

Nov. 28, 1961

G. BATSCH
MACHINES FOR CRIMPING YARNS BY FALSE
TWIST, AND THEIR PARTS

3,010,271

Filed June 16, 1958

3 Sheets-Sheet 1

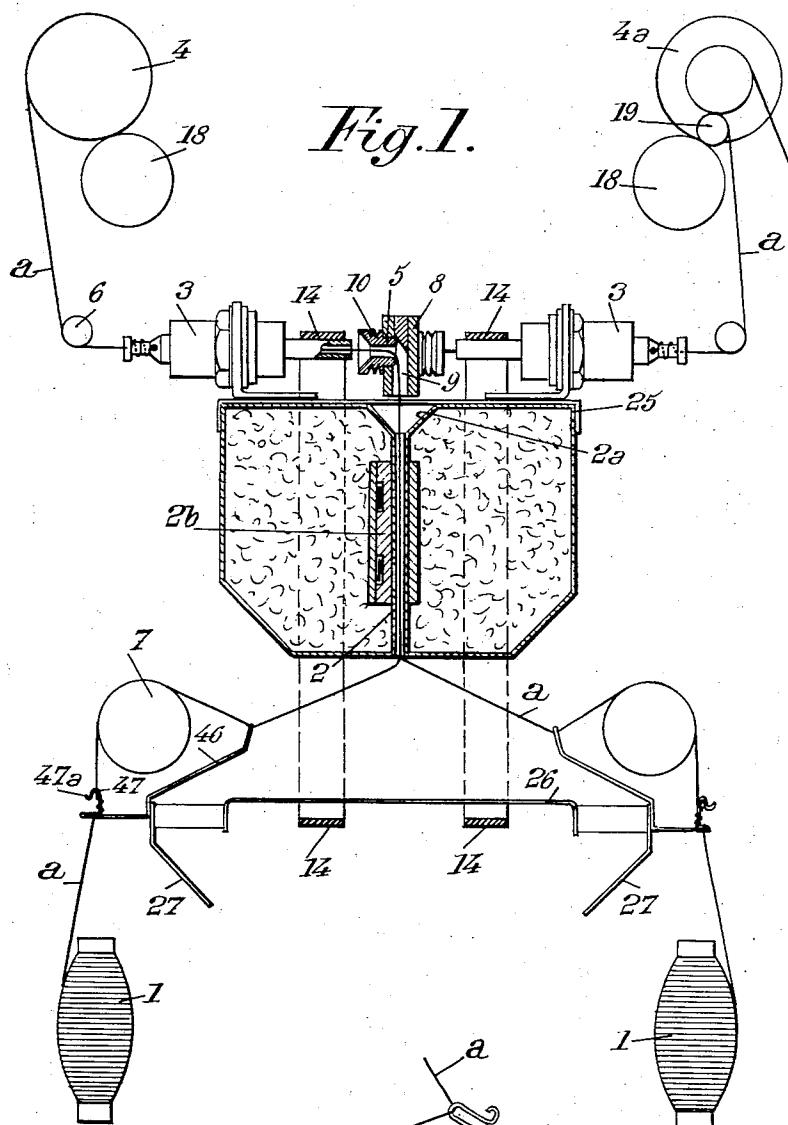


Fig. 3.

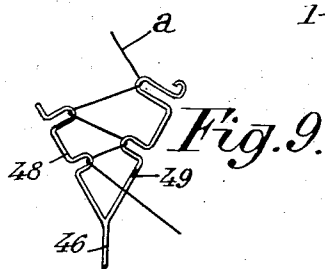
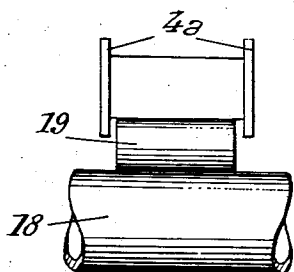


Fig. 9.



