

The invention concerns a method of shortening the transporting distances during the heat treatment and/or humidification, in a steaming container, of cops spun onto bobbins at several spinning stations of a spinning machine. The invention also relates to a device for spinning, heat treating and/or humidifying threads, containing:

- a spinning machine with several spinning stations arranged in series, on which cops are produced, each cop containing a bobbin;
- a conveyor for taking away the complete spun cops;
- a draw-off apparatus for bringing empty bobbins to the spinning machine and for removing the cops from the spinning machine and for placing the cops on the conveyor;
- a steaming container for heat treating and/or humidifying the complete spun cops.

In a known method and a known device of this type (FR-A-2620743, EP-A-2620743 and EP-A-2614633), the steaming container is located between the spinning machine and the winding machine. The complete spun cops are transported from the spinning machine into the steaming container by a conveyor belt. Then, the complete steamed cops are transported from the steaming container to the winding machine by a second conveyor belt. In so doing, the complete spun cops must be brought by a draw-off apparatus from the spinning machine onto the first conveyor belt. In addition, a second conveyor belt is required between the steaming container and winding machine. Thus, in the known devices, two conveyor belts are required, which need a great deal of space. With the known method, there is also the risk that materials will be confused (the cops).

The invention is based on two aims:

- a) To create a method for heat treating and/or humidifying cops which can be implemented with the least possible expense and requires the fewest possible modifications, requiring additional space, to the device for implementing the method.
- b) It is intended to create a device which allows the cops to be heat treated and/or humidified in the most space-saving and simple manner possible.

According to the invention, the first cited aim is achieved in that each cop is subjected to the heat treatment and/or humidification directly near the spinning station of the spinning machine, in order to avoid long transporting distances between the spinning machine and steaming container. - The term "spinning station" used in the claim should be understood as the space required - for ballooning - during spinning, around the cop to be produced.

Through this mode of operation, the heat treatment and/or humidification now takes place in the immediate vicinity of the spinning stations of the spinning machine and a conveyor belt between the spinning machine and steaming container is no longer required. A particular advantage lies in the dwell time during and after the steaming which is mainly freely determinable. Consequently, the cops no longer have to be removed from the flow of materials. The method according to the invention can be implemented more quickly than that previously known and excludes the possibility of materials being confused. Furthermore, a great deal of space is saved as compared to the known spinning systems with a steaming container placed at a distance. The steaming container is designed as a closeable, open channel in the manner of a long trough.

The second cited aim, namely the creation of a device for implementation, is achieved according to the invention in that the steaming container has a series of steaming stations and is

erected parallel to the spinning machine such that there is a steaming station near each spinning station, and, for each spinning station, the draw-off apparatus has a gripping apparatus which removes the complete spun cops from the spinning station and inserts them into the adjacent steaming station of the steaming container.

Through this design and arrangement of the steaming container, very little space is required in the spinning system for the steaming container. Furthermore, the work sequence is optimal as a result since the cops only have to cover very short distances for the heat treatment and/or humidification.

Further developments of the subject matter of the invention are characterised in the following dependent claims.

The steps of the method cited in claim 2 enable the use of a draw-off apparatus which is in any case required in spinning machines and which, with slight adaptation modifications, is used to remove the cops from the spinning station and to insert them into the steaming container, to remove the steamed cops from the steaming container and to place them on the conveyor which transports the cops to the winding machine.

The steps of the method cited in claim 3 allow optimum utilisation of the treatment and cycle times.

The process implementation according to claim 4 has proven particularly suitable.

A further development of this method is provided by the evacuation drying according to claim 5.

The sequential flow of materials (handling) preferentially takes place in accordance with the method according to claim 6.

Claims 7 to 10 list options for temporarily storing a batch during the steam treatment of a second, which should be selected according to the configuration of the spinning machine and/or its draw-off apparatus and conveyor.

Depending on how the draw-off apparatus is designed and on the spatial conditions upstream of the spinning machine, it may be advantageous for the steaming container to be arranged on the side of conveyor, leading to the winding machine, facing away from the spinning machine or for it to be arranged between the spinning machine and a conveyor, leading to the winding machine, arranged upstream of the spinning machine and/or the draw-off apparatus (claims 12 to 14).

The entry of steam into the steaming container can be interrupted by blocking steam inlet openings in a simple manner, by means of two interacting movable perforated plates according to claim 15.

The amount of water is also controlled in a simple manner according to claim 16.

