March 10, 1931. M. SCHOENFELD 1,795,683

THREAD TWISTING DEVICE FOR KNITTING AND OTHER MACHINES

Filed Nov. 5, 1925 2 Sheets-Sheet 1

Fig. 1.

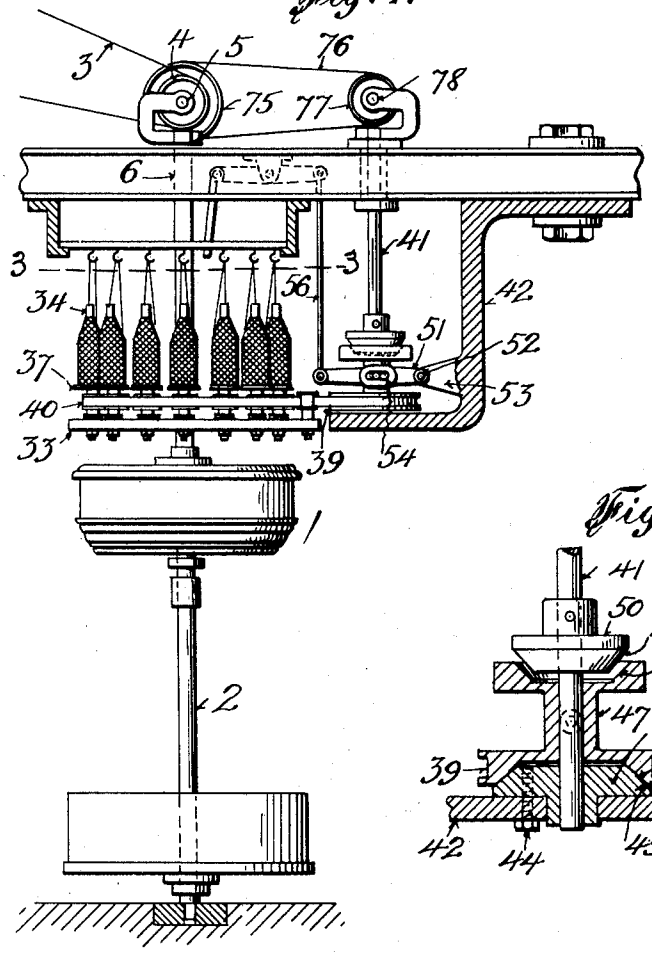


Fig. 5.

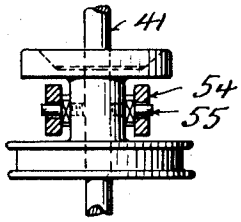


Fig. 4.

Fig. 2.

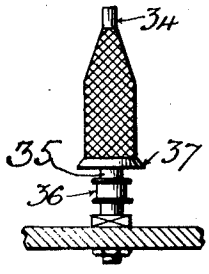
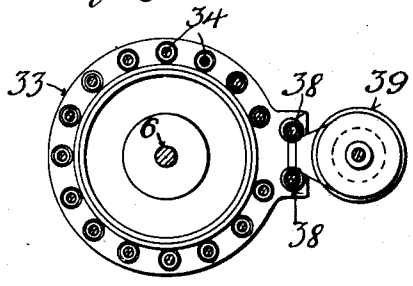


Fig. 3.



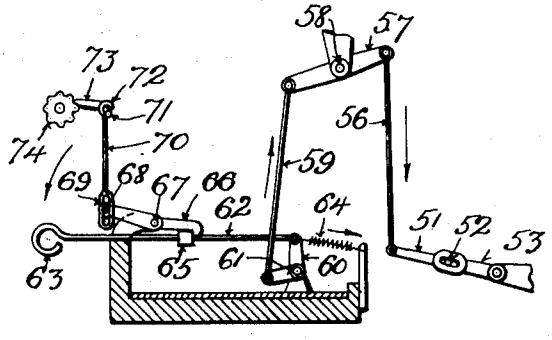


Fig. 6.