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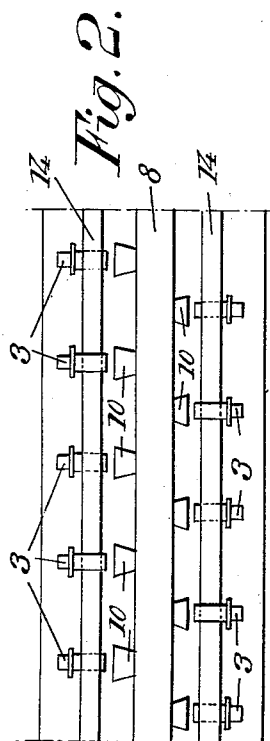
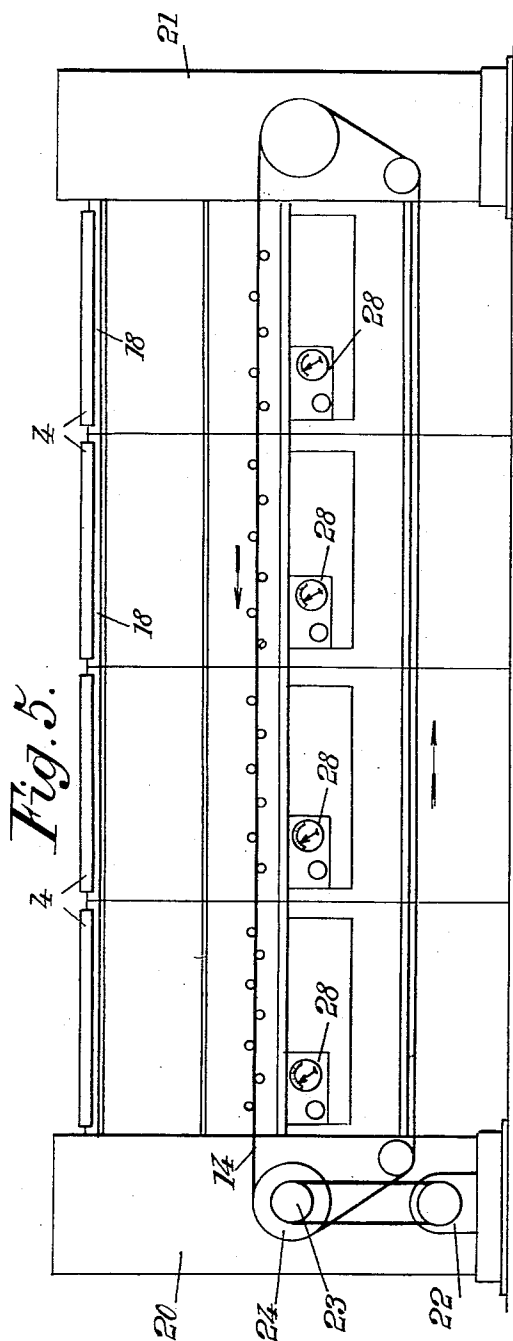
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

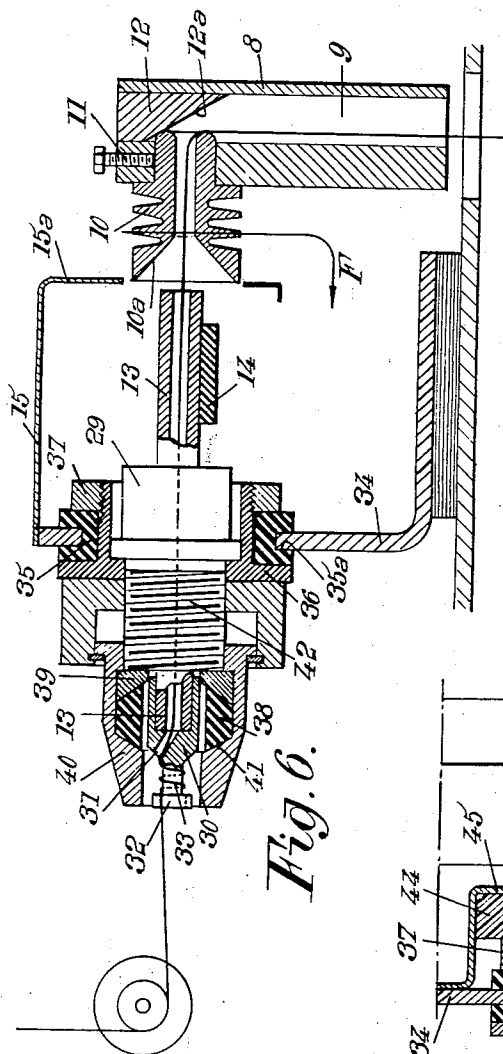


Fig. 6.