For transporting the cops, in place of the conventional draw-off apparatus or in place of a modified draw-off apparatus, a horizontally and vertically travelling conveying device may also be provided above the steaming container. Such a conveying device may, for example, be designed as a conventional loading device for a lathe, in the form of a gantry loader, see claim 17.

In the open state, the cover of the steaming container does not prevent the transportation of the cops into the steaming container or from the steaming container to the conveyor by means of the draw-off apparatus if the steaming container has a cover according to claim 18, coupled by a hinge to the side wall of the steaming container facing the spinning stations.

It is particularly simple from a structural viewpoint if the cover, according to claim 19, is actuatable by means of a lifting

cylinder fixed to the side wall and to a cantilever arm of the cover.

Adaptation of the steaming container to spinning machines of different sizes is possible at a low cost if the steaming container is composed, in a modular fashion, of several elements, arranged one after another, together forming the channel-shaped steaming container (claim 20).

The individual elements are optimally structurally designed according to the further, advantageous further development according to claim 21.

In the simplest case, the heating element consists of an electrical resistance heater; it may also be a heat exchanger of a steam heater, which is particularly advantageous if heat recovery systems are already present in the spinning mill.

The system according to claim 22 becomes autonomous by means of an external steam generator, which may be arranged as required.

The design according to claim 23 reduces the cost of the device; in addition to direct bolting of the steaming container to the machine frame, its flanging on can also be seen.

An additional space-saving can also be listed if the steaming container, according to claim 24, is arranged above the spinning machine. Draw-off apparatuses arranged in the upper region of the spinning machine are known, particularly in the form of so-called stationary, integrated automatic draw-off machines in ring spinning frames. - By means of simple structural adaptations, this type of draw-off apparatus can be used to take the cops into the steaming container arranged above the machine.

An embodiment of the method according to the invention and various embodiments of the device according to the invention for implementing the method are described in greater detail below,

for further clarification, with reference to the enclosed drawing. It shows, partly diagrammatically

Figure 1 a side view of the device for spinning and for heat treating threads which are wound to form cops;

Figure 2 a plan view of the device represented in figure 1;

Figure 3 a diagrammatic representation of this device represented in figures 1 and 2;

Figure 4 a side view of the device represented in figures 1-3;

Figure 5 a diagrammatic representation of a second embodiment of the device for spinning and for heat treating threads which are wound to form cops;

Figure 6 a side view of the device represented in figure 5;

Figure 7 a side view of a third embodiment of this device;

Figure 8 a diagrammatic representation of the device according to figure 6;

Figure 9 a diagrammatic representation of this device according to a fourth embodiment;

Figure 10 a vertical section through a steaming container according to a first embodiment;

Figure 11 a vertical section through the lower portion of a steaming container according to a second embodiment;

Figure 12 a plan view of the spinning machine and of the steaming container of a modular design;

Figure 13 a detail from figure 12, on an enlarged scale, according to a first embodiment;

Figure 14 a detail from figure 12, on an enlarged scale, according to a second embodiment;

Figure 15 a section through a further embodiment of the device represented in figures 1 and 2;

Figure 16 a diagrammatic representation of the water supply to the steaming container;

Figure 17 a diagrammatic representation of the vacuum system of this device;

Figure 18 a diagram of the sequence of the individual steps of the method as a function of the time t ;

Figure 19 a diagram which illustrates the course of the temperature and the pressure in the steaming container as a function of the time;

Figure 20 the time sequence of the method according to the invention and of the flow of materials, and

Figure 21 a sketch showing the principle of a commercially available cop removal rail.

According to figures 1-3, the device for spinning, for heat treating and/or for humidifying threads has the following elements:

- a) A spinning machine 1 for producing cops 15.
- b) A steamer 2 for heat treating and/or humidifying the cops 15 produced on the spinning machine. As can be seen from figure 2, a steamer 2 is arranged on both sides of the

spinning machine 1. According to figures 1 and 3, this steamer 2 has a head element 3, intermediate elements 4 and 5 and an end element 6, wherein the number of intermediate elements is dependent on the length of the spinning machine 1 and may be greater or smaller depending on the length of the spinning machine

- c) A vacuum unit 8 with which a vacuum may be produced in the steamer as required
- d) An electrical cabinet 9
- e) A conveyor 16 for supplying and removing empty bobbins 15a or complete cops 15 (figure 3)
- f) A draw-off apparatus 17 which performs the following tasks:
 - 1) The empty bobbins 15a supplied by the conveyor 16 are placed on the spinning machine 1.
 - 2) The complete wound cops 15 on the spinning machine are inserted in the steamer 2.
 - 3) The complete steamed and/or humidified cops are removed from the steamer 2, and
 - 4) The cops removed from the steamer are placed on the conveyor 16 by the draw-off apparatus 17.

