

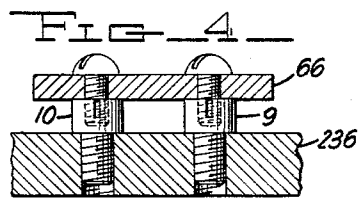
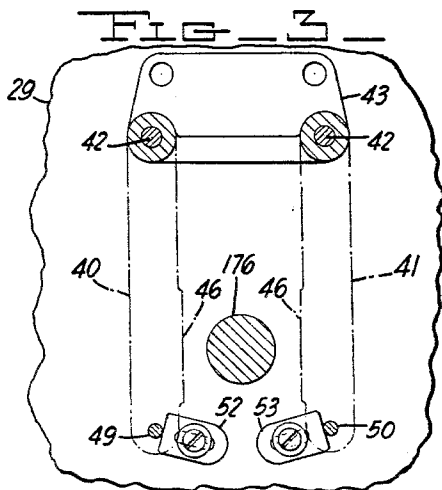
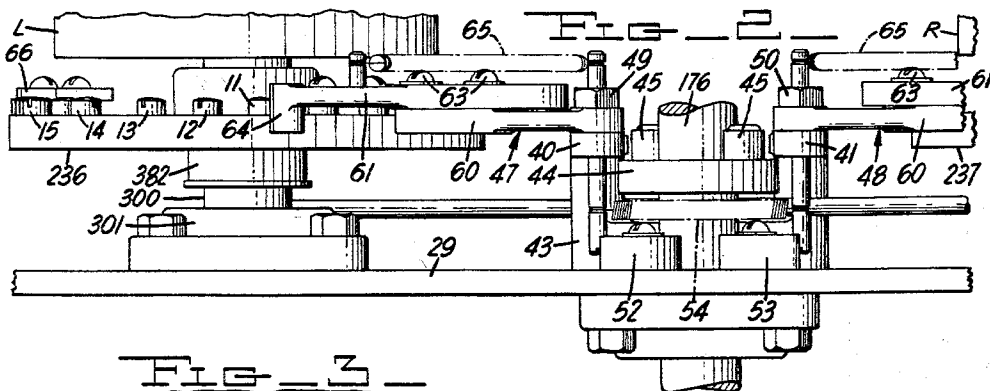
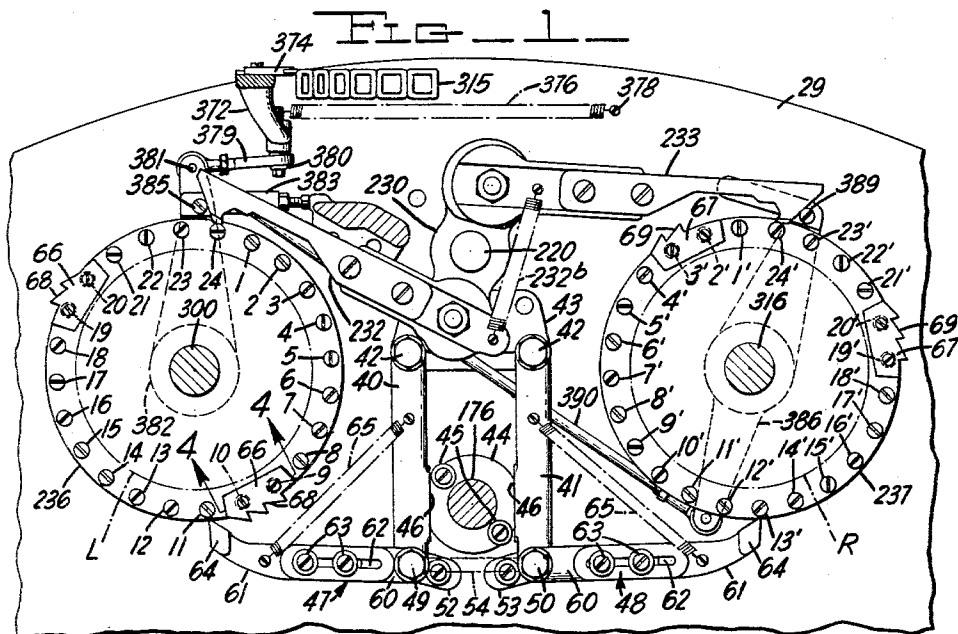
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B. F. COILE

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PATTERN MECHANISM FOR KNITTING MACHINES

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INVENTOR.
Benjamin Franklin Coile
BY
Carl S. Olson
ATTORNEY

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**PATTERN MECHANISM FOR KNITTING
 MACHINES**

Benjamin Franklin Coile, Athens, Ga., assignor to Textile
 Machine Works, Wyomissing, Pa., a corporation of
 Pennsylvania

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The instant invention relates to circular knitting machines and more particularly to the patterning means thereof.