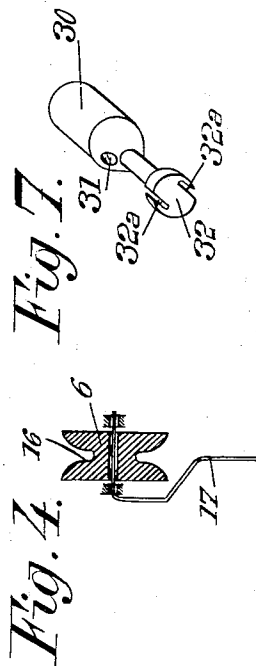


Fig. 4.¹⁶ Fig. 7.

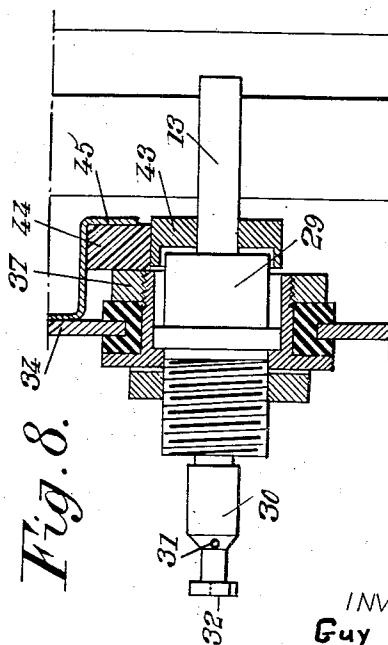


Fig. 8.

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1

2

3,010,271 MACHINES FOR CRIMPING YARNS BY FALSE TWIST, AND THEIR PARTS

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13 Claims. (Cl. 57—34)

The invention relates to machines for crimping yarns by false twist and more particularly to machines which utilize a rotary spindle to produce a twist in the yarn to be crimped, first in one direction and then in the opposite direction, this latter twist neutralizing the first. The yarn in this type of machine is subjected, while it is being twisted in the first direction and on the upstream side of the said spindle, to a heat treatment which the effect of fixing the reciprocal position of the molecules of the twisted yarn, so that the yarn, even after it has been completely untwisted, retains a crimped effect.

The invention has as a principal object the increasing of the efficiency of these machines while reducing their overall size and increasing their working speed.

A machine of the type contemplated in accordance with the invention is especially characterized in that the yarn to be crimped passes through a heating device in a vertical direction or slightly inclined with respect to the vertical, and is subjected, on the outgoing side of the heating device, to a change in direction in order to enter the spindle, the axis of which extends obliquely or horizontally, after which the yarn, when it has passed out of the spindle, is preferably subjected to a further change of direction upwards so as to be wound on a receiving reel mounted at a level higher than that of the spindle.

In accordance with a particularly advantageous embodiment of the invention, horizontal or inclined spindles are mounted on each side of the heating device located in the plane of symmetry of the machine, a part of the yarns, after their passage through the said device, being directed towards the right and another part towards the left of the said plane, the receiving reels and the cops from which the yarns to be crimped are unwound, being preferably also arranged on each side of the said plane of symmetry.

Further special features and advantages of the invention will become apparent from the description which follows below, reference being made to the accompanying drawings, in which:

FIG. 1 shows diagrammatically and in transverse cross-section, a crimping machine constructed in accordance with the invention;

FIG. 2 shows a plan view of the arrangement of a number of spindles of this machine with respect to the heating device;

FIG. 3 shows a drive for a receiving reel;

FIG. 4 shows a wheel for changing the direction of the yarn, with its support;

FIG. 5 is a view in elevation of the crimping machine;

FIG. 6 shows, in cross-section and on enlarged scale, the device for changing the direction of the yarn, the device being arranged on the outgoing side of the heating device and serving at the same time for cooling the yarn, together with a false twist spindle;

FIG. 7 shows a detail of the false twist spindle;

FIG. 8 shows an alternative form of a braking means for the false twist spindle; and

FIG. 9 shows a detail of an unwinding device interposed between the cop and the heating device.

The machine illustrated in the drawing is provided with a number of cops 1 from which are unwound the yarns a to be crimped by a false twist. These yarns are caused to pass through heating tubes 2 of a heating device, which

will be referred to hereinafter and then through a false twist spindle 3, after which the crimped yarns are wound on the receiving reels 4.

Heretofore, the heating tubes and the spindles have always been placed in line with each other. However, in accordance with the first arrangement of the invention, the axis of the spindle 3 is inclined at a certain angle with respect to the corresponding heating tube 2, this angle being preferably equal to 90°, the heating tube being vertical while the spindle is horizontal. There is interposed between the heating tube 2 and the corresponding spindle 3 a guiding device 5 which forces the yarns to change direction between the heating tube and the crimping spindle, in conformity with the angle which exists between the axes of the two members. After the yarn has passed out of the spindle 3, it is preferably subjected to a fresh change of direction by causing it to pass over a wheel 6, so that the receiving reel 4 for the yarn may be mounted at a higher level than that of the spindle 3.

