

SEWING MACHINE FOR SEWING A WAISTBAND ON TROUSERS OR SKIRTS.

DESCRIPTION

This patent application for industrial invention relates to a sewing machine used for sewing a waistband on the upper edge of trousers or skirts.

The field of reference is the textile sector, and particularly the
5 realization of waistbands for trousers or skirts; namely, the term
“waistband” of trousers refers to the ending portion of the trousers or the
skirt where the belt loops are made.

Although the present invention was devised for sewing a
waistband on the upper edge of trousers or skirts, the same invention
10 can be used for all applications that require sewing two lateral parallel
edges of a fabric with different thickness. Otherwise said, the present
invention can be used for the realization of parts that have a similar
configuration to the one of trousers or skirts.

In order to better understand the field of application of the present invention, Figs. 1 to 2 show a conventional pair of trousers and a conventional waistband, in particular;

- Fig. 1 is a diagrammatic front view of a pair of trousers with
5 the waistband sewn on the trousers;

- Fig. 1A is a sectional view of the trousers and of the waistband of Fig. 1 taken along the plane IV-IV, wherein the waistband is shown according to a first embodiment;

- Fig. 1B is a sectional view of the trousers and of the
10 waistband of Fig. 1 taken along the plane IV-IV, wherein the waistband is shown according to a second embodiment;

- Fig. 2 is a top view of the waistband.

It is noted that trousers are made according to the shape of the human body, which is different for men and women. In particular,
15 reference is made to the shape of the pelvis, which is very different for men and women.

In view of the different shape of the hips in men and women, a special shape must be given to the waistband of trousers in order to obtain an anatomically designed waistband.

20 In particular, and especially in women, the human body has a truncated-conical shape in the hips, and a substantially rectilinear shape in the front (stomach) and in the back (back). Therefore, a waistband (C) must have a shape like the one shown in Fig. 2, which is composed of:

- two rectilinear ending portions (C11, C12) suitable for being in contact with the stomach of the user, which are joined with male-female fastening means, such as buttons and eyelets;

- two curvilinear portions (C21, C22) disposed in consecutive
5 position relative to said rectilinear ending portions (C11, C12), which are suitable for being in contact with the hips of a user;

- a rectilinear portion (C3) that joins the two curvilinear portions (C21, C22) and is suitable for being in contact with the back of a user.

With reference to Fig. 2, the waistband (C) comprises two
10 longitudinal sides (Cc, Cr).

The waistband (C) for trousers is realized in a separate piece and is then sewn on the trousers (L). In particular, the waistband (C) is made by providing a fabric that is folded along its longitudinal axis. The fabric can be folded in two different ways, thus obtaining two waistbands of
15 different type, as shown in Fig. 1A and 1B.

According to the embodiment of Fig. 1A, the waistband (C) has two borders (B) in correspondence of one of the two longitudinal sides.

According to the embodiment of Fig. 1B, the waistband (C) has two borders (B) for each longitudinal side (Cr, Cc) in correspondence of
20 the two longitudinal sides (Cr, Cc).

According to the two embodiments, before sewing the waistband (C) to the trousers (L), an upper edge (L1) of the trousers (L) is positioned between the two borders (B) of a longitudinal side (Cc, Cr) of the waistband (C).

Then, the waistband (C) is sewn by sewing the longitudinal side wherein the upper edge (L1) of the trousers (L) is disposed (joining seam) and by sewing the opposite longitudinal side (finishing seam).

It must be noted that, in the following description, the term “joining side” (Cc) refers to the longitudinal side of the waistband (C) wherein the
5 upper edge (L1) of the trousers (L) is disposed, whereas the term “finishing side” (Cr) refers to the longitudinal side in opposite position to said joining side (Cc).

According to the prior art, the sewing is made by means of an
10 ordinary sewing machine (100) comprising:

- a working station,
- a worktop,
- two needles, one for sewing the joining side and one for sewing the finishing side (it must be noted that sewing machines are
15 available on the market, which comprise additional needles that are used to sew the waistband to the trousers together with said two needles or to make decorative sewing on the waistband);
- a puller device that is disposed downstream the two needles and presses the fabrics (trousers and waistband) in order to
20 frictionally pull them along the worktop.

