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(71) Applicant: **Toray Industries, Inc.**  
**Tokyo, 103-8666 (JP)**

(72) Inventors:  
• **KANO, Hidekazu**  
**Otsu-shi, Shiga 520-8558 (JP)**  
• **TSUCHIYA, Shohei**  
**Mishima-shi, Shizuoka 411-8652 (JP)**  
• **TAKECHI, Shingo**  
**Otsu-shi, Shiga 520-8558 (JP)**

(74) Representative: **Mewburn Ellis LLP**  
**Aurora Building**  
**Counterslip**  
**Bristol BS1 6BX (GB)**

(54) **GARMENT**

(57) In order to provide a garment capable of suppressing a stuffy feeling and a heatful feeling in the garment regardless of the presence or absence of air blowing from a blower fan, maintaining a comfortable environment in the garment, and having excellent wearing comfort, the garment includes a fabric mainly formed of hygroscopic fibers as constituent fibers, the fabric having air permeability of 45 cm<sup>3</sup>/cm<sup>2</sup>/s or less; and at least one air inlet for taking outside air into the garment.

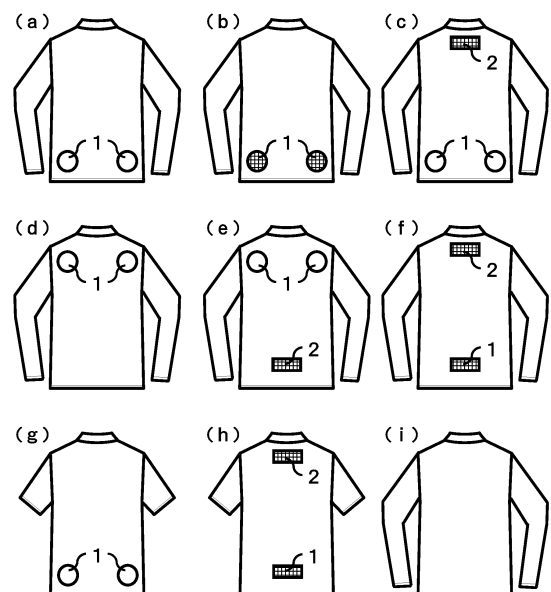


Fig. 1

**Description**

## TECHNICAL FIELD

5 **[0001]** The present invention relates to a garment that can be suitably used in a high temperature and/or high humidity environment and various wearing scenes requiring comfort such as outdoors and indoors.

## BACKGROUND ART

10 **[0002]** With the progress of global warming, the temperature rises year by year, and high temperature and/or high humidity environments are increasing both outdoors and indoors. Various proposals have been made so far for comfortable materials and garments for summer.

**[0003]** For example, Patent Document 1 proposes a woven and knitted fabric formed of a composite yarn including two types of yarns having difference in yarn length change at the time of drying and at the time of water absorption/moisture absorption, and the fabric having air permeability changing according to the humidity in the garment. According to this proposal, when the inside of the garment has high humidity, the fiber absorbs moisture and extends, so that the air permeability is improved; whereas when the inside of the garment has low humidity, the fiber releases moisture and contracts, so that the air permeability is reduced, and thereby the environment inside the garment can be kept comfortable.

15 **[0004]** In addition, Patent Document 2 proposes a garment (so-called air-conditioning garment) in which a blower fan is attached to the garment made of fabric having low air permeability. In this proposal, the outside air is taken into the garment by the blower fans attached to both sides of the waist of the back of the human body, and thereby cool feeling can be obtained.

## PRIOR ART DOCUMENTS

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## PATENT DOCUMENTS

**[0005]**

30 Patent Document 1: Pamphlet of International Publication No. WO 2007/004589  
Patent Document 2: Pamphlet of International Publication No. WO 2017/006481

## SUMMARY OF THE INVENTION

## 35 PROBLEMS TO BE SOLVED BY THE INVENTION

**[0006]** In the method disclosed in Patent Document 1, specifically, since a cellulose fiber having hygroscopicity is used, there is a considerable effect on suppression of stuffy feeling in the garment, and in addition, when the inside of the garment has high humidity, the air permeability is improved, and therefore there is a slight effect on suppression of heatful feeling in the garment. However, none of the effects is large, and a drastic improvement effect of comfort has not been obtained.

**[0007]** In addition, the garment disclosed in Patent Document 2 is effective for heat stroke prevention in outdoor construction sites in summer and in wearing scenes such as indoors where air conditioning is not effective. However, since the garment is the one using a fabric having low air permeability made of fibers having no hygroscopicity, it is possible to suppress the stuffy feeling and the heatful feeling in the garment while the outside air is taken in the garment by the blower fan. However, in a case where the blower fan is not used or in a case where the blower fan is stopped due to battery exhaustion or the like, the stuffy feeling and the heatful feeling in the garment are increased, and there is a problem in that wearing comfort is impaired.

45 **[0008]** An object of the present invention is to solve the above-described problems in the related art, and to provide a garment capable of suppressing a stuffy feeling and a heatful feeling in the garment regardless of the presence or absence of air blowing from a blower fan, maintaining a comfortable environment in the garment, and having excellent wearing comfort.

## SOLUTIONS TO THE PROBLEMS

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**[0009]** The above problem can be solved by the present invention, that is, a garment including a fabric mainly formed of hygroscopic fibers as constituent fibers, the fabric having air permeability of 45 cm<sup>3</sup>/cm<sup>2</sup>/s or less, and at least one air inlet for taking outside air into the garment.

**[0010]** In addition, it is preferable that a moisture absorption rate difference ( $\Delta MR$ ) of the hygroscopic fibers is 2.0 to 10.0%, and the hygroscopic fiber is a polyester-based hygroscopic fiber and/or a polyamide-based fiber.

**[0011]** Furthermore, it is preferable that a diameter of a circumscribed circle of the air inlet is 80 mm or less, and that a blower fan unit for taking the outside air into the garment is provided.

## EFFECTS OF THE INVENTION

**[0012]** According to the present invention, it is possible to provide a garment capable of suppressing a stuffy feeling and a heatful feeling in the garment regardless of the presence or absence of air blowing from a blower fan, maintaining a comfortable environment in the garment, and having excellent wearing comfort, and thus the garment can be suitably used in a high temperature and/or high humidity environment, and various wearing scenes requiring comfort such as outdoors and indoors.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** Fig. 1 is a schematic explanatory view of a garment back portion illustrating an embodiment of the present invention.

## EMBODIMENTS OF THE INVENTION

**[0014]** The garment of the present invention is a garment including a fabric mainly formed of hygroscopic fibers as constituent fibers, the fabric having air permeability of  $45 \text{ cm}^3/\text{cm}^2/\text{s}$  or less, and at least one air inlet for taking outside air into the garment.

**[0015]** Hereinafter, the present invention will be described in detail.

**[0016]** It is important that the garment of the present invention is made of a fabric mainly formed of hygroscopic fibers as constituent fibers. Here, the main constituent fibers are fibers having a mixing ratio of 50% by mass or more in the fabric. By using the hygroscopic fibers as the main constituent fibers, the release of moisture from the inside of the garment to the outside of the garment can be promoted, the humidity in the vicinity of the portion using the hygroscopic fibers can be reduced, and the stuffy feeling can be suppressed. Therefore, not only when the outside air is taken into the garment by the blower fan unit or the like, but also when the outside air is not taken into the garment, the garment has suppressed stuffy feeling. As a result, for example, even when the use of the blower fan unit is stopped or when the blower fan unit is stopped due to battery exhaustion or the like, the wearing comfort is maintained. The mixing ratio of the hygroscopic fibers in the fabric is more preferably 70% by mass or more, still more preferably 90% by mass or more, and particularly preferably 95% by mass or more.

