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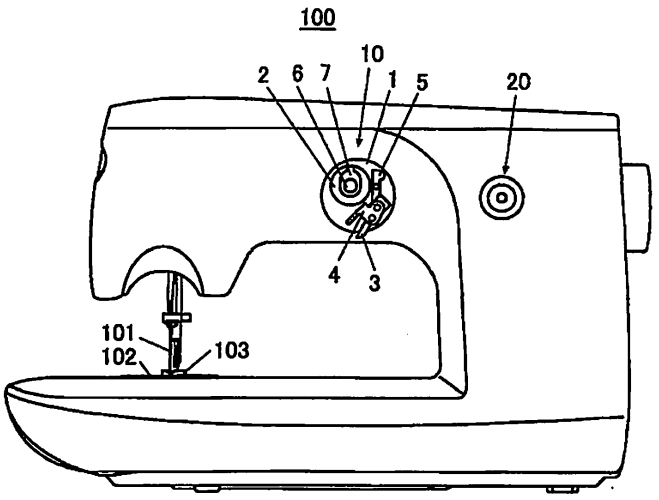
(54) Thread winding device of sewing machine

(57) There is provided a thread winding device of a sewing machine. The thread winding device includes a base portion, a driving shaft, a rotating member, a clamp member, a resistance applying member, and an operating member. The driving shaft is rotatable interlockingly with a driving source. The rotating member is supported rotatably on the base portion interlockingly with the driving shaft and having a shaft portion for removably holding a bobbin. The clamp member is supported on the rotating member and interposes a tip of a thread together with the rotating member. The resistance applying member is engageable to temporarily apply a resistance to the thread toward the clamp member. The operating member moves the resistance applying member to a position in which the thread is engaged with the resistance applying member and a position in which the thread is not engaged with the resistance applying member.

FIG. 1



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Description

FIELD

[0001] The present invention relates to a thread winding device of a sewing machine.

BACKGROUND

[0002] There is known a thread winding device of a sewing machine for obtaining a driving force from a main shaft of the sewing machine to be rotated and driven by means of a sewing machine motor, thereby winding a bobbin thread upon a bobbin (see JP-A-2009-183706, for instance).

[0003] The thread winding device includes a clamp portion for holding a thread and serves to interpose one of ends of the thread in the clamp portion, and to set the bobbin onto a thread winding shaft and to rotate them, thereby winding the thread.

[0004] When a winding start part is tightly wound to increase an amount of thread winding in the thread winding device, one of ends of the thread in the winding start part is pulled out of the clamp portion so that the winding start part cannot be wound tightly because of a small holding force of the clamp portion.

[0005] As a countermeasure, the holding force of the clamp portion is increased so that the thread in the winding start part can be prevented from being pulled out of the clamp portion.

[0006] When the thread is to be interposed in the clamp portion having the holding force increased, however, it is necessary to apply a higher tension to the thread on a thread supply source side. In other words, if a load (tension) is applied to the thread by only the related-art thread tensioner, the thread is simply sent out of the thread supply source. For this reason, it is hard to interpose the thread in the clamp portion.

SUMMARY

[0007] It is an object of an exemplary embodiment of the invention to provide a thread winding device of a sewing machine which can engage a thread in a winding start part, thereby interposing the thread easily through a clamp portion having a holding force increased.

[0008] A first aspect of the embodiment is directed to a thread winding device of a sewing machine, the thread winding device including

a base portion (1) disposed fixedly to a surface of a machine frame of a sewing machine;

a driving shaft (6) which is rotatable interlockingly with a driving source;

a rotating member (2) supported rotatably on the base portion interlockingly with the driving shaft and having a shaft portion for removably holding a bobbin;

a clamp member (7) which is supported on the rotating member and interposes a tip of a thread to be supplied from a predetermined thread supply source and wound upon the bobbin between the clamp member and the rotating member;

a resistance applying member (5) which is engageable to temporarily apply a resistance to the thread supplied from the thread supply source toward the clamp member; and

an operating member (3) configured to move the resistance applying member to a position in which the thread is engaged with the resistance applying member and a position in which the thread is not engaged with the resistance applying member.

[0009] A second aspect of the embodiment is directed to the thread winding device which has the same structure as that of the first aspect of the embodiment, and is characterized in that the resistance applying member has a guiding portion (5a) for guiding the thread supplied from the thread supply source toward the clamp member so as to be bent, and an interposing portion (5b) for interposing the thread that is passed through the guiding portion between an engaging surface provided in the base portion and the interposing portion.

[0010] A third aspect of the embodiment is directed to the thread winding device which has the same structure as that of the first or second aspect of the embodiment, and further includes a thread winding amount detecting member (4) supported to enable approach and separation with respect to a thread winding portion of the bobbin, and configured to abut on the thread wound upon the bobbin held in the shaft portion and to detect that a thread winding amount becomes proper according to a thickness of the wound thread,

wherein the resistance applying member is supported to be rotated integrally with the thread winding amount detecting member and, when winding the thread on the bobbin starts, rotates and shifts to an arrangement in which the thread hung on the resistance applying member is removed in association with rotation of the thread winding amount detecting member toward a shaft portion side.

[0011] A fourth aspect of the embodiment is directed to the thread winding device which has the same structure as that of the third aspect of the embodiment, and is characterized in that an abutting surface (1b) is formed in the base portion, the abutting surface for stopping the resistance applying member at a predetermined rotation angle when the thread winding amount detecting member detects that the amount of the thread wound upon the bobbin becomes proper.

[0012] A fifth aspect of the embodiment is directed to the thread winding device of a sewing machine which has the same structure as that of the third or fourth aspect of the embodiment, and further includes a stopper mechanism (8,9) which stops the rotating member at a predetermined rotation angle when the thread winding amount detecting member detects that the amount of the thread wound upon the bobbin becomes proper.

[0013] A sixth aspect of the embodiment is directed to the thread winding device which has the same structure

as that of the first aspect of the embodiment, and is characterized in that the rotating member, the clamp member and the resistance applying member are configured to be supported on the base portion.

[0014] A seventh aspect of the embodiment is directed to the thread winding device which has the same structure as that of the third aspect of the embodiment, and is characterized in that the resistance applying member is provided in a lever member configured to be operated to approximate the thread winding amount detecting member to the thread winding portion of the bobbin.

