Jan. 17, 1967 R. SCHMIDT ET AL 3,298,203

THREAD FEEDING ARRANGEMENT FOR KNITTING MACHINES

Filed Jan. 28, 1963 2 Sheets-Sheet 1

FIG. 1

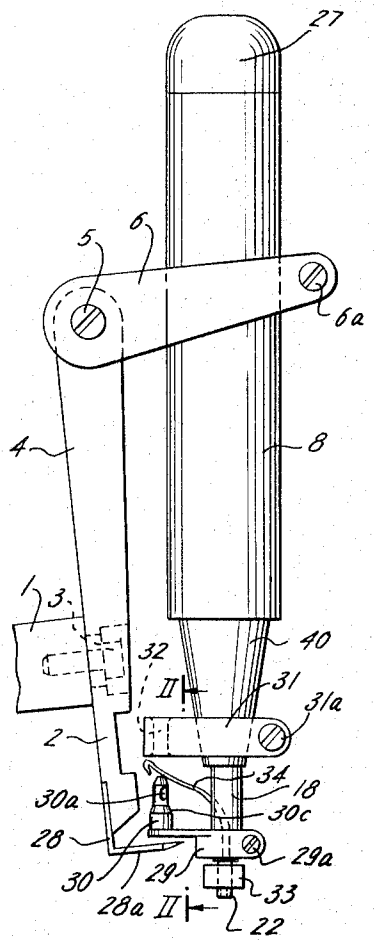


FIG. 2

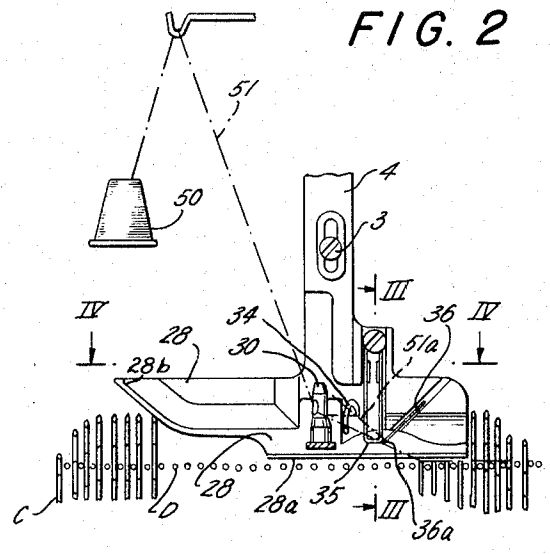


FIG. 4

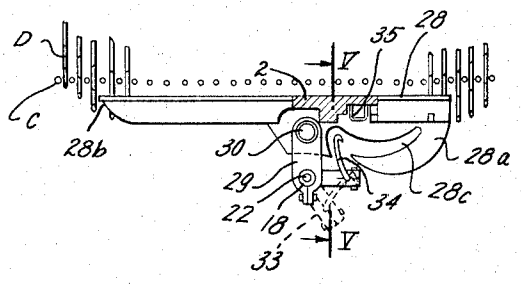


FIG. 3

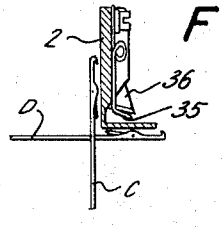
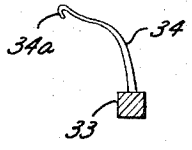


