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DESCRIPTION



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HIGH SHRINKAGE MACHINE SEWING THREAD

5 **Technical Field**

 The present invention relates to a machine sewing thread giving
good seam tightness. The high shrinkage machine sewing thread is
suitably used as a machine sewing thread used for sewing buttons, a
machine sewing thread for waterproof or windbreak products, and the like,
10 which need good durability and strong seam tightness.

Background Art

 The machine sewing threads are used in wide fields. And, the
machine threads need strong seam tightness for some uses from the
15 following reasons. (1). Fabrics to be sewed are strongly and closely brought
into contact with each other to enlarge the sewing strength. (2). The
opening of a seam is prevented to improve the appearance of the seam and
further prevent the leakage of air and water. (3). A machine sewing thread
is closely sewed to prevent the fray of the seam. And the like.

20 For example, for the uses of bar tacks for sewing and reinforcing the
sewed ends of seat belts, bags, shoes, or the like, strong seam tightness is
especially required from the reason (1). For the uses of waterproof or
windshield products such as tents or sheets, the strong seam tightness is
especially required from the reason (2). Further, for the uses of button
25 sewing or the like, the strong seam tightness is especially required from the
reason (3).

 So far, in uses requiring such the strong seam tightness, the strong
sewing tightness has been obtained by high-tension sewing methods.
However, the high-tension sewing methods have problems, for example, the
30 frequent occurrence of sewing troubles such as the deterioration of
sewability and the breakage of machine sewing needles, and the
deterioration of seam strength due to the damages of machine sewing
threads.

 On the other hand, for example, in JP-A 6-272128 (hereinafter, JP-A
35 means "Japanese Unexamined Patent Publication") and JP-A 8-199440, it

has been proposed that sewed fabrics are thermally treated with an iron or the like to shrink the machine sewing thread.

However, seam tightness has been able to be strengthened by such the methods using the high shrinkage machine sewing threads just after the sewing treatments, but the durability of the seam tightness has still been insufficient. Therefore, the improvement in the durability has been required.

Disclosure of the Invention

The object of the present invention is to provide a machine sewing thread having not only strong seam tightness but also the excellent durability of the seam tightness.

The above-described object can be achieved with the high shrinkage machine sewing thread of the present invention.

The high shrinkage machine sewing thread of the present invention is characterized by comprising one or more high shrinkage yarns having a heat shrinkage factor of not less than 5 % at a temperature of 100°C in a dry state and one or more fuzzed yarns having fuzzes on the yarn surfaces and having the maximum heat shrinkage stress of 0.1 to 0.5 cN / dtex at a temperature of 100 to 150°C in a dry state.

Therein, it is preferable on the acquisition of excellent sewability that the tensile strength of the machine sewing thread is in a range of 2 to 4 cN / dtex.

It is also preferable that the weight ratio of the high shrinkage yarns : the fuzzed yarns is 30 : 70 to 70 : 30.

In the high shrinkage machine sewing thread of the present invention, it is preferable that the high shrinkage yarns are the multifilament yarns of a copolyester prepared by copolymerizing polyethylene terephthalate with a third component. On the other hand, it is preferable that the fuzzed yarns are polyester spun yarns.

In the high shrinkage machine sewing thread of the present invention, it is preferable on the points of strong seam tightness and its durability that the high shrinkage yarns and the fuzzed yarns are primarily twisted at twisting rates of 100 to 1,200 T / m, respectively, and secondarily doubled at a twisting rate which is 50 to 95% of the primary

twisting rate.

Further, in the high shrinkage machine sewing thread of the present invention, it is preferable for obtaining the dyed high shrinkage machine sewing thread that the high shrinkage machine sewing yarn is
5 subjected to a known dyeing treatment and then stretched at the ordinary temperature.