This arrangement in accordance with the invention enables, on the one hand, space to be saved in height and, on the other hand, the spindles can be fixed rigidly to the frame of the machine while at the same time insuring easy access to the spindles for setting the yarn in position.

In accordance with a preferred form of embodiment which enables a machine to be constructed with a minimum overall size for a given number of spindles, the heating tubes and the heating device are arranged in the vertical plane of symmetry of the machine (see FIG. 1), while the spindles 3, horizontal or inclined, together with the cops 1 and preferably also the receiving reels 4, are placed on each side of the said vertical plane of symmetry of the machine. It should be noted here that the term "plane of symmetry" should not be construed in its strict sense. In general, the symmetry is approximate only.

In this advantageous form of embodiment, the yarn is subjected to a change in direction of about 90°, not only after it leaves the spindle 3, but moreover it is subjected to two changes in direction of about 90° between the cop and the guiding ring at the entry of the heating tube 2.

With respect to the various guiding means which insure the path of the yarn through the machine, which has just been described, these guiding means can be arranged in various ways. It would appear however to be particularly useful to employ the means described below.

In order to insure the first change of direction of the yarn which leaves the cop 1 in an essentially perpendicular direction, use is preferably made of a rotating roller 7 which forms a part of an unwinding device which will be referred to later. The yarn, which is sent by this roller in a substantially horizontal direction, passes into the heating tube 2 of the heating device through a guiding ring provided at the entry of this tube, and compelling the yarn to follow a second change in direction, so that it passes through this tube 2 in a vertical direction.

As far as concerns the direction-changing device 5 mounted at the outlet of the heating tube, it serves with advantage at the same time for cooling the yarn after it passes out of the said heating device.

In accordance with a preferred form of embodiment, this direction-changing device 5 is constituted by a bar 8 in which are formed a plurality of vertical conduits 9, each conduit being located opposite a heating tube 2 and receiving a pre-determined yarn. Each conduit 9 communicates with a socket 10 with a horizontal axis, fixed in the side wall of the bar 8, and on the inlet edge of which the yarn rubs when it passes from the vertical conduit 9 into the horizontal conduit formed by the socket 10.

Along the bar 8, the sockets 10 are arranged alternately on the left-hand side and on the right-hand side,

3

and the yarn which passes out of each socket passes alternately into the spindle 3 arranged on the left and into the spindle 3 arranged on the right of the vertical plane of symmetry of the machine.

In order to facilitate the cooling of the yarn during its change of direction, the sockets 10 are preferably provided with cooling ribs. The cooling of the yarn at its outlet from the heating device and before it passes into the spindle 3, improves the fixation of the molecules of the yarn in the position which they have taken up as a result of the twist of the yarn. Since the inlet openings of the sockets are constantly subjected to an intense friction from the yarn, the sockets are formed, at least in their portions adjacent the inlet, by a piece having a very great surface hardness. In spite of this, it is an advantage to provide means for distributing the wear over the whole circumference of the inlet, in order to increase the life of the sockets. To this end, the sockets are preferably mounted in such manner in the bar 8 that they can be angularly displaced in their housings and are fixed in each desired position by means of a clamping screw 11 (see FIG. 6).

The passage formed for the yarn in the sockets 10 is preferably given a relatively small diameter in order to prevent any ballooning of the yarn.

The outlets of the sockets 10 and also those of the heating tubes 2 are advantageously provided with a flare so as to give them the shape of a funnel indicated respectively by 10a and 2a, and opposite each inlet of the socket 10, there is provided a member 12 comprising an oblique surface 12a. In this way, it is possible to thread a yarn by a single movement of the operator. In fact, a yarn-finding needle mounted on an elastic support is passed simultaneously through the spindle 3, the socket 10, the conduit 9 and the corresponding heating tube 2.

The yarn after having left the socket 10, passes axially into a spindle 3.

