March 4, 1952 P. W. BRISTOW 2,587,816

AUXILIARY SPEED CONTROL MECHANISM FOR KNITTING MACHINES

Filed March 23, 1950 3 Sheets-Sheet 1

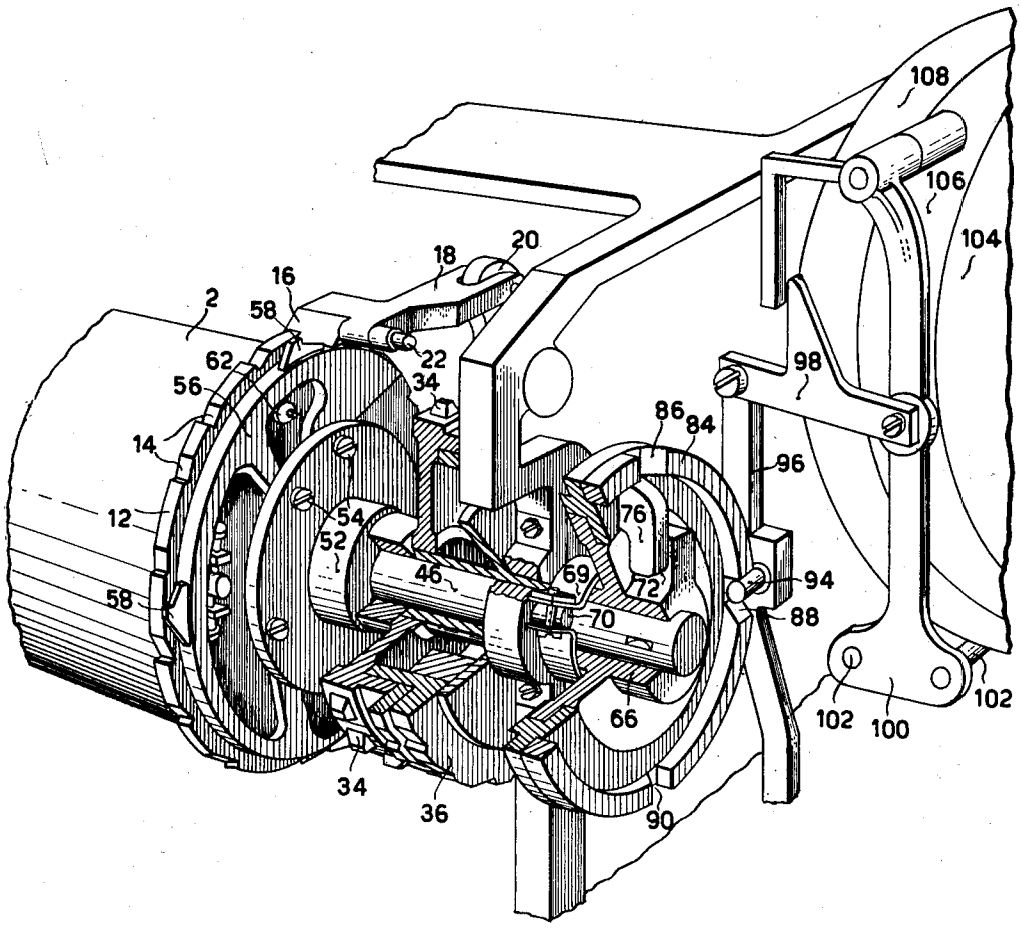


FIG. 1.

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Filed March 23, 1950 3 Sheets-Sheet 2