**[0017]** Specific examples of the hygroscopic fiber in the present invention include, but are not limited to, polyester-based hygroscopic fibers, polyamide-based fibers, polyacryl-based fibers, rayon-based fibers, acetate-based fibers, cotton, hemp, silk, and wool. Among them, polyester-based hygroscopic fibers and polyamide-based fibers are preferable from the viewpoint of excellent mechanical properties and durability. In addition, the polyester-based hygroscopic fiber also has quick drying properties. Therefore, it is particularly preferable from the viewpoint that so-called cold feeling after sweating in which the body is cooled by losing the body temperature due to wearing of garment wetted with sweat after sweating is reduced. As a method for imparting the hygroscopicity to fibers, there is hygroscopicity processing in which fibers are treated with a hydrophilic compound or the like. However, as in the present invention, the hygroscopic fibers in which the fibers themselves have the hygroscopicity are preferable from the viewpoint that a decrease in the hygroscopicity during use due to wearing, washing, or the like is suppressed and durability of the effect of the hygroscopicity is excellent.

**[0018]** The moisture absorption rate difference ( $\Delta MR$ ) of the hygroscopic fibers of the present invention is preferably 2.0 to 10.0%. The moisture absorption rate difference ( $\Delta MR$ ) of the hygroscopic fibers in the present invention refers to a value measured by the method described in examples. The  $\Delta MR$  means a difference between a moisture absorption rate at a temperature of 30°C and a humidity of 90% RH assuming a temperature and a humidity in the garment after light exercise and a moisture absorption rate at a temperature of 20°C and a humidity of 65% RH as an outside air temperature and humidity. That is, the  $\Delta MR$  is an index of the hygroscopicity, and as a value of  $\Delta MR$  is higher, the stuffy feeling and sticky feeling during sweating are reduced, and the wearing comfort of the garment is improved. When the  $\Delta MR$  of the hygroscopic fibers is 2.0% or more, the stuffy feeling and sticky feeling in the garment during sweating are small when the garment of the present invention is worn, and the wearing comfort is improved, which is preferable. In addition, not only when the outside air is taken into the garment by the blower fan unit or the like, but also when the outside air is not taken into the garment, the garment has suppressed the heatful feeling and the stuffy feeling. Therefore, for example, even when the use of the blower fan unit is stopped or the blower fan unit is stopped due to battery exhaustion or the like, the wearing comfort is preferably maintained. The  $\Delta MR$  of the hygroscopic fibers is more preferably 3.0% or

more, and still more preferably 4.0% or more. On the other hand, when the  $\Delta MR$  of the hygroscopic fibers is 10.0% or less, process passability and handleability at the time of manufacturing a fabric or a garment are good, and durability at the time of use is also excellent, which is preferable. The  $\Delta MR$  of the hygroscopic fibers is more preferably 9.0% or less, and still more preferably 8.0% or less.

**[0019]** The fabric of the present invention may be formed by mixing, blending, interweaving, or interknitting other fibers with the hygroscopic fibers as long as the fabric has the hygroscopic fibers as main constituent fibers. Specific examples of the other fibers include, but are not limited to, polyester-based fibers, polyamide-based fibers, polyacryl-based fibers, polyolefin-based fibers, and polyurethane-based fibers having a moisture absorption rate difference ( $\Delta MR$ ) of less than 2.0%.

**[0020]** The hygroscopic fibers and other fibers used in the garment of the present invention may be any of filaments, staples, spun yarns, and the like, and may be processed into false twisting, twisting, and the like.

**[0021]** The hygroscopic fibers and other fibers to be used in the garment of the present invention are not particularly limited in the total fineness as the multifilament, and can be appropriately selected according to the application and required properties, but are preferably 10 to 500 dtex. When the total fineness is 10 dtex or more, yarn breakage occurs less and process passability is good, and in addition, generation of fuzz during use is less and durability of the garment is excellent, which is preferable. The total fineness is more preferably 30 dtex or more, and still more preferably 50 dtex or more. On the other hand, when the total fineness is 500 dtex or less, the flexibility of the garment is not impaired, which is preferable. The total fineness is more preferably 400 dtex or less, and still more preferably 300 dtex or less.

**[0022]** The hygroscopic fibers and other fibers to be used in the garment of the present invention are not particularly limited in the single fiber fineness, and can be appropriately selected according to the application and required properties, but are preferably 0.5 to 4.0 dtex. The single fiber fineness in the present invention refers to a value obtained by dividing the total fineness by the number of single fibers. When the single fiber fineness is 0.5 dtex or more, yarn breakage occurs less and process passability is good, and in addition, generation of fuzz during use is less and durability of the garment is excellent, which is preferable. The single fiber fineness is more preferably 0.6 dtex or more, and still more preferably 0.8 dtex or more. On the other hand, when the single fiber fineness is 4.0 dtex or less, the flexibility of the garment is not impaired, which is preferable. The single fiber fineness is more preferably 2.0 dtex or less, and still more preferably 1.5 dtex or less.

**[0023]** The hygroscopic fibers and other fibers used in the garment of the present invention are not particularly limited in breaking strength of the fiber, and can be appropriately selected according to the application and required properties, but are preferably 2.0 to 5.0 cN/dtex from the viewpoint of the mechanical properties. When the breaking strength is 2.0 cN/dtex or more, generation of fuzz during use is less, and the durability of the garment is excellent, which is preferable. The breaking strength is more preferably 2.5 cN/dtex or more, and still more preferably 3.0 cN/dtex or more. On the other hand, when the breaking strength is 5.0 cN/dtex or less, the flexibility of the garment is not impaired, which is preferable.

**[0024]** The hygroscopic fibers and other fibers used in the garment of the present invention are not particularly limited in breaking elongation of the fiber, and can be appropriately selected according to the application and required properties, but are preferably 10% to 60% from the viewpoint of the durability. When the breaking elongation is 10% or more, abrasion resistance of the garment is improved, the generation of fuzz during use is reduced, and the durability of the garment is improved, which is preferable. The breaking elongation is more preferably 15% or more, and still more preferably 20% or more. On the other hand, when the breaking elongation is 60% or less, the dimensional stability of the garment is improved, and the durability of the garment is excellent, which is preferable. The breaking elongation is more preferably 55% or less, and still more preferably 50% or less.

**[0025]** The hygroscopic fibers and other fibers used in the garment of the present invention are not particularly limited in terms of the cross-sectional shape of the fiber, and can be appropriately selected according to the application and required properties. The cross-section may be a perfect circular cross-section or a non-circular cross-section. Specific examples of the non-circular cross-section include, but are not limited to, multilobal, polygonal, flat, elliptical, and the like.

**[0026]** In the garment of the present invention, it is important that the air permeability of the fabric is  $45 \text{ cm}^3/\text{cm}^2/\text{s}$  or less. The air permeability of the fabric in the present invention refers to a value measured by the method described in examples. When the air permeability of the fabric is  $45 \text{ cm}^3/\text{cm}^2/\text{s}$  or less, the outside air taken into the garment by the blower fan unit or the like can be suppressed from being discharged from a gap between the fabrics, and the outside air taken into the garment can be efficiently circulated in the garment. As a result, sweat coming out of the body in the garment can be efficiently evaporated, and the cooling of the body can be promoted using the heat of vaporization at the time of evaporation. The air permeability of the fabric is more preferably  $40 \text{ cm}^3/\text{cm}^2/\text{s}$  or less, still more preferably  $30 \text{ cm}^3/\text{cm}^2/\text{s}$  or less, and particularly preferably  $20 \text{ cm}^3/\text{cm}^2/\text{s}$  or less. The air permeability of the fabric is preferably  $10 \text{ cm}^3/\text{cm}^2/\text{s}$  or more. When the air permeability of the fabric is  $10 \text{ cm}^3/\text{cm}^2/\text{s}$  or more, the heatful feeling and the stuffy feeling can be suppressed, which is preferable. In the garment of the present invention, a fabric that does not have the above-described air permeability and fiber configuration may be partially used as long as the object of the present invention is not impaired.

