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Strauss

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[54] **DEVICE FOR FORMING COILS OF THREAD**

[75] Inventor: **Edgar Strauss**, Ruti, Zurich, Switzerland

[73] Assignee: **Ruti Machinery Works Ltd. (formerly Casper Honegger)**, Ruti, Zurich, Switzerland

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[52] **U.S. Cl.** **139/12**

[51] **Int. Cl.** **D03d 47/26**

[58] **Field of Search** ..... 242/47.12, 47.13; 139/12, 122 R

[56] **References Cited**

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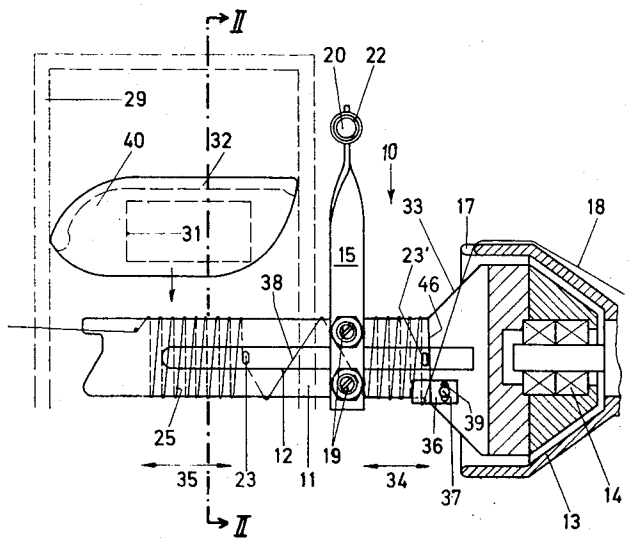
Primary Examiner—Henry S. Jaudon

Attorney—Donald D. Denton

[57] **ABSTRACT**

A device useful on a loom to form coils of thread, e.g., for weft thread insertions, utilizing a rotating element positioned at one end of a thread coiling member and rotatable with respect thereto so as to wind turns of thread about the coiling member, the coils being formed by periodic displacement of a given number of the thread turns from a coiling zone of the coiling member to a delivery zone thereof, and one or more pieces of material are provided at the coiling zone as means to augment the peripheral extent of the device in the area of the coiling zone so as to provide a greater cross-sectional periphery in the device at the rotating element end of the coiling zone than at the delivery zone end thereof.