Two seams can be made by disposing the waistband and the trousers on the worktop and by pulling them with the puller device, namely one seam in the joining side (Cc) and one seam in the finishing side (Cr).

With reference to Figs. 1A and 1B, the joining side (Cc) and the finishing side (Cr) of the waistband (C) have a different thickness.

More particularly, the thickness of the joining side (Cc) is higher than the thickness of the finishing side (Cr) because the upper edge (L1) of the trousers (L), which is disposed between the two borders (B), increases the thickness of the joining side (Cc).

Such a difference in thickness results in a difference in the pressure exerted by the puller device against the two sides of the waistband, and consequently in a different traveling speed along the worktop of one side compared to the other side.

More precisely, the puller device exerts a higher pressure on the joining side (Cc) because of its higher thickness and therefore said joining side (Cc) will travel along the worktop with a higher speed than the finishing side (Cr).

Such a different speed of the two sides can be useful in order to sew the curvilinear portion (C21, C22) of the waistband (C) because the two sides (Cc, Cr) have a different length in correspondence of said curvilinear portion (C21, C22).

On the contrary, because of the different traveling speed, it is not possible to make two parallel seams while sewing a rectilinear portion (C11, C12, C3) because the puller device creates a misalignment of the two sides of the waistband (C) due to the different pressure exerted on the two sides (C). Such a misalignment must be necessarily compensated by an operator who is situated upstream the needles (A)

and performs a retention action on the side that travels faster, thus providing the same traveling speed of the two sides under the needles.

It must be noted that, while sewing the curvilinear portion (C21, C22) taking advantage of the different traveling speed of the two sides, 5 in order for sewing to be precise, complex additional devices must be used and moved either manually or automatically in order to correctly and constantly direct the fabrics upstream the needle.

Therefore, the sewing precision will depend on the action performed by said complex additional devices, which are difficult to use 10 and need to be programmed, if they are automatically operated; moreover, in such a case, the quality of the final result is largely affected by the accuracy of the programming operations.

In such a case, the operator cannot perform any manual operation in order to avoid a possible mistake. So, it will be necessary to 15 perform very accurate programming operations by means of specialized workers.

The purpose of the present invention is to provide a sewing machine that is capable of varying the relative traveling speed between two sides of a fabric, without the need to use the aforementioned 20 complex devices.

An additional purpose of the present invention is to provide a sewing machine that is capable of simultaneously making two parallel seams along a trajectory with rectilinear and curvilinear sections.

Another purpose of the present invention is to provide a sewing machine that is capable of making two opposite sides of a fabric with different thickness travel uniformly along a worktop.

Finally, another purpose of the present invention is to provide a sewing machine that, in addition to achieving the aforementioned purposes, can be used manually or can be programmed in a simple way in view of the simplicity of its innovative parts.

These purposes are achieved according to the invention with the characteristics of the appended independent claim 1.

Advantageous embodiments appear from the dependent claims.

The sewing machine according to the invention is defined by claim 1.

The advantages of the sewing machine according to the invention are evident. The provision of the movable top surface and of the translation means for said movable top surface permits to adjust the pressure exerted by the puller device on one side of the fabric (waistband), thus varying the relative traveling speed between the two sides of the fabric (waistband).

For the sake of clarity, the description of the sewing machine according to the invention continues with reference to the appended drawings, which only have a merely illustrative, not limiting value, wherein:

- Fig. 1 is a diagrammatic front view of a pair of trousers with the waistband sewn on the trousers;