FIG. 5



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FIG. 6

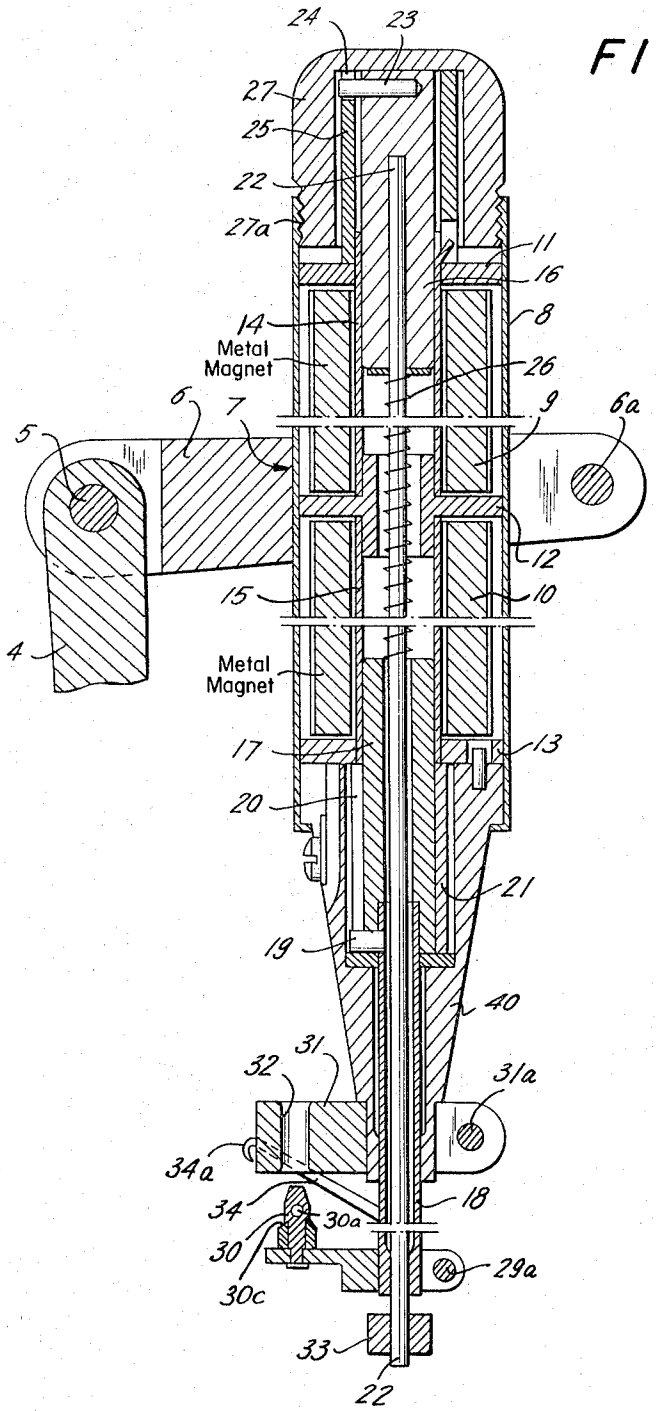
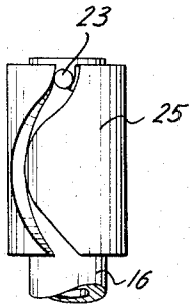


FIG. 6a



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THREAD FEEDING ARRANGEMENT FOR KNITTING MACHINES

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8 Claims. (Cl. 66—131)

The present invention relates to a thread feeding arrangement for knitting machines, and more particularly to an arrangement for feeding a thread or yarn for a limited period to the needles of a circular knitting machine.

Apparatus serving the same purpose is disclosed in the copending application Schmidt et al., Serial No. 54,155, filed September 6, 1960, and now issued as U.S. Patent 3,115,761.

The feeder arrangement disclosed in the copending application comprises a member which performs all functions necessary for effecting feeding of a thread to the knitting needles, clamping of the thread, and cutting of the thread when the knitting operation is to be continued without the thread. It is one object of the present invention to improve the arrangement of the U.S. Patent 3,115,761, and to provide a feeding arrangement in which separate means are provided for feeding the thread to the knitting needles, and for effecting clamping and cutting of the thread when the knitting operation with the respective thread is to be discontinued.

Another object of the invention is to provide a reliably operating thread feeding arrangement for a circular knitting machine.

Another object of the present invention is to provide a thread guide means which has small mass and inertia, so that it can be easily operated by electromagnetic or pneumatic means.

Another object of the present invention is to provide one means for drawing a thread toward the knitting needles of the machine so that the thread is knitted into a fabric, and another means for effecting the cutting of the thread when the knitting operation with the particular thread is to be terminated.

With these objects in view, a feeding arrangement according to the present invention is advantageously applied for feeding a thread to the needles of a circular knitting machine. One embodiment of the invention comprises first operating means, for example thread guiding means having an eye for the thread, movable between a normal position for guiding a thread to the needles of the machine and an operative position; second operating means movable between an inoperative position and an operative position and being operable to catch the thread when moving to said operative position and to draw the caught thread to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means for moving the first and second operating means in timed relation.

When the first operating means move to the operative position thereof, they cause clamping of the thread and cutting of the thread. Consequently, movement of the first operating means to the operative position thereof interrupts the knitting of the thread, and movement of the second operating means to the operative position thereof starts the knitting of the thread into the fabric.