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THREAD TWISTING DEVICE FOR KNITTING AND OTHER MACHINES

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Fig. 1.

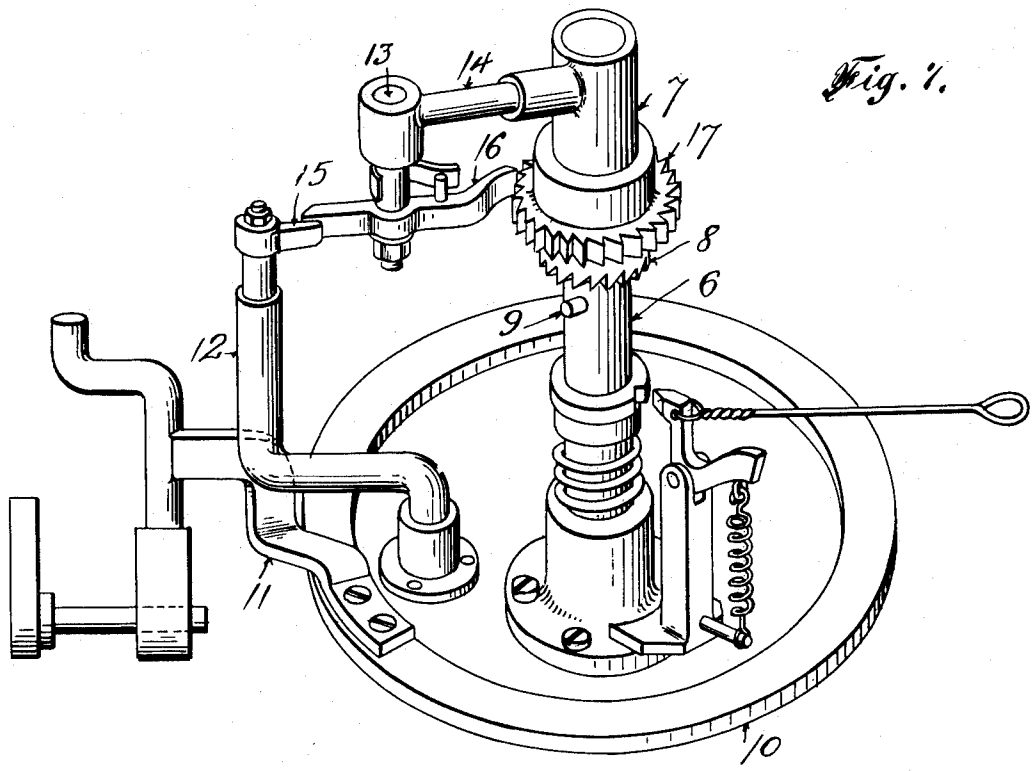
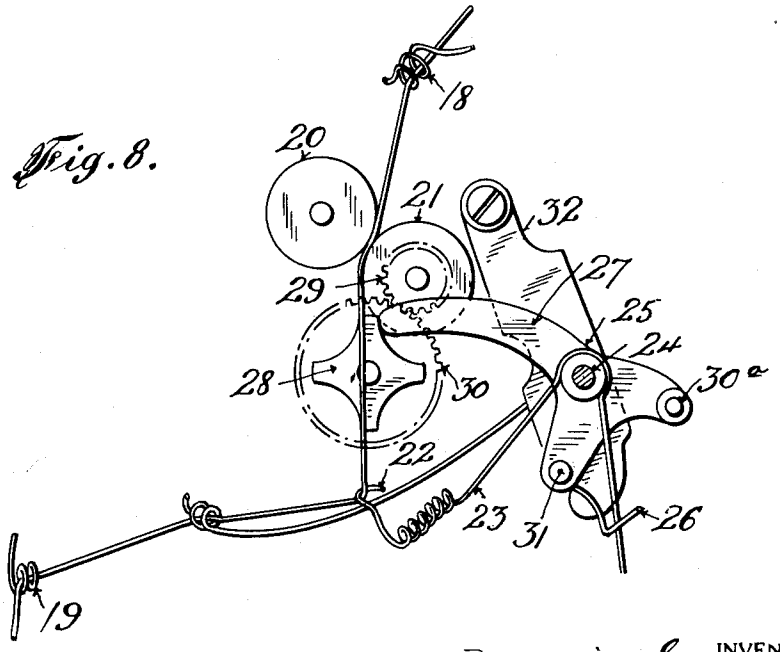


Fig. 8.