[0015] An eighth aspect of the embodiment is directed to a thread winding device of a sewing machine, the thread winding device including:

a base portion (1) disposed fixedly to a surface of a machine frame of a sewing machine;
a driving shaft (6) which is rotatable interlockingly with a driving source;
a rotating member (2) supported rotatably on the base portion and coupled to the driving shaft;
a shaft portion (6) which is rotatable integrally with the rotating member and supports a bobbin having a thread winding portion;
a clamp member (7) supported on the rotating member and having an elastic force which interposes a tip of a thread to be supplied from a predetermined thread supply source and to be wound upon the thread winding portion of the bobbin between the clamp member and the rotating member;
a thread winding amount detecting member (4) which is supported rotatably on the base portion to approach or separate with respect to the thread winding portion of the bobbin supported on the shaft portion and is normally held in a separate position;
a lever member (3) configured to be operated to rotate the thread winding amount detecting member from the separate position to an abutting position with respect to the thread winding portion of the bobbin; and
a resistance applying member (5) supported to enable rotating operation integrally with the lever member,
wherein the resistance applying member is provided with:

an interposing portion (5b) configured to interpose the thread supplied from the thread supply source toward the clamp member between the interposing portion and the rotating member in the separate position and to release the thread in the abutting position; and
a guiding portion (5a) that causes the thread between the interposing portion and the thread supply source to be engageable in the separate position and to release the engagement in the abutting position.

A ninth aspect of the embodiment is directed to the thread winding device which has the same structure as that of the eighth aspect of the embodiment, and is characterized in that the resistance applying member is configured by a slender plate material,
the interposing portion is formed in a tip part of the slender plate material,
the guiding portion has a semispherical smooth surface protruded from an intermediate part of the slender plate material, and
in the guiding portion, a groove portion is formed on the semispherical smooth surface, the groove portion capable of engaging the thread between the interposing portion and the thread supply source in the separate position.

[0016] According to the first or second aspects of the embodiment, the resistance applying member temporarily applies a resistance to the thread before the thread is engaged with the rotating member in the thread winding device of a sewing machine. When pulling the thread out of the thread supply source side toward the rotating member, therefore, it is possible to prevent the thread from being excessively sent out. Consequently, it is possible to appropriately apply a force to the thread, thereby interposing the thread between the rotating member and the clamp member easily.

[0017] Even if the clamp member for interposing one of the ends of the thread in a winding start part together with the rotating member is changed to be stronger, the resistance applying member applies a resistance to the thread to be engaged with the rotating member, thereby enabling a regulation so as to prevent the thread from being excessively sent out and interposing the thread between the rotating member and the clamp member reliably with one hand.

[0018] According to the third aspect of the embodiment, when the operation for winding the thread upon the bobbin held in the shaft portion is to be started in the thread winding device of a sewing machine, the resistance applying member is rotated integrally with the thread winding amount detecting member so that the thread hung on the resistance applying member is removed if the thread winding amount detecting member is rotated toward the shaft portion side in order to cause the thread winding amount detecting member to abut on the peripheral surface of the thread to be wound upon the bobbin. Consequently, it is possible to quickly wind the thread.

[0019] According to the fourth aspect of the embodiment, the resistance applying member can be stopped at the predetermined rotation angle with a simple structure.

[0020] According to the fifth aspect of the embodiment, when the thread winding amount detecting member detects that the amount of the thread wound upon the bobbin becomes proper, the stopper mechanism stops the rotating member at the predetermined rotation angle.

Consequently, it is possible to always stop the rotating member in the same posture.

[0021] If the rotating member is stopped in the same posture at the predetermined rotation angle, the portion of the rotating member which engages the thread always has the same arrangement. When a next thread winding operation is to be carried out, therefore, it is possible to engage the thread with the rotating member without regulating the angle of the rotating member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] A general configuration that implements the various features of the invention will be described with reference to the drawings. The drawings and the associated descriptions are provided to illustrate embodiments of the invention and should not limit the scope of the invention.

Fig. 1 is a front view showing a sewing machine including a thread winding device.

Fig. 2 is a perspective view showing the thread winding device of the sewing machine according to the embodiment.

Fig. 3 is an explanatory view showing a state in which a thread is hung on a resistance applying member in the thread winding device according to the embodiment.

Figs. 4A to 4C are explanatory views showing a process for removing the thread from the resistance applying member to start a thread winding operation according to the embodiment. Fig. 4A is an explanatory view showing a state in which the thread is removed from a guiding portion of the resistance applying member. Fig. 4B is an explanatory view showing a state in which the thread is removed from an interposing portion of the resistance applying member. Fig. 4C is an explanatory view showing a state in which the thread is started to be wound upon a bobbin held by a rotating member

Fig. 5 is an explanatory view showing a state in which the thread is ended to be wound upon the bobbin in the thread winding device according to the embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0023] An exemplary embodiment for carrying out the invention will be described below with reference to the drawings. Although various restrictions which are technically preferable for carrying out the invention are imposed on the embodiment which will be described below, the scope of the invention is not restricted to the following embodiment and illustrated examples.

[0024] A sewing machine 100 includes a needle driving mechanism, a cloth feeding mechanism and a shuttle mechanism which are driven by rotation of a main shaft (not shown) to which a driving force is transmitted from a sewing machine motor serving as a driving source, which is not shown. The needle driving mechanism vertically drives a needle 101 through which a needle thread is inserted. The thread feeding mechanism delivers a workpiece such as a cloth which is mounted on a throat plate 102 and is pressed by a cloth presser 103 synchronously with the needle driving mechanism. The shuttle mechanism has a rotating shuttle and a bobbin which is accommodated in the shuttle and upon which a bobbin thread is wound, and entangles the needle thread with the bobbin thread in cooperation with the needle 101 below the throat plate 102 through the rotation of the shuttle. Since the mechanisms of the sewing machine are the same as the conventional well-known mechanisms, they will not be described in detail in the embodiment.

[0025] The sewing machine 100 is provided with a thread winding device 10 for previously winding the bobbin thread upon the bobbin. The bobbin is an ordinary commercial product having a structure in which a thread is wound upon a shaft-shaped thread winding portion.