**[0027]** The fabric used for the garment of the present invention is not particularly limited in terms of fabric form, and may be a woven fabric, a knitted fabric, a pile fabric, a nonwoven fabric, or the like according to a known method. The fabric of the present invention may have any weave structure or knitted structure, and plain weave, twill weave, satin weave, double weave, or modified weave thereof, warp knit, weft knit, circular knit, lace knit, or modified knit thereof can be suitably employed.

**[0028]** The fabric used for the garment of the present invention may be dyed as necessary. A dyeing method is not particularly limited, and a cheese dyeing machine, a liquid flow dyeing machine, a drum dyeing machine, a beam dyeing machine, a jigger, a high-pressure jigger, and the like can be suitably employed according to a known method. In the present invention, the dye concentration and the dyeing temperature are not particularly limited, and a known method can be suitably employed.

**[0029]** It is important that the garment of the present invention has at least one air inlet for taking the outside air into the garment. Here, the air inlet is not an opening portion such as a collar, a sleeve, or a hem of a normal garment, but a portion that is separately provided for taking outside air into the garment and has higher air permeability than that of a basic portion of the garment. With such an air inlet, the outside air can be efficiently taken into the garment, so that it is possible to suppress the heatful feeling and the stuffy feeling, and the garment is excellent in the wearing comfort. Therefore, not only when the outside air is taken into the garment by the blower fan unit or the like, but also when the outside air is not taken into the garment, the garment has suppressed the heatful feeling and the stuffy feeling. For example, even when the use of the blower fan unit is stopped or the blower fan unit is stopped due to the battery exhaustion or the like, the wearing comfort is maintained.

**[0030]** In the garment of the present invention, the number of air inlets and the positions of the air inlets are not particularly limited, and can be appropriately selected within a range that does not impair the wearing feeling, design, and the like. Since the specific gravity of the air heated inside the garment by the body temperature is decreased, the air flows upward inside the garment due to a so-called chimney effect in which an upward airflow occurs inside the garment. Therefore, the position of the air inlet for taking the outside air into the garment is preferably, for example, the vicinity of a lower back portion such as the waist or the flank.

**[0031]** The air inlet provided in the garment of the present invention is preferably formed by cutting out the fabric of the portion or by using a material having higher air permeability than the fabric of a basic portion (garment body) constituting the garment. By making the air permeability of the air inlet higher than that of the fabric of the garment body, the outside air can be efficiently taken into the garment. From the viewpoint of design, it is preferable to use a material having higher air permeability than the fabric of the basic portion (garment body) constituting the garment. Further, the air permeability of the air inlet is not particularly limited, but when the air permeability is  $200 \text{ cm}^3/\text{cm}^2/\text{s}$  or more, the outside air can be efficiently taken into the garment, and the heatful feeling and the stuffy feeling can be suppressed, which is preferable. The air permeability of the air inlet is more preferably  $300 \text{ cm}^3/\text{cm}^2/\text{s}$  or more, and still more preferably  $400 \text{ cm}^3/\text{cm}^2/\text{s}$  or more.

**[0032]** In the air inlet provided in the garment of the present invention, the diameter of the circumscribed circle is preferably 80 mm or less. Since the shape of the air inlet is not necessarily a perfect circle, when the air inlet is not a perfect circle, the diameter of the circumscribed circle is considered as the size of the air inlet. When the diameter of the circumscribed circle of the air inlet is 80 mm or less, the outside air can be efficiently taken into the garment without impairing the design, and the garment is excellent in the wearing comfort, which is preferable. The diameter of the circumscribed circle of the air inlet is more preferably 70 mm or less, still more preferably 60 mm or less, and particularly preferably 50 mm or less. The diameter of the circumscribed circle of the air inlet is preferably 10 mm or more. When the diameter of the circumscribed circle of the air inlet is 10 mm or more, the outside air can be taken into the garment, and the heatful feeling and the stuffy feeling can be suppressed, which is preferable.

**[0033]** As the air inlet provided in the garment of the present invention, a ventilation mechanism of a fastener type is preferably used. If the air inlet has a ventilation mechanism of a fastener type, the environment inside the garment can be adjusted by opening and closing the fastener according to the heatful feeling or the chilly feeling at the time of wearing, and the environment inside the garment can be kept comfortable, which is preferable.

**[0034]** The garment of the present invention may include an air outlet for discharging air in the garment to the outside of the garment. The air outlet is not an opening portion of a collar, a sleeve, a hem, or the like of normal garment, but is a portion having higher air permeability than that of the basic portion of the garment separately provided so as to correspond to the air inlet in order to discharge the air in the garment to the outside of the garment. When such an air outlet is provided, ventilation in the garment can be promoted, so that it is possible to suppress the heatful feeling and the stuffy feeling, and the garment is excellent in the wearing comfort, which is preferable. With this, not only when the outside air is taken into the garment by the blower fan unit or the like, but also when the outside air is not taken into the garment, the garment has suppressed the heatful feeling and the stuffy feeling. Therefore, for example, even when the use of the blower fan unit is stopped or the blower fan unit is stopped due to battery exhaustion or the like, the wearing comfort is preferably maintained. In addition, in a case where the air outlet is not provided, when the outside air is taken into the garment by the blower fan unit or the like, the air is discharged to the outside of the garment from the opening

portions such as the collar, the sleeve, and the hem, so that the garment has an inflated shape, and the wearing feeling and design are deteriorated. However, in a case where the air outlet is provided, the inflation of the garment as described above can be suppressed, and the garment is excellent in the wearing feeling and design, which is preferable.

**[0035]** In the garment of the present invention, the number of air outlets and the positions of the air outlets are not particularly limited, and can be appropriately selected within a range that does not impair the wearing feeling, design, and the like. As described above, since the air heated inside the garment by the body temperature flows upward inside the garment due to the chimney effect, the position of the air outlet for discharging the air inside the garment to the outside of the garment is preferably, for example, in the vicinity of the upper back portion such as under the arms or behind the neck. Alternatively, a portion that is likely to feel cool in the human body, that is, the vicinity of a portion having a high density of cold spots, and the like can be suitably employed. Examples of the site having a high density of cold spots include, but are not limited to, a shoulder, a scapula, a back, and a waist.

**[0036]** The air outlet provided in the garment of the present invention is preferably formed by cutting out the fabric of the portion or by using a material having higher air permeability than the fabric of a basic portion (garment body) constituting the garment. By making the air permeability of the air outlet higher than that of the fabric of the garment body, the air inside the garment can be efficiently discharged to the outside of the garment. From the viewpoint of design, it is preferable to use a material having higher air permeability than the fabric of the basic portion (garment body) constituting the garment. Further, the air permeability of the air outlet is not particularly limited, but when the air permeability is  $200 \text{ cm}^3/\text{cm}^2/\text{s}$  or more, the air inside the garment can be efficiently discharged to the outside of the garment, and the heatful feeling and the stuffy feeling can be suppressed, which is preferable. The air permeability of the air outlet is more preferably  $300 \text{ cm}^3/\text{cm}^2/\text{s}$  or more, and still more preferably  $400 \text{ cm}^3/\text{cm}^2/\text{s}$  or more.

**[0037]** In the air outlet provided in the garment of the present invention, the diameter of the circumscribed circle is preferably 80 mm or less. Since the shape of the air outlet is not necessarily a perfect circle, when the air outlet is not a perfect circle, the diameter of the circumscribed circle is considered as the size of the air outlet. When the diameter of the circumscribed circle of the air outlet is 80 mm or less, the air inside the garment can be efficiently discharged to the outside of the garment without impairing the design, and the garment is excellent in the wearing comfort, which is preferable. The diameter of the circumscribed circle of the air outlet is more preferably 70 mm or less, still more preferably 60 mm or less, and particularly preferably 50 mm or less. The diameter of the circumscribed circle of the air outlet is preferably 10 mm or more. When the diameter of the circumscribed circle of the air outlet is 10 mm or more, the air inside the garment can be discharged to the outside of the garment, and the heatful feeling and the stuffy feeling can be suppressed, which is preferable.