9 Claims, 5 Drawing Figures



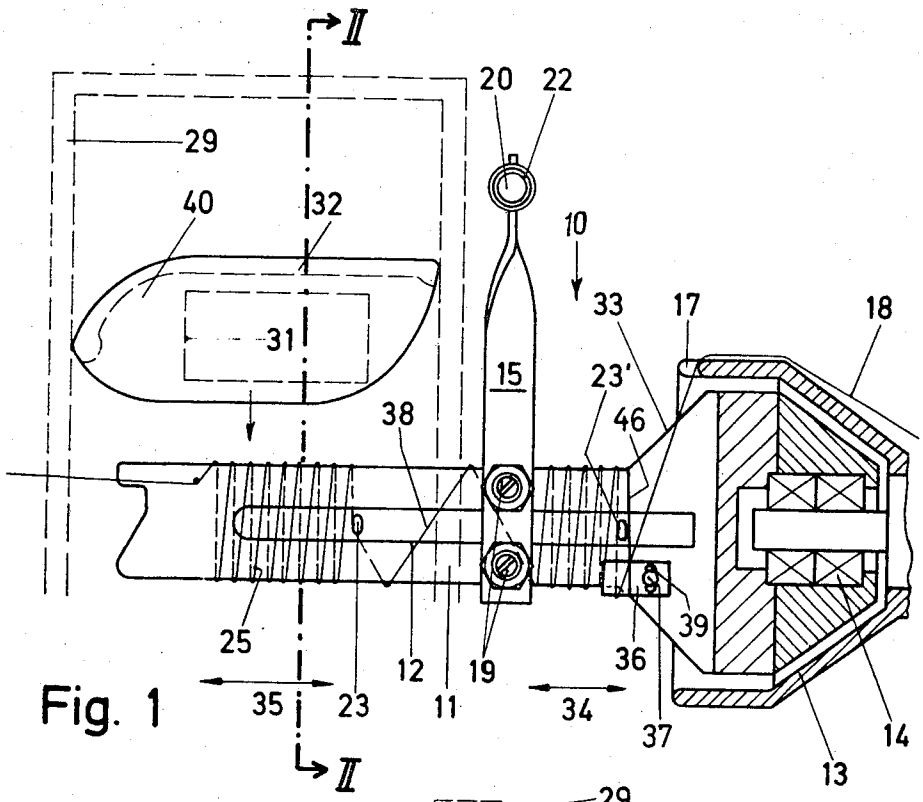

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Fig. 1

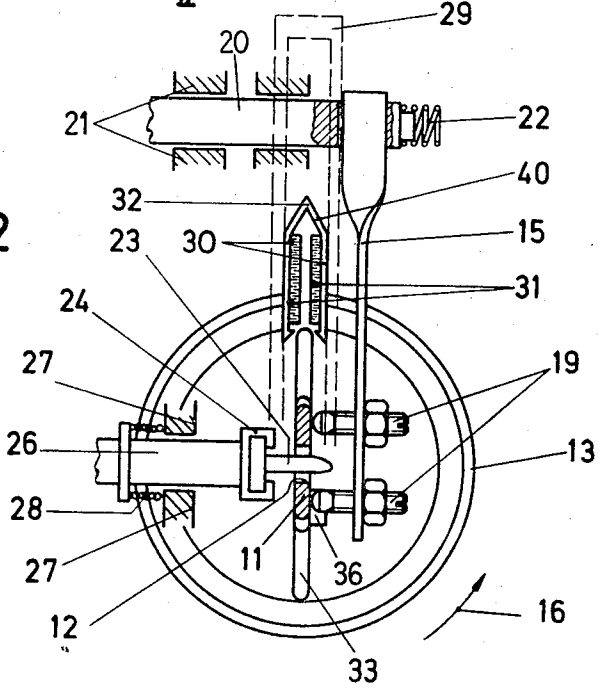
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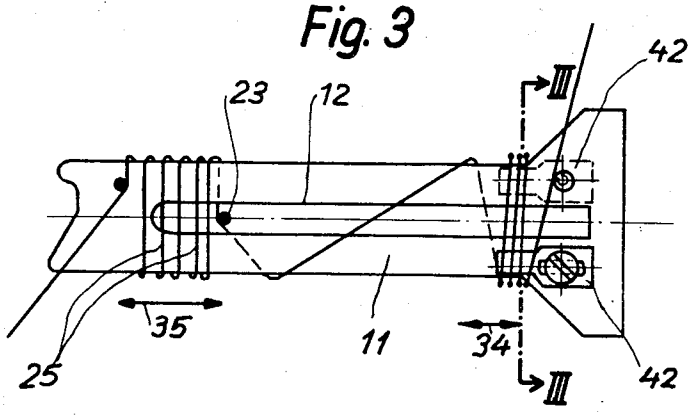
Fig. 2