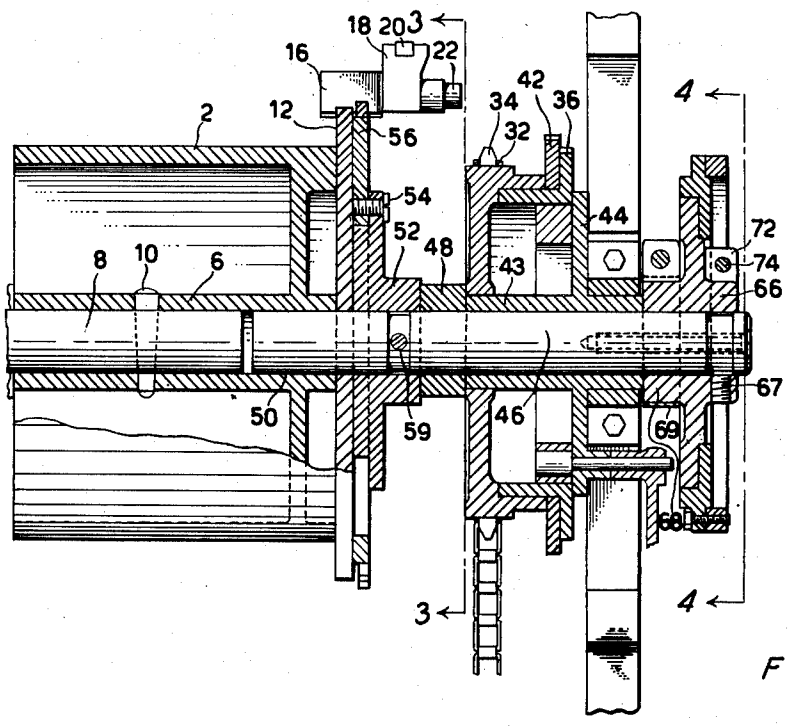


FIG. 2.

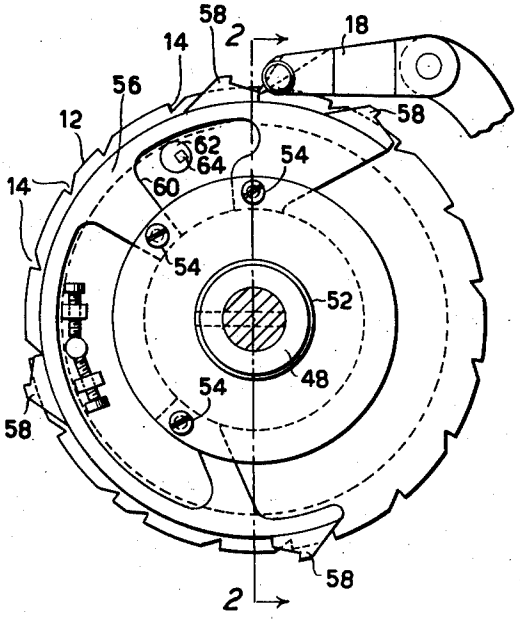


FIG. 3.

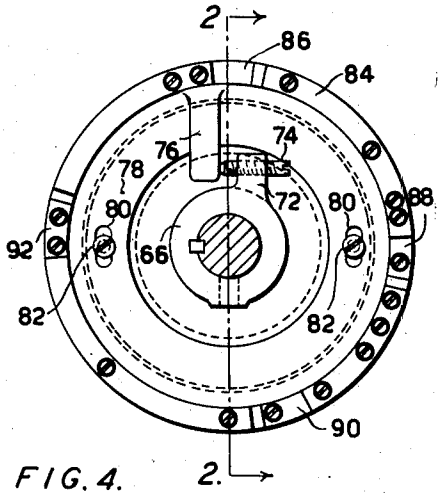


FIG. 4.

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Filed March 23, 1950 3 Sheets-Sheet 3

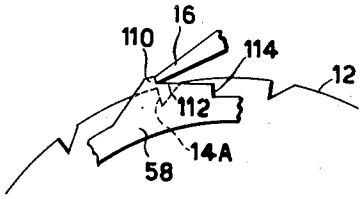


FIG. 6.

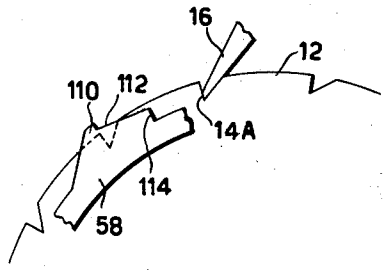


FIG. 8.