The second operating means include a hook which catches the cut off clamped thread end and draws the thread into the region of the knitting needles. In the preferred embodiment of the invention, a guide plate supports resilient clamping means and cutting means for the thread, and is formed with an elongated recess through which the thread passes during the knitting operation.

The hook of the second operating means performs in addition to a straight movement, a turning movement for moving the caught thread into the region of the slot of the guide plate.

Before the thread is inserted into the resilient clamping means, it is first clamped by the thread guiding means against a rigid clamping member where the thread is temporarily clamped while the operation of the knitting needles draws the thread under the resilient clamping means and against the cutting means.

The control means by which the thread guide and the feeder hook are operated, include two electromagnetic means which can be selectively energized to start, or interrupt, respectively, knitting operations in which the thread is knitted into the fabric.

Preferably, a rod-shaped control member is slidable and turnable in a tubular control member, and each control member is operated by one of the electromagnetic means. The tubular control member preferably supports the thread guide, and the rod-shaped control member supports the feeder hook. A projection on the rod-shaped control member is guided in a helical guide groove so that the hook is not only moved downward, but is also turned when the respective electromagnetic means is energized.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of one embodiment of the invention;

FIG. 2 is a fragmentary front view taken on line II—II in FIG. 1;

FIG. 3 is a cross-sectional view taken on line III—III in FIG. 2;

FIG. 4 is a fragmentary plan view taken on line IV—IV in FIG. 2;

FIG. 5 is a fragmentary cross-sectional view taken on line V—V in FIG. 4;

FIG. 6 is a sectional view on an enlarged scale illustrating the electromagnetic control means of a preferred embodiment of the invention; and

FIG. 6*a* is a fragmentary rear view of a detail of the electromagnetic control means.

The embodiment illustrated in the drawing is provided in a circular knitting machine of the type disclosed in the U.S. Patent 3,115,761. The feeding arrangement of the present invention may be provided in the position of the feeding arrangement shown in FIG. 6 of this patent.

Referring now to the drawings, a support member **4** is secured by screw **3** to a stationary frame portion **1** of the knitting machine. Screw **3** permits an adjustment of support means **4**, so that the feeder plate or guide plate **2**, which is fixedly secured to support member **4**, can be adjusted to be placed in a higher or lower position.

A holder means **6** is mounted for turning movement at the upper end of support means **4**, and can be fixed in adjusted positions by screw means **5**. The holder **6** clamps and holds the housing **8** of electromagnetic control means **7**, and can be tightened by screw **6***a*. In this manner, the electromagnetic control means **7** can be raised or lowered, and also angularly adjusted by turning holder **6**.

The construction of the electromagnetic control means **7** is best seen in FIG. 6. Two electromagnetic means **9** and **10** are located in the tubular housing **8**, and are held in position by ring-shaped members **11**, **12** and **13** which are secured to the housing. Tubular guide means

14 and 15 for the armatures 16 and 17 are secured to members 11, 12 and 13. An end member of substantially frusto-conical configuration closes the lower end of the tubular housing 8, and a plug 27 closes the upper end and is screwed by threads 27*a* into the tubular housing 8. Members 40 and 27 form thrust bearings against which the ends of armatures 17 and 16 abut when electromagnetic means 9 and 10 are not energized, since a coil spring 26 is located between armatures 16 and 17. A rod-shaped control member 22 is secured to armature 16, and a tubular control member 18 is secured to armature 17. Control member 22 passes through the tubular member 18 and is guided along a bearing surface in the same. A transverse pin 19 is secured to the tubular control member 18, and projects into an axially extending straight guide track 20 provided in a bushing 21 which is secured to end member 40. Consequently, upon energization of the electromagnetic means 10, armature 17 with tubular control member 18 will perform a straight movement in upward direction without any turning.

Armature 16 to which the rod-shaped control member 22 is secured, has a follower member 23 located in a guide track of a bushing 25 which is fixedly secured to plug 27. As best seen in FIG. 6*a*, the shape of guide track 24 is curved, and preferably partly helical so that downward movement of armature 16 with control rod 22 will result in turning of the control rod 22 relative to the tubular control member 18. Electromagnetic means 10, and electromagnetic means 9 are selectively energized in accordance with a program, so that control member 18 is raised, and control member 22 is lowered in a timed relation as required by the desired sequence of operations of the feeding arrangement which is controlled by control members 18 and 22. When the electromagnetic means 9 or 10 of one of the control members is de-energized, the respective control member turns to its normal position illustrated in FIG. 6 due to the biasing action of spring 26.