[0026] As shown in Fig. 1, the thread winding device 10 of the sewing machine is provided on a side surface of a machine frame in an arm portion of the sewing machine 100 and a thread tensioner 20 for applying a tension to a needle thread is provided in the vicinity of the thread winding device 10.

[0027] As shown in Fig. 2, the thread winding device 10 includes a base member 1 serving as a backing member which is fixed to the surface of the machine frame of the sewing machine 100, a rotating member 2 supported rotatably with respect to the base member 1, a lever member 3 serving as an operating member which is supported rotatably with respect to the base member 1, and a thread winding amount detecting member 4 and a resistance applying member 5 which are fixed to the lever member 3 and are rotated integrally with the lever member 3. The base member 1 may be directly formed integrally with the surface of the machine frame of the sewing machine 100, and the base member 1 and the case of the formation on the surface of the machine frame will be generally referred to as a base portion.

[0028] The base member 1 has an engaging surface 1a and an abutting surface 1b on a surface. The engaging surface 1a is formed on an end face (a surface) in an axial direction along a rotating direction of the resistance applying member 5 which will be described below and the abutting surface 1b is linked to the engaging surface 1a and is orthogonal to the rotating direction of the resistance applying member 5.

[0029] The rotating member 2 is coupled to a tip of a driving shaft 6 which is connected to a main shaft to be rotated and driven by a sewing machine motor and is rotatable, which is not shown. As shown in Fig. 2, a surface of the rotating member 2 is almost disk-shaped and a shaft portion 6a holding a bobbin B removably is protruded concentrically with the driving shaft 6. The rotating member 2 is rotated by a rotation of the driving shaft 6 in thread winding.

[0030] A clamp member 7 to be an elastic plate material fixed to an end face at a tip side in an axial direction of the rotating member 2 is disposed to be extended in a radial direction to pass through an axis of the shaft portion 6a, and a tip of the clamp member 7 is provided with a thread guarding portion 7a which is opposed to the engaging surface 1a.

[0031] Moreover, a thread engaging portion 2a is formed on the end face (surface) at the tip side in the axial direction of the rotating member 2. The thread engaging portion 2a is formed to be lower with a slight step over a rotating path of the thread guarding portion 7a.

[0032] A tip of a thread to be supplied from a predetermined thread supply source (for example, the thread tensioner 20 side) and wound upon the bobbin B held in the shaft portion 6a is interposed between the rotating member 2 and the clamp member 7, and the thread is engaged with the rotating member 2 by an elastic force of the clamp member 7. In the embodiment, great tightening between the rotating member 2 and the clamp member 7 is designed to increase the elastic force of the clamp member 7 in order to enhance a holding force for interposing the thread between the rotating member 2 and the clamp member 7.

[0033] A support shaft 3A which is parallel with the driving shaft 6 is supported rotatably with respect to the base member 1.

[0034] The lever member 3 is fixed to a tip part of the support shaft 3A and is rotated around an axis of the support shaft 3A.

[0035] The lever member 3 is coupled to an energizing mechanism (not shown) through the support shaft 3A, for example. The lever member 3 is rotated by an energizing force of a spring through the energizing mechanism.

[0036] For example, the lever member 3 is energized to be rotated clockwise when it is positioned in a clockwise direction from a predetermined fulcrum, and the lever member 3 is energized to be rotated counterclockwise when it is positioned in a counterclockwise direction from the predetermined fulcrum. The fulcrum of the lever member 3 corresponds to a rotating position of the lever member 3 positioned when the thread wound upon the bobbin B on the shaft portion 6a reaches a predetermined thread winding amount.

[0037] The thread winding amount detecting member 4 is fixed to the lever member 3 and has a thread presser 4a opposed to a thread winding portion of the bobbin B held on the shaft portion 6a at a tip thereof. The thread winding amount detecting member 4 is rotated to cause the thread presser 4a to approach the shaft portion 6a when the lever member 3 is rotated in the clockwise direction of Fig. 2.

[0038] The slender resistance applying member 5 is fixed to a back side of the lever member 3 and is rotated integrally with the lever member 3. As shown in Fig. 2, the resistance applying member 5 has a guiding portion 5a protruded from a surface of an intermediate part in a longitudinal direction and an interposing portion 5b formed in a tip part in the longitudinal direction.

[0039] The guiding portion 5a is disposed in a protrusion in a path for the needle thread supplied from a thread supply source (for example, the thread tensioner 20 side) toward the thread engaging portion 2a of the rotating member 2, and serves to guide the needle thread to be bent.

[0040] The guiding portion 5a has a smooth surface taking a hemispherical shape as shown in Fig. 3, and the thread tends to slip in the spherical part. However, a thread groove 5c for guarding a thread is formed in a notch in a radial direction within a predetermined circumferential range in a part of the guiding portion 5a, and the thread can be hung on the thread groove 5c portion.

[0041] The interposing portion 5b interposes the needle thread passing through the guiding portion 5a between the interposing portion 5b and the engaging surface 1a of the base member 1.

[0042] As shown in Figs. 2 and 3, when the thread winding amount detecting member 4 detects that the amount of the thread wound upon the bobbin B becomes proper and the thread winding amount detecting member 4 and the resistance applying member 5 are rotated in the counterclockwise direction, the abutting surface 1b of the base member 1 abuts on the resistance applying member 5 to engage the thread winding amount detecting member 4 with the resistance applying member 5 at a predetermined rotation angle. Furthermore, the engaging surface 1a is disposed opposite to the interposing portion 5b of the resistance applying member 5 engaged at the predetermined rotation angle, and can interpose a thread T passing through the guiding portion 5a.

[0043] The resistance applying member 5 temporarily applies a resistance to the thread hung on the resistance applying member 5 before the thread to be wound upon the bobbin B is engaged with the rotating member 2.

[0044] As shown in Fig. 2, moreover, a cam member 8 having an engaging groove 8a formed thereon is fixed to the driving shaft 6, and a pawl member 9 having an engaging pawl 9a formed thereon is fixed to the support shaft 3A.