These elements will now be described in greater detail below:

- a) The spinning machine 1 has, at both ends, a control box 1a and 1b (see figure 3) and, as can be seen in figure 3, a series of cops 15, which are spun on the spinning machine 1 in a manner which is known in itself and is not represented in greater detail here, is located between

these two control boxes 1a and 1b. Since the spinning machine 1 is assumed to be known, it is not described in greater detail here

b) In its head element 3, the steamer 2 contains the following elements:

- a vacuum and aeration line
- a temperature sensor
- a pressure sensor
- a feed water connection and
- a drive for opening and closing a steaming container.

In its intermediate elements 4 and 5, the steamer also contains the following elements:

- electric or steam heating elements, and
- a water level sensor

The following elements are contained in the end element 6 of the steamer:

- a fan
- further heating elements and
- a further drive for opening and closing the steaming container.

Since the steamer 2 differs only little from known steamers of this type, not all the aforementioned components are described in detail.

According to figure 1, the vacuum unit 8 and the electrical cabinet 9, which here are also assumed to be known and are not described, are located at one end of the spinning machine 1. Depending on the size of the steamer 2, the vacuum unit 8 has one or more low pressure pumps, which are also not represented and described in greater detail. The electrical cabinet 9 contains electric current distributors, particularly contactors for the

motors and for the heating elements, which are also assumed to be known and are not described in greater detail. The control cabinet 10 contains all the elements needed to control and monitor the following data:

- a) Water temperature or steaming space temperature
 - b) Water or steam pressure
 - c) Water level
 - d) Water covering
- 3) Ventilation of the steaming container

According to figures 3 and 5, the steamer 2 extends over the entire length of the spinning machine 1 and has exactly the same number of steaming stations 2b as the spinning machine 1 has spinning stations 14.

All these control and monitoring elements are assumed to be known and consequently are neither represented nor described.

According to figure 2, two spinning machines 1 are placed next to one another. On both sides of these spinning machines 1, there is a steamer 2. A control cabinet 10 is present for each steamer 2.

According to figure 3 and figure 4, a cop 15 is located at each spinning station 14. According to figure 3, between the two control boxes 1a and 1b, the spinning machine 1 has a long series of spinning stations 14, all of which are provided with cops 15. A conveyor 16, which is somewhat deeper than the spinning points 14 is arranged upstream of this series of spinning stations 14.

The conveyor 16 essentially performs two tasks:

- 1) Supplying the empty bobbins 15a to the spinning stations 14
- 2) Supplying the complete cops 15 to a winding machine 12 (figure 1).

To this end, the conveyor 16 extends over the entire length of the spinning machine 1 and has the same number of receiving stations as there are spinning stations 14 on the spinning machine 1. The steamer 2, which again extends over the entire length of the spinning machine 1 and has the same number of receiving stations as the spinning machine 1 has spinning stations, is located upstream of the conveyor 16.

According to figures 3 and 4, the draw-off apparatus 17 is coupled to two beams 40, which are located at the top of the spinning machine 1. According to figure 4, a pivot 41 is displaceably mounted on these beams 40. With the aid of an actuating cylinder 42, the pivot 41 can be displaced from its foremost position, indicated by unbroken lines, into rear positions indicated by dot and dash lines. A piston 43, which is fixed to the pivot 41 via a piston rod 44, is located in the cylinder 42 fixed to the beam 40.

The piston 43 is displaced in the cylinder 42 in a conventional pneumatic or hydraulic manner. According to figure 3, two bars 45 are pivotally coupled to this axis 41. Two further bars 46 are coupled to the lower end of these bars 45. A cop removal rail 47 is fixed to the lower end of the bars 46. This cop removal rail 47 extends over the entire length of the spinning machine 1 and, for each spinning station 14 of the spinning machine 1, has a gripper 48 (figure 4) for grasping a cop. This gripper 48 is represented in figure 4 and is explained in detail further below. For raising and lowering the cop removal rail 47, a roller 50 is mounted on each beam 40, a tape 51 being wound onto said roller 50, the lower end 49 of said tape 51 being fixed to the cop removal rail 47. According to figure 3, the rail 47 can, with the aid of the tapes 51, be lowered from an upper position,

indicated by unbroken lines, into a lower position, indicated by dot and dash lines, and at the same time, the bars 45 and 46 also swivel into the dot and dash positions. The roller 50 can be rotated using a motor 52 in both directions of rotation in order to wind and unwind the tape 51. According to figure 4, the removal rail 47 must be moved with the grippers 48 into three different positions, namely