- Fig. 1A is a sectional view of the trousers of Fig. 1, taken along the plane IV-IV, wherein the waistband is shown according to a first embodiment;
- Fig. 1B is a sectional view of the trousers of Fig. 1, taken
5 along the plane IV-IV, wherein the waistband is shown according to a second embodiment;
- Fig. 2 is a top view of a conventional waistband;
- Fig. 3 is a side view of the sewing machine according to the invention, wherein the puller device is in raised position and the
10 movable top surface is in retracted position;
- Fig. 4 is a side view of the sewing machine according to the invention, wherein the puller device is in lowered position and the movable top surface is in retracted position;
- Fig. 5 is a side view of the sewing machine according to
15 the invention, wherein the puller device is in lowered position and the movable top surface is in extracted position;
- Fig. 5A is an enlarged view of the detail of Fig. 5
- Fig. 6 is a front view of the sewing machine according to the invention, wherein said movable top surface is in extracted position;
- Fig. 7 shows a rectilinear fabric that is used for realizing the
20 waistband;
- Fig. 8 shows a waistband obtained with the fabric shown in Fig. 7 and sewn to a pair of trousers, wherein the waistband has curvilinear portions thanks to the sewing machine of the invention;

- Fig. 9 is the same as Fig. 8, except for the fact that it is provided with a central section with opposite concavity compared to the lateral curvilinear portions.

With reference to Figs. 3, 4, 5, 5A and 6, a sewing machine
5 according to the invention is disclosed, which is generally indicated with the reference numeral (100).

The sewing machine (100) of the invention was devised for sewing fabrics, in particular a waistband (C) to an upper edge of a pair of trousers (L) or of a skirt.

10 The sewing machine (100) comprises a working station (S) and a worktop (P) in correspondence of the working station (S), whereon the fabrics are disposed.

The sewing machine (100) comprises a sewing head (1) and two needles (A) supported by said sewing head (1).

15 Although only two needles (A) are shown in the appended figures, the sewing machine (100) can be also provided with additional needles (A) for decorative sewing.

Additionally, the sewing machine (100) comprises supporting and moving means (Q) for said needles (A). The supporting and moving
20 means are suitably configured in such a way that each needle (A) can be moved closer to or away from the worktop (P). Preferably, said supporting and moving means (Q) are configured in such a way to move the two needles (A) synchronously. The supporting and moving means (Q) for said needles (A) can be also configured in such a way to move

the needles (A) along a vertical, a horizontal and a parallel direction relative to the sewing direction.

With reference to Figs. 3, 4, 5 and 6, the sewing machine (100) comprises a puller device (8) disposed in said working station (L) downstream said needles (A).

The puller device (8) pulls the fabrics along the worktop (P). The puller device (8) consists in a device that presses the fabrics in order to frictionally pull them along the worktop (P).

The sewing machine (100) also comprises a motor suitable for activating the puller device (8) in order to pull the fabrics along the worktop (P).

Said puller device (8) consists in a wheel (80) or in a set of wheels (80) that is/are driven into rotation by driving means, such as a belt that transmits the motion from the motor to the wheel (80) or to the wheels (80) of the puller device (8). With reference to Fig. 6, in particular the puller device (8) comprises two joint wheels (80), of which one wheel is aligned with a needle (A) and the other wheel is aligned with the other needle (A). The edge of the wheels (80) presses the fabric or fabrics.

Alternatively, the puller device (8) can directly coincide with the belt of the driving means, which presses the fabric or fabrics with its external edge.

The puller device (8) can be in a raised position (shown in Fig. 3), wherein said puller device (8) is raised and is not in contact with the fabrics, and in a lowered position (shown in Fig. 5) wherein said puller

device (8) is lowered and is in contact with the fabric or fabrics in such a way to pull the fabric or fabrics along the worktop (P). The puller device (8) is moved between said lowered position and said raised position by moving means (M).

5 Advantageously, the sewing machine (100) is also provided with a claw (not shown in the appended figures) disposed on the worktop (P) under the needles (A); the claw is synchronized with the movement of the needles (A) and cooperates with the puller device (8) when pulling the fabric or fabrics along the worktop (P).

10 The sewing machine (100) comprises a foot or multiple feet (3) disposed in the point where said needles (A) make the sewing.

 The foot or feet (3) press the fabrics against the claw and cooperate to move the fabric or fabrics along the worktop (P).

 The peculiarity of the sewing machine (100) according to the
15 invention consists in the fact that it comprises a movable top surface (5) disposed on the worktop (P) downstream the two needles, in aligned position with one of the two needles (A) and under the puller device (8), in such a way to cooperate with said puller device (8) when pulling the fabrics.