**[0038]** As the air outlet provided in the garment of the present invention, a ventilation mechanism of a fastener type is preferably used. If the air outlet has a ventilation mechanism of a fastener type, the environment inside the garment can be adjusted by opening and closing the fastener according to the heatful feeling or the chilly feeling at the time of wearing, and the environment inside the garment can be kept comfortable, which is preferable.

**[0039]** When the garment of the present invention has both an air inlet and an air outlet and includes a blower fan unit to be described later, one located closer to the blower fan unit is defined as the air inlet, and the other one located farther from the blower fan unit is defined as the air outlet. In addition, when the garment of the present invention has both an air inlet and an air outlet and does not include an air blower fan unit, as described above, the air heated inside the garment by the body temperature flows upward inside the garment due to the chimney effect, and thus one present at a lower position of the garment is defined as the air inlet and the other one present at a higher position of the garment is defined as the air outlet.

**[0040]** The garment of the present invention preferably includes a blower fan unit for taking outside air into the garment. Here, the blower fan unit is a unit including at least a fan and a motor. By taking the outside air into a space between the garment and the body by the blower fan unit, air stagnant in the garment can be discharged from the air outlet or an opening such as a collar or a sleeve, so that the body can be efficiently cooled.

**[0041]** In the blower fan unit of the present invention, the diameter of the circumscribed circle is preferably 80 mm or less. Since the shape of the blower fan unit is not necessarily a perfect circle, when the blower fan unit is not a perfect circle, the diameter of the circumscribed circle is defined as the size of the blower fan unit. When the diameter of the circumscribed circle of the blower fan unit is 80 mm or less, the discomfort at the time of wearing is reduced, the outside air can be taken into a space between the garment and the body by the blower fan unit without impairing the design, and the garment is excellent in the wearing comfort, which is preferable. In addition, it is possible to obtain a sufficient air volume for taking the outside air into the garment, and furthermore, noise at the time of driving the blower fan unit is reduced, which is preferable. The diameter of the circumscribed circle of the blower fan unit is more preferably 70 mm or less, still more preferably 60 mm or less, and particularly preferably 50 mm or less.

**[0042]** The blower fan unit of the present invention preferably has a thickness of 3 to 30 mm in a fan axial direction. The thickness of 3 mm or more in the fan axial direction is preferable from the viewpoint that a sufficient air volume for taking outside air into the garment can be obtained. The thickness in the fan axial direction is more preferably 5 mm or more, and still more preferably 7 mm or more. On the other hand, when the thickness in the fan axial direction is 30 mm

or less, the discomfort at the time of wearing is reduced, and the design is not impaired, which is preferable. The thickness in the fan axial direction is more preferably 25 mm or less, and still more preferably 20 mm or less.

**[0043]** In the garment of the present invention, the number of blower fan units is not particularly limited, and the blower fan units can be attached to the garment within a range in which the wearing feeling, design, and the like are not impaired according to the diameter of the circumscribed circle of the blower fan unit and the thickness in the fan axial direction.

**[0044]** The form of the garment of the present invention is not particularly limited, and may be either an upper garment or a lower garment; the upper wear may be either a long sleeve or a short sleeve, and the bottom wear may be either a long hem or a short hem. In the present invention, the upper wear means a garment worn on the upper body, and the bottom wear means a garment worn on the lower body. Specific examples of the upper wear in the present invention include, but are not limited to, underwear such as an inner shirt, a tank top, and a camisole, general garment such as a T-shirt, a polo shirt, a cut and sew, a pajama, a shirt, a blouson, and a work wear, and sports garment such as a sports inner shirt and a sports shirt. Specific examples of the bottom wear in the present invention include, but are not limited to, underwear such as inner pants, general garment such as a slack, pants, a skirt, a pajama, and a work wear, and sports garment such as sports pants.

**[0045]** Since the stuffy feeling and the heatful feeling in the garment of the present invention can be suppressed to keep the environment in the garment comfortable, and the wearing comfort and the design are excellent, it can be suitably used in a high temperature and/or high humidity environment and various wearing scenes requiring comfort scenes such as outdoors and indoors.

[Examples]

**[0046]** Hereinafter, the present invention will be described in more detail with reference to examples. Each characteristic value in examples was obtained by the following method.

#### A. Moisture absorption rate difference ( $\Delta$ MR)

**[0047]** Fibers constituting the garment were used as a sample, first dried with hot air at 60°C for 30 minutes, and then allowed to stand for 24 hours in a thermohygrostat LHU-123 manufactured by ESPEC CORP. moistened at a temperature of 20°C and a humidity of 65% RH, and a weight W1 (g) of the sample was measured. Thereafter, the sample was allowed to stand for 24 hours in a thermohygrostat humidified at a temperature of 30°C and a humidity of 90% RH, and a weight W2 (g) of the sample was measured. Thereafter, the sample was hot-air dried at 105°C for 2 hours, and a weight W3 (g) of the sample after absolute drying was measured. A moisture absorption rate MR1 (%) when the sample was left to stand in an atmosphere at a temperature of 20°C and a humidity of 65% RH for 24 hours from an absolute dry condition was calculated by the following formula using the weights W1 and W3 of the sample, a moisture absorption rate MR2 (%) when the sample was left to stand in an atmosphere at a temperature of 30°C and a humidity of 90% RH for 24 hours from an absolute dry condition was calculated by the following formula using the weights W2 and W3 of the sample, and then the moisture absorption rate difference ( $\Delta$ MR) was calculated by the following formula.

$$\text{MR1 (\%)} = \{(W1 - W3)/W3\} \times 100$$

$$\text{MR2 (\%)} = \{(W2 - W3)/W3\} \times 100$$

$$\text{Moisture absorption rate difference (\Delta MR) (\%)} = \text{MR2} -$$

$$\text{MR1}$$

**[0048]** The measurement was performed five times per sample, and the average value thereof was taken as the moisture absorption rate difference ( $\Delta$ MR).

#### B. Air permeability

**[0049]** The air permeability was calculated according to JIS L 1096: 2010 (Testing Methods for Fabrics and Knitted Fabrics) 8.26.1 (Method A) using the fabrics obtained in examples and the materials constituting the air inlet and the air outlet used in examples as samples. The measurement was performed five times per sample, and the average value thereof was taken as the air permeability ( $\text{cm}^3/\text{cm}^2/\text{s}$ ). In addition, in a case where the air inlet and/or the air outlet were

provided by cutting out the fabric, the fabric was not present in the portion, and thus the air permeability was "not applicable".

#### C. Comfort (stuffy feeling, heatful feeling, and cold feeling after sweating)

**[0050]** The evaluation of the comfort was performed on 20 subjects wearing the garments produced in the examples in a room at a temperature of 30°C and a humidity of 90% RH assuming an outdoor environment in summer under three conditions of "before air blowing", "during air blowing", and "after air blowing". For "before air blowing", the comfort after walking for 30 minutes without mounting the blower fan unit on the garment produced in the examples was evaluated. For "during air blowing", immediately after the evaluation of "before air blowing" was performed, the blower fan unit was attached to the garment produced in the examples, and the comfort after walking for 30 minutes while blowing air was evaluated. For "after air blowing", the comfort after stopping blowing air from the blower fan unit and continuing walking for 30 minutes was evaluated immediately after the evaluation of "during air blowing". With respect to the situation inside the garment under the respective conditions of "before air blowing", "during air blowing", and "after air blowing", an average score of scores given by 20 subjects was calculated, and an average score of 3.0 points or more was regarded as pass, where 5 points were given to "no stuffy feeling, heatful feeling, or cold feeling after sweating was felt", 4 points were given to "almost no stuffy feeling, heatful feeling, or cold feeling after sweating was felt", 3 points were given to "stuffy feeling, heatful feeling, or cold feeling after sweating was slightly felt", 2 points were given to "one of stuffy feeling, heatful feeling, and cold feeling after sweating was felt", and 1 point was given to "one of stuffy feeling, heatful feeling, and cold feeling after sweating was strongly felt".

