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CIRCULAR KNITTING MACHINE, PARTICULARLY CIRCULAR KNITTING MACHINE FOR STOCKINGS

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Fig.1

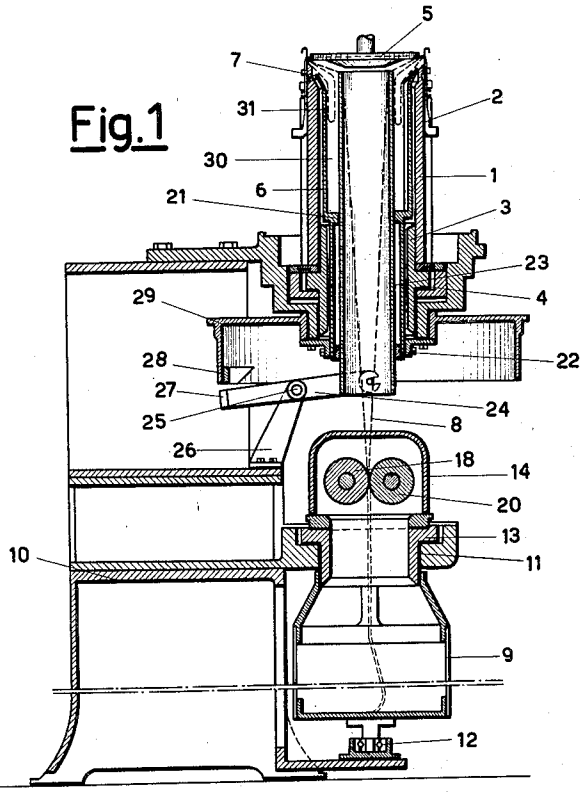


Fig.2

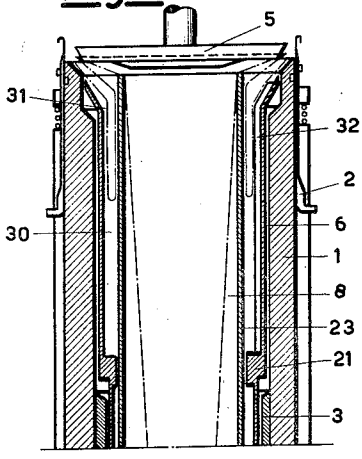
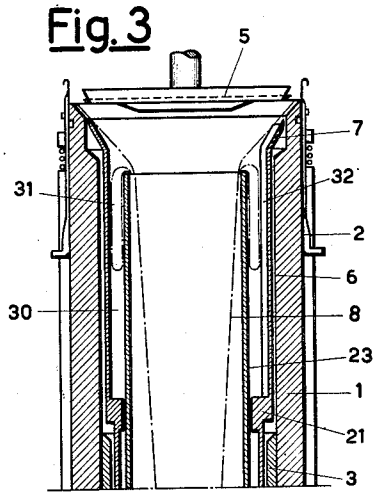


Fig.3



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CIRCULAR KNITTING MACHINE, PARTICULARLY CIRCULAR KNITTING MACHINE FOR STOCKINGS

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4 Claims. (Cl. 66—150)

This invention relates to circular knitting machines, particularly for use in knitting stockings, in which the fabric is continuously formed, the stockings being united with one another by means of a number of rows of knitting made with a so-called "separator" thread which is subsequently removed to separate the stockings.

In the fanufacture of women's stockings it is necessary, at the beginning, to form a double thickness welt before knitting the leg of the stocking.

For this operation, the fabric already knitted is transferred to hooks which hold it until the welt has been completed, after which the welt is attached to the leg in order to proceed with the knitting of this latter. To permit continuous manufacture of stockings (i. e. where one stocking is connected to the next one) without it being necessary to stop the machine each time a stocking is completed so as to be able to extract it therefrom, it is necessary to transfer the already knitted fabric (that is to say, the end part of the last stocking made) to the hooks, and then proceed with the knitting of the welt of the next stocking which is then attached to the leg, the knitting of which can then be proceeded with. The stockings are colletced in a receptacle disposed beneath the needle cylinder, the receptacle being connected to the needle cylinder so as to rotate in synchronism therewith.

It is known that the formation of the meshes of the knitted fabric is facilitated and that the knitted fabric assumes a more regular and uniform appearance if the fabric itself is maintained under a steady tension during its formation. Particularly in the case of women's stockings of high quality, it is essential and it is of the utmost importance that said tension be rigorously steady. Many devices have been designed to the purpose of creating this tension in the knitted fabric being formed. Generally, tensioning rollers are employed and these are mounted on the receptacle and driven by suitable means so as to pull the fabric at a desired tension. These tensioning rollers exert their tension continuously and this fact creates certain difficulties when the double thickness welt as described above is to be knitted, as the already knitted fabric which is transferred to the hooks and kept under tension by the tensioning rollers constitutes an obstacle to the formation of the welt, as it does not allow sufficient space for the proper development of the welt.