20 In order to move the movable top surface (5), the sewing machine (100) comprises translation means (50) that are suitable for disposing the movable top surface (5) between a retracted position (shown in Fig. 4), wherein the movable top surface (5) is under or flush with said worktop (P), and an extracted position (shown in Fig. 5), wherein said

movable top surface (5) protrudes from said worktop (P) and presses the fabrics against the puller device (8).

Preferably, the translation means (50) are configured in such a way to dispose the movable top surface (5) in the retracted position, in
5 the extracted position, and also in a set of intermediate positions between said retracted position and said extracted position, so that said movable top surface (5) presses the fabric or fabrics against the puller device (8) with a higher or lower force.

Therefore, by moving the movable top surface (5), it is possible to
10 vary the pressure exerted on the waistband (C) against the edge of the wheel (80). In particular, by raising the movable top surface (5), the pressure of the waistband (C) against the edge of the wheel (80) is increased and therefore the edge of the wheel (80) can have a higher grip on the waistband (C), thus pulling the waistband (C) along the
15 worktop (P) at a higher speed.

For illustrative purposes, said translation means (50) for said movable top surface (5) consist in linear actuators of mechanical type (screw/worm, cam), electromechanical type (step-by-step motor connected to a female screw whereon a worm slides), hydraulic type or
20 pneumatic type.

The translation means (50) of the movable top surface (5) can be activated in a programmed way by programming a work cycle of a control unit that is operatively connected to said translation means.

Alternatively, the translation means (50) can be activated manually by means of an activation device, such as a button or a knob.

By moving the movable top surface (5) from the retracted position to the extracted position, the movable top surface (5) exerts an
 5 increasingly higher pressure against the edge of the wheel (80).

The provision of the movable top surface (5) permits to vary the traveling speed of a longitudinal side (Cc, Cr) of a fabric.

In particular, by placing the attention on the sewing of the waistband (C) on an upper edge (L1) of a pair of trousers (L), moving the
 10 movable top surface (5) between the lowered position and the raised position, the traveling speed of the finishing side (Cr) can be varied.

More precisely, by raising the movable top surface (5) in aligned position with the needle (A) that sews the finishing side (Cr) – which has a lower thickness than the joining side (Cc) - the difference in thickness
 15 between the two longitudinal sides (Cr, Cc) can be compensated, in such a way that the two longitudinal sides (Cr, Cc) can travel at the same speed along the worktop (P). In fact, the movable top surface (5) tends to press the finishing side (Cr) against the edge of the wheel (80) of the puller device (8), so that the joining side (Cc) and the finishing side
 20 (Cr) are equally in contact with the edge of the wheel (80). In this way, being equally in contact with the two sides, the edge of the wheel (80) pulls the two sides at the same speed along the worktop (P) and under the needles (A).

On the contrary, by lowering the movable top surface (5), the edge of the wheel (80) of the puller device (8) is in contact with the two longitudinal sides (Cc, Cr) in a different way. In particular, the edge of the wheel (80) is in contact with higher pressure against the joining side (Cc) compared to the finishing side (Cr) and therefore the joining side (Cc) is pulled with a higher speed compared to the finishing side (Cr).

Following is a description of a process for realizing a waistband (C) and for sewing said waistband (C) to an upper edge (L1) of a pair of trousers (L).

10 Firstly, the process provides for realizing said waistband (C) by cutting a fabric provided with multiple portions (C11, C21, C22, C12, C3), namely:

- two rectilinear ending portions (C11, C12), and specifically a first rectilinear ending portion (C11) and a second rectilinear ending portion (C12);

- two curvilinear portions (C21, C22) disposed in consecutive position with respect to said rectilinear ending portions (C11, C12), and specifically a first curvilinear portion (C21) in consecutive position with respect to said first rectilinear ending portion (C11), and a second curvilinear portion (C22) in consecutive position to said second rectilinear ending portion (C12);

- one rectilinear portion (C3) that joins the two curvilinear portions (C21, C22).

With reference to Fig. 1A, 1B and 2, the waistband (C) has two longitudinal sides (Cr, Cc), and specifically a joining side (Cc) and a finishing side (Cr). Two borders (B) are provided on the joining side (Cc) or on the two longitudinal sides (Cr, Cc).