The portion of the spindle which is located immediately opposite the socket 10 is advantageously arranged in the form of a tube 13 against which is applied the belt 14 which drives the spindle. In this way, the belt passes in the immediate vicinity of the socket 10 and of the bar 8, and the air which is carried along with its movement effectively contributes to the cooling of the said bar and socket. This cooling effect may be still further increased by means of a casing 15 (see FIG. 6), in the interior of which moves the side of the belt which drives the spindles, the said casing only permitting the entry of air through the space which exists between its side wall 15a and the bar 8, the sockets 10 being located in this space. The air drawn in by the belt 14 must therefore follow a path such as that indicated by the arrow F.

In the machine as it is shown in FIG. 2, and comprising two rows of spindles on each side of the bar 8, two sides of the belt 14 move to the right and to the left of the bar and alongside the bar.

With regard to the rollers 6 which guide the yarn passing out of the spindles 3 towards their receiving reel 4, these are with advantage given the form shown in FIG. 4, that is to say a deep groove 16 is formed in these rollers, the groove being flared from the interior towards the exterior, and terminating in a wide portion with widely-rounded walls. These rollers are preferably mounted elastically in the machine, for example, by means of a steel wire 17 (piano wire) which serves at the same time as the shaft of rotation.

The shape of the groove 16 insures a correct centering of the yarn which passes out of the spindle, and enables the use of eyelets to be dispensed with. This simplifies the construction and facilitates the work of the operator who has no particular action to carry out during the threading of a yarn through the machine. In addition, these rollers permit a change in direction of 90° of the yarn without appreciable friction likely to damage the yarn. Finally, the elastic mounting of the said rollers permits of the

4

absorption of slight over-tensions which may occur during the operation of the machine.

The receiving reels 4 are driven by a driving tube 18 of large diameter which may be a standard commercial tube. When the reels are reels without cheeks, the tube 18 may be applied directly against the mass of yarn which has been wound on the reel (see the left-hand portion of FIG. 1). The winding on the reels is then effected from above. On the other hand, if the reels are provided with cheeks 4a (FIG. 3), there must be interposed between the driving tube 18 and each of the reels, an intermediate cylinder 19 which fits into the space between the cheeks 4a to be applied against the mass of yarn wound on these reels, the winding of the yarn being then preferably effected from below (see the right-hand portion of FIG. 1).

As far as the whole machine is concerned, this is made-up, in accordance with a further arrangement of in invention, by the juxtaposition of a number of similar assemblies which extend between two end supports 20 and 21 (see FIG. 5). The support 20, known as the headpiece, comprises a motor 22 which actuates the driving shaft 23 on which are fixed two pulleys 24 serving to drive two belts 14 which extend on each side of the vertical plane of symmetry of the machine. In addition, the support 20 comprises the transmissions for driving the tubes 18 which actuate the receiving reels, together with the cam (not shown) providing the to-and-fro movement necessary for distributing the yarn which is wound on the reels uniformly over the entire length of each reel.

In accordance with this further arrangement of the invention, each of the units interposed between the two supports 20 and 21 is provided with a heating device for a plurality of yarns, the number of spindles, supports, cops and receiving reels which corresponds to the number of yarns passing through the multiple heating device, and for each side of the machine, one or a number of sections of driving tube co-operating with the number of receiving reels which are located on each side of the machine. By means of the juxtaposition of a variable number of such units, it is possible to obtain machines of different sizes. In the form of embodiment shown in FIG. 5, four units of the kind indicated have been mounted side by side, each of these units comprising for example forty-eight cops, spindles and receiving reels arranged in groups of twenty-four on each side of the vertical plane of symmetry of the machine. In this example, each heating device also comprises forty-eight heating tubes.

The size of each unit is limited by the expansion of the heating device, which expansion should not exceed a certain maximum value, and especially by the necessity of obtaining a uniform temperature over the whole length of the multiple heating device.

Each multiple heating device preferably comprises a metallic block 2b heat-insulated and preferably electrically heated, and in which are formed as many passages as there are yarns to be heated by the device.

In order to assemble a complete machine, it is only necessary to join together the desired number of the units referred to above, and to couple them to each other and to two end supports by means of girders which pass over the whole length of the machine from one end support to the other, and of which two have been shown in FIG. 1 and designated by the reference numbers 25 and 26.

On the upper girder 25 are fixed in particular the heating devices and the spindles of each unit.

It should be noted that the combination of a multiple heating device with spindles placed, in plan view, in quin-cunx on each side of this device (see FIG. 2) forms a particularly useful arrangement of the present invention. In fact, for a given minimum distance between two adjacent spindles located on the same side of the heating

5

device, it is possible by the said combination to double the number of yarns treated by the heating device without increasing the mass of the metallic block, the quantity of insulating material and the overall dimensions of the said device, and even without substantially increasing the consumption of electrical heating energy.