Fig. 3



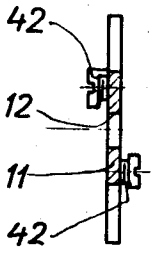


Fig.3a

Fig. 4

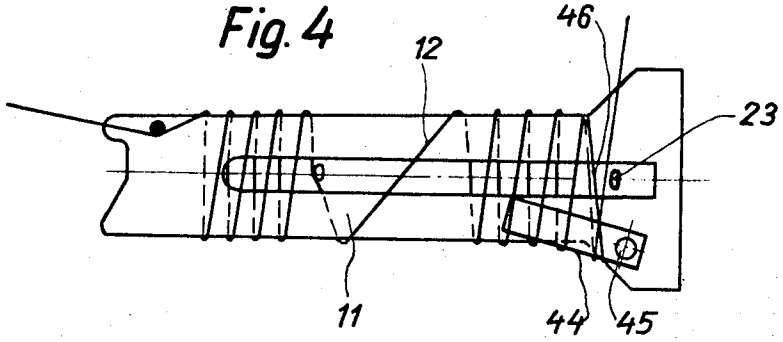
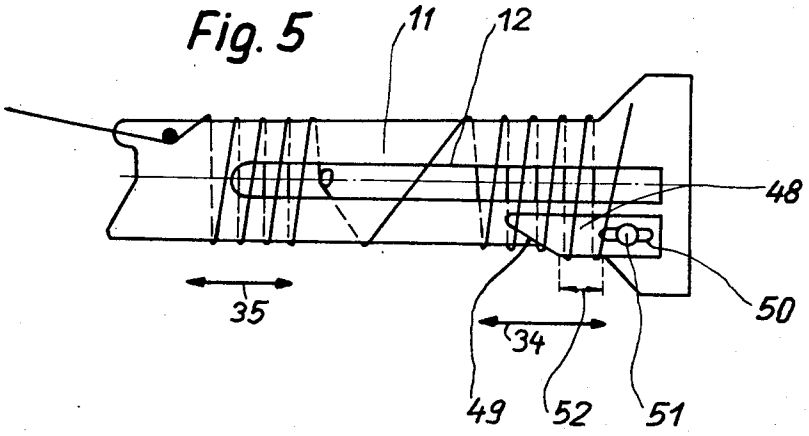


Fig. 5



DEVICE FOR FORMING COILS OF THREAD

BACKGROUND OF THE INVENTION

The present invention relates to a device, having particular use in a loom, for forming coils of thread of a predetermined length, which device includes a rotating element which is located at one end of a coiling member so that rotation of the element winds a series of thread turns around the coiling member. As this happens, coils are formed from the turns of thread wound onto the coiling member by periodically displacing a predetermined number of the turns along the coiling member from a coiling zone of this member to a delivery zone thereof.

It is known to form coils of thread which consist of individual turns and which all contain the same length of thread. The coils are formed by providing a rotating element which continuously winds a thread around the coiling zone of a coiling member for the thread. As soon as the prescribed number of turns has been wound on the coiling zone, these turns are shifted along the coiling member into a delivery zone of the coiling member as a coil of thread turns having a predetermined length of thread. When weaving is carried out on a loom of the kind that forms a wave-like shed, the coil of thread located in the delivery zone is passed to a shuttle and is inserted as a weft thread into the shed by the shuttle during the weaving process.

SUMMARY OF THE INVENTION

When a coil of the thread is being shifted from the coiling zone to the delivery zone, the portion of thread between the coil being shifted and the new coil being formed by the rotating element over the coiling zone is not cut. In this process therefore, it is necessary for one or several of the turns of the coil being formed to be extended in the direction of shift so that the thread does not break. In many cases this does not cause any difficulty since the turns may not be taut and since the surface condition of the coiling member may be such that the thread can very readily slide along it. However, it has been found that in the case of certain yarns sliding of the turns along the coiling member does not occur in a satisfactory manner. In these cases, the thread may break during the shifting of the coil. Furthermore, with a view to providing a neater mode of operation, it is desirable that the least number of turns of thread possible should be present between the displaced coil and the coil that is being formed. Additionally, the present invention is intended to enable the device for forming coils of thread to be adapted in a simple manner to suit a very wide variety of types of yarn in the sense that, in all cases, the mode of operation involves as little friction as possible.

The present invention is characterized in that at least one piece of material is provided at the coiling zone of the thread coiling member as coiling member enlarging means to augment the periphery thereof, so that the peripheral extent of the device that is measured around the coiling member and the piece of material in a cross-sectional plane of the coiling member is greater at that end of the coiling zone presented to the rotating element than the peripheral extent that is measured in a cross-sectional plane of the coiling member which is at that end of the coiling zone presented to the delivery zone.

The arrangement in accordance with the invention offers the additional advantage that the individual thread turns of the coils shifted from the coiling zone to the delivery zone remain neatly disposed in relation to each other. This is an unexpected phenomenon. To prevent the turns of thread, or thread turns, which are disposed side-by-side around the coiling member in the coiling zone from becoming superposed during their displacement, these turns have hitherto been wound relatively tautly. Experience has shown however, that the relatively slack turns, which are formed as the result of the use of the piece or pieces of material provided by this invention at the coiling zone for augmenting at least a portion of the periphery thereof, remain much more neatly arranged alongside each other along the coiling member during their displacement along this member than do the relatively taut turns.