- a) above the spinning stations 14
- b) above the conveyor 16
- c) above the steamer 2

Thus, the piston 43 must also move into three different positions and the tape 51 must be lowered accordingly to three different heights. According to figure 4, the steamer 2, with a steaming container 2a of rectangular cross-section, is lower than the conveyor. A cover 7 is coupled to a hinge 19 of the steamer 2, on the side wall 18 of the steamer 2 facing the spinning machine 1 or the conveyor 16. The cover 7 has a cantilever arm 20, on which a lifting cylinder 21 acts, which is coupled to a projection 22 of the side wall 18 at its lower end. A piston 21' in the lifting cylinder 21 is coupled to the cantilever arm 20 via a piston bar 21".

If the piston 21' moves downwards with the piston rod 21", the cover 7 is opened.

According to figures 3 and 4, a series of cops 15 is located above a water bath 24 inside the steaming container 2. This water bath 24 has a water bath covering 23 on which the cops 15 are held at the steaming stations. The water bath 24 can be heated cyclically by means of heating elements 25.

In the spinning system according to the invention, the following flow of materials is obtained: once a series of cops 15 has been

completely spun, the automatic draw-off apparatus 17, seen on the left in figure 4, grips all the cops 15 at the spinning stations 14 together and transports them into the opened steaming container 2a. This sequence of movements is indicated in figure 4 by the two arrows a and b. If the cops 15" are in the steaming container 2, its cover 7 is closed by means of the lifting cylinder 21 and the steaming process can start. During the steaming process, the draw-off apparatus 17 fetches empty spinning bobbins, which are not represented in figure 4, from the conveyor 16 and places them on the spinning stations 14. This is indicated by an arrow c. Then, the next batch of cops 15 can be spun. Once the steaming process in the steaming container 2a has ended, the cops 15" are removed from the steaming container by the draw-off apparatus 17, once the cover 7 has been opened, and are placed on the conveyor 16. This movement is indicated by the arrow d. The conveyor 16 then transports the cops 15' to the winding machine 12 (figure 1). This cycle is repeated in that the draw-off apparatus 17 again inserts complete spun cops 15 into the steaming container 2a.

In the device according to figure 5, the steamer 2 is located between the spinning machine 1 and the conveyor 16. The draw-off apparatus 17 is arranged on the side of the conveyor 16 facing away from the spinning machine 1.

According to figures 5 and 6, a spindle 53 is located upstream of and completely below the conveyor 16, said spindle 53 extending over the entire length of the spinning machine 1. Two slides 54 are displaceably mounted on this spindle 53. A bar 55 is pivotally coupled to each of these slides 54. A second bar 56 is coupled, on the one hand, fixed at a point 57 (figure 5) and, on the other hand, coupled in the vicinity of the upper end of the bar 55, to said bar 55. A cop removal rail 58 is coupled to the upper end of the two bars 55. This cop removal rail 58 extends over the entire length of the spinning machine 1 and has a gripper 48 for each spinning station 14 of the spinning machine 1, just as in the removal rail 47 described further above. This

gripper 48 is represented in figure 4 and is described in detail further below. The spindle 53 is rotated in order to raise and lower the cop removal rail 58. In this way, the slides 54 are moved into the position 54' and the two bars 55 and 56 are thus moved into the position of the bars 55' and 56' indicated by dashed lines. The swivelling of the bars 55 and 56 into the position 55' and 56' moves the cop removal rail 58 from its lower position into the upper position, which is designated by reference numeral 58'. Furthermore, according to figure 6, the two bars 55 and 56 can be swivelled about the spindle axis 53, as indicated by the arrow B. In this way, the cop removal rail 58 can be swivelled to the left and right, in addition to being raised and lowered.