To overcome this difficulty it has already been proposed to mount a second coaxial tube on the tube usually provided inside the needle cylinder and extending up to the top of said cylinder, thus providing an annular space between these tubes into which the welt of the stocking can be developed. The upper edge of the second coaxial tube has the function of keeping the already knitted fabric displaced towards the centre of the needle cylinder and

held away from the inner surface of said needle cylinder so that the welt of the stocking may be free in the annular space. During the formation of the stocking proper, that is to say, after the border has been attached to the leg, the knitted fabric being formed must pass over the upper edge of the second coaxial tube and pass down inside such tube. It will be evident therefore, that during this stage, the second tube should not hinder in any way the knitting of the fabric nor interfere with the tension applied thereto.

The prior known arrangement described above, however, is not able to satisfy these last mentioned requirements, and consequently the use thereof has not been altogether satisfactory.

An object of the present invention is to provide an improved construction of knitting machine wherein these requirements are adequately fulfilled, and which is of simple construction.

According to the present invention there is provided a circular knitting machine for use in knitting stockings, comprising a rotatable needle cylinder; a disc, having peripheral hooks which serve to support already knitted fabric when a double thickness is being knitted, disposed above said needle cylinder, a hollow tube disposed within said needle cylinder; an inner sleeve located coaxially within said hollow tube to provide an annular free space therebetween; a receptacle beneath said inner sleeve for receiving knitted fabric; and a tensioning device for maintaining a tension in the fabric as it is knitted, in which the inner sleeve is capable of axial movement between a first position wherein its upper end is close to the disc and a second position wherein its upper end is spaced away from the disc, means being provided for moving the inner tube to said first position when a double thickness stocking welt is being knitted so that such welt is received in the annular free space, and to said second position when the remainder of the stocking is being knitted, this latter being received by and passing down the inner sleeve to the receptacle.

The invention will be described further, by way of example, with reference to the accompanying drawing in which:

Fig. 1 is a cross-sectional side elevation of a circular hosiery knitting machine constructed in accordance with the present invention; and

Figs. 2 and 3 are fragmentary detailed views on an enlarged scale corresponding to Fig. 1, Fig. 2 showing the disposition of the parts during the knitting of a stocking welt and Fig. 3 showing the same parts when the remainder of the stocking is being knitted.

Only those parts of the knitting machine which are essential for the understanding of the invention have been illustrated in the drawings.

The knitting machine comprises a needle cylinder 1 carrying needles 2 and driven by a known cam mechanism (not shown). The needle cylinder 1 is mounted on a driving sleeve 3, this latter having a toothed wheel 4 integral therewith which is rotated or oscillated by a main shaft (not shown) of the machine.

A disc 5 arranged above the needle cylinder 1 has hooks on its periphery and these serve in a known manner to hold fabric which has already been knitted in order to permit the formation of a double thickness welt at the end of a woman's stocking. The disc 5 rotates, during the knitting of the welt, synchronously with the needle cylinder 1.

A hollow tube 6 is arranged inside the needle cylinder 1, and this hollow tube 6 is secured to a stationary part of the machine (see Fig. 1) and consequently does not participate in the rotation or oscillation of the needle cylinder 1. The upper end of the hollow tube 6 is belled at 7 and forms a continuation of the upper inner surface of the needle cylinder 1. Beneath the hollow tube 6 is arranged, coaxially therewith, a receptacle 9 for reception of fabric 8 as it is knitted. The receptacle basket 9 is supported in a frame 10 of the machine by an upper bearing 11 and a lower bearing 12. A gear wheel 13, integral with the receptacle 9, is driven by gears (not shown) to perform a rotating or oscillating motion synchronized with that of the needle cylinder 1.

The receptacle 9 supports a tensioning device generally indicated by the reference numeral 14 which comprises two rollers 18 and 20 between which the knitted fabric 8 passes and which are rotated by means (not shown) to impart a specified tension to the fabric 8.

The hollow tube 6 has, on its inner surface, annular protuberances 21 and 22 which serve to locate an inner sleeve 23 slidably and coaxially arranged within the hollow tube 6. The inner sleeve 23 is supported at its lower end by a forked lever 24 which is pivoted at 25 in a bracket 26 secured to the frame 10 of the machine. The forked lever 24 at its end remote from the inner sleeve 23 bears a cam follower 27 which contacts a cam 28 provided on a drum 29 of the machine.

Between the hollow tube 6 and the inner sleeve 23 is a free annular space 30 and this serves to accommodate the welt (shown at 31) of a stocking during its formation, as will later be described.

On the inner surface of the hollow tube 6 are a plurality of ribs 32 and these serve to guide the welt 31 of the stocking into the free annular space 30 during the formation thereof. This is done as follows:

As soon as the formation of the welt of a stocking is to be started, the cam follower 27 of the forked lever 24 engages a protrusion (not shown) of the cam 28 and the forked lever 24 consequently lifts the inner sleeve 23 to the position shown in Figs. 1 and 2.

