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(11)

EP 1 683 901 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.07.2006 Bulletin 2006/30

(51) Int Cl.:
D05B 47/00 (2006.01) D05B 47/04 (2006.01)

(21) Application number: **05000476.1**

(22) Date of filing: **12.01.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

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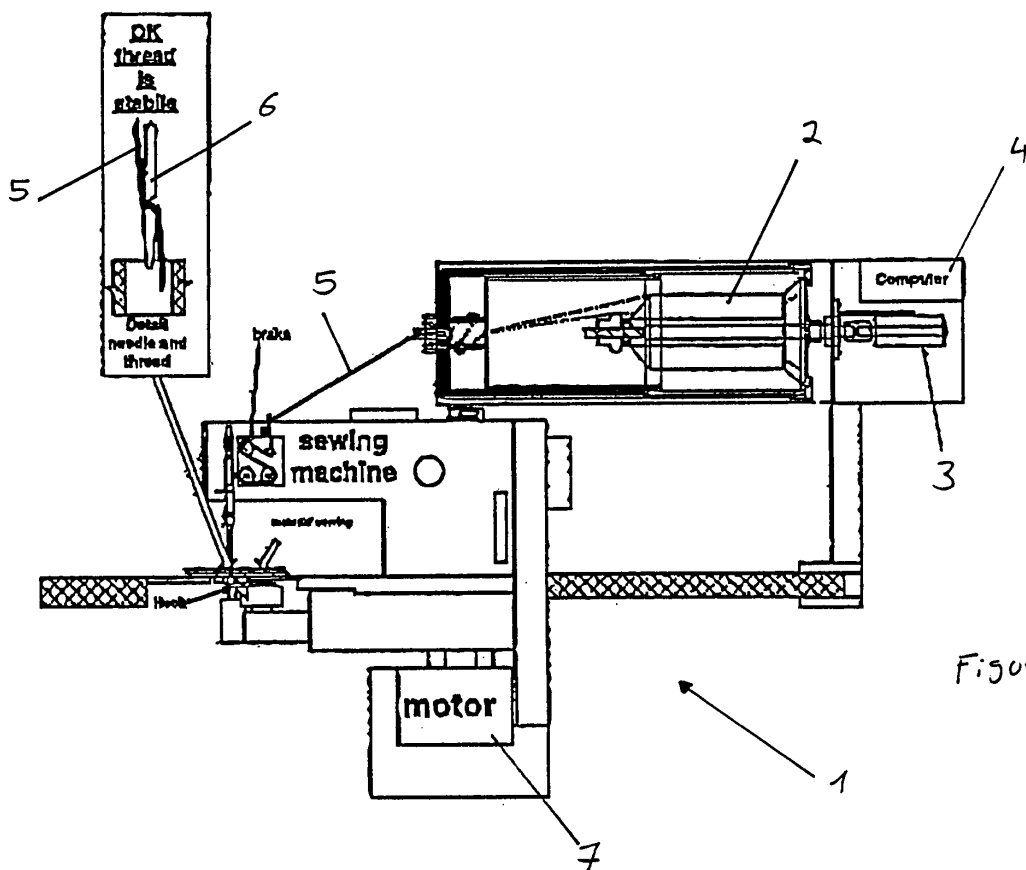
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(54) Improved sewing machine

(57) The present invention is related to a sewing apparatus with a needle, a thread and a bobbin, whereas the thread is guided from the bobbin to the needle. The

present invention is furthermore related to a sewing process and the use of the inventive sewing machine and the inventive sewing process.



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Description

[0001] The present invention is related to a sewing apparatus with a needle, a thread and a bobbin, whereas the thread is guided from the bobbin to the needle. The present invention is furthermore related to a sewing process and the use of the inventive sewing machine and/or the inventive sewing process.

[0002] On a standard sewing machine, the sewing thread is guided from a bobbin to the needle through a number of tension brakes and/or guides. With every contact to these tension brakes or guides, the natural twist of the thread is deformed. These deformation is worsened by the variation in sewing speed, especially at the beginning and at the end of a seam. All this results in a rise of the flattening effect on the thread and the original twist tends to be collected before the first barrier on the sewing machine, usually the tension brake, as the so called over twist. After a couple of sewing cycles, the collected over twist of the thread creates a knot which either causes the rupture of the thread or the knot slips through the needle eye and remains on the sewing seam. The knot is in fact a loop of sewing thread distorted/twisted to the form of a knot and when the product is in use, the knot cannot unwind itself, the thread breaks when stretched and the sewing seam opens thus creating a hole in the seamed product. This is especially a problem when the knot appears in an airbag seam where the knot can endanger the functionality of the airbag. Therefore, all products with knots especially within airbag constructions must be repaired or must be scrapped.

[0003] It is therefore the objective of the present invention to provide a sewing machine on which the creation of knots is at least reduced.

[0004] This problem is solved with a sewing machine according to claim 1. Preferred embodiments of the inventive sewing machine are claimed in claims 2 to 7.