Best Mode for Carrying Out the Invention

First, the high shrinkage yarns for forming the high shrinkage
10 machine sewing thread of the present invention is necessary to have a heat shrinkage factor of not less than 5% (preferably 10 to 50%) at a temperature of 100°C in a dry state. Said heat shrinkage factor smaller than 5% is not preferable because of not giving strong seam tightness. When having heat shrinkage factors of not less than 5% at a temperature of 100°C in a dry
15 state, conventional known fibers such as natural fibers, synthetic fibers, semi-synthetic fibers or their combination can arbitrarily be used as such the high shrinkage yarns. When it is considered that the acquisition of a prescribed maximum heat shrinkage stress is necessary for the machine sewing thread as described below, polyester fibers not or slightly thermally
20 set in a process for producing the fibers, or copolyester fibers comprising a polyester having ethylene terephthalate units as main repeating units and copolyesterized with a third component in an amount 8 to 30 percent by mole (based on terephthalic acid component) are preferably exemplified as the above-described fibers having the heat shrinkage factor in such the range.
25 Such the third component includes difunctional dicarboxylic acids such as isophthalic acid, naphthalenedicarboxylic acid, adipic acid, and sebacic acid, and diol compounds such as neopentyl glycol, butanediol, diethylene glycol, and propylene glycol. Further, if necessary, in a range not spoiling the object of the present invention, the above-described polyester may be mixed
30 with one or more additives selected from a micropore-forming agent, a cation dyeable agent, a coloration-preventing agent, a thermal stabilizer, a flame retardant, a fluorescent brightening agent, a delustering agent, a coloring agent, an antistatic agent, a moisture absorbent, an antimicrobial agent, inorganic fine particles, and the like.

35 Such the high shrinkage yarns may comprise filaments

(multifilament yarns) or staple fibers. In particular, the multifilament yarns are preferable for the strength of the machine sewing thread. If necessary, the high shrinkage yarns may further be subjected to a known air processing treatment such as an interlacing treatment or a Taslan processing treatment or to a known false-twisting treatment such as a spindle false-twisting treatment, a friction disk false-twisting treatment or a belt false-twisting treatment.

The total fineness and single fineness of the above-described high shrinkage yarn are especially not limited, but suitably 30 to 3,000 dtex and 1 to 10 dtex, respectively. The cross-sectional shape of each single fiber for forming the high shrinkage yarns is especially not limited, but a known cross-sectional shape such as a circular shape, a triangular shape or a hollow shape may be adopted. Furthermore, conjugate fibers may be used.

Next, the other fuzzed yarns for forming the high shrinkage machine sewing thread of the present invention are yarns having fuzzes on the yarn surfaces. Such the fuzzed yarns each preferably has 20 or more fuzzes having lengths of not less than 0.5 mm per cm of the length of the fuzzed yarn. And, the kind of the fuzzed yarns is especially not limited, but include ordinary spun yarns, the blend yarns of the ordinary spun yarns with multifilament yarns, and textured yarns or fancy yarns having fuzzes on the yarn surfaces. In particular, the ordinary spun yarns are preferable from the point of production cost and from a point giving excellent seam tightness durability which is the main object of the present invention.

The kind of the fibers for forming the above-described fuzzed yarns is especially not limited, but includes polyester fibers, rayon fibers and cotton. In particular, the polyester fibers are preferable from the point of the strength of the machine sewing thread. Particularly, it is preferable to use spun yarns comprising polyester staple fibers as the fuzzed yarns. Such the polyester may be mixed with one or more additives selected from a micropore-forming agent, a cation dyeable agent, a coloration-preventing agent, a thermal stabilizer, a flame retardant, a fluorescent brightening agent, a delustering agent, a coloring agent, an antistatic agent, a moisture absorbent, an antimicrobial agent, inorganic fine particles, and the like.

The tensile strength of each of the above-described fuzzed yarns is preferable to be not less than 2 cN / dtex (more preferably not less than 3.5

cN / dtex). Further, the fineness of each of said fuzzed yarns is especially not limited, but preferably in a range of 10 to 100 count. Additionally, the cross-sectional shape of each single fiber for forming the fuzzed yarns is especially not limited, but a known cross-sectional shape such as a circular shape, a triangular shape or a hollow shape may be adopted. Furthermore, said fuzzed yarns may be conjugate yarns.

The high shrinkage machine sewing thread of the present invention comprises the above-described one or more high shrinkage yarns and the above-described one or more fuzzed yarns. The form of the formed high shrinkage machine sewing thread includes (A) a thread prepared by doubling primarily twisted high shrinkage yarns with the primarily twisted fuzzed yarns, (B) a thread prepared by paralleling and primarily twisting the high shrinkage yarns and the fuzzed yarns and then paralleling and doubling the obtained twisted yarns, and (C) a core spun yarn or covered yarn prepared by disposing the fuzzed yarns as a sheath on the high shrinkage yarns as a core.

Especially, the high shrinkage machine sewing thread prepared by primarily twisting the high shrinkage yarns and the fuzzed yarns at twisting rates of 100 to 1,200 T / m (more preferably 300 to 1,000 T / m), respectively, and secondarily doubling the twisted high shrinkage yarns with the twisted fuzzed yarns at a twisting rate which is 50 to 95% (more preferably 60 to 80%) of the primary twisting rate is preferable from the points of strong seam tightness and its durability.