In order to swivel the spindle axis 53, according to figure 7, on the base 60, a cylinder 61 is pivotally coupled to a retainer 62. This cylinder 61 contains a piston 63, which is connected via a piston rod 64 to a swivel arm 65, which is fixed to the spindle 53. Displacement of the piston 63 in the cylinder 61 thus enables the spindle 53 to be rotated and thus enables the bars 55 and 56 also to be swivelled, as indicated by the arrow B in figures 6 and 7. As in the first embodiment (according to figures 3 and 4), the cop removal rail 58 of the second embodiment according to 5, 6 and 7 must be moved into three different positions. These movements are as follows:

- a) The draw-off apparatus is swivelled to the left in order to grasp the cops 15, arrow a.
- b) The cops 15 are brought from the spinning station 14 into the steaming container 2a, arrow b.
- c) The steamed cops 15 are brought from the steaming container 2a to the conveyor 16, arrow d.
- d) Empty bobbins are brought from the conveyor 16 to the spinning stations 14 of the spinning machine 1, arrow c.

In figures 6 and 7, the same draw-off apparatus 17 is used. However, in figure 6, the steamer 2 is located between the conveyor 16 and the spinning machine 1. On the other hand, in figure 7, the conveyor 16 is located between the steamer 2 and the spinning machine 1.

According to figure 8, a spindle 70 is drivable, by means of a motor 71, in both directions of rotation, as indicated by a double arrow 72. Two slides 73 and 74 are displaceably arranged on this spindle 70. One of the slides 73 is displaced by means of a right-hand thread 75 and the other slide 74 is displaced by means of a left-hand thread 76, such that, when the spindle 70 is rotated by means of the motor 71, the two slides 73 and 74 move towards each other, if the spindle 70 is rotated in one direction of rotation, or are moved away from one another if the spindle 70 is moved in the other direction of rotation. A scissor-like linkage 77, 78, 79, 80 is coupled to the two slides. A cop removal rail 81, which has already been mentioned and which extends over the entire length of the spinning machine 1, exactly like the cop removal rails 47 or 58 described further above, is coupled to the rods 77 and 78 of this linkage 77 to 80. The cop removal rail 81 is raised and lowered by several linkages 77 to 80. However, just a single linkage 77 to 80 is represented in figure 8. The spindle 70 also extends over the entire length of the spinning machine 1 and serves to drive all the linkages 77 to 80. A cylinder 82, which contains a piston 83, is used to swivel the linkage 77 to 80 with the cop removal rail 81. This piston 83 is coupled via a piston rod 84 to a plate 85. This plate 85 is fixed to the slide 74. With the aid of the cylinder 82, the plate 85 can thus be swivelled into three different positions with the slide 74 and the linkage 77 to 80. These different positions are indicated by dot and dash lines of the plate 85 and the cop removal rail 81. Grippers 48, which are described further below (see figure 21), for grasping the cops 15 are fixed to the cop removal rail 81. The cylinder 82 is coupled to a carrier 86 which can be displaced parallel to the spindle 70. The spindle 70 is mounted on several bases 88. Only

one base 88 can be seen in figure 8. The device according to figure 9 essentially differs from the device represented in figure 8 in that the two slides 73 and 74 are not pivotally arranged with the linkage 77 to 80. Rather, a plate 87 is raised and lowered by the linkage 77 to 80 if the spindle 70 rotates in one or the other direction of rotation. A scissor-like linkage 89 and 90 is also coupled to this plate 87. The cop removal rail 81, which has already been mentioned, is coupled to the rod 89. A cylinder 92, which contains a piston 93, is used to displace the cop removal rail 81 in the horizontal direction according to the arrow 91. This piston 93 is coupled to the rod 89 of the linkage 89 and 90 via a piston rod 94. The cylinder 92, in turn, is coupled to the cop removal rail 81. Thus, the plate 87 can be raised and lowered in the direction of the arrow 92' with the aid of the spindle 70, and the cop removal rail 81 can be displaced in the horizontal direction with the aid of the cylinder 92. Thus, the scissor-like linkage 89, 90 can be opened and closed if one end of the rod 90 of the linkage 89, 90 is displaceably mounted in the plate 87 in a slot 87'.

According to figure 10, the steaming container 2a is located above a water channel 26 of circular cross-section. From this water channel 26, a rising pipe 27 leads upwards into the water bath space 24 of the steaming container 2. A stop valve 28 is used to be able to open or close the rising pipe 27. The water bath covering 23, in turn, is used to support the cops 15" introduced into the steaming container 2. Furthermore, a cable channel 29, running parallel to the water channel 26, in which run electrical lines 30, can be seen in figure 10, as can sealing elements 2' in the region of the cover 7.