[0005] It was totally surprising for a person skilled in the art, that the creation of knots during the sewing process are significantly reduced with the inventive sewing machine. Sewn products, that have to be repaired or that are scrapped are drastically reduced. The inventive sewing machine is produced and operated easily.

[0006] According to the present invention, the speed of rotation of the bobbin is controlled. In a preferred embodiment the present invention, the speed of rotation of the bobbin is adjusted to the speed of the sewing machine; i. e. both speeds are synchronised. The synchronisation of both speeds ensures balanced unwinding of the sewing thread from the bobbin without creation of an over-twisted loops in the sewing thread.

[0007] Preferably, the rotation of the bobbin is controlled such, that the natural twist of the thread is neither increased nor decreased significantly but the rotation of the bobbin can be controlled also in such a way that the effect of increased or decreased twist is achieved on purpose for special applications

[0008] In another preferred embodiment, the thread is

inspected by some type of detection means, for example a camera. As soon as the detection means discover the formation of a knot, the speed of rotation of the bobbin is either increased or reduced in order to eliminate the knot.

[0009] Preferably, the bobbin is rotated by motor means. Thus, the speed of rotation of the bobbin can be controlled by the motor. It is preferably achieved by a computer, which is even more preferably also connected to the motor of the sewing machine and is able to synchronise the speed of the sewing machine and the speed the motor that rotates the bobbin.

[0010] In a preferred embodiment of the present invention, the thread axially is drawn of the bobbin.

[0011] In an other preferred embodiment, the thread is tangentially drawn of the bobbin.

[0012] Preferably, the bobbin is arranged horizontally but it can be arranged also vertically.

[0013] An other subject matter of the present invention is sewing process, whereas a thread is taken from a bobbin and guided to a needle, whereas the speed of rotation of the bobbin is controlled during the sewing.

[0014] With the inventive process, the formation of knots during the sewing process is significantly reduced. The inventive process is carried out easily.

[0015] According to the present invention, the speed of rotation of the bobbin is controlled during the sewing. Preferably, the rotation of the bobbin is controlled such, that the natural twist of the thread is neither increased nor decreased significantly. Thus, preferably, the speed of rotation of the bobbin is synchronized with the sewing speed.

[0016] Preferably, the thread is drawn from the bobbin either axially or tangentially.

[0017] The inventive sewing machine and/or the inventive process can be used for the sewing of any kind of product. However, the inventive sewing machine and/or the inventive process are especially valuable for sewing processes for the production of the security relevant products.

[0018] The use of the inventive sewing machine and/or the inventive process for the production of parts in the automotive industry is therefore another subject matter of the present invention.

[0019] Preferably, the inventive sewing machine or the inventive process are used to produce parts made of fabric and/or leather. More preferably, the inventive sewing machine and/or the inventive process are used to produce parts of airbag moduls.

[0020] The inventive sewing machine and the inventive process are now explained in more detail with figure 1. These explanations do not limit the scope of protection of the present inventions.

[0021] Figure 1 shows the inventive sewing machine, which comprises a bobbin 2 on which a thread 5 is coiled. During the sewing, the fabric (not depicted) is transported into or out of the papers plane. During this transportation, the fabric is sewn. Therefore, the thread 5 is uncoiled of

the bobbin 2 and a seam (not depicted) is produced by the needle 6. The sewing machine comprises a motor 7 to actuate the needle and/or to transport the fabric. Another motor 3 is connected to the bobbin 2 in order to activate the bobbin 2 rotatively.

[0022] According to the present invention, the speed of rotation of the motor and the sewing speed of the sewing machine are synchronized. This is preferably achieved by a computer 4 that gets a signal from motor 7 that indicates the sewing speed; i. e. especially the speed of motion of the needle 6. The computer produces an output signal that is transferred to motor 3 in order to control this motor and consequently the speed of rotation of the bobbin 2. Preferably, the synchronization is carried out such, that the natural twist of the bobbin remains essentially unchanged during the sewing process.