Therein, the above-described primary twisting treatment may be a spinning twisting treatment. When the primary twisting number of the high shrinkage yarns is different from the primary twisting number of the fuzzed yarns, it is preferable from the points of strong seam tightness and its durability to double the high shrinkage yarns with the fuzzed yarns at a twisting rate which is 50 to 95% (more preferably 60 to 80%) of the larger primary twisting rate.

When the above-described high shrinkage yarns and the above-described fuzzed yarns are used to produce the high shrinkage machine sewing thread, the number of the high shrinkage yarns and the number of the fuzzed yarns are especially not limited, but the combination of the former and the latter may be either of the combinations of the single

yarn and the single yarn, the single yarn and the yarns, the yarns and the single yarn, and the yarns and the yarns, respectively.

Next, the high shrinkage machine sewing thread of the present invention is necessary to have the maximum heat shrinkage stress of 0.1 to 05 cN / dtex (preferably 0.2 to 0.4 cN / dtex) at a temperature of 100 to 150°C in a dry state. Said maximum heat shrinkage stress smaller than 0.1 cN / dtex is not preferable, because strong seam tightness is not obtained due to the small shrinkage stress, when the machine sewing thread is thermally treated with a heating device such as an iron or a press at a sewing site. On the contrary, said maximum shrinkage stress exceeding 0.5 cN / dtex is also not preferable, because a sewed fabric may be damaged.

The machine sewing thread having such the maximum heat shrinkage stress is easily obtained by using polyester yarns not or slightly thermally set in a spinning process or the yarns of a copolyester obtained by copolymerizing polyethylene terephthalate with a third component, as the above-described high shrinkage yarns, and selecting proper production conditions.

Additionally, the maximum heat shrinkage stress of the present invention is the maximum heat stress value read in the range of 80 to 150°C from a heat stress-temperature curve measured with a heat stress measuring device made by Kanebo Engineering (Ltd.).

Next, it is preferable from the point of high sewability that the high shrinkage machine sewing thread of the present invention has a tensile strength of 2 to 4 cN / dtex (preferably 2.5 to 3.5 cN / dtex). When said tensile strength is smaller than 2 cN / dtex, the high sewability is liable not to be obtained. On the contrary, when said tensile strength exceeds 4 cN / dtex, the production cost is liable to be enhanced.

In the high shrinkage machine sewing thread of the present invention, the weight ratio of the above-described high shrinkage yarns : the above-described fuzzed yarns is especially not limited, and suitably selected in response to uses. For example, it is preferable that the weight ratio of the high shrinkage yarns is larger, when strong seam tightness is valued. On the other hand, when high sewability is valued, it is preferable that the weight ratio of the fuzzed yarns is larger. Generally, it is proper that the weight ratio of (the high shrinkage yarns : the fuzzed yarns) is 30 :

70 to 70 : 30 (more preferably 35 : 65 to 65 : 35).

Further, the high shrinkage machine sewing thread of the present invention may contain one or more other yarns such as low shrinkage multifilament yarns in a range not spoiling the object of the present invention.

The high shrinkage machine sewing thread of the present invention may be dyed or not. When the high shrinkage machine sewing thread is not dyed, the machine sewing thread comprising the above-described high shrinkage yarns and the above-described fuzzed yarns is obtained by suitably selecting the kinds of the yarns, the weight ratio of the high shrinkage yarns : the fuzzed yarns, and the like so that the maximum heat shrinkage stress of the machine sewing thread is controlled in the above-described range.

On the other hand, when the high shrinkage sewing thread is dyed, the high shrinkage sewing thread of the present invention is obtained by using the high shrinkage yarns having a heat shrinkage factor of not less than 5 % at a temperature of 100°C in a dry state and the fuzzed yarns having the fuzzes on the yarn surfaces to obtain the machine sewing thread, dyeing said machine sewing thread, and then stretching the machine sewing thread shrunk by the dyeing treatment at the ordinary temperature.

Therein, the stretch rate is suitably selected to control the maximum heat stress value of the stretched machine sewing thread in the above-described range. For example, when a large heat shrinkage stress value is desired, it is preferable to enlarge said stretch rate. However, when said stretch rate exceeds the shrinkage rate on the dyeing treatment, the damage of the yarn is liable to be caused. From the reason, it is usually suitable to control said stretch rate in a range of 5 to 50%.

Further, the above-described ordinary temperature means a temperature of 0 to 40°C at which a special heating or cooling treatment is not carried out.