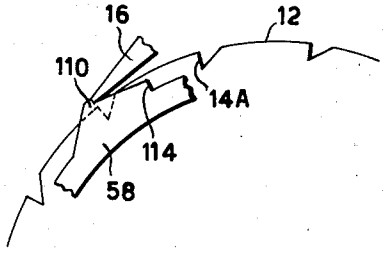


FIG. 7.

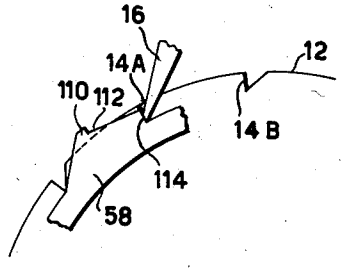


FIG. 9.

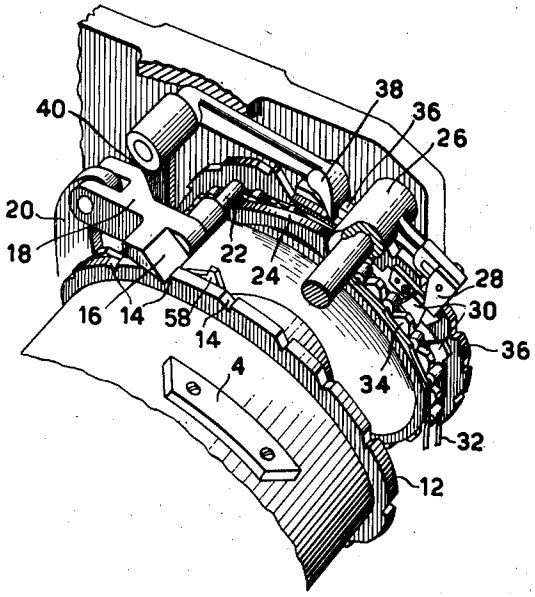


FIG. 5.

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2,587,816

AUXILIARY SPEED CONTROL MECHANISM FOR KNITTING MACHINES

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Application March 23, 1950, Serial No. 151,465

8 Claims. (Cl. 66—56)

1

This invention relates to an auxiliary speed control mechanism for knitting machines designed to save moves of a main pattern drum of the machine while at the same time providing for necessary speed changes.

In knitting machines intended for the production of elaborate types of hosiery there is the necessity for making the most out of the available steps of the main pattern drum. In order to speed up production it is desirable to operate the knitting machine at high speeds whenever such speeds are permissible for straight away knitting. Accordingly, the machines are provided with speed control cams which will shift the drive from low speed to high speed and vice versa in the production of a stocking. Assuming that the machine is operating at high speed and that it is required to operate at low speed for the changes necessary to effect some subsequent knitting operation, it is necessary that the machine should be slowed down before the changes are made; in other words, it is not generally permissible to effect the slowing down of the machine simultaneously with the making of the changes. If the speed control cams are secured to and moved with the pattern drum it is evident that the last requirement makes necessary the use of two steps of the drum in order to effect the change, the first step being necessary to provide the slowing down of the machine and the second for the actual effecting of the requiring change. If, for example, in the knitting of a complete stocking four slow downs from high speed are required there are correspondingly used four steps of the main pattern drum which might otherwise be used. In accordance with the present invention these steps of the main drum which would ordinarily be used for the purpose of slowing down the machine are saved with the result that they may be used, if desired, for other purposes. The result is that without increasing the steps of the main drum more elaborate knitting may be produced.

In order to make clear the particular advantages of the invention there may be here and hereafter considered the application of the invention to a machine of superposed cylinder type capable of knitting broad rib stockings and involving the wrapping of panels of needles between broad ribs to secure clocks or other pattern formations. A typical sequence of knitting in such a machine for the formation of an elaborate stocking with the attainment of high speeds of knitting to increase production whenever such high speeds are permissible may be described as follows:

Starting with the looping rounds after completion of a toe, these looping rounds may be produced during high speed operation of the machine. Following their completion the machine must be slowed down for the transfer of needles for the production of the first welt. The slow speed operation will then continue during the knitting of the first welt, during the formation of the press-off draw thread, and during the knitting of the regular welt. The last knitting of the regular welt is then followed by the formation of a 1 x 1 rib top which may be knitted at high speed. However, the machine must again be slowed down prior to the transfer of needles to produce broad rib knitting. After this transfer is effected the machine may again resume high speed operation for the knitting of broad rib fabric at the top of the leg preceding wrapping, for example for the formation of a clock Before wrapping is started the machine must again pass to low speed operation which is continued through the wrapping, the half-round transfer of needles before the heel and the formation of the heel. If clocks are provided there is then a continuation of wrapping in the foot and the low speed operation is continued through such wrapping. When the wrapping is completed, however, high speed operation may again be resumed for completion of the foot and low speed operation resumed prior to the transfer which occurs before the formation of the advanced toe. Low speed operation is then continued through the formation of the toe and until the beginning of the looping rounds.

2

It will be noted that in the foregoing there are four necessary transitions from high speed to low speed operation and these transitions must be completed prior to the operations which follow including, for example, transfers of needles between the cylinders and beginning of wrapping.

Since in the formation of such an elaborate stocking a large number of moves of the main drum are required it is advantageous to conserve these moves as far as possible. In accordance with the present invention an auxiliary speed control mechanism is provided associated with the main drum but of such nature that it performs the operations of slowing down the machine prior to the moves of the drum to positions requiring the slow operation. These results are accomplished without corresponding moves of the main drum.

The broad object of the invention will become apparent from the foregoing and consists of the attainment of the advantageous results indicated. The securing of this broad object as well as other objects particularly relating to details of con-

struction and operation will become apparent from the following description read in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view with certain parts broken away showing the application of the invention to a conventional knitting machine which for consistency of description may be considered to be of the superposed cylinder type involving wrapping as mentioned above;

Figure 2 is a vertical section taken through the part illustrated in Figure 1, this section being on the vertical plane indicated by the traces shown at 2—2 in Figures 3 and 4;

Figure 3 is a vertical section taken on the plane the trace of which is indicated at 3—3 in Figure 2;

Figure 4 is a section taken on the plane indicated at 4—4 in Figure 2;

Figure 5 is a fragmentary perspective view serving for the clearer illustration of certain of the parts shown in Figure 1; and

Figures 6, 7, 8 and 9 are diagrammatic figures showing the sequence of operations involved in speed change.

At 2 there is indicated the main cam drum of the machine carrying controlling cams such as indicated at 4. In some machines this main cam drum actually consists of two drums, one a clutch control drum and the other a so-called quality drum. While these drums rotate together in unison they may be made relatively angularly adjustable so as to provide fine adjustment of the timing of the quality steps with respect to the clutch changes from reciprocation to rotation and vice versa. The drum 2 is illustrated as provided with a hollow hub 6 pinned as indicated at 10 to a shaft 8 having a left-hand bearing which is not illustrated in Figure 2. Secured for angular adjustment to the drum 2 is the ratchet 12 which is provided with teeth defined by notches 14 engageable by the nose 16 of a pawl 18 pivoted to an arm 20 which is rocked in conventional fashion in time with the needle cylinders. It may be assumed, as is usual, that the lever 20 has a complete stroke for every two revolutions of the needle cylinders. The pawl 18 is provided with a laterally extending pin 22 which overlies an arm 24 carried by a hub 26 pivoted on a fixed pin which hub also carries a follower 28 engageable by lugs 30 on the main pattern chain 32 carried by the sprocket wheel 34. To this sprocket wheel 34 there is secured a ratchet 36 which is advanced in general the distance of one full link for each two revolutions of the needle cylinder by a pawl 38 supported by a lever 40. Mounted on the hub portion of the ratchet 36 for free rotation relative to ratchet 36 and the sprocket wheel 34 is a masking ratchet 42 also engageable by the pawl 38 and provided with a relieved space in its circumference to permit the pawl 38 to engage the ratchet 36, this ratchet being disengaged by the pawl due to the masking action of the ratchet 42 when the chain is not to be advanced. One or more lateral lugs (not shown) carried by the chain 32 control the movements of the masking ratchet 42. The parts so far described are conventional and need not be more fully referred to since their constructions and operation are fully described in my prior Patent 2,436,468, dated February 24, 1948. As will become more evident hereafter, with reference to said patent, the parts so far indicated operate in their usual fashions.