[0045] When the lever member 3 is rotated counterclockwise (Fig. 2), the pawl member 9 rotated counterclockwise together with the lever member 3 comes in contact with a peripheral surface of the cam member 8. A one-way clutch device (not shown) is disposed between the driving shaft 6 and the main shaft of the sewing machine to stop the rotation of the driving shaft 6a through an engagement of the engaging pawl 9a of the pawl member 9 with the engaging groove 8a of the cam member 8. For example, when the engaging pawl 9a is engaged with the engaging groove 8a, the driving operation of the main shaft of the sewing machine (not shown) is not stopped but a transmission of a driving force from the main shaft to the driving shaft 6 is interrupted to stop the rotation of the rotating member 2 together with the driving shaft 6.

[0046] By stopping the driving operation of the main shaft of the sewing machine (not shown) in a timing in which the pawl member 9 is engaged with the cam member 8, it is also possible to stop the rotation of the rotating member 2 together with the driving shaft 6.

[0047] In particular, the cam member 8 provided on the driving shaft 6 and the pawl member 9 provided on the support shaft 3A function as a stopper mechanism for stopping the rotating member 2. When the rotation of the rotating member 2 is to be stopped, the stopper mechanism can stop the rotating member 2 at a predetermined rotation angle at which the thread engaging portion 2a of the rotating member 2 is placed above.

[0048] The thread tensioner 20 includes a pair of thread tension discs, a spring for pressing the mutual thread tension discs, and an adjusting screw for adjusting a pressing force of the spring, for example.

[0049] The thread tensioner 20 serves to apply a load to the thread passing through a portion between the thread tension discs, thereby regulating a tension to be applied to the thread.

[0050] The driving shaft 6 and the support shaft 3A are extended in the machine frame of the sewing machine 100.

[0051] Next, description will be given to a procedure for winding the thread T upon the bobbin B by means of the thread winding device 10 of the sewing machine.

[0052] The thread winding device 10 in Fig. 2 is set into a state in which the lever member 3 is fully turned counterclockwise. In this state, the pawl member 9 is engaged with the cam member 8 and is stopped in a predetermined position (at a rotation angle) in which the thread engaging portion 2a of the rotating member 2 is placed above. Moreover, the interposing portion 5b of the resistance applying member 5 comes in contact with the abutting surface 1b of the base member 1. Furthermore, the thread groove 5c of the resistance applying member 5 is positioned on a left and lower side in Fig. 2 and is placed in a position in which the thread T between the thread tensioner 20 and the interposing portion 1a can be engaged.

[0053] An operator inserts the thread T supplied from a predetermined thread supply source through the thread tensioner 20 and pulls the thread T from the thread tensioner 20 toward the thread winding device 10.

[0054] First of all, the operator hangs the thread T pulled out of the thread tensioner 20 side on the thread groove 5c of the guiding portion 5a of the resistance applying member 5 as shown in Fig. 3.

[0055] Next, the operator pulls the thread T toward the interposing portion 5b side placed above the guiding portion 5a and interposes the thread T between the interposing portion 5b of the resistance applying member 5 and the base member 1.

[0056] The guiding portion 5a of the resistance applying member 5 is positioned on a lower side of the thread engaging portion 2a of the rotating member 2. Therefore, the thread T supplied from the thread tensioner 20 toward the thread engaging portion 2a is bent by the guiding portion 5a. Moreover, the thread T supplied from the guiding portion 5a to the interposing portion 5b goes around from a surface having the guiding portion 5a in the resistance applying member 5 to a back face at an opposite side and is thus pressed between the interposing portion 5b and the base member 1. Consequently, the thread T is laid over the resistance applying member 5 in an almost N shape.

[0057] Subsequently, the operator pulls the thread T laid over the guiding portion 5a and the interposing portion 5b in the resistance applying member 5 toward the thread engaging portion 2a of the rotating member 2 and interposes one of ends of the thread T between the thread engaging portion 2a and the thread guarding portion 7a.

[0058] In that case, the thread T is bent to take an almost N shape and is laid over the resistance applying member 5. Therefore, a resistance such as a friction is applied from the resistance applying member 5 to the pulled thread T so that the thread T is supplied from the thread tensioner 20 side with difficulty.

[0059] In other words, also in a state in which tightening between the thread guarding portion 7a of the clamp member 7 and the thread engaging portion 2a of the rotating member 2 is great and the thread T is interposed between the thread engaging portion 2a and the thread guarding portion 7a with difficulty, a resistance is applied from the resistance applying member 5 to the thread T, thereby interposing the thread T hung on the resistance applying member 5 between the thread guarding portion 7a and the thread engaging portion 2a. Thus, a proper tension is applied to the thread T so that the thread T can be prevented from being excessively sent out and the thread T can easily be interposed and engaged between the thread engaging portion 2a and the thread guarding portion 7a.

[0060] Then, the operator engages one of the ends of the thread T between the thread engaging portion 2a of the rotating member 2 and the thread guarding portion 7a of the clamp member 7, and thereafter attaches the bobbin B to the shaft portion 6a of the rotating member 2.

[0061] Subsequently, the operator rotates the lever member 3 clockwise to disengage the pawl member 9 from the cam member 8 in order to start to wind the thread T upon the bobbin B. If the operator rotates the lever member 3 in the clockwise direction from a predetermined fulcrum, the lever member 3 is rotated by means of an energizing mechanism (not shown) so that the thread winding amount detecting member 4 and the resistance applying member 5 are rotated integrally with the lever member 3 until the thread presser 4a of the thread winding amount detecting member 4 abuts on a central axis of the bobbin B.

[0062] The clockwise rotation of the lever member 3 will be described stepwise based on Figs. 4A, 4B and 4C.

[0063] The lever member 3 is rotated clockwise so that the resistance applying member 5 is rotated clockwise. Consequently, the arrangement of the guiding portion 5a

of the resistance applying member 5 is switched so that the position of the thread groove 5c is gradually turned upward. As shown in Fig. 4A, the arrangement is switched in such a manner that the thread groove 5c is positioned above. Consequently, the thread T slips out of the thread groove 5c and comes in contact with the spherical guiding portion 5a. The thread T coming in contact with the guiding portion 5a is removed from the guiding portion 5a to slide over the spherical part of the guiding portion 5a.

[0064] When the lever member 3 is rotated clockwise, furthermore, the resistance applying member 5 is separated from the base member 1 so that a clearance is formed as shown in Fig. 4B. Consequently, the thread T interposed between the interposing portion 5b of the resistance applying member 5 and the base member 1 is removed.