The high shrinkage yarn is shrunk by the heating treatment on the dyeing treatment to stabilize the structure of the yarn, thereby extremely reducing the heat shrinkage stress. However, when the shrunk yarn is stretched at the ordinary temperature, the structure of the yarn is unstabilized to redevelop the shrinkage stress. The example of the

above-described dyeing method is preferably a hank dyeing method by which the high shrinkage yarn can sufficiently be shrunk.

As described above, the high shrinkage machine sewing thread of the present invention comprises the one or more high shrinkage yarns and the one or more fuzzed yarns and has a specific heat shrinkage stress. Therefore, when fabrics are sewed with the high shrinkage machine sewing thread and then thermally treated with an iron or the like in the seam portion, the machine sewing thread is shrunk to give the strong seam tightness. Further, by the "hooking effect" of the fuzzes contained in the high shrinkage machine sewing thread of the present invention, the slippage of the machine sewing thread on the fabrics is reduced, whereby it is prevented that the seam tightened by the shrinkage is loosed due to the slippage. Thus, the strong seam tightness is maintained for a long period. Simultaneously, excellent sewability is also added, because the fuzzes of the fuzzed yarns guard the machine sewing thread from heat and wear on the sewing treatment.

Examples

The examples and comparative examples of the present invention will be described in detail hereinafter, but the present invention is not limited by the examples and the comparative examples. Therein, measurement items in the examples were measured by the following methods, respectively.

<Dry heat shrinkage factor>

The heat shrinkage factor at a temperature of 100°C in a dry state was measured according to JIS L1013.

<Tensile strength>

The tensile strength (cN / dtex) was measured according to JIS L1013.

<Seam tightness>

A machine sewing thread was used to sew six serge fabrics, and the seam portion was steamed with a 150°C steam iron for one minute. The seam thread (machine sewing thread) was unsewed, and the shrinkage factor (%) of said seam thread was measured. The measured shrinkage factor was used as the substitute characteristic of the seam tightness.

<Seam tightness durability>

A machine sewing thread was used to sew six serge fabrics, and the seam portion was steamed with a 150°C steam iron for one minute. The sewed product was washed six times, and the quality of the seam tightness was visually judged. The evaluation was carried out at three stages: "superior", "normal", and "inferior". (n number = 15).

<Sewability>

A final sewing machine was used to sew two serge fabrics with a needle #14 at a speed of 3,000 spm for one minute. When the machine sewing thread was not broken, the result was evaluated as "good". On the other hand, when the machine sewing thread was broken, the result was evaluated as "bad"

[Example 1]

Undrawn filaments obtained by spinning polyethylene terephthalate copolymerized with isophthalic acid component in an amount of 10 percent by mole based on the total acid component and having an intrinsic viscosity of 0.64 were heated and drawn to prepare the 100 dtex / 36 filament high shrinkage yarn (heat shrinkage factor : 35% at 100°C in a dry state). The yarn was primarily twisted at a twisting rate of S1200 T / m.

On the other hand, a spun yarn comprising 64 / - count polyester staple fibers obtained from known polyethylene terephthalate by a conventional method was used as a fuzzed yarn. A spinning and twisting treatment (primary twist) of S1200 T / m had been applied to said spun yarn, and the spun yarn had 50 or more fuzzes having lengths of not less than 0.5 mm, per cm of the length.

Subsequently, two of the above-described primarily twisted high shrinkage yarns and one of the fuzzed yarn were paralleled, doubled at a twisting rate of Z1000 T / m, subjected to a hank dyeing treatment at 130°C for 30 minutes, subjected to a 20% stretching treatment at the ordinary temperature, and further subjected to the application of an oiling agent for machine sewing threads in an amount of 3 percent by weight to obtain the high shrinkage machine sewing thread of the present invention.

The high shrinkage yarns were taken out from said high

shrinkage machine sewing yarn, and the heat shrinkage factor of the taken high shrinkage yarns at 100°C in a dry state was measured. The measured heat shrinkage factor was 15%. The heat shrinkage stress of said high shrinkage machine sewing yarn was maximized at 100°C, and the maximum heat shrinkage stress was 0.3 cN / dtex. Further, the tensile strength of said high shrinkage machine sewing thread was 3 cN / dtex. The maximum heat shrinkage stress was obtained by measuring the heat stresses with a heat stress measurer made by Kanebo Engineering (Ltd.) and then reading the maximum heat shrinkage stress from the heat stress-temperature curve.

The seam tightness, seam tightness durability, and sewability of the obtained high shrinkage machine sewing thread were evaluated. The evaluated seam tightness, seam tightness durability, and sewability of the thread were 12%, "superior", and "good", respectively.