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UNITED STATES PATENT OFFICE

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THREAD-TWISTING DEVICE FOR KNITTING AND OTHER MACHINES

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The present invention is adapted to be applied to hosiery knitting machines, braiding machines, and other machines which operate with needles and with continuous threads which are taken from spools or bobbins. The principal object is to provide a device for partially or wholly twisting the threads which are fed to the needles of the machine, so that the twisting operation may be performed while the needles are performing their function of forming the fabric or stitching it, or whatever operation is accomplished by the action of the needles. In the case of a knitting machine, to which the invention has been applied in the drawings, the threads are taken from a series of spools and are fed to the knitting needles, but the threads undergo a twisting operation between the spools and the needles. The threads on the spools may be supplied entirely untwisted or they may be partially twisted, in which latter case the completion of the twisting will be accomplished with the present device.

So far as I am aware the twisting or forming of the threads has always been an independent process from that of constructing the threads into fabric. In the present case, however, the twisting of the threads and their utilization in the construction of a fabric, or the stitching of a fabric, is accomplished simultaneously and continuously, so that there is no intermediate handling required between the making of the thread and the formation of the fabric. The twisting operation takes place between the spools or bobbins which carry the threads and the needles, and preferably this is accomplished by revolving the spools or bobbins by suitable driving mechanism while the threads are being taken from the spools or bobbins, and fed through the needles. The spools or bobbins may be applied directly to the knitting or other form of machine, or they may be arranged independently thereof, and they may be arranged above or below or at the side of the knitting or other machine. Furthermore, the spools or bobbins may be arranged singly or in groups.

The spools or bobbins which carry the unformed or partially formed threads may be put into and out of operation singly or in groups, according to the requirements of the operation of the knitting or other machine. I also provide means for retarding or braking the motion of the spools or bobbins when the machine is stopped, and also provide a stop motion device for automatically stopping the thread twisting operation whenever a thread breaks, and a stopping mechanism may operate to stop the braiding or other machine simultaneously with the stopping of the thread twisting device.

In the drawings forming part of this application,

Figure 1 is a view showing, in elevation, the parts of a circular hosiery knitting machine to which my invention in one form has been applied,

Figure 2 is a detail view of the spool or bobbin and its pulley,

Figure 3 is a sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a sectional view showing the clutch through which the operation of the spools or bobbins is controlled,

Figure 5 is an elevation of the same,

Figure 6 is a detail view of the stop mechanism controlling the twisting device,

Figure 7 is a perspective view of a portion of the knitting machine, showing the usual stop motion device, and

Figure 8 is a detail view of the stop motion device for the knitting machine proper.

When artificial silk is formed, the individual fibers are usually continuous or of very great length, resulting, naturally, from the manner in which the fibres are formed; and when the fibres are twisted together they form a substantial thread even though there are fewer twists per yard than with other fibres. For this reason the spools or bobbins of the present device may be operated at sufficient speed to perform the twisting operation in the formation of the threads and deliver the threads continuously to the knitting needles as fast as these are required in the construction of the knitted fabric.