According to figure 10, there is an arm 106 on the steaming container 2a, on which is located a conical mandrel 107. This mandrel 107 is used to centre the cop removal rail 47, figure 3, or 58, figure 5, or 81, figures 8 and 9.

In the embodiment according to figure 11, the water bath space 24 is covered by two perforated plates 33, 34 lying one on top of the other. The lower perforated plate 33 is firmly connected to the walls of the steaming container 2. The upper perforated place 34 can be displaced in the longitudinal direction on the lower perforated plate 33. In this way it is possible to block off the water bath space 24 from the rest of the inner space of the steaming container 2. Here, the water bath covering 23 is also used as a carrier for the cops.

According to figure 12, the steamer 2 extends over the entire length of the spinning machine 1 and is composed of several intermediate elements 3, 4 and 5. Since this steamer 2 is exposed to severe temperature fluctuations, means must be present so that these intermediate elements 3, 4 and 5 can expand and contract unhindered. Two embodiments of such means are represented in figures 13 and 14.

According to figure 13, an O-ring, in the form of a sealing ring 95, is provided on the end of one of the intermediate elements 3, said sealing ring 95 lying against the inner wall 96 of the other intermediate element 4. If the two intermediate elements 3 and 4 expand or contract, the sealing ring 95 can slide on the outer wall 97 of the intermediate element 3. The inner wall 96 surrounds the sealing ring 95 in the form of an annular groove.

According to figure 14, a hose-shaped, dilatable seal 100 is present between an end wall 98 of one of the intermediate elements 4 and an end wall 99 of the other intermediate element 3, which can be compressed in the event of thermal expansion of the two intermediate elements 3 and 4 of the steamer 2.

According to figure 15, a telescope-like rod 101 is pivotally mounted about a pivot pin 102. This telescope-like rod 101 is composed of three pipe-shaped sections, which are of different diameters, so that they can be pushed into one another. A cop removal rail 104 is fixed to this rod 101 via a carrier 103. The

grippers 48, which are described further below with reference to figure 21 and with which the cops 15 can be transported from the spinning machine 1 to the steaming container 2, are fixed to this cop removal rail 104. The conical mandrel 107 which projects into a hole 105 of the carrier 103 is fixed to the steaming container 2 via the arm 106. In this way it is guaranteed that the cops 15 be pushed precisely into the steaming container 2.

In figure 16 it is shown that several rising pipes 27, 27a, 27b lead from the water channel 26 to the steaming container 2. The water channel 26 receives water from a compensation tank 31 by means of pumps 32. A flow meter 34' enables the amount of water supplied to be recorded. Controlled throttle valves 32', 33' control the inflow speed of the water; a level monitoring device 31' regulates the water level in the tank 31.

The vacuum system of a complete system is shown in figure 17. A vacuum pump 35 constantly evacuates a vacuum tank 36, to which a vacuum line 37 is connected, from which lines 39 lead, via a valve 38, to the individual steaming containers 2. The low pressure in each steaming container 2 can therefore be controlled by the particular valve 38.

The time sequence of the spinning and steaming method can be seen from figure 18:

- First, the complete cops 15 are removed from the steamer 2 and are moved onto the conveyor 16 in the intermediate position. Position A.
- The complete spun cops 15 are moved from the spinning machine 1 into the steamer 2. Position B.
- The steamer 2 is closed. Position B'.
- The empty bobbins are moved from the conveyor 16 to the spinning stations. Position C'.

- The spinning operation is started. Position C.
- The conveyor belt 16 moves the steamed cops 15 away continuously or optionally in stages and at the same time fetches new bobbins. Position D.
- The steamer 2 is evacuated and heated. Position E.
- The perforated plate 34 (see figure 11) is opened. Position F.
- The cops 15 are steamed. Position G.
- The steamer 2 is vented. Position H.
- The steamer 2 is drained. Position I.
- The cops 15 are dried. Position J.
- The steamer 2 is opened. Position K.
- The cops 15 are removed from the steamer once more. Position A.

The sequence is repeated.