5 After realizing the waistband (C), the upper edge (L1) is disposed in contact with the waistband (C).

In particular, the upper edge (L1) is positioned between two borders (B) of the waistband (C).

When the upper edge (L1) is disposed between the two borders
10 (B), the waistband (C) and the trousers (L) are disposed on the worktop (P) under the feet, with a portion disposed under the puller device (8).

Then, the puller device (8) is moved from its raised position to its lowered position (by means of the moving means (M)), in such a way that the edge of the wheel (80) of the puller device (8) is in contact with
15 the waistband (C) and the trousers (L) disposed on the worktop (P). The motor of the puller device (8) is actuated in order to sew the waistband (C) and the needles (A) are moved by activating said supporting and moving means.

The sewing of the waistband (C) to an upper edge (L1) of the
20 trousers (L) provides for raising and/or lowering the movable top surface (5) when sewing said waistband (C) to said upper edge (L1).

More precisely, the sewing of the first rectilinear ending portion (C11) is obtained by raising the movable top surface (5), in such a way that the movable top surface (5) pushes the finishing side (Cr) against

the edge of the wheel (80) of the puller device (8), thus compensating the difference in thickness between the two longitudinal sides (Cr, Cc), the wheel (80) exerts the same pressure on the two longitudinal sides (Cr, Cc), which are pulled along the worktop (P) at the same speed.

5 After finishing the first rectilinear ending portion (C11), the movable top surface (5) is lowered in order to sew the first curvilinear portion (C21).

The movable top surface (5) is lowered in order to benefit from the different thickness between the two longitudinal sides (Cr, Cc) in order to make the joining side (Cc) travel at a higher speed than the
10 finishing side (Cr).

With reference to Fig. 2, the joining side (Cc) has a higher length than the finishing side (Cr) in the curvilinear portions (C21, C22) and therefore, in order to provide the simultaneous movement of the two
15 sides, the joining side (Cc) must travel at a higher speed compared to the finishing side (Cr).

Likewise, for sewing the rectilinear portion (C3), the second curvilinear portion (C22) and the second rectilinear portion (C12), the movable top surface (5) is first raised, then lowered and raised again.

20 By providing multiple intermediate positions of the movable top surface (5) between the first position and the second position, it is possible to adjust the traveling speed of the finishing side (Cr) as desired, thus obtaining the curvilinear portions of the waistband.

Although in Fig. 2 the fabric used for the waistband (C) has curvilinear portions and rectilinear portions, the fabric may be completely rectilinear, and the curvature can be generated while sewing the fabric on the trousers (L), raising and lowering the movable top surface (5).

5 In particular, Figs. 7 and 8 show a fabric (T) with a substantially rectangular shape, which is suitable for being sewn as a waistband on a pair of trousers (L). By means of the sewing machine (100) according to the invention, said waistband (C) will be an “anatomically designed” waistband after sewing the waistband (C) to the trousers (L) with the
10 sewing machine (100) of the invention, as shown in Fig. 7; the expression “anatomically designed waistband” refers to a waistband that is not completely straight, and is provided with curvilinear portions (G1, G2) suitable for being disposed in the sides (L1, L2) of the trousers (L).

Moreover, it must be noted that, by means of the movable top
15 surface (5), by pressing the side of fabric or of the waistband (C) with a higher or lower force compared to the other side of the fabric or of the waistband (C), a waistband (C) or a fabric with curvilinear portions and opposite concavities can be obtained.

With reference to Fig. 9, by means of the sewing machine of the
20 invention, an anatomically designed waistband can be realized; in addition to said curvilinear portions (G1, G2), said anatomically designed waistband comprises a rear central portion that is suitable for embracing the lumbar region of a user and is provided with an opposite concavity compared to the one of the curvilinear portions (G1, G2).

The provision of said rear central portion will increase the comfort of the user in wearing the trousers.

If the sewing machine comprises only one movable top surface in correspondence of one of the two needles (A), in order to realize said rear central portion with opposite concavity compared to the two curvilinear portions (G1, G2) it will be simply necessary to raise the movable top surface (5) above the height that is used to realize a rectilinear portion of the waistband.