As can be seen from FIG. 1, the heating devices are suspended under the girder, which has the particular advantage that the glass wool, with which the casings of the heating devices are filled in order to give the necessary heat insulation to the heating tubes, acts at the same time to absorb the noise of operation.

As regards the lower girder 26, this is preferably arranged to serve as a protecting casing for the return of the belts 14. Metallic protecting sheets 27 (see FIG. 1) may also be fixed to the girder 26, these sheets breaking the current of air produced by the belts and which would be likely to interfere with the unwinding of the yarns from the cops.

Preferably, and in accordance with still another arrangement of the invention, there is employed for driving the spindles only the tight sides of the belts, which are the upper sides in the case of the direction of movement of the belts 14 shown by the arrows of FIG. 5. This permits of high speeds of the belts and in consequence high speeds of rotation of the spindles, while avoiding differences in the number of revolutions of spindles and in consequence differing amounts of twist in the yarns subjected to the false twist, this being obtained by means of the good conditions of working of the belts.

The spindles of one row, that is to say in the case of FIG. 1 the spindles arranged on one side only of the vertical plane of symmetry of the machine, are preferably placed alternately above and below the belt which drives them, so that two adjacent spindles always rotate in opposite directions without it being necessary to have recourse to intermediate rollers between the spindles (see FIG. 2).

The machine is also provided with safety means which cause it to stop if the temperature in the heating device forming part of one of the units to be connected together falls. To this end, each of these units comprises a thermometer 28 which operates contacts (not shown) as soon as the temperature which it indicates falls below a predetermined value.

In the machine which has just been described, use can obviously be made of any kind whatever of suitable false twist spindle. It appears however to be particularly useful to arrange the spindles themselves and their mountings as shown in FIGS. 6 to 8.

The spindle shown in these figures comprises a hollow tube 13 which is mounted with the interposition of bearings (not shown) in a stationary socket 29, this socket being itself preferably mounted by means which will be described hereinafter. The tube 13 is provided at its outlet extremity with a head 30 fixed on the tube and comprising an oblique channel 31 opening to the exterior through an eccentric orifice, this passage forming the continuation of the conduit formed by the tube 13. In addition, in accordance with a particular arrangement of the invention, the head 30 is provided with an extension constituted by a driving nose 32 having for example two notches 32a and a cylindrical portion 33. After passing out of the eccentric orifice, the yarn is passed once or several times round the cylindrical portion 33, and then through one of the notches of the driving nose 32. The fact that the yarn is passed round the cylindrical portion 33 produces a braking effect on the yarn, the value of which can be adapted to the nature of the yarn and to its size by varying the number of turns of the yarn round the said portion 33. The necessary tension of the yarn is thus obtained towards the outgoing side, while the incoming tension of the spindle can remain small.

The arrangement of the head 30 as a part which can be added to the tube 13 of the spindle enables the pro-

6

duction cost of this latter to be greatly reduced. In fact, the tube 13 with the socket 29 are standard commercial parts manufactured by mass production and are in consequence relatively cheap, and in order to obtain the complete false-twist spindle according to the invention, it is only necessary to provide the members 13 and 29 with a head 30.

In addition to the features which have already been mentioned, the head 30 has the further advantage of being relatively simple to manufacture, easy to use for placing the yarn in position, and it only adds very little weight to the spindle so that it permits high speeds of rotation.

As far as the mounting of the spindles is concerned, recourse is again made with advantage to a further arrangement in accordance with the invention, by which this mounting is given a certain elasticity. To this end, a ring 35 (FIG. 6) of elastic material, for example of rubber, is interposed between the support 34 in the form of an angle iron common to a number of spindles, and each of the spindles housed in a hole of one of the flanges of the support 34. This elastic mounting permits of high speeds of rotation without vibration being transmitted to the casings of the machine.

Again in accordance with a further arrangement of the invention, the spindle is preferably housed eccentrically in its support so that the position of its axis may be modified by a rotation of the spindle, this modifying in consequence the circular arc along which the incoming extremity of the tube 13 of the spindle, playing the part of a pulley, is in contact with the belt 14. At the same time, it is thus possible to regulate the pressure of the belt against the said extremity of the tube 13. Finally, by giving the said eccentricity a sufficient value, it is possible to disconnect the spindle by removing all contact between the belt and the tube 13.