The sprocket wheel 34 is journalled on the sleeve portion 43 of a member 44 secured in the machine frame. The sleeve 43 provides a bearing for a shaft 46 which at its left-hand end is journalled in the bore 50 of the drum 2. A spacer 48 surrounding the shaft 46 is interposed between the sprocket wheel 34 and the hub member 52 to which there is secured by screws 54 the speed control rack wheel 56 which carries at its periphery a series of bluff members 58 which, as will appear hereafter, are acted upon by the nose 16 of pawl 18. The hub 52 is secured to shaft 46 by a set screw 59. The rack wheel 56 is provided with an opening located to the right, as viewed in Figure 3 of a spoke 60 and into the space thus provided there projects an eccentric washer 62 secured by a screw 64 to the ratchet 12. As will be evident adjustment of the eccentric washer serves for the fine adjustment of the operating relationships between the ratchet 12 and the rack wheel 56.

A hub 66 is keyed to the shaft 46 and secured against lengthwise movement relative to the shaft by a set screw 67. A left-hand extension 68 of this hub as viewed in Figure 2 is surrounded by a brake band 69 which is arranged to engage a pin 70 secured to the frame to maintain it stationary so that it imposes a drag on the rotation of the hub 66 and shaft 46. An outwardly extending lug 72 on hub 66 has threaded therethrough a screw 74 arranged to abut a lug 76 on a cam carrier 78 which is slotted at 80 for the passage of screws 82 threaded into the hub 66. This arrangement provides for fine angular adjustment of the carrier 78 with respect to the hub 66. A group of cams 84 are bolted to the periphery of the carrier 78 and between these cams there are depressions 86, 88, 90 and 92 which will be referred to hereafter. The cams 84 are arranged to act upon a pin 94 carried by a lever 96 which is connected by link 98 to the lever 100 of a belt shifting arrangement including the fork members 102 for control of a belt which runs from a driving pulley to the idler pulley 104, the low speed pulley 106 or the high speed pulley 108. This belt shifting mechanism is conventional and need not be further described. As is usual it is associated with manual belt shifting means and with an arrangement for shifting the belt to the idle pulley under control of a stop motion device. The machine is provided with the usual arrangements, not shown, whereby under control of the clutch cams the drive may selectively rotate or reciprocate the needle cylinders.

The operation of the described mechanism may now be considered.

It will be evident that in the absence of bluffs 58 within the range of action of the pawl nose 16 the pawl 18 would effect advance of the pattern drum 2 in conventional fashion as controlled by the lugs 30 on the pattern chain 32, the nose 16 engaging to drive the drum the notches 14 in the ratchet 12.

Assume now that the machine is in a phase of high speed operation with the pin 94 within one of the spaces 86, 88, 90 or 92 and that a change of control is to occur which requires, at the time of the change, low speed operation of the machine. By reason of the action of the eccentric washer 62 on the surface of the spoke 60, the speed control rack wheel will have been dragged about as the drum 2 is stepped so that these two elements will, in general, have been moving in unison. In the movement of the drum 2 preceding that which is to control the change requiring low speed operation, the rack wheel 56 and

ratchet 12 will be positioned as indicated in Figure 6. Following such positioning there may be absence of lugs 30 on the chain 32 such as to prevent any action of the pawl 18 by causing its nose to be raised sufficiently high to miss both the bluff 58 and any of the notches 14.

Referring now to Figure 6 there may be described the details of a bluff 58 with particular reference to a certain notch 14A which would normally be the next notch to be engaged by the nose 16 of the pawl. The bluff 58 is provided with a tooth 110 which extends above a sloping edge 112, the left-hand end of which adjacent to the tooth is at a diameter exceeding the diameter of the periphery of the ratchet 12. This edge 112 terminates at a shoulder 114 which drops below the periphery of the ratchet 12.