BRIEF DESCRIPTION OF THE DRAWING

The invention will now be described in more detail by reference to preferred embodiments and to the accompanying drawing and description thereof, in which:

FIG. 1 is a side view in elevation of a device in accordance with the invention;

FIG. 2 shows a section through the device taken on line II—II of FIG. 1, and as seen from the left; and

FIGS. 3 to 5 are illustrations of further embodiments.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the Figures like parts are designated by like reference numerals.

Referring to the drawings, the device is designated generally by the numeral **10**. Device **10** has a thread coiling member **11** of narrow, blade-like form containing a slot **12** extending through it in its longitudinal direction. The member **11** is rotatably mounted in the rotating member or element **13** by means of the bearing **14**. The retaining member **15** prevents the coiling member **11** from turning. The rotating element **13** turns in the direction indicated by the arrow **16** (FIG. **2**). The rotating element **13** is provided with an eye **17**. Through this eye there runs the weft or weft thread **18** which is drawn from a supply bobbin, not illustrated, the thread passing from the bobbin towards the eye **17** by way of a longitudinal bore in the spindle of the rotating element **13**. It will be seen that during the rotation of the rotating element **13**, the weft thread **18** is continuously wound onto the coiling member **11**. The retaining member **15** bears, through its two pins **19**, on the blade-like coiling member **11**. The member **15** is carried by a retaining member rod **20**. This rod can slide in its longitudinal direction in the bearing **21**, and is continuously biased by the compression spring **22**.

The coil transfer means or pin **23** is linearly displaceable in directions parallel with the coiling member **11**, being movable in the guide **24** which is only shown in FIG. **2**. This displacement of the pin **23** serves to displace or transfer the coils **25** of weft thread along the coiling member **11** from right to left in the drawings. The guide **24** is carried by a rod **26** which is slidably mounted in the bearing **27** and can be displaced therein towards the coiling member **11** by the application of pressure as indicated in FIG. **2**. The compression spring **28** applies bias to the rod **26** in the opposite direction. When the guide **24** and the rod **26** are displaced to the

left in FIG. 2, the pin 23 does not extend into the slot 12.

In the present embodiment it will be assumed that the coils 25 of thread are delivered to the weft-inserting elements 40 of a loom of the type in which a wave-like shed is formed. These weft-inserting elements 40 are delivered in a continuous sequence from the run-out box 29. The mechanism used for doing this is not illustrated since it forms no part of the present invention. The weft-inserting elements or shuttles 40 are of mussel-like or conchoidal form. They have two side-walls 30, each of which has an inner lining 31 of plush material. The two sidewalls 30 are interconnected along the seam 32, but are not joined to each other over the remaining part of their peripheries. The weft-inserting elements 40 can therefore be pushed down over the blade 11 from the position shown in the drawing. (See FIGS. 1 and 2)

When, during operation of the loom, a weft-inserting element 40 is pushed down over the coiling element or member 11, the latter, carrying a coil 25, passes between the two plush linings 31 and these are thus applied to the coil 25 so as to engage it on both sides. Then the weft-inserting element 40 is moved to the left in FIG. 1, where it enters the shed of the loom, the linings 31 retaining the coil 25 of thread in the interior of the weft-inserting element 40, so that this thread coil 25 is thus drawn off the free end of the coiling member 11.

When the weft-inserting element 40 is pushed downwards, it is steadied or held by walls of the run-out box 29 so it remains during such movement through the box, in the same relative position shown in the drawing, i.e., it is displaced parallel with itself as indicated by the arrow in FIG. 1. As soon as it is positioned over the blade or coiling member 11, the latter is thus held by the weft-inserting element 40. Thus, retention of the blade 11 by the retaining member 15 is no longer necessary. When force or pressure is applied to the rod 20 in the direction opposed to that of the pressure applied by the compression spring 22, i.e., to the right in FIG. 2, the two pins 19 lift from the coiling member 11. Before the weft-inserting element 40 has moved downwards in the run-out box 29, the pin 23 will have been moved by means not shown to the rear or to the left in FIG. 2, and according to FIG. 1 towards the right-hand end of the slot 12 and will have moved forward again at this point. This point or position is indicated in FIG. 1 by the numeral 23'.