In figure 19, the temperature curve in the steaming container over time is shown in the upper region of a diagram and the pressure curve in the steaming container over time is represented underneath. The treatment method is divided into a treatment time t_s and a drying time t_r . The diagram clearly shows how, during the heating times, the low pressure decreases in each case. After heating twice, the temperature is maintained at a constant level, as is the pressure accordingly over a longer time period. For drying, the steaming container is aerated, heated, placed under vacuum and aerated again several times. In the diagram:

a	=	Initial vacuum	i	=	Aeration
b	=	Heating	k	=	Drying
c	=	Steam I	l	=	Vacuum
d	=	Intermediate vacuum	m	=	Aeration
e	=	Heating	n	=	Drying
f	=	Steam II	o	=	Vacuum
g	=	Aeration	p	=	Aeration
h	=	Final vacuum	q	=	Cooling
t _s	=	Treatment time	t _r	=	Drying time

The characteristic flow of materials over time during the steaming of cops can be seen in figure 20. Here, the actions are recorded on the ordinate and the time intervals are recorded on the abscissa t in hours h.

In the diagram:

A	=	Conveying	"1"	=	Start
B	=	Dwell	"2"	=	Steaming ended
C	=	Steaming	"3"	=	First batch ready
D	=	Spinning	"4"	=	Start winding operation

The intervals, which are not recorded and can be seen between the spinning D, are the times during which the draw-off apparatus is used.

In the event of temporary storage of the cops - after completion of the steaming operation and after preparation of the first batch - the draw-off apparatus is activated, i.e. ready for transfer of the stored cops.

The basic implementation of the process, the choice of steam pressure, temperature and the addition of any chemicals are known particularly from yarn steaming. See Freddy Wanger, Chemiefasern/Textilindustrie vol 30/82, 1980, pp 888-890; Melliand Textilberichte 66, 1985, pp 525-526; Textilbetrieb, Vogel-Verlag Würzburg, 1981, volume 7/8. The subject matter of

the invention can be adapted to all desired conditions of the method and operation.

Clearly, the term "heat treatment" used in the claim, should also be understood to mean sterilisation operations, such as are used in the production of sanitary articles, bandages, compresses, etc.

According to figure 21, a compressed air pipe 68 is fixed to the cops removal bar 47. A number of grippers 48, which - as described further above - are used to grasp cops 15, are fixed to this compressed air pipe 68. These cops 15 contain a bobbin 15a. On the spinning machine 1, the thread is spun on the bobbins 15a to form a cop 15. The gripper 48 has a nozzle 69 to which a small inflatable rubber balloon 67 is fixed with the aid of a clip 66. If there is no compressed air present in the compressed air pipe 68, this balloon 67 has the form indicated by the dashed line. Once compressed air has been fed into the pipe 68, the balloon inflates until it lies against the inner wall of the bobbin 15a and holds it firmly, as indicated by the unbroken lines.

As an alternative to this, the cops may be held on their periphery, in the manner of a collet chuck.

In order to reduce the size of the steaming container, the cops could be pushed together for the heat treatment and/or humidification. To this end, means or handling apparatuses, which are known in themselves, are available. - The embodiment according to figure 21 can be adapted to this requirement through the use of rails 47 of telescopic or elastic design.



Claims

1. A method of shortening the transporting distances during the heat treatment and/or humidification, in a steaming container, of cops spun onto bobbins at several spinning stations of a spinning machine, characterised in that each cop is subjected to the heat treatment and/or humidification directly near the spinning station.
2. A method according to claim 1, characterised in that, at the same time,
 - each complete spun cop (15) is removed from the spinning station (14) of the spinning machine (1);
 - each of the cops (15) removed from the spinning station (14) is inserted into an adjacent steaming station (2b) of the steaming container (2),
 - the inserted cops (15) are subjected to the heat treatment and/or humidification,
 - empty bobbins (15a) are transported to the spinning stations (14),
 - the treated cops (15) are transported away from the open steaming container for further treatment.
3. A method according to claim 2, characterised in that, during the treatment and/or humidification of the cops, empty spinning bobbins are taken by the conveyer with the draw-off apparatus to the spinning stations and that a batch of cops is then spun.
4. A method according to one of the preceding claims, characterised in that the cops in the steaming container are treated by the evacuation of said steaming container



and the heating of a water bath provided therein, firstly at low pressure and, as the temperature increases, at slight overpressure, and are then aerated and heated in the steaming container.