[0065] When the lever member 3 is rotated clockwise, thus, the thread winding amount detecting member 4 is rotated toward the bobbin B side of the shaft portion 6a and the resistance applying member 5 is also rotated to carry out switching into an arrangement in which the thread T hung on the resistance applying member 5 is removed. Then, a tension is applied to the thread T engaged with the thread engaging portion 2a of the rotating member 2 by means of the thread tensioner 20.

[0066] When the lever member 3 is fully rotated clockwise, the thread presser 4a of the thread winding amount detecting member 4 rotated clockwise together with the lever member 3 abuts on the central axis of the bobbin B as shown in Fig. 4C. Moreover, the pawl member 9 rotated clockwise together with the lever member 3 is separated from the cam member 8 so that the engagement is released. Consequently, the driving force of the main shaft of the sewing machine (not shown) is transmitted to the driving shaft 6 so that the driving shaft 6 is rotated and driven.

[0067] Subsequently, the driving shaft 6 is rotated and driven so that the rotating member 2 and the shaft portion 6a are rotated to wind the thread T upon the bobbin B rotated together with the rotating member 2 and the shaft portion 6a.

[0068] In a process in which the rotating member 2 is rotated so that the thread T is wound upon the bobbin B, the thread presser 4a of the thread winding amount detecting member 4 continuously abuts on the thread T wound upon the bobbin B. With an increase in the thickness of the wound thread, the thread presser 4a is pushed back to be separated from the central axis of the bobbin B.

[0069] With a gradual increase in the thread winding amount of the bobbin B, the thread presser 4a is separated from the shaft portion 6 of the rotating member 2 so that the thread winding amount detecting member 4 is rotated counterclockwise and the lever member 3 is also rotated counterclockwise together with the thread winding amount detecting member 4.

[0070] When the thread T in a proper thread winding amount is wound upon the bobbin B, the lever member 3 rotated integrally with the thread winding amount detecting member 4 (the thread presser 4a) abutting on the peripheral surface of the thread T wound upon the bobbin B reaches a predetermined fulcrum. Therefore, an energizing direction of the lever member 3 through an energizing mechanism (not shown) is switched from the clockwise direction into the counterclockwise direction. As shown in Fig. 5, the thread winding amount detecting member 4 and the resistance applying member 5 are rotated counterclockwise integrally with the lever member 3, and furthermore, the pawl member 9 is also rotated counterclockwise so that the pawl member 9 and the cam member 8 are engaged with each other. In other words, the thread presser 4a of the thread winding amount detecting member 4 abutting on the peripheral surface of the thread T wound upon the bobbin B detects that the thread winding amount in the bobbin B becomes proper so that the energizing direction of the lever member 3 through the energizing mechanism (not shown) is switched from the clockwise direction into the counterclockwise direction and the pawl member 9 and the cam member 8 are thus engaged with each other.

[0071] By the engagement of the pawl member 9 with the cam member 8, the rotation of the rotating member i2 is stopped so that the thread is ended to be wound upon the bobbin B. Then, the thread winding device 10 is brought into a stopping state at a predetermined rotation angle at which the thread engaging portion 2a of the rotating member 2 is positioned above.

[0072] Thus, the work for winding the thread upon the bobbin B in the thread winding device 10 of the sewing machine is completed.

[0073] As described above, the thread winding device 10 of the sewing machine hangs the thread T on the resistance applying member 5 before engaging one of the ends of the thread T in a winding start part with the rotating member 2. Consequently, it is possible to apply a resistance to the thread T pulled toward the thread engaging portion 2a of the rotating member 2.

[0074] In other words, even if the clamp member 7 for interposing the thread T in the winding start part is changed to be stronger in the thread winding device 10, it is possible to regulate the thread T so as not to be excessively sent out by applying a resistance to the thread T to be engaged with the rotating member 2 through the resistance applying member 5. Thus, it is possible to reliably engage the thread T between the thread engaging portion 2a and the thread guarding portion 7a with one hand.

[0075] When the operation for winding the thread T upon the bobbin B is to be started in the thread winding device 10, moreover, the lever member 3 is rotated clockwise in order to cause the thread presser 4a of the thread winding amount detecting member 4 to abut on the peripheral surface of the thread T to be wound upon the central shaft of the bobbin B. By rotating the resistance applying member 5 together with the lever member 3,

consequently, it is possible to remove the thread T hung on the resistance applying member 5.

[0076] In other words, when winding the thread T upon the bobbin B, the thread T is sent out through the thread tensioner 20. Consequently, it is possible to carry out the thread winding operation depending on the tension to be applied to the thread T by the thread tensioner 20.

[0077] When the thread presser 4a of the thread winding amount detecting member 4 abutting on the peripheral surface of the thread T wound upon the bobbin B detects that the thread winding amount in the bobbin B becomes proper, the rotation of the rotating member 2 is stopped to end the operation for winding the thread upon the bobbin B. Therefore, the thread winding device 10 can wind the thread T in a proper amount upon the bobbin B.

[0078] In particular, the clamp member 7 of the thread winding device 10 can be stronger than that in the related-art clamp member. Therefore, it is possible to wind the thread T by applying a higher tension than that in the related art. By tightly winding the thread T upon the bobbin B, it is possible to increase the amount of the thread wound upon the bobbin B. As a result, it is possible to enhance an operation efficiency of the sewing machine 100 by decreasing the number of exchanges of the bobbin B in the sewing machine 100. Consequently, it is possible to enhance a productivity of the sewing machine 100.

[0079] The application of the invention is not restricted to the embodiment but changes can be appropriately made without departing from the scope of the invention.

[0080] For example, although the description has been given to the example in which the thread tensioner 20 is disposed between the resistance applying member 5 and the thread supply source, the thread tensioner may be omitted.

[0081] Although the description has been given to the structure in which the resistance applying member 5 is rotated integrally with the lever member 3 (the thread winding amount detecting member 4), moreover, it is also possible to employ a structure in which the resistance applying member can be independently rotated.

Claims

1. A thread winding device of a sewing machine, the thread winding device comprising:

   a base portion disposed fixedly to a surface of a machine frame of a sewing machine;
   a driving shaft which is rotatable interlockingly with a driving source;
   a rotating member supported rotatably on the base portion interlockingly with the driving shaft and having a shaft portion for removably holding a bobbin;
   a clamp member which is supported on the rotating member and interposes a tip of a thread to be supplied from a predetermined thread supply source and wound upon the bobbin between the clamp member and the rotating member;
   a resistance applying member which is engageable to temporarily apply a resistance to the thread supplied from the thread supply source toward the clamp member; and
   an operating member configured to move the resistance applying member to a position in which the thread is engaged with the resistance applying member and a position in which the thread is not engaged with the resistance applying member.