#### D. Design

**[0051]** For the design, a blower fan unit was attached to the garment produced in the examples, the garment was then worn on a mannequin, and 20 subjects evaluated the appearance. an average score of scores given by 20 subjects was calculated, and an average score of 3.0 points or more was regarded as pass, where 5 points were given to "air inlet, air outlet, and blower fan unit are all inconspicuous and can be worn without any problem", 4 points were given to "the air inlet, the air outlet, and the blower fan unit are all hardly conspicuous, and there is no resistance to wearing", 3 points were given to "any one of the air inlet, the air outlet, and the blower fan unit is conspicuous, but it can be worn", 2 points were given to "any one of the air inlet, the air outlet, and the blower fan unit is noticeable, there is resistance to wearing", and 1 point was given to "any one of the air inlet, the air outlet, and the blower fan unit is noticeable, there is strong resistance to wearing".

#### Example 1

**[0052]** Fig. 1(a) is a schematic explanatory view of a garment back portion showing a position of an air inlet in Example 1. Using nylon fibers (false twisted yarns of 50 dtex-98 f) as warps and wefts, a plain weave fabric was produced by a known weaving method and then sewn to produce a long sleeve shirt. Subsequently, as an air inlet, two portions were cut out in a circular shape having a diameter of 50 mm at the lower back portion, and were subjected to a wearing test. After a cylindrical blower fan unit having an outer diameter of 48 mm and a thickness of 5 mm in the fan axial direction was attached to the position of the air inlet, the blower fan unit and the external power were connected by a cable, and the air flow rate from the blower fan unit was set to 2.0 m<sup>3</sup>/min/piece to perform a wearing test. The evaluation results of the obtained fabric and garment are shown in Table 1.

**[0053]** In the garment of Example 1, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design.

#### Examples 2 to 6, Comparative Examples 1 and 2

**[0054]** Garments were produced in the same manner as in Example 1 except that a false twisted yarn of "QUUP" (registered trademark) 33 dtex-26f manufactured by Toray Industries, Inc. was used as a hygroscopic nylon fiber in Example 2, a sea-islands type composite fiber (a false twisted yarn of 66 dtex-72f) described in Example 3 of Pamphlet of International Publication No. 2018/012318 was used as a hygroscopic polyester fiber in Example 3, a false twisted yarn of "Lynda" (registered trademark) 84 dtex-20f manufactured by Mitsubishi Chemical Corporation was used as an acetate fiber in Example 4, a spun yarn of English cotton yarn count 60S (corresponding to 98 dtex) was used as a cotton in Example 5, a false twisted yarn of "Bemberg" (registered trademark) 84 dtex-45f manufactured by Asahi Kasei Corp. was used as a rayon fiber in Example 6, a false twisted yarn of "Pylon" (registered trademark) 56 dtex-30f man-



ufactured by Mitsubishi Chemical Corporation was used as a polypropylene fiber in Comparative Example 1, and a false twisted yarn of "TETRON" (registered trademark) 84 dtex-36f manufactured by Toray Industries, Inc. was used as a non-hygroscopic polyester fiber in Comparative Example 2, and then, a wearing test was performed. The evaluation results of the obtained fabric and garment are shown in Table 1.

**[0055]** In the garments of Examples 2 to 6, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design. In addition, under the conditions before air blowing and after air blowing, the garment made of cellulosic fibers (Examples 4 to 6) had a slightly cold feeling after sweating; whereas the garment made of hygroscopic nylon fibers (Example 2) and the garment made of hygroscopic polyester fibers (Example 3) had almost no cold feeling after sweating. The garments of Comparative Examples 1 and 2 had good comfort due to the air blowing from the air blower fan unit during air blowing, but were not made of hygroscopic fibers. Therefore, the garments had a stuffy feeling and a heatful feeling before air blowing and after air blowing, and were poor in comfort.

Examples 7 to 9 and Comparative Example 3

**[0056]** Garments were produced in the same manner as in Example 1 except that the hygroscopic polyester fiber used in Example 3 and the polyester fiber used in Comparative Example 2 were interwoven at mixing ratios shown in Table 2 to produce a fabric, and then, a wearing test was performed. The evaluation results of the obtained fabric and garment are shown in Table 2.

**[0057]** In the garments of Examples 7 to 9, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design. The garment of Comparative Example 3 had good comfort due to the air blowing from the air blower fan unit during air blowing, but had a low mixing ratio of the hygroscopic polyester fibers. Therefore, the garment had a stuffy feeling and a heatful feeling before air blowing and after air blowing, and was poor in comfort.

Examples 10 and 11 and Comparative Examples 4 and 5

**[0058]** Garments were produced in the same manner as in Example 1 except that the air permeability of the fabric were changed as shown in Table 2, and then, a wearing test was performed. The evaluation results of the obtained fabric and garment are shown in Table 2.

**[0059]** In the garments of Examples 10 and 11, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design. In the garments of Comparative Examples 4 and 5, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed before air blowing and after air blowing, and the comfort was excellent, but since the air permeability was high, the outside air taken into the garment by air blowing from the blower fan unit was not able to be efficiently circulated in the garment during air blowing, and the suppression of the stuffy feeling and the heatful feeling was insufficient, and the comfort was poor.

Examples 12 to 18 and Comparative Example 6

**[0060]** Figs. 1(b) to 1(i) are schematic explanatory views of a garment back portion showing positions of an air inlet and an air outlet in Examples 12 to 18 and Comparative Example 6, respectively. In Example 12, a garment was produced in the same manner as in Example 2 except that two portions were cut out in a circular shape having a diameter of 50 mm at the lower back portion and a nylon mesh fabric having an air permeability of  $400 \text{ cm}^3/\text{cm}^2/\text{s}$  was attached as an air inlet, and then, a wearing test was performed. In Example 13, a garment was produced in the same manner as in Example 2 except that one portion was cut out in a rectangular shape of 30 mm in length  $\times$  74 mm at the upper back portion and a nylon mesh fabric having an air permeability of  $400 \text{ cm}^3/\text{cm}^2/\text{s}$  was attached as an air outlet, and then, a wearing test was performed. In Example 14, a garment was produced in the same manner as in Example 2 except that as an air inlet, two portions were cut out in a circular shape having a diameter of 50 mm at the upper back portion, and then a wearing test was performed. In Example 15, a garment was produced in the same manner as in Example 14 except that one portion was cut out in a rectangular shape of 30 mm in length  $\times$  74 mm at the lower back portion and a nylon mesh fabric having an air permeability of  $400 \text{ cm}^3/\text{cm}^2/\text{s}$  was attached as an air outlet, and then, a wearing test

was performed. In Example 16, as an air inlet, a garment was produced in the same manner as in Example 2 except that one portion was cut out into a rectangular shape of 30 mm in length  $\times$  74 mm in width at the lower back portion, a nylon mesh fabric having an air permeability of 400 cm<sup>3</sup>/cm<sup>2</sup>/s was attached, as an air outlet, one portion was cut out into a rectangular shape of 30 mm in length  $\times$  74 mm in width at the upper back portion, a nylon mesh fabric having an air permeability of 400 cm<sup>3</sup>/cm<sup>2</sup>/s was attached, and a rectangular parallelepiped blower fan unit having a size of 30 mm in length  $\times$  30 mm in width and a thickness of 5 mm in the fan axial direction was used as the air blower fan unit, and then, a wearing test was performed. In Example 17, a garment was produced in the same manner as in Example 2 except that a short sleeve shirt was used, and then, a wearing test was performed. In Example 18, a garment was produced in the same manner as in Example 16 except that a short sleeve shirt was used, and then, a wearing test was performed. In Comparative Example 6, a garment was produced in the same manner as in Example 2 except that no air inlet was provided, and then, a wearing test was performed. Note that, although the garment of Comparative Example 6 did not have an air inlet, the blower fan unit was attached at the same position as the position where the blower fan unit was attached in Example 2, inside the garment, and then, a wearing test was performed. The evaluation results of the obtained fabric and garment are shown in Table 3.