The fabric 8 which has already been knitted is held by the hooks and is tensioned by the tensioning rollers 18 and 20. This fabric 8 is held away from the inner surface of the needle cylinder 1 by the upper edge of the inner sleeve 23 and consequently sufficient space is provided therearound for unhindered formation of the welt 31.

As further fabric is knitted this hangs down on the outside of the inner sleeve 23 in the annular space 30, providing a double thickness welt 31 as shown in Fig. 2.

When sufficient of this double thickness welt has been knitted, the cam 28 permits the follower 27 to move upwards, so that the inner sleeve 23 moves to the position of Fig. 3. The fabric is transferred from the hooks of the disc 6 to the needles 2 and the knitting progresses to knit the leg of the stocking which is similar to the fabric 8 already described.

When sufficient of the fabric 8 has been knitted this is again transferred to the hooks of the disc 6 and the operations above described are repeated, to knit another welt. These operations are continued so as to knit a continuous length of fabric comprising alternate stocking legs and double thickness welts.

Should the inner sleeve 23 remain in its lifted position as shown in Fig. 3 during the knitting of the leg, it is apparent that it would interfere with the knitting thereof, so the mechanism described always lowers the said sleeve 23 when the legs are being knitted.

The invention is not limited to the precise details of the foregoing example in so far as variations may be made thereto without departing from the scope of the invention as defined by the appended claims.

I claim:

1. A circular knitting machine, for use in knitting stockings, comprising a rotatable needle cylinder; a disc, having peripheral hooks which serve to support already knitted fabric when double thickness fabric is being knitted, disposed above said needle cylinder; a hollow tube located in said needle cylinder; an inner sleeve, located coaxially in and axially slidable within said hollow tube between a first position wherein its upper end is close to said disc and a second position wherein its upper end is spaced away from said disc, providing an annular free space between said hollow tube and said inner sleeve; a receptacle disposed beneath said inner sleeve for receiving knitted fabric; a tensioning device for maintaining the knitted fabric under tension, and means for moving said inner tube to said first position when a double thickness stocking welt is being knitted so that said welt is received in said annular space and to said second position when the remainder of the stocking is being knitted, this being received by and passing down said inner sleeve to said receptacle.

2. A circular knitting machine for use in knitting stockings, comprising a rotatable needle cylinder; a disc, having peripheral hooks which serve to support already knitted fabric when double thickness fabric is being knitted, disposed above said needle cylinder; a hollow tube, having annular protuberances on its inner surface, located in said needle cylinder; an inner sleeve located by said protuberances coaxially in and axially slidable within said hollow tube between a first position wherein its upper end is close to said disc and a second position wherein its upper end is spaced away from said disc, providing an annular free space between said hollow tube and said inner sleeve; a receptacle disposed beneath said inner sleeve for receiving knitted fabric; a tensioning device for maintaining the knitted fabric under tension, and means for moving said inner tube to said first position when a double thickness stocking welt is being knitted so that said welt is received in said annular space and to said second position when the remainder of the stocking is being knitted, this being received by and passing down said inner sleeve to said receptacle.

3. A circular knitting machine, for use in knitting stockings, comprising a frame, a rotatable needle cylinder supported by said frame; a disc, having peripheral hooks which serve to support already knitted fabric when double thickness fabric is being knitted, disposed above said needle cylinder; a hollow tube, having annular protuberances on its inner surface, located in said needle cylinder; an inner sleeve located by said protuberances coaxially in and axially slidable within said hollow tube between a first position wherein its upper end is close to said disc and a second position wherein its upper end is spaced away from said disc, providing an annular free space between said hollow tube and said inner sleeve; a receptacle disposed beneath said inner sleeve for receiving knitted fabric; a tensioning device for maintaining the knitted fabric under tension; a forked lever pivoted to said frame and supporting said inner sleeve at its lower end; and means, acting upon said forked lever for moving said inner tube to said first position when a double thickness stocking welt is being knitted, so that said welt is received in said annular space, and to said second position when the remainder of a stocking is being knitted, this being received by and passing down said inner tube to said receptacle.

4. A circular knitting machine, for use in knitting stockings, comprising a frame; a rotatable needle cylinder supported by said frame; a disc, having peripheral hooks which serve to support already knitted fabric when double thickness fabric is being knitted, disposed above said needle cylinder; a hollow tube having annular protuberances on its inner surface, located in said needle cylinder; an inner sleeve located by said protuberances coaxially in and axially slidable within said hollow tube between a first position wherein its upper end is close to said disc and a second position wherein its upper end is spaced

away from said disc, providing an annular free space between said hollow tube and said inner sleeve; a receptacle disposed beneath said inner sleeve for receiving knitted fabric; a tensioning device for maintaining the knitted fabric under tension; a forked lever pivoted to said frame and supporting said inner sleeve at its lower end; a cam follower on said forked lever; and a cam carried by a disc of the machine and cooperating with said cam follower for moving said inner tube to said first position when a double thickness stocking welt is knitted, so that said welt

is received in said annular space, and to said second position when the remainder of the stocking is being knitted, this being received by and passing down said inner tube to said receptacle.

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