In the drawings I have shown only such parts of the complete knitting machine as is

necessary to show the application of my invention, and the machine is of the multiple feed type wherein there are as many threads fed simultaneously at different points as there are needles, although the invention is not limited to this application. In the drawings I have shown a portion of the basket 1, of an ordinary circular knitting machine and this revolves with the vertical shaft 2. The latter is operated from any source of power by means of the belt 3 arranged to pass around a pulley 4 on the shaft 5. From this shaft the power is applied through a pair of mitre gears (not shown) in the usual manner, to the vertical shaft 6. There is a sleeve 7 sliding vertically on the shaft 6 and on its lower end it carries a toothed clutch member 8 which is adapted to be engaged with and released from a pin 9 secured to the shaft 2 which is in axial alignment with the shaft 6. When this clutch 8 is engaged with the pin 9 the lower vertical shaft 2 will be revolved and therefore the knitting mechanism will be operated in accordance with well known practice; whereas, when the sleeve 7 is raised the clutch 8 is disengaged from the pin 9 and the driving force is cut off from the lower shaft 2 so that the knitting mechanism remains idle. There is an annular ring 10 through which the stop operating mechanism of the knitting machine proper is operated. This ring has an inclined plate 11 secured to it which is adapted to act upon the bent rod 12 for the purpose of lifting the same, and this rod acts through a shaft 13 and a connecting arm 14 to lift the sleeve 7 for the purpose of disengaging the clutch 8 from the pin 9. The movement of the ring 10 also produces a slight turning movement of the bent rod 12 and this action causes the arm 15 on the upper end of this bent rod to swing the pawl 16 so that its opposite end engages with the teeth of a ratchet 17 which is secured to the sleeve 7; and this causes braking action to be applied for the purpose of quickly stopping the knitting mechanism as the driving force is thrown out of action. These are all well known parts of a standard knitting machine.

The movement of the ring 11 to effect the stopping of the machine is usually controlled by the action of the knitting threads and in Figure 8 I have shown the parts usually employed for this purpose. Each knitting thread passes through a thread guide 18 and through a second thread guide 19 and between these two points it travels between a pair of feed rollers 20, 21 which control the feed of the thread to the needle. After passing through the bight of these rollers the thread also passes through a hook 22 on the end of a spring arm 23. When the thread is unbroken or taut the spring arm 23 is held in the position shown in Figure 8 and as this arm passes around the pivot 24 and the lever 25 and engages a projection 26 on one arm of this lever, it holds another arm 27 of this lever out of the path of a toothed member 28 which is revolved by means of the gears 29 and 30, the former being mounted on the shaft of the feed roller 21 and the latter on the shaft which carries the toothed member 28. The lever 25 is pivoted at 30^a to the ring 10. The pin 31 on one arm of this lever is acted upon by a lever arm 32 for restoring the parts to the inoperative or disengaged position. When the thread between the feed rollers 20, 21 and the guide 19 is broken the spring arm 23 swings downwardly and this allows the arm 27 to swing into the path of the toothed member 28 and the latter then acts against this arm to move the lever 25 to the right in Figure 8 and this imparts a turning movement to the ring 10 for the purpose of operating the stop mechanism above described.

There is a stationary supporting ring 33 shown mounted above the knitting mechanism, in the present illustration, and there are a number of arbors 34 bolted to this, supported and arranged in circular form corresponding with the form of the knitting mechanism. Upon each arbor 34 there is a sleeve 35 adapted to freely rotate, and each sleeve has a pulley 36 fastened thereto, or formed as part of the sleeve and above the same. The sleeve carries a spool or bobbin 37. There is an arbor and pulley for each spool or bobbin.

There are guide pulleys 38, arranged on the support 33 just outside of the circle of arbors and around the vertical shaft 6. Adjacent these pulleys 38 there is a driving pulley 39. There is an endless belt 40 which engages around the driving pulley 39 and around the idler or tension pulleys 38 and the belt engages around the circle of pulleys 36 which drive the individual spools or bobbins.