**[0061]** In the garments of Examples 12 to 18, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design. Since the garment of Comparative Example 6 had no air inlet, the outside air was not able to be taken into the garment, and the garment had strong stuffy feeling and heatful feeling inside the garment under any condition before air blowing, during air blowing, and after air blowing, and was poor in comfort.

#### Examples 19 to 21

**[0062]** In Example 3, a garment was produced in the same manner as in Example 3 except that the air inlet and the blower fan unit were changed as follows, and then, a wearing test was performed. In Example 19, two portions were cut out into a circular shape having a diameter of 60 mm in the lower back portion, and a cylindrical blower fan unit having an outer diameter of 58 mm and a thickness of 5 mm in the fan axial direction was attached to the position of the air inlet; in Example 20, two portions were cut out into a circular shape having a diameter of 80 mm in the lower back portion, and a cylindrical blower fan unit having an outer diameter of 78 mm and a thickness of 5 mm in the fan axial direction was attached to the position of the air inlet; in Example 21, two portions were cut out into a circular shape having a diameter of 90 mm in the lower back portion, and a cylindrical blower fan unit having an outer diameter of 88 mm and a thickness of 10 mm in the fan axial direction was attached to the position of the air inlet. The evaluation results of the obtained fabric and garment are shown in Table 4.

**[0063]** In the garments of Examples 19 to 21, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design.

#### Examples 22 and 23

**[0064]** A garment was produced in the same manner as in Example 13 except that the air outlet was changed as follows in Example 13, and then, a wearing test was performed. In Example 22, as an air outlet, one portion was cut out into a rectangular shape of 35 mm in length  $\times$  35 mm in width at the lower back portion, a nylon mesh fabric having an air permeability of 400 cm<sup>3</sup>/cm<sup>2</sup>/s was attached, and in Example 23, as an air outlet, one portion was cut out into a rectangular shape of 30 mm in length  $\times$  84 mm in width at the upper back portion, a nylon mesh fabric having an air permeability of 400 cm<sup>3</sup>/cm<sup>2</sup>/s was attached. The evaluation results of the obtained fabric and garment are shown in Table 4.

**[0065]** In the garments of Examples 22 and 23, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design.

#### Examples 24 to 26

**[0066]** A garment was produced in the same manner as in Example 16, except that in Example 24, the air permeability of the nylon mesh fabric attached to the air inlet was changed to 200 cm<sup>3</sup>/cm<sup>2</sup>/s, in Example 25, the air permeability of the nylon mesh fabric attached to the air outlet was changed to 200 cm<sup>3</sup>/cm<sup>2</sup>/s, and in Example 26, the air permeability

of the nylon mesh fabric attached to the air inlet and the air outlet was changed to  $200 \text{ cm}^3/\text{cm}^2/\text{s}$ , in Example 16, and then, a wearing test was performed. The evaluation results of the obtained fabric and garment are shown in Table 4.

**[0067]** In the garments of Examples 24 to 26, the stuffy feeling, the heatful feeling, and the cold feeling after sweating inside the garment were suppressed under any of the conditions before air blowing, during air blowing, and after air blowing, and the environment in the garment was able to be kept comfortable regardless of the presence or absence of air blowing from the blower fan unit, which resulted in excellent comfort and design.

[Table 1]

[0068]

Table 1

|        |                                 |                                               | Example 1 | Example 2         | Example 3             | Example 4 | Example 5 | Example 6 | Comparative Example 1 | Comparative Example 2 |       |
|--------|---------------------------------|-----------------------------------------------|-----------|-------------------|-----------------------|-----------|-----------|-----------|-----------------------|-----------------------|-------|
| Fabric | Hygroscopic fiber (A)           | Types                                         | Nylon     | Hygroscopic nylon | Hygroscopic polyester | Acetate   | Cotton    | Rayon     | -                     | -                     |       |
|        |                                 | Moisture absorption rate difference (ΔMR) [%] | 2.1       | 3.9               | 3.1                   | 3.3       | 4.1       | 8.2       | -                     | -                     |       |
|        | Other fibers (B)                | Types                                         | -         | -                 | -                     | -         | -         | -         | Polypropylene         | Polyester             |       |
|        |                                 | Moisture absorption rate difference (ΔMR) [%] | -         | -                 | -                     | -         | -         | -         | -                     | 0.0                   | 0.1   |
|        | Mixture ratio (A/B) [% by mass] |                                               | 100/0     | 100/0             | 100/0                 | 100/0     | 100/0     | 100/0     | 100/0                 | 0/100                 | 0/100 |
|        | Air permeability [cm³/cm²/s]    |                                               | 35        | 37                | 36                    | 34        | 38        | 35        | 37                    | 36                    |       |

(continued)

| Schematic view  | Example 1                                                 | Example 2      | Example 3      | Example 4      | Example 5      | Example 6      | Comparative Example 1 | Comparative Example 2 |
|-----------------|-----------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|-----------------------|-----------------------|
|                 | Fig. 1(a)                                                 | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)             | Fig. 1(a)             |
| Air inlet       | Diameter of circumscribed circle [mm]                     | 50             | 50             | 50             | 50             | 50             | 50                    | 50                    |
|                 | Air permeability [ $\text{cm}^3/\text{cm}^2/\text{s}$ ]   | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable        | Not applicable        |
| Air outlet      | Diameter of circumscribed circle [mm]                     | Absent         | Absent         | Absent         | Absent         | Absent         | Absent                | Absent                |
|                 | Air permeability [ $\text{cm}^3/\text{cm}^2/\text{s}$ ]   | -              | -              | -              | -              | -              | -                     | -                     |
| Blower fan unit | Diameter of circumscribed circle [mm]                     | 48             | 48             | 48             | 48             | 48             | 48                    | 48                    |
|                 | Thickness in fan axial direction [mm]                     | 5              | 5              | 5              | 5              | 5              | 5                     | 5                     |
|                 | Blower flow rate [ $\text{m}^3/\text{min}/\text{piece}$ ] | 2.0            | 2.0            | 2.0            | 2.0            | 2.0            | 2.0                   | 2.0                   |
| Wearing test    | Comfort (before air blowing)                              | 3.7            | 4.2            | 4.1            | 3.3            | 3.2            | 3.1                   | 2.0                   |
|                 | Comfort (during air blowing)                              | 3.8            | 4.3            | 4.3            | 4.1            | 4.2            | 4.3                   | 3.3                   |
|                 | Comfort (after air blowing)                               | 3.6            | 4.1            | 4.0            | 3.3            | 3.2            | 3.1                   | 1.7                   |
|                 | Design                                                    | 4.0            | 4.0            | 4.0            | 4.0            | 4.0            | 4.0                   | 4.0                   |

[Table 2]

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Table 2

|        |                                 |                                               | Example 7             | Example 8             | Example 9             | Comparative Example 3 | Example 10 | Example 11 | Comparative Example 4 | Comparative Example 5 |
|--------|---------------------------------|-----------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------|------------|-----------------------|-----------------------|
| Fabric | Hygroscopic fiber (A)           | Types                                         | Hygroscopic polyester | Hygroscopic polyester | Hygroscopic polyester | Hygroscopic polyester | Nylon      | Nylon      | Nylon                 | Nylon                 |
|        |                                 | Moisture absorption rate difference (ΔMR) [%] | 3.1                   | 3.1                   | 3.1                   | 3.1                   | 2.1        | 2.1        | 2.1                   | 2.1                   |
|        | Other fibers (B)                | Types                                         | Polyester             | Polyester             | Polyester             | Polyester             | -          | -          | -                     | -                     |
|        |                                 | Moisture absorption rate difference (ΔMR) [%] | 0.1                   | 0.1                   | 0.1                   | 0.1                   | -          | -          | -                     | -                     |
|        | Mixture ratio (A/B) [% by mass] |                                               | 90/10                 | 70/30                 | 50/50                 | 30/70                 | 100/0      | 100/0      | 100/0                 | 100/0                 |
|        | Air permeability [cm³/cm²/s]    |                                               | 38                    | 36                    | 34                    | 37                    | 19         | 45         | 52                    | 105                   |