Figure 6 illustrates the pawl nose 16 at the beginning of its stroke when it has been positioned by the action of a lug 30 on the pattern chain to have an active stroke. The beginning of this stroke will be timed to occur two cylinder revolutions before the change required of the pattern drum. As will be evident from Figures 6 and 7 the stroke of the pawl will advance the bluff 58 but, though the nose 16 engages the tooth 110 it will be prevented from engaging in the notch 14A by reason of the fact that it rests on the bluff edge 112 beyond the periphery of ratchet 12. Accordingly at the end of its forward stroke the parts will be in the position illustrated in Figure 7. The advance of the bluff will have rotated the cams 84 so that the pin 94 will be moved outwardly to shift the belt to the low speed pulley 106. The machine will accordingly slow down and will have the period of approximately two revolutions of the needle cylinders to reach slow speed before the drum 2 is advanced as will now be described.

The pawl after withdrawing to the beginning of its next stroke will occupy the position illustrated in Figure 8 in which it enters the notch 14A. A second lug 30 on the next succeeding chain link causes the pawl to still remain active. As the pawl advances from the position of Figure 8 to that of Figure 9 it will be evident that the ratchet 12 will be advanced one step to move the main drum to a position to effect the change of control which required the low speed operation. During the forward movement the nose 16 will engage the step 114 of bluff 58 and will advance the bluff to the position relative to the ratchet indicated in Figure 9. Thereafter the bluffs will be carried about in usual fashion by the main drum through the action of eccentric 62 on the spoke 60, the brake 69 retarding free movement of the bluffs and their associated parts so that when the next bluff reaches operative position it will be properly located with respect to another notch 14 of the ratchet.

From the foregoing it will be seen that the objects of the invention are accomplished in that the shift from high speed to low speed operation does not require one of the steps of the pattern drum, the only step of the pattern drum involved being that which controls the machine elements requiring the low speed of operation as a condition precedent to their occurrence.

It will be evident that these transitions from high to low speed may be produced wherever required, the cam interruptions at 86, 88, 90 and 92 being provided, for example, to correspond to the transitions described specifically above with reference to the knitting of a stocking on a superposed cylinder machine with wrapping of clocks.

Transitions from low speed to high speed operation may, in general, be made simultaneously with advances of the pattern drum and need not involve the special actions described. It will be evident, however, that if necessary such changes may also involve the use of the bluffs. The cam interruptions may be of any suitable extent corresponding to the duration of high speed operation.

It will, of course, be evident that the invention is of quite general application to various types of knitting machines and it is therefore to be understood that the invention is not to be regarded as limited except as required by the following claims.

What is claimed is:

1. In a knitting machine, a pattern device, a cyclically operating element for advancing said pattern device step by step, means controlling the occurrence of active cycles of said element, means for controlling the speed of the knitting machine, and means for effecting in one active cycle of said element an advance of said speed controlling means to change the speed of the knitting machine while the pattern device remains stationary, and in a subsequent active cycle of said element an advance of said pattern device.

2. In a knitting machine, a pattern device, a ratchet connected to said pattern device, a cyclically operating pawl engaging said ratchet to advance said pattern device step by step, means effective to control the path of movement of said pawl thereby to control the occurrence of active and inactive cycles of said pawl, means for controlling the speed of the knitting machine including a cam device, and racking members secured to said cam device and engageable by said pawl during active cycles thereof, said racking members having guard portions which, when engaged by said pawl, prevent engagement of said ratchet by the pawl, and said cam device being mounted to be advanced with said pattern device in movements thereof, the racking members being so arranged relative to said ratchet that in one active cycle of said pawl the cam device is advanced to change the speed of the knitting machine while the pattern device remains stationary, and in a subsequent active cycle of said pawl the pattern device is advanced.

3. In a knitting machine, a pattern device, a ratchet connected to said pattern device, a cyclically operating pawl engaging said ratchet to advance said pattern device step by step, means effective to control the path of movement of said pawl thereby to control the occurrence of active and inactive cycles of said pawl, means for controlling the speed of the knitting machine including a cam device, and racking members secured to said cam device and engageable by said pawl during active cycles thereof, said racking members having guard portions which, when engaged by said pawl, prevent engagement of said ratchet by the pawl, and said cam device being mounted to be advanced with said pattern device in movements thereof, the racking members being so arranged relative to said ratchet that in one active cycle of said pawl the cam device is advanced to change the speed of the knitting machine while the pattern device remains stationary, and in the next active cycle of said pawl the pattern device is advanced.