During the entire course of the operation described and to be described, the rotating element 13 turns continuously and winds the weft thread 18 around the coiling member 11. As this happens, the individual thread turns slide down along the inclined sides 33 of the coiling member 11 and move into contact with each other in the zone 34. Each new turn pushes the already formed turns slightly to the left. This results in the creation of a single-ply coil of thread, which extends over the zone 34 of the coiling member 11. This zone 34 is herein referred to as the coiling zone.

During the above-described phase of operations, the weft-inserting element 40 will have been pushed over the blade-like coiling member 11, and the pin 23 brought into the position 23' in which it extends through the slot 12. During the subsequent leftward displacement of the weft-inserting element 40 by means not illustrated, the pin 23 will at the same time also be moved to the left along the carrier or guide 24 from the position 23' shown in FIG. 1. The coil 25, which is located in the delivery zone of coiling member 11 designated by the numeral 35, is pulled off the coiling member 11 by the weft-inserting element 40, i.e., by the plush inner linings 31 therein and is thus passed to the element 40. This weft-inserting element 40 then participates in the weaving process and inserts the thread from coil 25, as a weft thread, between the warp threads.

Simultaneously with the displacement of the weft-inserting element 40 to the left, the pin 23 is pushed leftwards from the position 23', and thus pushes or delivers, a new coil 25 to the left and into the delivery zone 35. As already mentioned, the pins 19 of the retaining member 15 are lifted from the coiling member 11 during this phase, so that a coil 25 can be readily pushed along. During this displacement further turns of thread are continuously being formed on the member 11 in its coiling zone 34. If a coiling member 11 of uniform cross-section were used, a number of turns of the fresh coil being formed would have to be extended in the direction of the delivery zone 35 of the coiling element by the displacement of the coil 25. This is possible in many cases if the surface condition of the coiling member is such that the thread can readily slide over it and if it is assumed that the individual turns have not been wound on in a completely taut manner. There are however weft thread materials such as man-made fibers and mixtures thereof with natural fibers, which despite being enabled to slide readily, occasionally break when a coil 25 is shifted or transferred along the coiling member.

In order to prevent such breakages and in accordance with the invention, a piece of material or coiling member enlarging means 36 is fitted at the coiling zone 34 of the coiling member 11 as means to augment or increase the peripheral extent of the device in the area of the coiling zone. This piece of material is replaceable and is secured to the coiling member 11 by means of the screw 37. It extends over part of the coiling zone 34. In the example illustrated in FIG. 1, the piece of material 36 takes the form of a rod or strip. It contains a vertical slot 39, as seen in FIG. 1, so that by loosening the screw 37 it can be adjusted to any required position in the direction transverse of the coiling member 11. Thus, the piece of material 36 can be caused to project to any adjustable extent beyond the lower edge of the blade-like coiling member 11.

When using the above-described arrangement, a coil 25 of thread is shifted from the coiling zone 34 to the delivery zone 35, the length or portion 38 of thread, that extends between the shifted coil and the coil being formed, is delivered in that for drawing out one-half to a complete turn in the longitudinal direction of the coiling member 11, those turns of the coil being formed, that are already located to the left of the piece of material 36, are tightened so that they bear on the coiling member in a somewhat tauter condition. The length 38 of thread between the coils, that is necessary for the displacement, is however also delivered by the tightening of the rearmost turns of the leftwardly moving coil 25.

In this connection, it might be mentioned that the pin 23 is controlled in such manner that after each predetermined number of revolutions of the rotating element 13 it is pushed through the slot 12 in the blade-like coil-

ing member **11** and then pushes a coil **25** from the coiling zone to the left. Thus, all the coils **25** contain the same length of thread.

After the pin **23** has pushed a coil **25** past or beneath the retaining member **15**, the pins **19** on this member are again applied to the coiling member **11** and thus prevent the coiling member from moving from its vertical position after the weft-inserting element **40** has been pushed away from the coiling member **11**. At the same time, the pins prevent the extreme left-hand turns on the coiling zone **34**, as seen in FIG. **1**, from sliding away to the left in the event of the weft-thread material used being of the kind that can readily slip or slide.