Reference signs

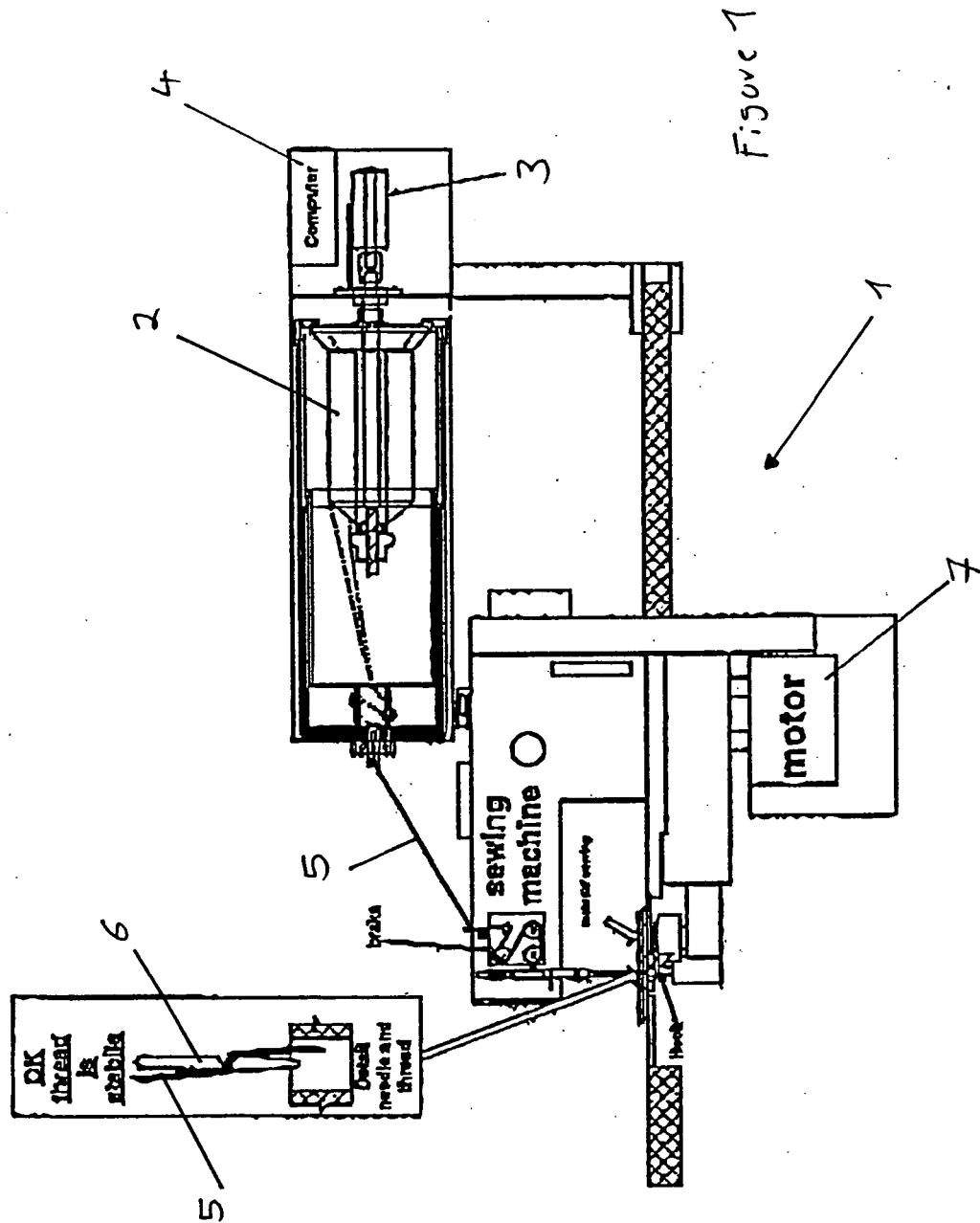
[0023]

- 1 sewing machine
- 2 bobbin
- 3 motor
- 4 computer
- 5 thread
- 6 needle
- 7 motor

Claims

1. Sewing apparatus with a needle, a thread and a bobbin, whereas the thread is guided from the bobbin to the needle, **characterized in, that** the bobbin rotates during the unwind of the thread and that the speed of rotation of the bobbin is controlled. 35
2. Sewing machine according to claim 1, **characterized in, that** the speed of rotation is adjusted to the speed of the sewing machine. 40
3. Sewing machine according to one of the preceding claims, **characterized in, that** the bobbin is rotated by motor means. 45
4. Sewing machine according to claim 3, **characterized in that** the speed of rotation of the bobbin is controlled by the motor. 50
5. Sewing machine, according to one of the preceding claims, **characterized in, that** the thread is drawn of the bobbin axially.
6. Sewing machine, preferably according to one of claims 1 - 4, **characterized in, that** the thread is drawn of the bobbin tangentially. 55

7. Sewing machine, according to one of the preceding claims, **characterized in, that** the bobbin is arranged horizontally or vertically.
- 5 8. Sewing process, whereas a thread is taken from a bobbin and guided to a needle, **characterized in, that** the speed of rotation of the bobbin is controlled during the sewing.
- 10 9. Sewing process, according to claim 8, **characterized in, that** the speed of rotation of the bobbin is controlled according to the sewing speed.
- 15 10. Sewing process, according to one of the preceding claims, **characterized in** the thread is drawn from the bobbin axially or tangentially.
- 20 11. Use of the sewing machine or the process according to one of the preceding for the production of sewn parts in general.
- 25 12. Use according to claim 11, **characterized in, that** the parts are made of fabric, leather, artificial leather, paper, plastics, foams or combination of those materials.
- 30 13. Use according to claim 12, **characterized in that** the parts are parts from airbag modules.





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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search Munich		Date of completion of the search 3 June 2005	Examiner Herry-Martin, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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