4. In a knitting machine, a pattern drum, a ratchet connected to said pattern drum to rotate therewith, a cyclically operating pawl engaging

said ratchet to advance said pattern drum step by step, means effective to control the path of movement of said pawl thereby to control the occurrence of active and inactive cycles of said pawl, means for controlling the speed of the knitting machine including a cam device mounted coaxially with said pattern drum, and racking members secured to said cam device and engageable by said pawl during active cycles thereof, said racking members having guard portions which, when engaged by said pawl, prevent engagement of said ratchet by the pawl, and said cam device being mounted to be advanced with said pattern drum in movements thereof, the racking members being so arranged relative to said ratchet that in one active cycle of said pawl the cam device is advanced to change the speed of the knitting machine while the pattern drum remains stationary, and in a subsequent active cycle of said pawl the pattern drum is advanced.

5. In a knitting machine, a pattern drum, a ratchet connected to said pattern drum to rotate therewith, a cyclically operating pawl engaging said ratchet to advance said pattern drum step by step, means effective to control the path of movement of said pawl thereby to control the occurrence of active and inactive cycles of said pawl, means for controlling the speed of the knitting machine including a cam device mounted coaxially with said pattern drum, and racking members secured to said cam device and engageable by said pawl during active cycles thereof, said racking members having guard portions which, when engaged by said pawl, prevent engagement of said ratchet by the pawl, and said cam device being mounted to be advanced with said pattern drum in movements thereof, the racking members being so arranged relative to said ratchet that in one active cycle of said pawl the cam device is advanced to change the speed of the knitting machine while the pattern drum remains stationary, and in the next active cycle of said pawl the pattern drum is advanced.

6. In a knitting machine, a pattern drum, a ratchet connected to said pattern drum to rotate therewith, a cyclically operating pawl engaging said ratchet to advance said pattern drum step by step, means comprising a main pattern chain effective to control the path of movement of said pawl thereby to control the occurrence of active and inactive cycles of said pawl, means for controlling the speed of the knitting machine including a cam device mounted coaxially with said pattern drum, and racking members secured to said cam device and engageable by said pawl during active cycles thereof, said racking members having guard portions which, when engaged by said pawl, prevent engagement of said ratchet by the pawl, and said cam device being mounted to be advanced with said pattern drum in movements thereof, the racking members being so arranged relative to said ratchet that in one active cycle of said pawl the cam device is advanced to change the speed of the knitting machine while the pattern drum remains stationary, and in a subsequent active cycle of said pawl the pattern drum is advanced.

7. In a knitting machine, a pattern drum, a ratchet connected to said pattern drum to rotate therewith, a cyclically operating pawl engaging said ratchet to advance said pattern drum step by step, means comprising a main pattern chain effective to control the path of movement of said pawl thereby to control the occurrence of active and inactive cycles of said pawl, means for controlling the speed of the knitting machine including a cam device mounted coaxially with said pattern drum, and racking members secured to said cam device and engageable by said pawl during active cycles thereof, said racking members having guard portions which, when engaged by said pawl, prevent engagement of said ratchet by the pawl, and said cam device being mounted to be advanced with said pattern drum in movements thereof, the racking members being so arranged relative to said ratchet that in one active cycle of said pawl the cam device is advanced to change the speed of the knitting machine while the pattern drum remains stationary, and in the next active cycle of said pawl the pattern drum is advanced.

8. In a knitting machine a pattern device, a cyclically operating element for advancing said pattern device step by step, means controlling the occurrence of active cycles of said element, means for controlling the speed of the knitting machine, and means for effecting in one active cycle of said element an advance of said speed controlling means to reduce the speed of the knitting machine while the pattern device remains stationary, and in a subsequent active cycle of said element an advance of said pattern device.

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The following references are of record in the file of this patent:

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