With the movement of the pin **23** to the left, the weft-inserting element **40** is also pushed away to the left and from the coiling member **11**. Thereupon, the pin **23** again moves to the rear and to the right (as seen in FIG. **1**), and after a prescribed number of revolutions of the rotating element **13** is again pushed through the slot **12** at the point **23'**.

It can be seen that with the arrangement illustrated in FIG. **1**, only one length or turn **38** of thread must be present between the two coils or must be extended in the longitudinal direction of the coiling member **11**. This leads to the coils **25** being passed in a very neat manner to the weft-inserting element **40** when the invention is used on a loom of the kind forming a wave-like shed.

The arrangement described however also offers the additional advantage that the individual turns of the coil **25** do not become superposed during displacement along the coiling member **11**. Whereas, as mentioned previously, it has been assumed that such superposition of the turns of the coil is best avoided if the turns are applied to the coiling member **11** in a relatively taut manner, experience has shown that when use is made of the piece of material **36** provided on the coiling member **11**, relatively slack turns are formed, and presumably for this very reason the individual turns of the coils **25** remain neatly arranged side-by-side.

To suit different conditions resulting from various types of yarn, the piece of material **36**, being adjustable in position, can be set by means of the screw **37** at different vertical positions along the slot **39**, so that it projects to varying extents beyond the lower edge of the coiling member **11**, as seen in FIG. **1**. It can also be so adjusted that it does not project beyond this lower edge at all. The length of each turn is determined by the cross-section of the blade **11** and that of the piece of material **36** at that cross-sectional position or point along the coiling zone **34** where the inclined sides **33** terminate at the coiling zone. The position of the cross-section that controls the length of a turn is indicated in FIG. **1** by the numeral **46**. Since the piece of material **36** extends only over the right-hand portion of the zone **34**, the cross-section of this zone is smaller at that of its ends presented to the delivery zone **35**. Thus, when the turns of thread are displaced to the left, they become relatively slack after moving away from the piece of material **36**, so that sufficient thread material is available for extending the length of thread or turn **38**.

FIG. **3** illustrates a further embodiment. The blade-shaped coiling element **11** again contains a slot **12** along which a pin **23** can be displaced and through which said pin can be pushed and withdrawn again in order to displace coils **25** of thread from the coiling zone **34** to the delivery zone **35**. Instead of the single piece of material **36** there are provided the two pieces **42** for accomplishing a similar function thereto. These pieces **42** take the form of small elongate plates. They are positioned on different sides of the coiling member **11** as can be seen from the cross-sectional view provided by FIG. **3***a*. This view is along the line III — III of FIG. **3**.

In another embodiment shown in FIG. **4**, the piece of material is again formed by a plate, i.e., the plate **44**. This can be swung about the pin **45** and immobilized at any required angular position in relation to the edges of the coiling member **11**. Thus the length of the individual turns, which is dependent upon the cross-section of the coiling member **11** and the piece of material **44**, and upon the position of the latter, can be adapted to suit the conditions that exist. The length of the individual turns is dependent upon the cross-section at the point or position **46**.

In yet another embodiment illustrated in FIG. **5**, the piece of material is designated **48** and has at that of its ends presented to the delivery zone **35** of the blade **11**, an inclined edge **49** or a generally tapered form whereby a reduction, in this direction, of the peripheral extent of the combined cross-section of the coiling member **11** and the piece of material **48** is obtained. The piece of material **48** is displaceable along the slot **50**, i.e., parallel with the longitudinal axis of the coiling member **11**, and can be immobilized by means of the screw **51**. Thus, a zone of constant cross-section, having the length **52**, can be adjusted as required.

It will be clear that the present invention is not limited to use on a type of loom that forms wave-like sheds, but that it is also suitable for other weaving processes in which portions of weft thread of predetermined length are inserted into the shed. An example of such a process is that wherein the weft threads are inserted by means of a jet of water. In a process of this kind, the pieces of thread of predetermined length can be sprayed directly into the shed from the coiling member, or first passed to a thread store. In order to enable the withdrawal of the thread from the delivery zone to be carried out as easily as possible, i.e., with the minimum of tensile force, the coiling member is in this case of cylindrical form and has an at least approximately circular cross-section.

