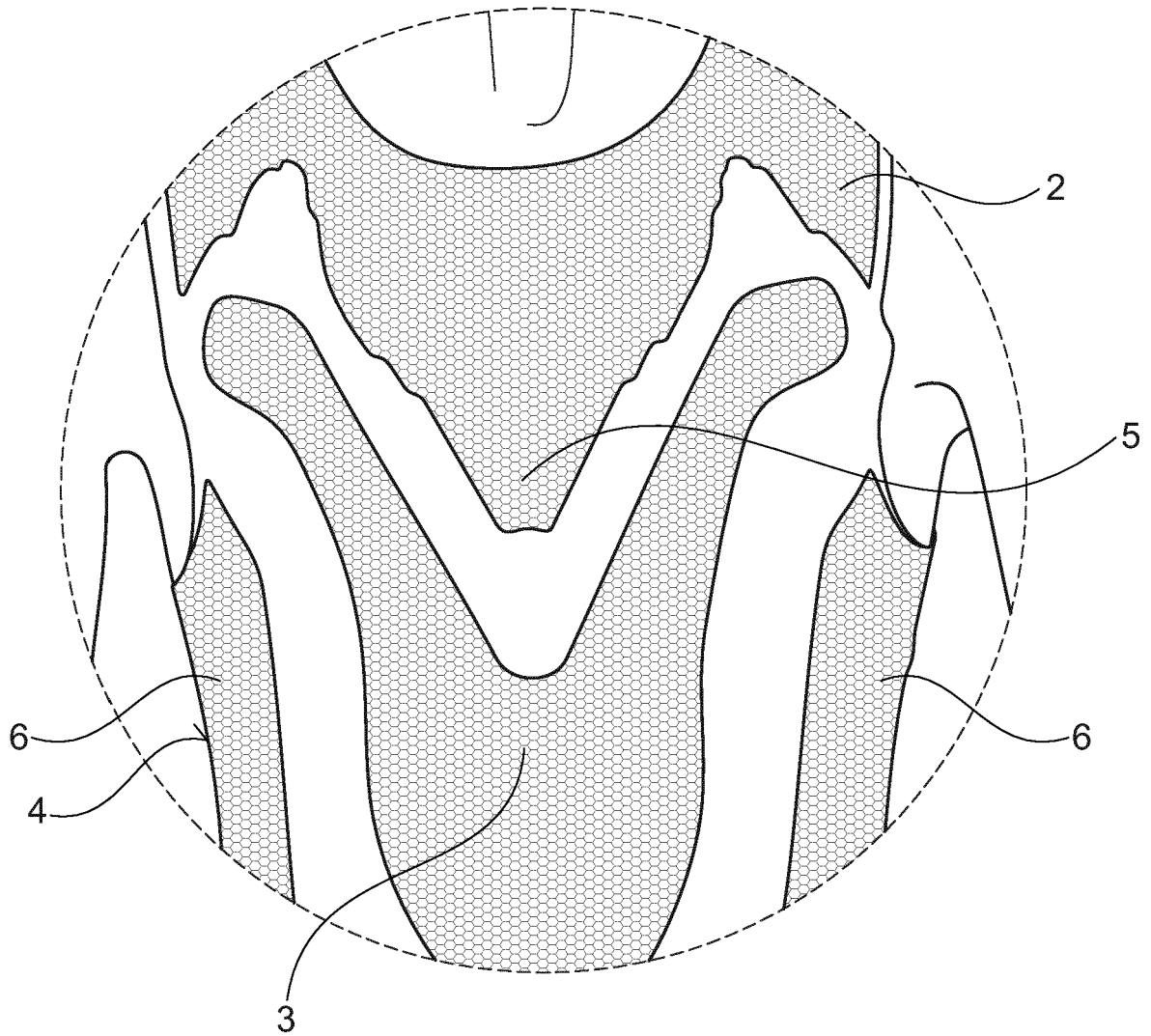


Fig. 2

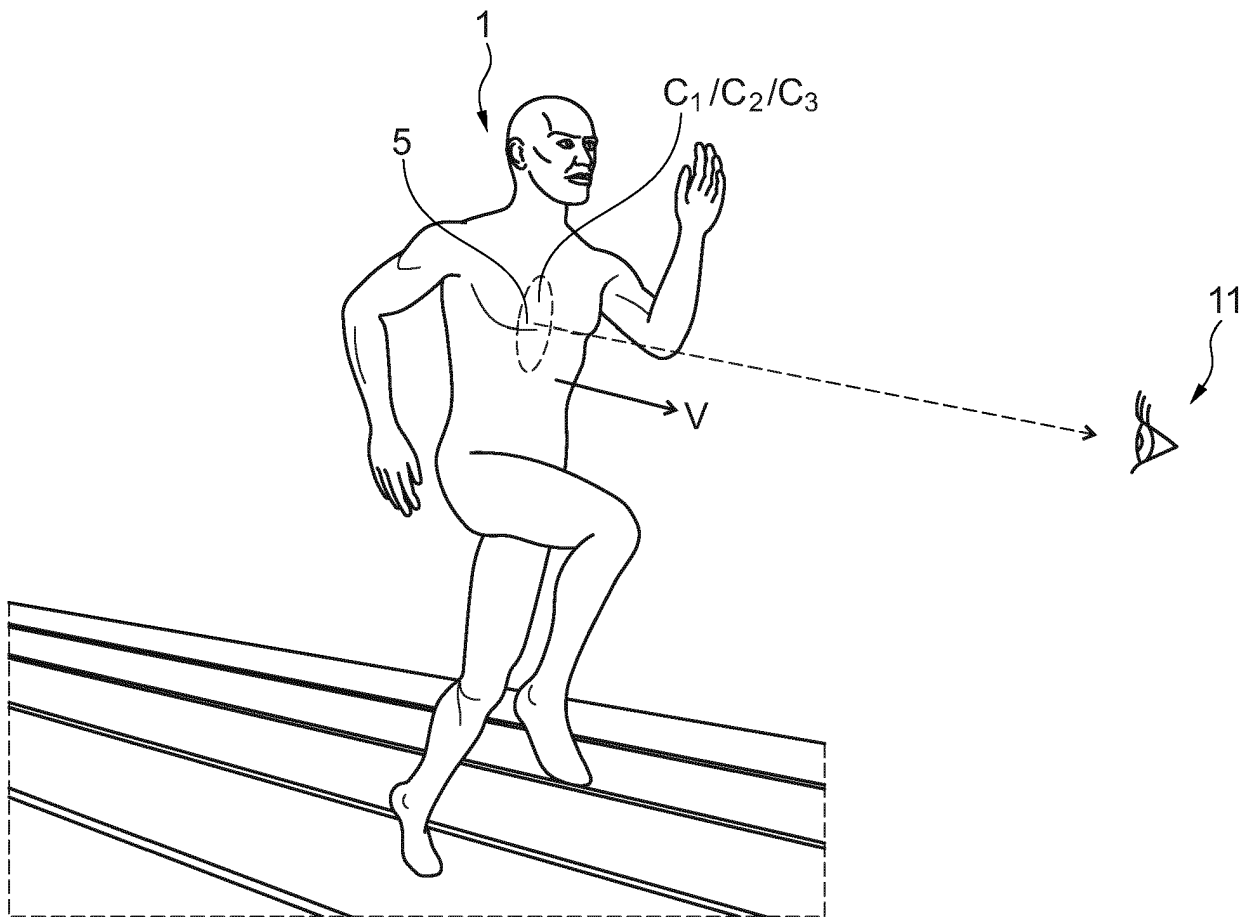


Fig. 3

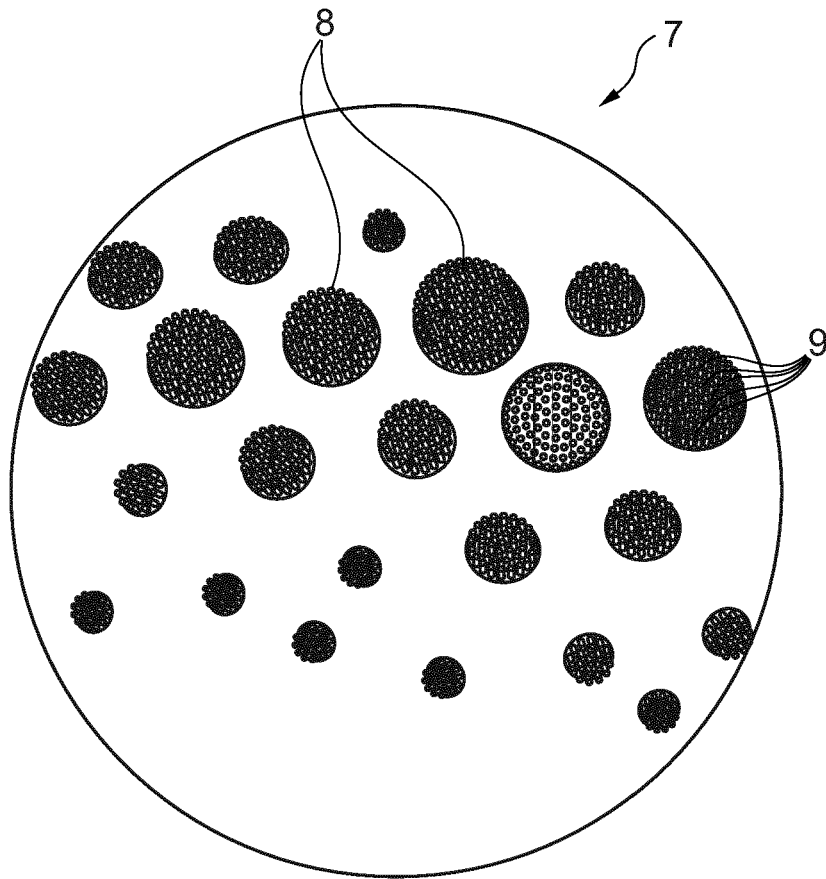


Fig. 4

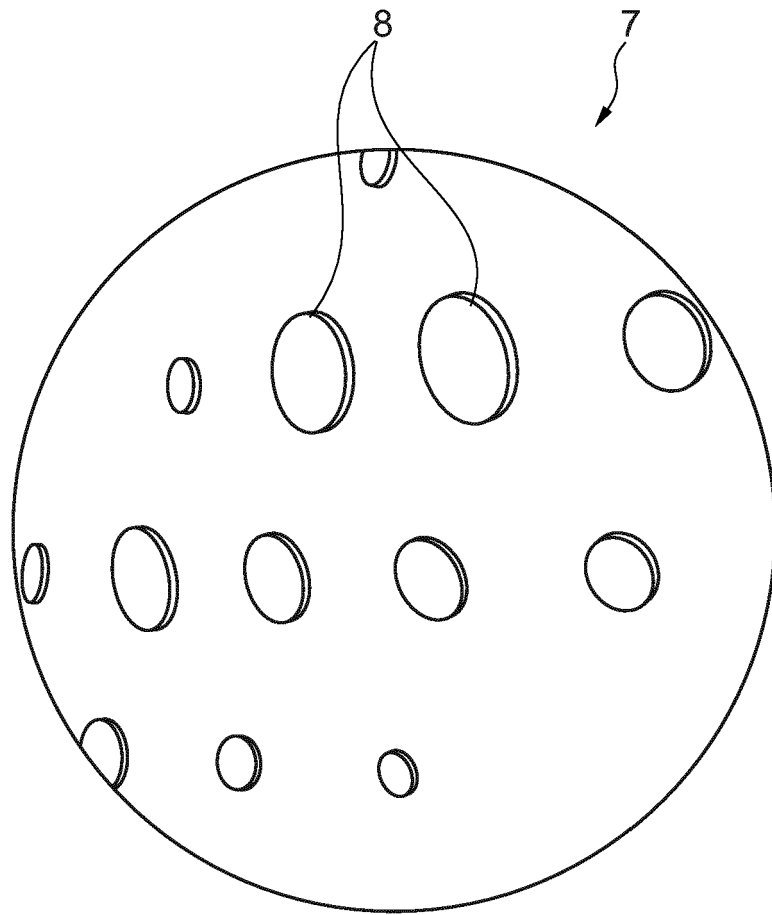


Fig. 5

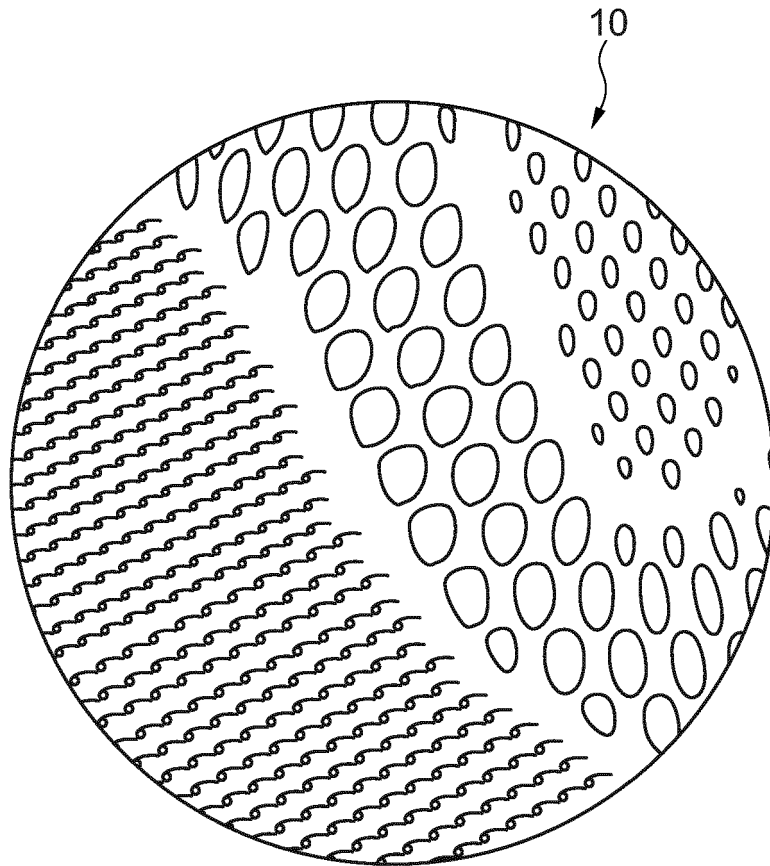


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2018196939 A1 [0003]
- WO 2016086172 A1 [0003]
- US 20130263352 A1 [0003]
- EP 3335582 A1 [0003]
- AU 2014201839 B1 [0022]
- DE 202013104519 U1 [0023]
- EP 1631161 B1 [0023]
- US 20040237164 A1 [0023]
- GB 2469745 A [0023]
- MX 2009007299 A [0023]
- US 5376699 A [0023]
- EP 2924494 A1 [0023]
- EP 2924495 A [0023]
- EP 2927736 A1 [0023]
- EP 2927737 A1 [0023]
- EP 2933675 A1 [0023]
- US 4642250 A [0023]