(continued)

| Schematic view  | Example 7      | Example 8      | Example 9      | Comparative Example 3 | Example 10     | Example 11     | Comparative Example 4 | Comparative Example 5 |
|-----------------|----------------|----------------|----------------|-----------------------|----------------|----------------|-----------------------|-----------------------|
|                 | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)             | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)             | Fig. 1(a)             |
| Air inlet       | 50             | 50             | 50             | 50                    | 50             | 50             | 50                    | 50                    |
|                 | Not applicable | Not applicable | Not applicable | Not applicable        | Not applicable | Not applicable | Not applicable        | Not applicable        |
| Air outlet      | Absent         | Absent         | Absent         | Absent                | Absent         | Absent         | Absent                | Absent                |
|                 | -              | -              | -              | -                     | -              | -              | -                     | -                     |
| Blower fan unit | 48             | 48             | 48             | 48                    | 48             | 48             | 48                    | 48                    |
|                 | 5              | 5              | 5              | 5                     | 5              | 5              | 5                     | 5                     |
| Wearing test    | 2.0            | 2.0            | 2.0            | 2.0                   | 2.0            | 2.0            | 2.0                   | 2.0                   |
|                 | 3.9            | 3.5            | 3.1            | 2.7                   | 3.5            | 3.8            | 3.9                   | 4.0                   |
| Design          | 4.0            | 3.8            | 3.6            | 3.4                   | 4.5            | 3.2            | 2.9                   | 2.6                   |
|                 | 3.8            | 3.4            | 3.0            | 2.5                   | 3.3            | 3.7            | 3.8                   | 4.0                   |
| Garment         |                | 4.0            | 4.0            | 4.0                   | 4.0            | 4.0            | 4.0                   | 4.0                   |



[Table 3]

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Table 3

| Fabric | Types                                                  |                                                        | Example 12        | Example 13        | Example 14        | Example 15        | Example 16        | Example 17        | Example 18        | Comparative Example 6 |
|--------|--------------------------------------------------------|--------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|
|        | Hygroscopic fiber (A)                                  | Moisture absorption rate difference ( $\Delta$ MR) [%] | Hygroscopic nylon | Hygroscopic nylon | Hygroscopic nylon | Hygroscopic nylon | Hygroscopic nylon | Hygroscopic nylon | Hygroscopic nylon | Hygroscopic nylon     |
|        |                                                        |                                                        | 3.9               | 3.9               | 3.9               | 3.9               | 3.9               | 3.9               | 3.9               | 3.9                   |
|        |                                                        |                                                        | -                 | -                 | -                 | -                 | -                 | -                 | -                 | -                     |
|        |                                                        |                                                        | -                 | -                 | -                 | -                 | -                 | -                 | -                 | -                     |
|        | Other fibers (B)                                       | Moisture absorption rate difference ( $\Delta$ MR) [%] | 100/0             | 100/0             | 100/0             | 100/0             | 100/0             | 100/0             | 100/0             | 100/0                 |
|        |                                                        |                                                        | 37                | 37                | 37                | 37                | 37                | 37                | 37                | 37                    |
|        | Air permeability [cm <sup>3</sup> /cm <sup>2</sup> /s] |                                                        |                   |                   |                   |                   |                   |                   |                   |                       |

(continued)

| Schematic view  | Example 12                                                | Example 13 | Example 14     | Example 15     | Example 16 | Example 17     | Example 18 | Comparative Example 6 |
|-----------------|-----------------------------------------------------------|------------|----------------|----------------|------------|----------------|------------|-----------------------|
|                 | Fig. 1(b)                                                 | Fig. 1(c)  | Fig. 1(d)      | Fig. 1(e)      | Fig. 1(f)  | Fig. 1(g)      | Fig. 1(h)  | Fig. 1(i)             |
| Air inlet       | Diameter of circumscribed circle [mm]                     | 50         | 50             | 50             | 80         | 50             | 80         | Absent                |
|                 | Air permeability [ $\text{cm}^3/\text{cm}^2/\text{s}$ ]   | 400        | Not applicable | Not applicable | 400        | Not applicable | 400        |                       |
| Air outlet      | Diameter of circumscribed circle [mm]                     | Absent     | 80             | 80             | 80         | Absent         | 80         | Absent                |
|                 | Air permeability [ $\text{cm}^3/\text{cm}^2/\text{s}$ ]   | -          | 400            | 400            | 400        | -              | 400        | -                     |
| Blower fan unit | Diameter of circumscribed circle [mm]                     | 48         | 48             | 48             | 43         | 48             | 43         | 48                    |
|                 | Thickness in fan axial direction [mm]                     | 5          | 5              | 5              | 5          | 5              | 5          | 5                     |
| Wearing test    | Blower flow rate [ $\text{m}^3/\text{min}/\text{piece}$ ] | 2.0        | 2.0            | 2.0            | 2.0        | 2.0            | 2.0        | 2.0                   |
|                 | Comfort (before air blowing)                              | 4.0        | 4.3            | 3.9            | 4.0        | 4.4            | 4.6        | 1.5                   |
|                 | Comfort (during air blowing)                              | 4.2        | 4.5            | 4.0            | 4.1        | 4.5            | 4.7        | 1.6                   |
|                 | Comfort (after air blowing)                               | 3.9        | 4.3            | 3.7            | 3.8        | 4.3            | 4.6        | 1.5                   |
| Design          | 4.3                                                       | 3.9        | 3.4            | 3.2            | 4.6        | 4.0            | 4.6        | 4.9                   |

[Table 4]

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Table 4

| Fabric                                                 | Types                 |                                                        | Example 19 | Example 20 | Example 21 | Example 22 | Example 23 | Example 24 | Example 25 | Example 26 |
|--------------------------------------------------------|-----------------------|--------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                                        | Hygroscopic fiber (A) | Moisture absorption rate difference ( $\Delta$ MR) [%] | 3.1        | 3.1        | 3.1        | 3.9        | 3.9        | 3.9        | 3.9        | 3.9        |
|                                                        |                       | Types                                                  | -          | -          | -          | -          | -          | -          | -          | -          |
|                                                        |                       | Moisture absorption rate difference ( $\Delta$ MR) [%] | -          | -          | -          | -          | -          | -          | -          | -          |
|                                                        | Other fibers (B)      | Mixture ratio (A/B) [% by mass]                        | 100/0      | 100/0      | 100/0      | 100/0      | 100/0      | 100/0      | 100/0      | 100/0      |
| Air permeability [cm <sup>3</sup> /cm <sup>2</sup> /s] |                       |                                                        | 36         | 36         | 36         | 37         | 37         | 37         | 37         | 37         |

(continued)

| Schematic view  | Example 19     | Example 20     | Example 21     | Example 22     | Example 23     | Example 24 | Example 25 | Example 26 |
|-----------------|----------------|----------------|----------------|----------------|----------------|------------|------------|------------|
|                 | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(a)      | Fig. 1(c)      | Fig. 1(c)      | Fig. 1(f)  | Fig. 1(f)  | Fig. 1(f)  |
| Air inlet       | 60             | 80             | 90             | 50             | 50             | 80         | 80         | 80         |
|                 | Not applicable | Not applicable | Not applicable | Not applicable | Not applicable | 200        | 400        | 200        |
| Air outlet      | Absent         | Absent         | Absent         | 50             | 90             | 80         | 80         | 80         |
|                 | -              | -              | -              | 400            | 400            | 400        | 200        | 200        |
| Blower fan unit | 58             | 78             | 88             | 48             | 48             | 43         | 43         | 43         |
|                 | 5              | 5              | 10             | 5              | 5              | 5          | 5          | 5          |
| Wearing test    | 2.0            | 2.0            | 2.0            | 2.0            | 2.0            | 2.0        | 2.0        | 2.0        |
|                 | 4.2            | 4.4            | 4.5            | 4.2            | 4.4            | 4.0        | 4.2        | 3.7        |
|                 | 4.4            | 4.6            | 4.7            | 4.4            | 4.6            | 4.3        | 4.4        | 4.0        |
|                 | 4.1            | 4.3            | 4.4            | 4.1            | 4.3            | 3.9        | 4.1        | 3.5        |
|                 | 3.8            | 3.3            | 3.1            | 4.0            | 3.8            | 4.6        | 4.6        | 4.7        |
| Design          |                |                |                |                |                |            |            |            |

## INDUSTRIAL APPLICABILITY

**[0072]** A garment of the present invention is capable of suppressing a stuffy feeling and a heatful feeling in the garment regardless of the presence or absence of air blowing from a blower fan, maintaining a comfortable environment in the garment, and having excellent wearing comfort. Therefore, it can be suitably used in a high temperature and/or high humidity environment and various wearing scenes requiring comfort such as outdoors and indoors.