2. The thread winding device of claim 1, wherein the resistance applying member has a guiding portion for guiding the thread supplied from the thread supply source toward the clamp member so as to be bent, and an interposing portion for interposing the thread that is passed through the guiding portion between an engaging surface provided in the base portion and the interposing portion.

3. The thread winding device of claim 1 or 2, further comprising a thread winding amount detecting member supported to enable approach and separation with respect to a thread winding portion of the bobbin, and configured to abut on the thread wound upon the bobbin held in the shaft portion and to detect that a thread winding amount becomes proper according to a thickness of the wound thread,
   wherein the resistance applying member is supported to be rotated integrally with the thread winding amount detecting member and, when winding the thread on the bobbin starts, rotates and shifts to an arrangement in which the thread hung on the resistance applying member is removed in association with rotation of the thread winding amount detecting member toward a shaft portion side.

4. The thread winding device of claim 3, wherein an abutting surface is formed in the base portion, the abutting surface for stopping the resistance applying member at a predetermined rotation angle when the thread winding amount detecting member detects that the amount of the thread wound upon the bobbin becomes proper.

5. The thread winding device of claim 3 or 4, further comprising a stopper mechanism which stops the rotating member at a predetermined rotation angle when the thread winding amount detecting member detects that the amount of the thread wound upon the bobbin becomes proper.

6. The thread winding device of claim 1, wherein the rotating member, the clamp member and the resist-

ance applying member are configured to be supported on the base portion.

7. The thread winding device of claim 3, wherein the resistance applying member is provided in a lever member configured to be operated to approximate the thread winding amount detecting member to the thread winding portion of the bobbin.

8. A thread winding device of a sewing machine, the thread winding device comprising:

a base portion disposed fixedly to a surface of a machine frame of a sewing machine;
a driving shaft which is rotatable interlockingly with a driving source;
a rotating member supported rotatably on the base portion and coupled to the driving shaft;
a shaft portion which is rotatable integrally with the rotating member and supports a bobbin having a thread winding portion;
a clamp member supported on the rotating member and having an elastic force which interposes a tip of a thread to be supplied from a predetermined thread supply source and to be wound upon the thread winding portion of the bobbin between the clamp member and the rotating member;
a thread winding amount detecting member which is supported rotatably on the base portion to approach or separate with respect to the thread winding portion of the bobbin supported on the shaft portion and is normally held in a separate position;
a lever member configured to be operated to rotate the thread winding amount detecting member from the separate position to an abutting position with respect to the thread winding portion of the bobbin; and
a resistance applying member supported to enable rotating operation integrally with the lever member,
wherein the resistance applying member is provided

with:

an interposing portion configured to interpose the thread supplied from the thread supply source toward the clamp member between the interposing portion and the rotating member in the separate position and to release the thread in the abutting position; and
a guiding portion that causes the thread between the interposing portion and the thread supply source to be engageable in the separate position and to release the engagement in the abutting position.

9. The thread winding device of claim 8,
wherein the resistance applying member is configured by a slender plate material,
wherein the interposing portion is formed in a tip part of the slender plate material,
wherein the guiding portion has a semispherical smooth surface protruded from an intermediate part of the slender plate material, and
wherein in the guiding portion, a groove portion is formed on the semispherical smooth surface, the groove portion capable of engaging the thread between the interposing portion and the thread supply source in the separate position.