[Example 2]

Undrawn filaments obtained by spinning polyethylene terephthalate copolymerized with isophthalic acid component in an amount of 10 percent by mole based on the total acid component and having an intrinsic viscosity of 0.64 were heated and drawn to prepare the 100 dtex / 36 filament high shrinkage yarn (heat shrinkage factor : 35% at 100°C in a dry state). The yarn was primarily twisted at a twisting rate of S1200 T / m.

On the other hand, a spun yarn comprising 53 / - count polyester staple fibers obtained from known polyethylene terephthalate by a conventional method was used as a fuzzed yarn. A spinning and twisting treatment (primary twist) of S1200 T / m had been applied to said spun yarn, and the spun yarn had 40 or more fuzzes having lengths of not less than 0.5 mm, per cm of the length.

Subsequently, one of the above-described primarily twisted high shrinkage yarn and two of the fuzzed yarns were paralleled, doubled at a twisting rate of Z1000 T / m, subjected to a hank dyeing treatment at 130°C for 30 minutes, subjected to a 20% stretching treatment at the ordinary temperature, and further subjected to the application of an oiling agent for machine sewing threads in an amount of 3 percent by weight to obtain the

high shrinkage machine sewing thread of the present invention.

The high shrinkage yarn was taken out from said high shrinkage machine sewing yarn, and the heat shrinkage factor of the taken high shrinkage yarn at 100°C in a dry state was measured. The measured heat shrinkage factor was 14%. The heat shrinkage stress of said high shrinkage machine sewing yarn was maximized at 100°C, and the maximum heat shrinkage stress was 0.25 cN / dtex. Further, the tensile strength of said high shrinkage machine sewing thread was 2.8 cN / dtex. The maximum heat shrinkage stress was obtained by measuring the heat stresses with a heat stress measurer made by Kanebo Engineering (Ltd.) and then reading the maximum heat shrinkage stress from the heat stress-temperature curve.

The seam tightness, seam tightness durability, and sewability of the obtained high shrinkage machine sewing thread were evaluated. The evaluated seam tightness, seam tightness durability, and sewability of the thread were 10%, "superior", and "good", respectively.

[Comparative Example 1]

A machine sewing thread was obtained similarly as in Example 1 in conditions not using a fuzzed yarn and using only three high shrinkage yarns.

The heat shrinkage factor of said machine sewing thread at 100°C in a dry state was measured. The measured heat shrinkage factor was 20%. The heat shrinkage stress of said machine sewing yarn was maximized at 100°C, and the maximum heat shrinkage stress was 0.3 cN / dtex. Further, the tensile strength of said high shrinkage machine sewing yarn was 3.0 cN / dtex.

The seam tightness, seam tightness durability, and sewability of the obtained high shrinkage machine sewing thread were evaluated. The evaluated seam tightness, seam tightness durability, and sewability of the thread were 16%, "inferior", and "bad", respectively.

Industrial Applicability

The high shrinkage machine sewing thread of the present invention has not only strong seam tightness but also excellent seam

tightness durability. Therefore, the high shrinkage machine sewing thread of the present invention is suitably used as a machine sewing thread for sewing buttons, a machine sewing thread for waterproof or windbreak products or the like, which need strong seam tightness and good durability.

CLAIMS

What is claimed is:

1. A high shrinkage machine sewing thread characterized by comprising one or more high shrinkage yarns having a heat shrinkage factor of not less than 5 % at a temperature of 100°C in a dry state and one or more fuzzed yarns having fuzzes on the yarn surfaces and having the maximum heat shrinkage stress of 0.1 to 0.5 cN / dtex at a temperature of 100 to 150°C in a dry state.
2. The high shrinkage machine sewing thread according to Claim 1, wherein the tensile strength of the machine sewing thread is 2 to 4 cN / dtex.
3. The high shrinkage machine sewing thread according to Claim 1, wherein the weight ratio of the high shrinkage yarns : the fuzzed yarns is 30 : 70 to 70 : 30.
4. The high shrinkage machine sewing thread according to Claim 1, wherein the high shrinkage yarns are the multifilament yarns of a copolyester prepared by copolymerizing polyethylene terephthalate with a third component.
5. The high shrinkage machine sewing thread according to Claim 1, wherein the fuzzed yarns are polyester spun yarns.
6. The high shrinkage machine sewing thread according to Claim 1, wherein the high shrinkage yarns and the fuzzed yarns are primarily twisted at twisting rates of 100 to 1,200 T / m, respectively, and secondarily doubled at a twisting rate which is 50 to 95% of the primary twisting rate.
7. The high shrinkage machine sewing thread according to Claim 1, wherein the thread is subjected to a dyeing treatment and then stretched at the ordinary temperature.