The lower end portions of control members 22 and 18 are disposed in the region of a substantially horizontal plate portion 28*a* which transversely projects from an angular plate 28 which has a vertical portion secured to member 2. Plate 28 has a pointed end 28*b* pointing in a direction opposite to the direction of the movement of the periphery of the needle cylinder of the machine. A holder 29 is adjustably clamped to tubular control member 18 by operation of a screw 29*a*, and carries the thread guiding means 30 which has near its upper end an eye 30*a*, and below eye 30*a* is a substantially frusto-conical shoulder 30*c*.

Another holder 31 is adjustably clamped by a screw 31*a* to end member 40, and is formed with a bore 32 into which the upper portion of thread guiding means 30 fits. The lower end of bore 32 is formed as a frusto-conical seat engaged by the frusto-conical shoulder 30*c* when tubular control member 18 is raised upon energization of electromagnetic means 10. During operation of the feeding arrangement, a thread passes through eye 30*a*, and such thread is clamped if shoulder 30*c* abuts the seat of bore 32. Thus, member 31 with bore 32 constitutes a rigid clamping member for clamping a thread guided by thread guide means 30 in the operative raised position of thread guide means 30.

Control member 22 carries a holder 33 to which a feeder means in the form of a wire hook 34 is secured, as best seen in FIGS. 1 and 5. As best seen in FIG. 4, the guide plate 28*a* has a guide recess 28*c* opening on the front edge of guide plate 28*a*. Feeder hook 34 is arranged in this region. As explained above, the feeder hook 34 is secured to control member 22 which is not only longitudinally movable, but also turns during such movement. Consequently feeder hook 34 will turn from the position shown in FIG. 4 to a transversely displaced position for guilding a thread into the guide recess 28*c* when control member 22 moves downward.

Feeder hook 34 projects from holder 33 into the region of the eye of thread guide means 30, and is consequently positioned to catch a thread passing through eye 30*a*.

A resilient clamping member 35 is secured by a screw to the upright wall of guide plate 28, and resiliently abuts plate 28. A thread is supplied from a thread supply means, passes through eye 30*a* of thread guide means 30, below hook 34, and is clamped between resilient clamping member 35 and plate 28. A cutting means 36 is located on the other side of resilient clamping means 35 and serves for cutting of the thread adjacent clamping means 35.

The thread feeding device operates as follows: In the illustrated position, thread guide 30 is in its normal low position, since electromagnetic means 10 is not energized so that spring 26 urges armature 17 with control member 18 down to the position shown in FIG. 6.

In this normal guiding position of thread guide means 30, the thread passes from the thread supply means 50, the eye 30*a*, the end of guide recess 28*c* and to the cylinder needles C and dial needles D of the knitting machine so that needles C and D knit the thread into a fabric and draw continuously thread 51 from the supply means through eye 30*a* as shown by a dash and dot line in FIG. 2.

When in accordance with the knitted pattern, the thread is no longer necessary in the fabric, an electric pulse is supplied to electromagnetic means 10 which is energized and raises armature 17 with tubular control member 18 so that thread guide means 30 is raised to an operative position in which the eye 30*a* is inserted into bore 32, and the thread is clamped by the shoulder 30*c* against the seat at the lower end of bore 32. Since the knitting needles continue to knit the thread, the same is pulled to a tensioned position so that it slips under resilient clamping means 35 and is urged against the cutting edge of cutting means 36, and cut off. The cut off portion is knitted into the fabric, and the thread portion which is connected to the thread supply is clamped by resilient clamping means 35 at the end thereof as shown by a broken line 51*a* in FIG. 2, so that thread guide 30 can be moved to its normal lower position, which is effected by de-energizing electromagnetic means 10. The thread portion between eye 30*a* and clamping means 35 is in the lower position of thread guide 30 below the feeder hook 34 which is in the higher position shown in FIG. 1 since electromagnetic means 9 is not energized.

When it is desired to start again a knitting operation with the thread, electromagnetic means 9 is energized, and moves armature 16 with control member 22 downward, and due to the fact that follower member 23 is guided in the guide track 24, control member 22 will not only move down, but will also turn together with hook 34.

During such downward movement of hook 34, the hook engages the portion of the thread between thread guide means 32 and clamping means 35 and pulls the same down while the thread is drawn through eye 30*a* from the thread supply. However, the free end of the thread remains clamped by clamping means 35. Due to the turning movement of the feeder hook 34 to the position shown in broken lines in FIG. 4, the caught thread portion is pulled around the projecting portion of the guide plate 28*a* and below the opening of guide recess 28 until the needles catch the thread and knit the same into the fabric. In this manner, a pull is exerted on the thread which is drawn to the end of recess 28*c*. The feeder hook is immediately moved back to its normal inoperative position.