On the contrary, if the sewing machine comprises two movable top surfaces (5), each of them in correspondence of one of the needles (A), it will be simply necessary to alternatively raise or lower one of said movable top surfaces (5) to realize a waistband provided with curvilinear portions with opposite concavities.

Numerous equivalent variations and modifications, which are within the reach of an expert of the field and fall in any case within the scope of the invention as disclosed by the appended claims, can be made to the present embodiment of the invention.

For illustrative purposes, instead of only one movable top surface (5), the sewing machine (100) can be provided with two movable top surfaces (5) in side-by-side position, of which one is aligned with a needle (A), and the other is aligned with the other needle (A), in such a way to adjust the traveling speed of the two longitudinal sides (Cr, Cc) of the waistband (C), thus achieving a higher versatility of the sewing machine (100).

CLAIMS

1) Sewing machine (100) for sewing fabrics, in particular a waistband (C) to an upper edge of a pair of trousers (L) or of a skirt; said sewing machine (100) comprising:

- a working station (S);
- 5 - a worktop (P) in correspondence of said working station (S) whereon the fabrics are positioned and disposed;
- a sewing head (1);
- two needles (A) that are supported by said sewing head (1) in side-by-side position;
- 10 - supporting and moving means (Q) for said needles (A); said supporting and moving means being suitably configured in such a way that each needle (A) can be moved closer to or away from the worktop (P);

- a puller device (8) that is disposed in said working station (S) downstream said needles (A) and pulls said fabrics along the worktop (P); said puller device (8) consisting in a device that presses the fabrics in order to frictionally pull the fabrics along the worktop (P); said
 5 puller device (8) being suitable for being in a raised position, wherein said puller device (8) is raised and is not in contact with the fabrics, and in a lowered position, wherein said puller device (8) is lowered and is in contact with the fabrics in such a way to pull the fabrics along the worktop (P);

10 - a motor for the activation of the puller device (8);
 - moving means (M) for said puller device (8); said moving means (M) moving the puller device (8) between said raised position and said lowered position;

characterized in that it comprises;

15 - a movable top surface (5) disposed on the worktop (P) downstream and in aligned position with one of the two needles (A); said movable top surface (5) being disposed under the puller device (8);

- translation means (50) for said movable top surface (5) that are suitably configured so that the movable top surface (5) can be
 20 disposed between a retracted position, wherein the movable top surface (5) is under or flush with said worktop (P), and an extracted position, wherein said movable top surface (5) protrudes from said worktop (P).

2) The sewing machine (100) of claim 1, wherein said translation means (50) are suitably configured in such a way to dispose

the movable top surface (5) in a set of intermediate positions between said retracted position and said extracted position, so that said movable top surface (5) presses the fabric or fabrics against the puller device (8) with a higher or lower force.

5 3) The sewing machine (100) of any one of the preceding claims, comprising two movable top surfaces (5), and specifically one in aligned position with a needle (A) and the other one in aligned position with the other needle (A).

 4) The sewing machine (100) of any one of the preceding
10 claims, wherein said puller device (8) comprises a wheel (80) that presses with its edge on the fabric when said puller device (8) is in lowered position.

 5) The sewing machine (100) of claim 4, comprising driving means to transmit the motion from the motor to the wheel (80) of the
15 puller device (8).

 6) The sewing machine (100) of any one of the preceding claims, comprising a foot (3) disposed in the point where the sewing is made by said needle (A).

 7) The sewing machine (100) of any one of the preceding
20 claims, comprising a claw disposed on the worktop (P) under the needles (A); said claw cooperating with the puller device (8) in order to pull the fabrics along the worktop (P).

 8) Sewing process for sewing a waistband (C) to an upper edge (L1) of a pair of trousers (L) or of a skirt by means of a sewing

machine (100) according to any one of claims 1 to 7; said process providing for raising and/or lowering the movable top surface (5) while sewing said waistband to said upper edge (L1).

- 9) Trousers (L) obtained with the process according to claim 8.
- 10) Skirt obtained with the process according to claim 8.