In order to produce this eccentric mounting, the whole of the ring 35 which serves as a housing for the spindle can be made eccentric with respect to its groove 35a by means of which this ring is mounted in the support 34. This ring is rotated with the spindle.

The position of the spindle in the ring 35 is effected by a tubular member 36 which is applied by means of an end-plate against the front face of the ring 35 and provided with a nut 37 at its extremity which projects beyond the ring 35 towards the rear. When once the nut 37 has been removed, this method of fixation enables the spindle to be freed towards the front when it is desired to remove it.

In order to obtain the eccentric mounting which has been described above, it is of course possible to give a certain eccentricity to the member 36 instead of eccentrically arranging the internal hole of the ring 35.

In order to be able to brake the spindle, use may be made of two methods shown in FIG. 6.

In this figure, the head 30 of the spindle is surrounded by a brake-shoe 38 in the form of a ring of elastic material, this ring having a trapezoidal cross-section and being applied on the one hand against a wedge-shaped element 39 which is in axial abutment against the stationary socket 29 of the spindle, and on the other hand against a hollow member 40 which is also provided with a wedge surface 41 and is screwed on an external thread 42 on the said socket 29. By screwing the hollow element on the thread 42, the shoe 38 is forced to be radially deformed inwards and to be applied against the outer surface of the head 30 of the spindle, thus producing a braking effect on this head and on the tube 13 to which the head is rigidly fixed.

A further form of embodiment of spindle brake is shown in FIG. 8. In this figure, a cylindrical sleeve 43 is fixed on the tube 13, against which sleeve can be clamped a shoe 44 which is placed between an elbow member 45 on the one hand, rigidly fixed to the support 34 and the nut 37, and on the other hand, the said sleeve 43. By forcing the shoe 44 against the sleeve 43, the

7

tube 13 is stopped and the driving belt 14 slips on this tube.

Finally, as regards the unwinding device interposed between each cop 1 and the entry of the yarn into the heating device, this is preferably arranged in accordance with a further feature of the invention.

With this arrangement, the cylinder 7 over which the yarn *a* passes, is caused to rotate at a tangential speed which is preferably variable and is with advantage greater than that of the yarn, and means are provided for keeping the yarn in contact with a portion of the periphery of this cylinder, these means acting at the same time as a light brake on the yarn and as a tension-regulating device for the yarn.

The said means may be constituted by a steel wire 46 fixed to the girder 26, and having one of its extremities in the form of an inlet tension device constituted by a rod 47 terminating in a hook 47*a* and having wound around it one or a number of turns of the yarn *a*. The other extremity of the wire 46 forms the outlet tension device and is constituted to that end by two branches 48 and 49 inclined one with respect to the other and each provided with elbowed portions intended to guide the yarn which passes through these elbows in the manner shown in FIG. 9. When the tension of the yarn has a tendency to vary, the angle between the two arms 48 and 49 closes or opens, so as to provide the desired compensation for the variations in tension which are liable to occur.

From the preceding description it follows that the cop-unwinding device of the invention is simple in its construction and easy to use, since it does not require any special action of the operator during the placing of the yarn in position, this operation being carried out with one hand only.

The machine thus produced has, among other advantages, those of small overall dimensions, a high efficiency, ease of supervision, and especially ease of introduction of the yarns, great accessibility of all its parts and facility of removal and replacing in position of the spindles.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. A machine for crimping yarns by false twist, including and in which each yarn to be crimped passes successively through a heating device and a rotary spindle which twists said yarn in one direction on the entry side and untwists said yarn by an equal amount on the outgoing side, said machine comprising essentially: means defining a plurality of yarn-passages in each said heating device; means for mounting said heating device with said yarn-passages substantially vertical; means for mounting each said spindle with its axis substantially horizontal; and a yarn-guiding device for changing the direction of travel of each yarn between the exit side of said heating device and the entering side of each said spindle.

2. A machine as claimed in claim 1, in which the said heating device is located substantially in the longitudinal plane of symmetry of said machine, and further comprising: means for horizontally mounting a plurality of said spindles on each side of said heating device; means for guiding a corresponding plurality of yarns from the outgoing sides of said yarn-passages to the corresponding spindles on each side of said plane of symmetry; a receiving reel and a delivery cop for each said yarn; and means for mounting said reels and cops corresponding to said plurality of yarns, on each side of said plane of symmetry, and on the same side as the yarns with which they are associated.