It will be appreciated that the pieces of material **36**, **42**, **44** and **48** form periphery augmenting or coiling member enlarging means which increase the size of at least a portion of the area of the coiling zone in thickness and/or height dimension and thus the length of its cross-sectional periphery relative to that of the delivery zone. Also, the height, length, and thickness of the pieces of material **36**, **42**, **44**, and **48**, which can be of metal similar to member **11**, can be varied and these pieces of material can take various configurations. Also, the pieces of material can be variously positioned with respect to the coiling zone so as to provide the good arrangement of the thread turns that have the desired degree of slackness.

Various changes and modifications can be made, as will be appreciated, all within the spirit and scope of the inventive concepts contained herein.

What is claimed is:

1. A device for forming successive coils of thread on a loom, each coil having a predetermined length and a plurality of thread turns therein and capable of being transferred with respect to thread turns of a succeeding

coil being formed which comprises: an elongated coiling member for receiving thread turns wound about the periphery thereof, said coiling member having a coiling zone for forming successive windings of thread turns continuously thereon and a delivery zone for receiving the formed coils of thread turns transferred thereto from said coiling zone; a rotating means positioned at one end of said coiling member and adapted to be rotated with respect thereto for continuously winding thread in a series of thread turns around said member in said coiling zone; said coiling zone having one end adjacent said rotating means and its other end directed towards said delivery zone; coil transfer means operative between said coiling zone and said delivery zone for periodically displacing a predetermined number of the thread turns in the form of a coil from said coiling zone to said delivery zone, so that the coil transferred remains connected to and spaced from thread turns of a succeeding coil being formed in the coiling zone; and coiling member enlarging means operatively connected to and attached laterally to the outer surface of a portion of the periphery of said coiling member for enlarging a portion only of the periphery of said coiling zone adjacent to said rotating means so that the periphery as measured around the coiling member and said enlarging means is greater than the periphery around the remaining portion of said coiling member; whereby a portion of each thread turn is spaced by said enlarging means away from the surface of said coiling member during coil formation in order that the thread turns of each coil are made relatively slack, the thread turns thereby being transferrable by said coil transfer means as a succession of intact connected coils from said coiling zone to said delivery zone, each said coil being made up of a predetermined number of thread turns.

2. The device of claim **1,** in which the coiling member enlarging means has a form that tapers towards the said delivery zone.

3. The device of claim **1,** in which attachment means are provided for replaceably securing said coiling member enlarging means to the coiling member.

4. The device of claim **1** in which the attachment means is a screw and slot arrangement for adjustably securing said coiling member enlargement means to the coiling member at different positions in relation to said coiling zone.

5. The device of claim **1** in which a portion of the coiling member enlarging means projects beyond an edge of the coiling member and has a portion which is inclined in relation to the said edge and which runs towards the said edge in the direction of the said delivery zone.

6. A device for forming coils of thread of predetermined length which device comprises: a blade-like coiling member for receiving thread turns wound about the periphery thereof, said coiling member having a coiling zone for forming windings of thread turns thereon and a delivery zone for receiving formed coils of thread turns from said coiling zone; a rotating element positioned at one end of said coiling member and rotatable with respect thereto for winding a portion of thread around the coiling member in a series of turns to form coils of thread turns thereon; said coiling zone having one end adjacent said rotating means and its other end directed towards said delivery zone; coil transfer means operative to periodically displace a predetermined number of said turns along the coiling member from said coiling zone to said delivery zone; and at least one coiling member enlarging means that takes the form of a strip at the coiling zone for augmenting a portion of the periphery thereof, said strip secured to said coiling member with one of its side faces bearing against a side wall of said coiling member; whereby the peripheral extent of said device measured around the coiling member and the enlarging means in a cross-sectional plane of the coiling member is greater at that end of the coiling zone adjacent the rotating element than the peripheral extent as measured in a cross-sectional plane of the coiling member at that end of the coiling zone presented to the delivery zone.

7. The device of claim **6** in which said coiling member enlarging means is a rod.

8. The device of claim **6** in which a second coiling member enlarging means is provided in the form of a strip which is secured to the coiling member with one of its side faces bearing against the other side wall of said coiling member.

9. The device of claim **8** in which said second coiling member enlarging means is a rod.

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