FIG. 1

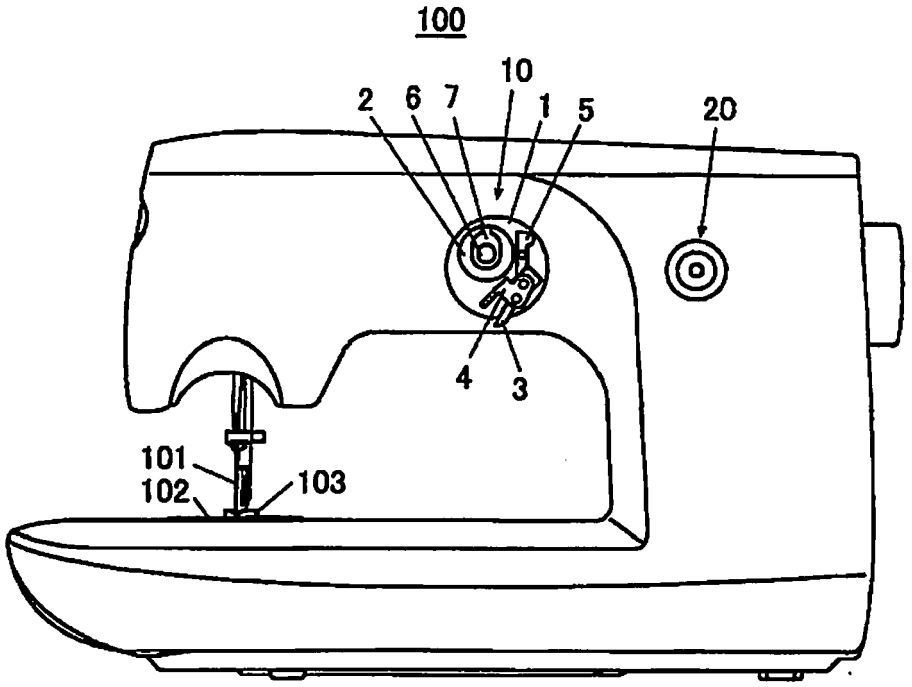


FIG. 2

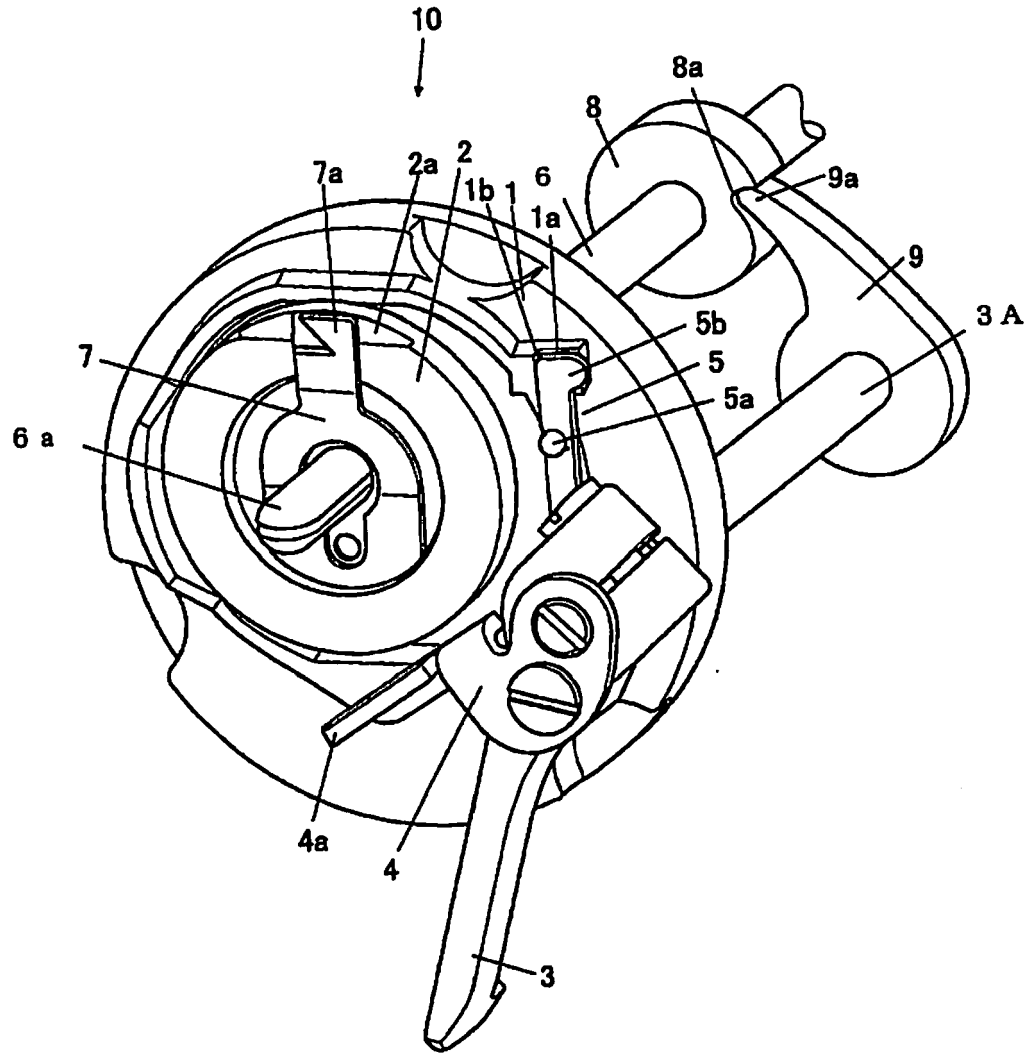


FIG. 3

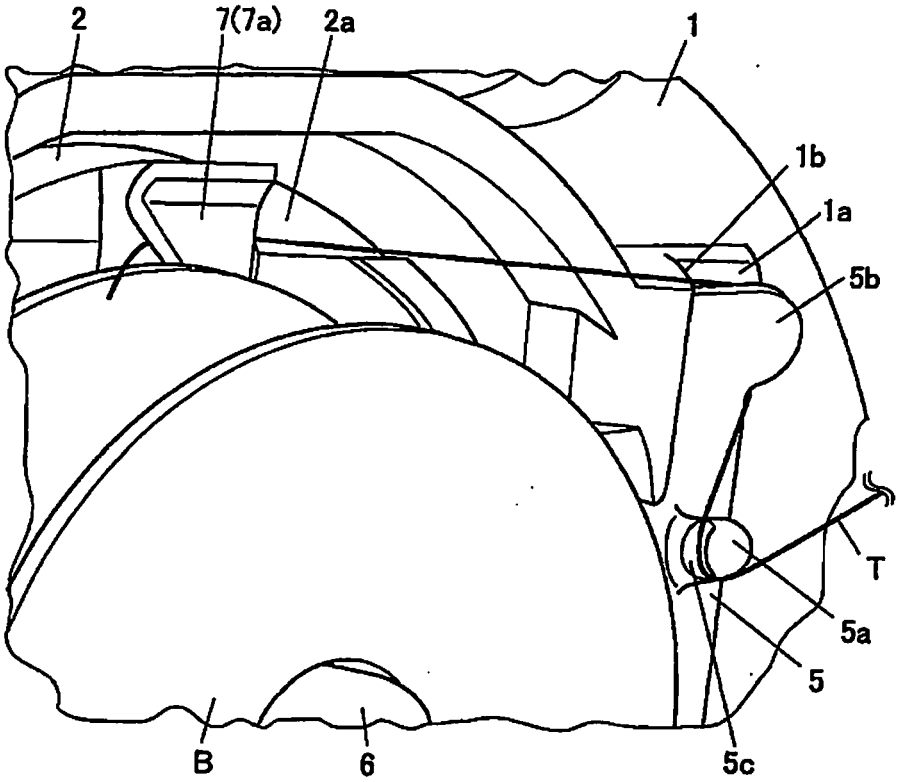


FIG. 4A

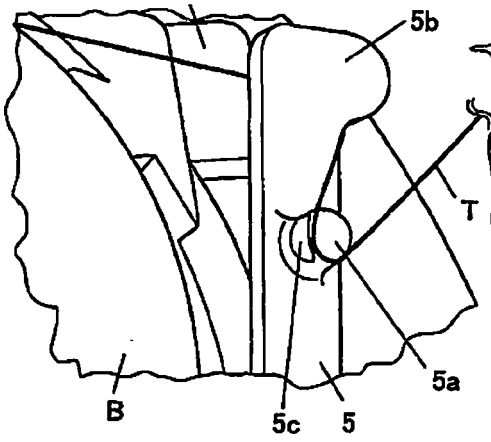


FIG. 4B

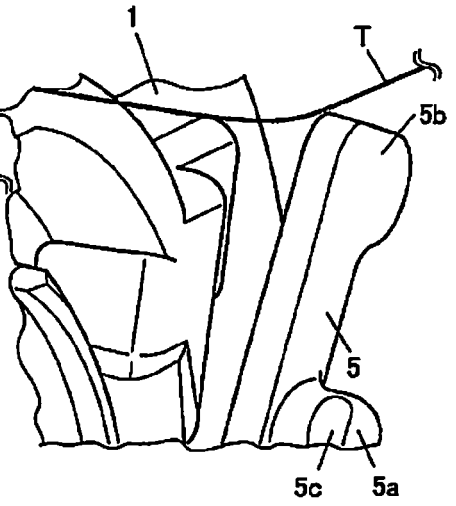


FIG. 4C