8

3. A machine as claimed in claim 1, in which the said horizontal spindle-mounting means are disposed adjacent the upper face of said heating device in such manner that the axes of said spindles are transverse with respect to said device, and in which each said guiding device for changing the direction of travel of said yarn comprises a tubular socket co-operating in spaced relation with the entry orifice of each said spindle and with the exit orifice of each yarn-passage of said heating device.

4. A machine as claimed in claim 3, in which the said exit orifices of said heating device are each flared in the form of a funnel opposite the entry orifice of the said tubular socket interposed between the heating device and the spindle, and in which the exit orifice of each said tubular socket is also flared in the form of a funnel opposite the entry orifice of said spindle.

5. A machine as claimed in claim 3, in which the said tubular sockets are each provided with external cooling fins, and in which the entry orifices of said sockets are smoothly and widely rounded and are made of a metal with great surface-hardness.

6. A machine as claimed in claim 1, and further comprising: means for simultaneously driving in rotation each plurality of spindles disposed on each side of said plane of symmetry; casing means for enclosing each said plurality of spindles and their associated driving means, whereby a current of fresh air displaced by the motion of said driving means is channelled over and cools said spindles and said yarn-guiding means.

7. A machine for crimping yarns by false twist, in which each individual yarn to be crimped passes successively through a heating device and a false twist spindle, the said machine being composed of at least two similar unit assemblies as claimed in claim 1, and further comprising: a head-support for housing the driving means of said machine; a second support at the other extremity of said machine; means for mounting said units side by side between the said supports; for each said unit, a heating device for heating a plurality of yarns, a plurality of false twist spindles, cops, and receiving reels, in number corresponding to the number of yarns passing through said heating device, yarn-guiding members and driving-shaft section for said receiving reels, the length of each said unit being determined by the requirements of uniform temperature along the length of the unit and by the maximum permissible expansion of said heating device, the number of said juxtaposed units depending on the total number of spindles in the said machine.

8. A machine as claimed in claim 1, in which the said heating device is located substantially in the longitudinal plane of symmetry of said machine, and further comprising: means for horizontally mounting a plurality of said spindles on each side of said heating device; pulley-driven belt means for rotatably driving all the spindles mounted on one side of said plane of symmetry by tangential contact of the driving members of said spindles with the tight side of said belt; a second similarly-disposed pulley-driven belt for driving the spindles mounted on the other side of the said plane of symmetry; means for guiding a corresponding plurality of yarns from the outgoing sides of said yarn-passages to the corresponding spindles on each side of said plane of symmetry; a receiving reel and a delivery cop for each said yarn; and means for mounting said reels and cops corresponding to said plurality of yarns, on each side of said plane of symmetry, and on the same side as the yarns with which they are associated.

9. A machine as claimed in claim 1, in which each said false twist spindle comprises: an eccentrically-disposed exit orifice for the yarn; a cylindrical portion of smaller diameter; and a driving nose on the free extremity of said cylindrical portion, the yarn being wound at least once round the said cylindrical portion to give the desired yarn tension.

10. A machine as claimed in claim 9, in which the said driving nose is constituted by a cylindrical head axially

9

bored to a driving fit on the free extremity of said cylindrical portion, and two oppositely-disposed longitudinal slots formed in said head.

11. A machine as claimed in claim 1, in which each rotary spindle is fixed in its support through the intermediary of elastic means constituted by a ring of elastic material.

12. A machine as claimed in claim 8, in which each rotary spindle is mounted in its support by means of an eccentric member, the rotation of which permits the angle and the pressure of the driving member of said spindle against the driving belt to be varied, even to the extent of de-coupling the drive of said spindle.

13. A machine as claimed in claim 1, and further comprising an unwinding device interposed between the cop of the yarn to be crimped and said heating device, said unwinding device comprising a cylinder over which

10

the yarn passes, said unwinding device rotating at a tangential speed variable and greater than that of the yarn wound on said receiving reel, the yarn being in contact with a part of the periphery of said cylinder, and means for regulating the yarn tension comprising an elastic tensioning device adapted to act at the same time as a brake.

References Cited in the file of this patent

UNITED STATES PATENTS

2,741,893	Vandamme et al. Apr. 17, 1956
2,803,109	Stoddard et al. Aug. 20, 1957
2,951,330	Bouvet Sept. 6, 1960

FOREIGN PATENTS

1,127,005	France Aug. 6, 1956
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