From the above description of a preferred embodiment of the invention it will become apparent that first operating means 17, 18, 30 and 32 have a normal position for guiding the thread, and an operative position causing clamping of the thread and cutting of the same, and that the control means 10 effect movement of the first operating means to the operative position when a knitting operation with the thread is to be terminated. Second operating means 22, 33, and 34 are moved to an operative position for catching a thread clamped by clamping means

35, and to draw the caught thread to a position adapted to be engaged by the needles of the knitting machine so that by operation of the control means 9, a knitting operation with the thread is started.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of feeding arrangements for knitting machines differing from the types described above.

While the invention has been illustrated and described as embodied in a feeding arrangement including a thread guide, and a feeder member movable relative to each other in timed relation, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a knitting machine, in combination, a feeding arrangement for feeding a thread to the knitting needles of the machine, comprising first operating means movable between a normal position for guiding a thread to the needles and an operative position for causing clamping of the thread; severing means for the thread disposed to engage the clamped thread for severing the same; second operating means including hook means turnable about an axis and reciprocable along said axis between an inoperative position and an operative position, and being disposed relative to said first operating means to catch a clamped thread during axial movement from said inoperative position to said operative position, and to draw the caught thread during turning movement to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means for moving said first and second operating means in timed relation between said positions of the same.

2. In a knitting machine, in combination, a feeding arrangement for feeding a thread to the knitting needles of the machine, comprising severing means; clamping means; first operating means movable between a normal position for guiding a thread to the needles and an operative position for causing clamping of the thread by said clamping means, and severing of the thread portion connected to the needles by said severing means; second operating means including hook means turnable about an axis and reciprocable along said axis between an inoperative position and an operative position, and being disposed relative to said first operating means to catch a clamped thread during axial movement from said inoperative position to said operative position, and to draw the caught thread during turning movement to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means for moving said first and second operating means in timed relation between said positions of the same and including means for reciprocating said first and second operating means in the direction of said axis, a follower member secured to said second operating means, and curved guide means engaged by said follower member for turning said second operating means during movement in axial direction whereby by movement of said first operating means to said operative position thereof the knitting of the thread is interrupted, and by movement of said second operating means to said operative position thereof the knitting of the thread is started.

3. In a knitting machine, in combination, a feeding arrangement for feeding a thread to the knitting needles of the machine, comprising clamping means; cutting means; first operating means movable between a normal position for guiding a thread to the needles and an operative position for causing clamping of the thread by said clamping means and severing of the thread portion connected to the needles by said cutting means; second operating means including hook means turnable about an axis and reciprocable along said axis between an inoperative position and an operative position, and being disposed relative to said first operating means to catch a clamped thread during axial movement from said inoperative position to said operative position, and to draw the caught thread during turning movement to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means for moving said first and second operating means in timed relation between said positions of the same and including first and second electromagnetic means for reciprocating said first and second operating means in the direction of said axis, a follower member secured to said second operating means, and curved guide means engaged by said follower member for turning said second operating means during movement in axial direction whereby by movement of said first operating means to said operative position thereof the knitting of the thread is interrupted, and by movement of said second operating means to said operative position thereof the knitting of the thread is started.

4. In a knitting machine, in combination, a feeding arrangement for feeding a thread to the knitting needles of the machine, comprising first clamping means; second clamping means; cutting means; first operating means movable between a normal position for guiding a thread to the needles and an operative position for causing clamping of the thread by urging the same against said first clamping means whereby the pull of the needles is adapted to move the thread into clamping engagement with said second clamping means and into cutting engagement with said cutting means; whereupon said first operating means release said thread from said first clamping means; second operating means including a feeder means movable between an inoperative position and an operative position, and being disposed relative to said first operating means and said second clamping means to catch a thread clamped by said second clamping means during movement from said inoperative position to said operative position, and to draw the caught thread to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means for moving said first and second operating means in timed relation between said position of the same whereby by movement of said first operating means to said operative position thereof the knitting of the thread is interrupted, and by movement of said second operating means to said operative position thereof the knitting of the thread is started.