The shaft 41 is journaled at its lower end in a bracket 42 depending from the upper framework of the machine, and this bearing is formed in a cone shaped plate 43 stationarily secured in the bracket 42 by means of the bolt 44. The upper surface of this plate 43 has a frustro conical surface 45 which is received in a frustro conical opening 46 in the lower side of the drive pulley 39. This drive pulley is formed as part of a sleeve 47 which is adapted to have a slight vertical movement on the shaft 41 but it is feathered thereto so that the shaft and sleeve revolve together. The upper end of the sleeve 47 is provided with a frustro conical recess 48 to engage with the frustro conical surface 49 of a clutch member 50 which is fixed to the shaft 41. When the sleeve is in raised position the surface 48 engages with the surface 49 so that the sleeve is revolved with the member 50 and the shaft 41, these parts acting as a clutch through which the revolving motion

for the spools is transmitted from the shaft 41. When the sleeve 47 is in its lower position the surface 46 clutches against the surface 45 and as the member 43 is stationary this serves as a brake to prevent further turning of the sleeve 47 of which the drive pulley 39 is a part, so that when this action takes place the revolving motion of the spools is quickly arrested.

There is a lever 51 pivoted at 52 to an arm 53 on the bracket 42 and this has a portion which straddles the neck of the sleeve 47 and it has elongated openings 54 through which project pins 55 on the sleeve. The swinging action of this lever 51 causes the sleeve 47 to be either raised into locking engagement with the member 50 or lowered into engagement with the brake member 43. There is a rod 56 pivoted at one end to the free end of the lever 51 and its other end is pivoted to a lever 57 rocking on the point 58 from the upper framework of the machine. There is another rod 59 pivoted at one end to the second arm of the lever 57 and the other end of this rod is pivoted to a bell crank lever 60 which latter rocks upon the pivot 61. There is a horizontally extending rod 62 pivoted at one end to the second arm of this bell crank lever 60 and this rod projects outwardly and is provided with a loop 63 by means of which the rod may be operated by hand. One arm of the bell crank lever is drawn in one direction by a spring 64 fastened at one end to the lever and at the other end to a fixed point. Upon the rod 62 there is secured a block 65 which is adapted to be engaged by a hook 66 forming part of a lever which is pivoted at the point 67. The other arm of this lever is provided with a pin 68 which engages in an elongated aperture 69, in the lower end of a light rod 70 which is adapted to be acted upon by the thread 71 at a point between the spools and the knitting needles. This member 70 is provided with a hook or loop 72 through which the thread passes. This member also has a finger or pawl 73 which is adapted to engage with the teeth of a member 74 which is operated continuously, similar to the toothed member 28 shown in Figure 8. The parts shown in Figure 6 below the lever 57 are duplicated as many times as there are spools in the machine, so that there will be a stop device for each individual thread.

The vertical shaft 6 from which the spools receive their driving force, may be independently operated or, as shown in the drawings, it may be operated from a pulley 75 arranged on the shaft 5 from which the knitting mechanism is driven. A belt 76 travelling around this pulley also travels around a pulley 77 arranged on a short horizontal shaft 78 above the vertical shaft 41. By means of a pair of mitre gears the driving action is transmitted from the shaft 78 to the vertical shaft 41. It will be understood that the ratio of the pulleys 75 and 77 will depend upon the number of twists per yard, which is to be imparted to the several threads, and this factor may be varied according to the requirements.