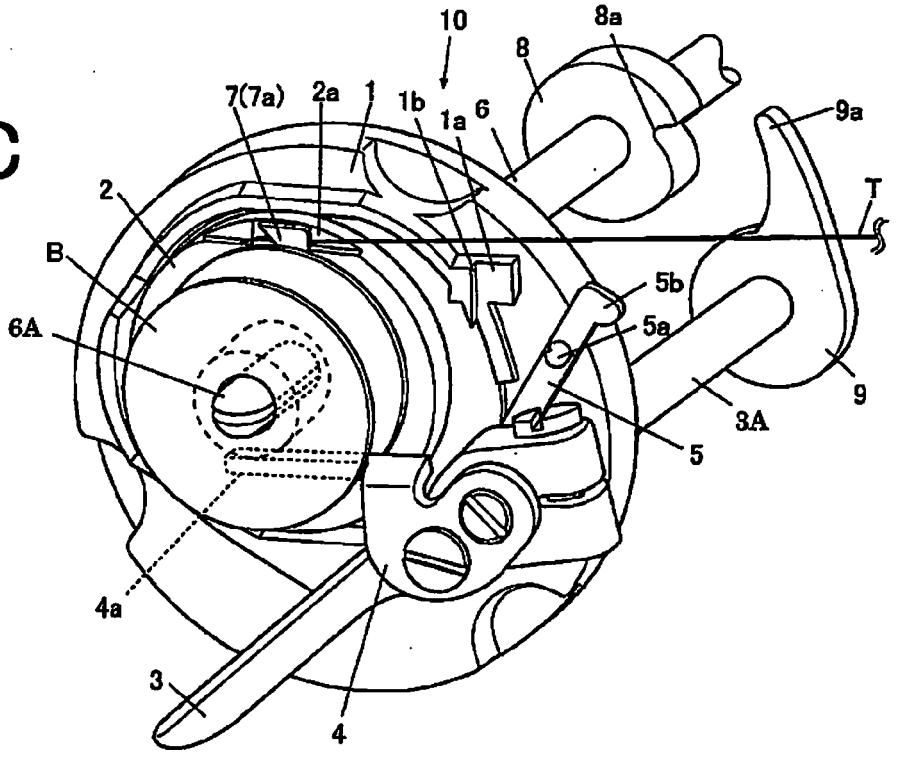
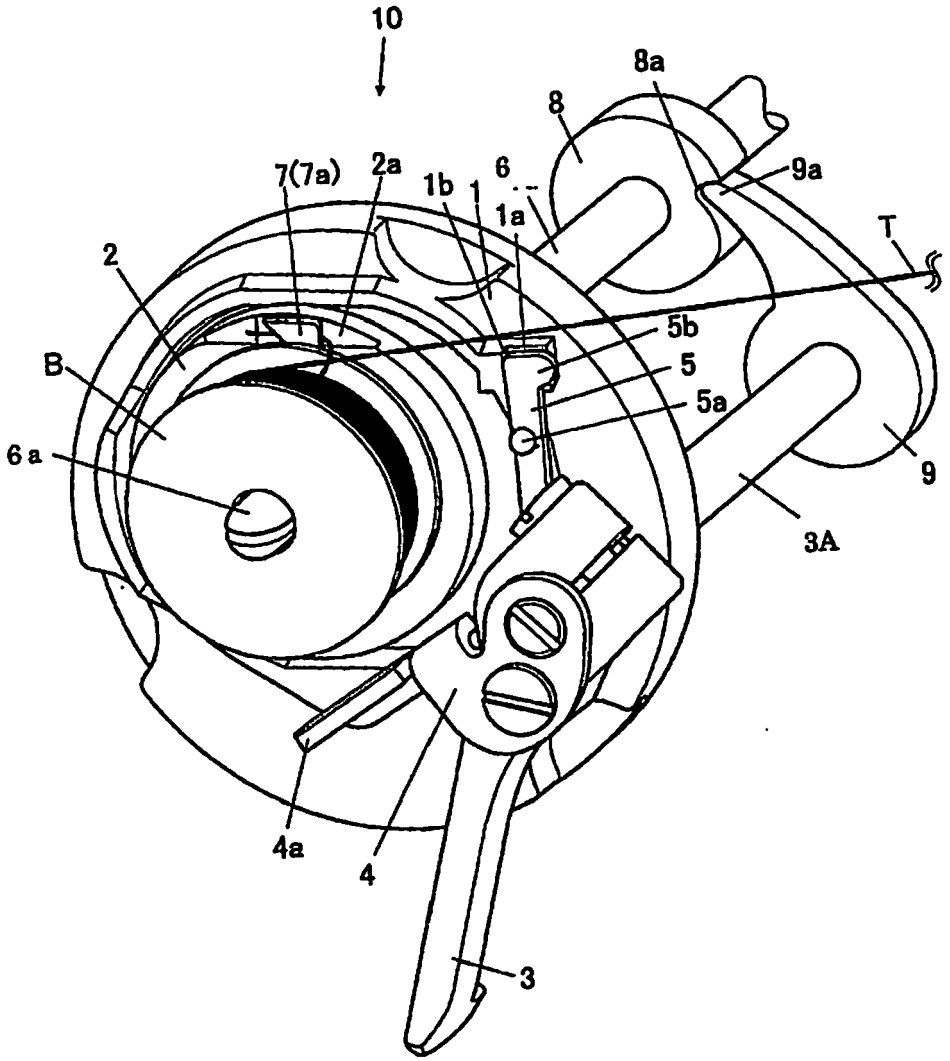


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 9435

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 March 2012	Herry-Martin, D

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