5. In a knitting machine, in combination, a thread feeding arrangement for feeding a thread to the needles of the knitting machine, comprising clamping means; thread guide means movable between a normal guiding position for guiding a thread while the same is knitted and a clamping position for causing clamping of the thread by said clamping means; means for severing the clamped thread; feeder means including hook means movable in a composite linear and turning movement between an inoperative position and an operative position, and being disposed relative to said clamping means and said thread guide means to catch a thread clamped by said clamping means during movement from said inoperative position to said operative position, and by its turning movement to draw the thread to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means including a tubular control member, a rod-shaped control member guided in said tubular control member, one of said control members being movable only in longitudinal direction thereof and connected to said guide means, and the other control member being movable in longitudinal direction and also turnable, said other control member being connected to said hook means, and actuating means for actuating said control members in timed relation, and for actu-

ating said other control member in such a manner that said hook means first turns in one direction while moving in one longitudinal direction to draw the thread into the region of the needles, and then turns in opposite direction while moving in the opposite longitudinal direction to release the thread during knitting and for moving said thread guide means and hook means in timed relation between said positions of the same whereby by movement of said thread guide means to said clamping position the knitting of the thread is interrupted, and by movement of said hook means to said operative position the knitting of the thread is started.

6. In a knitting machine, in combination, a thread feeding arrangement for feeding a thread to the needles of the knitting machine, comprising clamping means; thread guide means movable between a normal guiding position for guiding a thread while the same is knitted and a clamping position for causing clamping of the thread by said clamping means; means for severing the clamped thread; feeder means movable in a composite linear and turning movement between an inoperative position and an operative position, and being disposed relative to said clamping means and said thread guide means to catch a thread clamped by said clamping means during movement from said inoperative position to said operative position, and by its turning movement to draw the thread to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means including two movable control members for moving said thread guide means and feeder means in timed relation between said positions of the same, and actuating means for actuating said control members, and for actuating the control member operating said feeder means so that the same first turns to draw the thread, and then turns in the opposite direction to release the thread, said actuating means including a follower on said last mentioned control member, and a curved guide track for said follower whereby by movement of said thread guide means to said clamping position the knitting of the thread is interrupted, and by movement of said feeder means to said operative position the knitting of the thread is started.

7. In a knitting machine, in combination, a thread feeding arrangement for feeding a thread to the needles of the knitting machine, comprising a rigid clamping member; a resilient clamping member; cutting means located in the proximity of said resilient clamping member on the side remote from said rigid clamping member; thread guide means movable between a normal guiding position for guiding a thread while the same is knitted and a clamping position pressing the thread against said rigid clamping member, said resilient clamping member and said cutting means being disposed so that the thread clamped by said rigid clamping member is drawn by the pull of the knitting operation under said resilient clamping member and against said cutting means whereby the thread is cut off while clamped by said resilient clamping member so that the thread remains clamped by said resilient clamping member when said thread guide means moves out of said clamping position into said guiding position, releasing said thread from said rigid clamping member; feeder means movable between an inoperative position and an operative position, and being disposed relative to said resilient clamping member and said thread guide means to catch after release from said rigid clamping member the thread clamped by said resilient clamping member during movement from said inoperative position to said operative position, and to draw the thread to a position adapted to be engaged and knitted by the needles of the knitting machine; and control means for moving said thread guide means and feeder means in timed relation in such a manner that said guide means is moved from said clamping into said guiding position thereof terminating pressing of the thread against said rigid clamping member upon the severance of the thread by the said cutting means.

8. A thread feeding arrangement as set forth in claim 7 wherein said control means include a control tube supporting said thread guide means, a control rod supporting said feeder means and guided in said tube, electromagnetic means for selectively moving said tube and said rod relative to each other in opposite longitudinal directions and means for turning said rod during longitudinal movement thereof whereby said feeder means are turned to direct the thread toward the needles.

References Cited by the Examiner

UNITED STATES PATENTS

1,240,250	9/1917	Peters	66—134
2,015,136	9/1935	Bromley et al.	66—140
2,053,192	9/1936	Grothey	66—134 X
2,138,738	11/1938	Grothey	66—140
2,286,955	6/1942	Cloutier	66—134 X
2,604,769	7/1952	St. Pierre	66—131
2,881,607	4/1959	St. Pierre	66—140
2,971,722	2/1961	Penman	242—149
3,029,622	4/1962	Berg	66—146
3,115,761	12/1963	Schmidt	66—131

FOREIGN PATENTS

17,702	1905	Great Britain.
36,722	4/1930	France.

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