## DESCRIPTION OF REFERENCE SIGNS

**[0073]**

- 1: Air inlet
- 2: Air outlet

**Claims**

1. A garment comprising:
  - a fabric mainly formed of hygroscopic fibers as constituent fibers, the fabric having air permeability of 45 cm<sup>3</sup>/cm<sup>2</sup>/s or less; and
  - at least one air inlet for taking outside air into the garment.
2. The garment according to claim 1, wherein a moisture absorption rate difference ( $\Delta MR$ ) of the hygroscopic fibers is 2.0 to 10.0%.
3. The garment according to claim 1 or 2, wherein the hygroscopic fiber is a polyester-based hygroscopic fiber and/or a polyamide-based fiber.
4. The garment according to any one of claims 1 to 3, wherein a diameter of a circumscribed circle of the air inlet is 80 mm or less.
5. The garment according to any one of claims 1 to 4, further comprising: a blower fan unit for taking outside air into the garment.

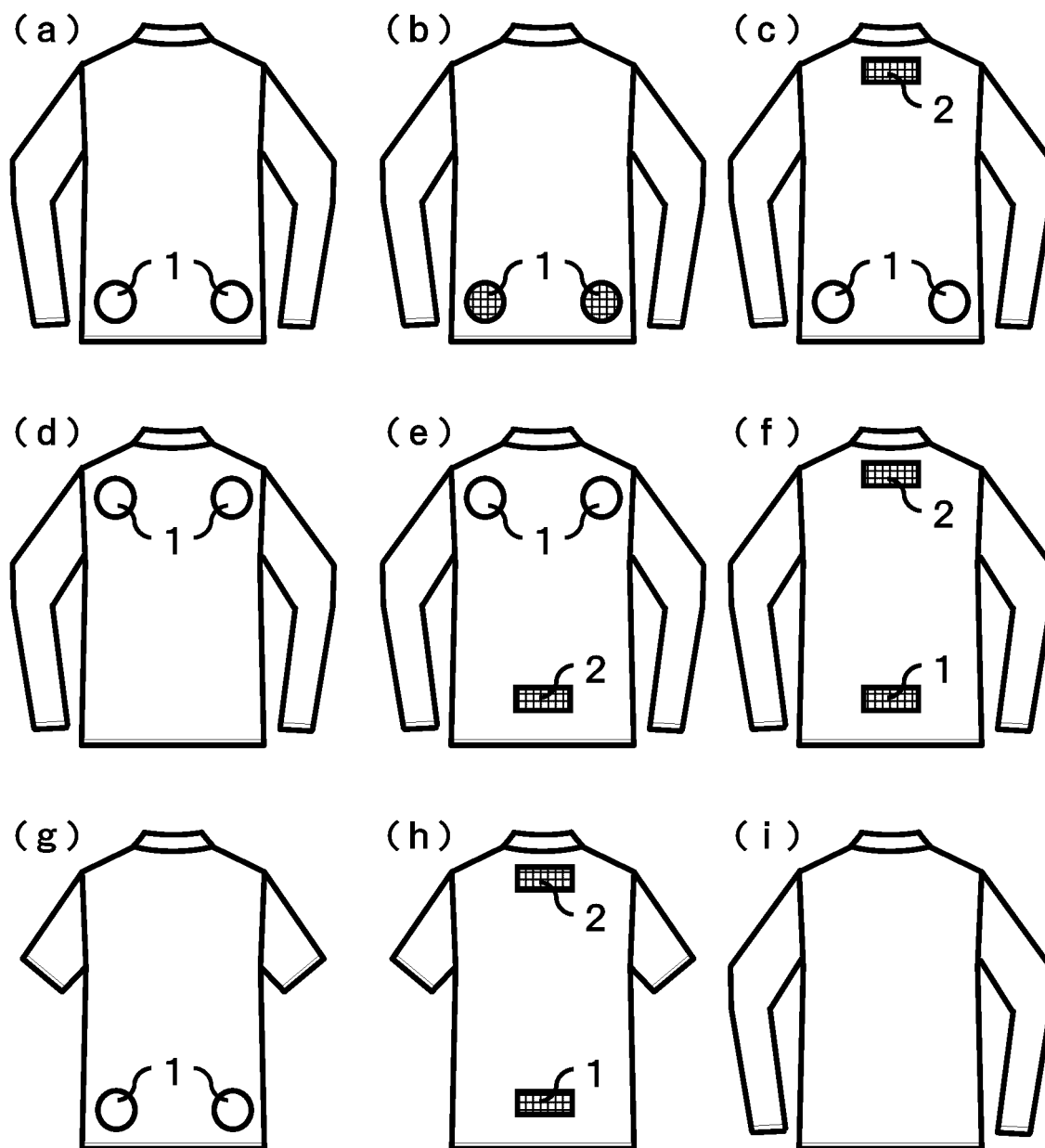


Fig. 1



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/029936

## A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. A41D13/002 (2006.01) i, A41D27/28 (2006.01) i, A41D31/12 (2019.01) i,  
A41D31/14 (2019.01) i  
FI: A41D27/28A, A41D27/28E, A41D27/28B, A41D31/14, A41D31/12, A41D13/002105  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
Int.Cl. A41D13/002, A41D27/28, A41D31/12, A41D31/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Published examined utility model applications of Japan 1922-1996  
Published unexamined utility model applications of Japan 1971-2020  
Registered utility model specifications of Japan 1996-2020  
Published registered utility model applications of Japan 1994-2020

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                       | Relevant to claim No. |
|-----------|--------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Y         | WO 2017/006481 A1 (SFT LABORATORY CO., LTD.) 12 January 2017 (2017-01-12), paragraphs [0015]-[0064], fig. 1-8            | 1-5                   |
| Y         | WO 2018/012318 A1 (TORAY INDUSTRIES, INC.) 18 January 2018 (2018-01-18), paragraphs [0023]-[0166], fig. 1-4              | 1-5                   |
| Y         | WO 02/067708 A1 (SFT LABORATORY CO., LTD.) 06 September 2002 (2002-09-06), page 5, line 1 to page 30, line 11, fig. 1-14 | 4-5                   |
| A         | JP 2019-127675 A (TEIJIN LTD.) 01 August 2019 (2019-08-01), entire text, all drawings                                    | 1-5                   |



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search  
20 October 2020

Date of mailing of the international search report  
27 October 2020

Name and mailing address of the ISA/  
Japan Patent Office  
3-4-3, Kasumigaseki, Chiyoda-ku,  
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2020/029936

WO 2017/006481 A1 12 January 2017 CN 107072334 A

WO 2018/012318 A1 18 January 2018 US 2019/0242033 A1  
paragraphs [0042]-[0168],  
fig. 1-4  
EP 3483312 A1  
CN 109415846 A  
KR 10-2019-0028643 A

WO 02/067708 A1 06 September 2002 US 2004/0083526 A1  
paragraphs [0028]-[0118], fig. 1-14

JP 2019-127675 A 01 August 2019 WO 2019/146363 A1  
entire text, all drawings

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- WO 2007004589 A [0005]
- WO 2017006481 A [0005]