Assuming the mechanism to be in operative condition, the vertical shaft 6 will be driven by the power supplied from the belt 3 and transmitted from the shaft 5 to the vertical shaft 6 and this will be effective through the clutch 8 and pin 9 to revolve the shaft 6 which latter operates the ordinary knitting mechanism. The power transmitted through the belt 77 to the shaft 78 is transmitted to the vertical shaft 41 so that the revolving of the pulley 39 serves to drive all of the spools through the operation of the belt 40, it being understood that the spools remain in fixed positions and that they simply revolve on their own axes. This revolving motion of the several spools twists the threads which are delivered from the spools to the knitting needles. The thread supplied by these spools may be straight strands, entirely untwisted, or they may be partially twisted, so that the threads receive their final twisting from the present device. As long as the machine continues to operate, the threads will be given a definite number of twists per yard automatically, the same time that they feed to the knitting needles, so that the twisting and knitting operations are performed continuously, and without any intermediate handling of the threads. If a thread should become broken near the point of knitting or between the feed rollers 20, 21 and the guide 19 the spring member 23 of the particular thread which is broken will drop down and allow the arm 27 to swing into the path of the toothed member 28 and the latter will then act on this arm to thrust the lever 25 to the right in Figure 8 and this will turn the ring 10 sufficiently to both lift and partially turn the curved arm 12 for the purpose of lifting the sleeve 7, disengaging the clutch 8 from the pin 9 and disconnect the operating force from the shaft 6, and also to throw the pawl 16 into engagement with the ratchet 17 and arrest the rotation of the knitting mechanism. As long as the threads between the spools and the above described testing device are unbroken the several rods 70 will be held in their raised positions by the individual threads which pass under the hooks 72. When one of the threads leading from any one of the spools breaks, the rod or feeler 70 will drop sufficiently to bring the pawl 73 into the path of the teeth of the revolving member 74 and in this action the feeler 70 is not required to move the lever 66 owing to the lost motion permitted by the slot 69. After the pawl 73 has engaged the toothed member 74 the latter supplies the operating force for moving the feeler 70 downwardly and this rocks the lever 66 and disengages its hook from the block 65. This permits the spring 64 to pull over the

rod 62 and the bell crank lever 60, and the movement is imparted through the rod 59, the lever 57, and the rod 56 to the rocking lever 51 which moves the sleeve 47 downwardly to disengage the clutch 48, 49 and to engage the driving pulley 39 and the braking disc 43. When this action takes place, the driving force from the shaft 41 ceases to operate the sleeve 47 and the brake disc 43 acts on the drive pulley 39 to arrest the same and to stop the revolving motion of the several spools, in order that the twisting operation may be arrested on all of the threads when any one of them becomes broken. It will be understood that the break in the thread which causes the stopping of the spools, will also cause, either simultaneously or immediately thereafter, the stopping of the knitting action of the machine. As there is a stop device for each individual thread feeding from the several spools it will be apparent that the stop motion will be effective when any one of the several threads is broken. When the broken thread has been repaired the rod 19 which is actuated by the broken thread, will be restored by the operator grasping the loop 63 and pulling the rod 62 forward until the hook 66 engages the block 65. This action also serves to lift the sleeve 47 so that the pulley 39 disengages from the brake disc 43 and the cone surface 48 reengages with the driving clutch 50 so that the machine continues in operation as before. As there is a detecting device for each of the threads which leave the spools, the twisting device will be automatically stopped when any of the individual threads break.

From the above it will be apparent that the threads are automatically twisted as they are fed to the needles, so that the thread is partially or wholly formed at the same time that they are employed in constructing the fabric, thereby eliminating all the intermediate handling of the threads, and the cost incident thereto.

Having described my invention, what I claim is:

1. The combination in an organized machine having needles of spools or bobbins containing thread-forming continuous length fibrous textile strands which require twisting by the respective spools or bobbins to provide unitary threads in a finished state for use by the needles, the threads being twisted to complete state by the respective bobbins and delivered thereby directly to the needles, whereby there is no intermediate handling of the threads between completion by the spools or bobbins and delivery to the needles, a fixed support for the spools or bobbins and means to rotate each of the bobbins or spools at twisting speed.

2. An organized machine as in claim 1 in which the fibres on the bobbins are in an untwisted state.

3. An organized machine as in claim 1 having a common operating mechanism for both spools and bobbins and needles.

4. A method which consists in supplying continuous length fibrous textile strands to twisting means which forms the strands into a unitary thread and then directly delivering the thread as thus formed to a needle that requires a finished or complete thread in the performance of its function.

Signed in the city, county and State of New York, on the 27th day of May, 1925.

MORRIS SCHOENFELD.