5. A method according to one of claims 1 to 3, characterised in that the cops in the steaming container are treated by the evacuation of said steaming container and the heating of a water bath provided therein, firstly at low pressure and, as the temperature increases, at slight overpressure, and are then dried in the steaming container by means of alternate aeration, heating and evacuation.
6. A method according to claim 1, characterised in that, in a first step of the method, all the spun cops (15) are simultaneously removed from the spinning station (14), in a second step are lowered into the steaming container (2) and said steaming container (2) is closed, that, in a third step, the steam treatment is carried out, that, in a fourth step, bobbins stored parallel to the spinning machine (1) are taken to the spinning station (14) and spun, that, upon completion of the steam treatment, the steaming container (2) is opened in a fifth step and the cops (15) are cooled, that, in a sixth step, the cops are taken for further processing.
7. A method according to claim 6, characterised in that, during the steam treatment, cops (15) are temporarily stored on the cover (7) of the steaming container (2).
8. A method according to claim 6, characterised in that, during the steam treatment, cops (15) are temporarily stored parallel to the spinning machine (1).
9. A method according to claim 8, characterised in that, during the steam treatment, cops (15) are temporarily stored on the conveyor (16).



10. A method according to claim 6, characterised in that the cops are temporarily stored between empty bobbins.

11. A device for spinning, heat treating and/or humidifying threads, containing:

- a spinning machine (1) with several spinning stations (14) arranged in series, on which cops (15) are produced, each cop containing a bobbin (15a),
- a conveyor (16) for taking away the complete spun cops (15),
- a draw-off apparatus (17) for bringing empty bobbins (15a) to the spinning machine (1) and for removing the cops (15) from the spinning machine (1) and for placing the cops (15) on the conveyor (16),
- a steaming container (2) for heat treating and/or humidifying the complete spun cops (15)

characterised in that

- the steaming container (2) has a series of steaming stations (2b) and is placed parallel to the spinning machine (1) such that there is a steaming station (2b) near each spinning station (14)
- the draw-off apparatus (17) for each spinning station (14) has a gripping apparatus (48) which removes the complete spun cops (15) from the spinning station (14) and inserts them in the adjacent steaming station (2b) of the steaming container (2).

12. A device according to claim 11, characterised in that the steaming container (2) is arranged between the spinning



stations (14) and an automatic draw-off apparatus (17) for the cops (15).

13. A device according to claim 11, characterised in that the steaming container (2) is arranged on the side, facing away from the spinning machine (1), of a conveyor (16) leading to the winding machine (12).
14. A device according to claim 11, characterised in that the steaming container (2) is arranged between the spinning machine (1) and a conveyor (16), arranged upstream of said spinning machine (1) and leading to the winding machine (12).
15. A device according to claim 11 or one of the following claims, characterised in that a water bath chamber (24), covered by a perforated plate (33) is provided in the steaming container (2) and that a second perforated plate (34) of the steaming container (2) is movably arranged on said perforated plate (33) for closing the water bath chamber (24).
16. A device according to claim 11 or one of the following claims, characterised in that the steaming container (2) is arranged above a water channel (26) and that rising pipes (27) provided with a stop valve (28) lead from said water channel (26) to the water bath chamber (24) of the steaming container (2).
17. A device according to claim 11 or one of the following claims, characterised in that a horizontally and vertically travelling conveying device for transporting the cops (15) is provided between the spinning stations (14) and the steaming container (2) and the conveyor (16) above the steaming container (2).



18. A device according to claim 11 or one of the following claims, characterised in that the steaming container (2) has a cover (7) on the side wall (18) of the steaming container (2) facing the spinning stations (14), said cover being coupled by a hinge (19) and lockable.
19. A device according to claim 11 or one of the following claims, characterised in that the cover (7) is actuatable by means of a lifting cylinder (21) fixed to the side wall (18) and to a cantilever arm (20) of the cover (7).
20. A device according to claim 11 or one of the following claims, characterised in that the steaming container (2) is composed of several elements (3-6), arranged one after another, together forming the channel-shaped steaming container (2).
21. A device according to claim 11 or one of the following claims, characterised in that the steaming container (2) is formed of a head element (3), at least one intermediate element (4, 5) and an end element (6), wherein the head element (3) has connections for the vacuum and aeration line, temperature sensor, pressure sensor, a feedwater connection and a drive for the cover (7) of the steaming container, wherein each intermediate element (4, 5) has a heating element (25), a cover (7) and a connection for a water level sensor and the end element (6) has a heating element (25), a further cover (7) of the steaming container (2) and a ventilation connection.
22. A device according to claim 11, characterised in that a steam generator arranged outside the steaming container (2) is provided, said steam generator cooperating with the steaming container (2).



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23. A device according to claim 11 or one of the following claims, characterised in that the steaming container (2) is arranged directly parallel to the spinning machine (1).
24. A device according to claim 11 or one of the following claims, characterised in that the steaming container (2) is arranged above the spinning machine (1).