In my co-pending application Serial No. 329,801, filed January 6, 1953, now Patent No. 3,136,145, issued June 9, 1964 I have shown and described a multifeed circular knitting machine adapted for both rotary and reciprocatory operation to produce fabrics of various constructions and patterns, the machine including a pattern system involving a pattern chain controlling the step-by-step operation of a pair of pattern control drum assemblies. The latter carry a plurality of pattern lugs at different levels which in turn serve through actuating mechanism to control the operations of various elements of the machine. The pattern chain and the pattern drum assemblies are operated through a complete cycle or revolution for each complete knitting cycle e.g. the knitting of a stocking or sock.

The principal object of the invention is provision of means supplementing the action of the main pattern chain to impart additional moves to the pattern drum assemblies. While the invention is particularly applicable to the drum assemblies of my said Patent No. 3,136,145 its use is not limited thereto as it may find fields of use in other knitting machines having single or multiple pattern drums.

Another object of the invention is the provision of means of the type referred to in the foregoing object in which the supplemental operation of the pattern drum assemblies is brought into play under the control of the pattern drum assemblies themselves.

A further object of the invention is the provision in such mechanism of means for permitting pattern drum assembly moves of greater frequencies and at other times as compared to the moves controlled by the main pattern chain.

Briefly described the invention is incorporated in a pattern drum assembly drive mechanism, suitably of the type of that disclosed in my said patent, the invention residing in the provision of auxiliary operating means, particularly pawls driven at predetermined frequencies, which may be greater than that of the normal pattern drum drive mechanism to advance the pattern drum, the auxiliary pawls coacting with auxiliary ratchets carried by the pattern drum assemblies. The auxiliary ratchets may be located at any desired point or points on the periphery of the pattern drum assemblies and may include any selected number of teeth to permit the auxiliary operating means to be employed at any predetermined point or points in the knitting cycle and for any predetermined period or periods.

My invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description to follow and to the accompanying drawings in which:

FIGURE 1 is a sectional view taken, similarly as FIG. 19 of my said patent, through a knitting machine substantially at the level of the drum assembly driving mechanism;

FIG. 2 is an elevational view on an enlarged scale of a portion of the mechanism illustrated in FIG. 1;

FIG. 3 is a detail view with parts in section of an auxiliary pawl operating mechanism illustrated in FIG. 1; and

FIG. 4 is a sectional view on an enlarged scale taken on the line 4-4 of FIG. 1 and looking in the direction of the arrows.

In the following description and in the drawings the invention is illustrated as incorporated in a knitting machine of the type of my said Patent No. 3,136,145 to which reference may be made for detailed information as to the construction and operation thereof. Moreover, as an aid to the understanding of the invention, parts common to the device of this application and to that of said patent will be indicated by the reference characters employed in the latter. However, as previously stated my invention is not to be considered to be limited in use to the machine of my said patent as it may be employed in other knitting machines or with pattern drums of other types.

Referring now to the drawings and particularly to FIGS. 1 and 2 there is shown portions of a knitting machine, as described in my said patent, and particularly there is shown the drive mechanism for the pattern drum assemblies. In addition the novel auxiliary mechanism of the instant invention is illustrated to which detailed reference will be made later. The pattern drum assemblies indicated at L and R, respectively, and each comprising superimposed pattern drums, are mounted on and for rotation with vertically extending shafts 300 and 316, respectively. The shafts in turn are mounted for rotation in bearings, one of such bearings for shaft 300 being shown at 301 in FIG. 2, on a bed plate 29.

The left and right pattern drum assemblies carry ratchet wheels 236 and 237 respectively secured to their respective shafts 300 and 316 below the pattern drum. Ratchet wheel 236 is provided with a plurality of peripherally mounted equally spaced pins comprising the teeth of the ratchet wheel. In the construction illustrated in this application, as well as in my said Patent No. 3,136,145, these pins are numbered from 1 to 24 and correspond to the number of moves that must be imparted to the pattern drum assembly to effect one complete revolution of the drum during a complete knitting cycle. Ratchet wheel 237 similarly carries twenty-four equally spaced pins numbered from 1' to 24' constituting the ratchet teeth for that wheel.

A pattern chain, a part of which is shown at 315 in FIG. 1 and which is illustrated in detail in FIGS. 20 and 22 of my said patent, carries a series of selectively spaced lugs and is operated in step-by-step movement by means (not shown) to bring the lugs serially into contact with a lever arm 372. The lever arm is pivoted for swinging movement on the frame of the machine and its lower free end is moved to the left as viewed in FIG. 1, against the action of a spring 376 connected at one end to the lever and at the other end to a pin 378 at a fixed point on the machine frame, upon movement of a chain lug into contact with a follower portion 374 carried by the lever arm.

One end of a link 379 is connected by a pivot pin 380 to the lower extremity of lever 372 and the opposite end of the link is pivotally connected by a pin 381 to the outer end of a drum idler plate 382 mounted on the shaft 300 below ratchet wheel 236 for free rotation about said shaft. Plate 382 is provided with a stop 383 which includes a screw 385 projecting above the stop 383 in a position to engage the outer end of a pawl 232, mounted for operation in the horizontal plane of the pins 1 to 24, and acting at certain times to prevent the pawl from engaging the nearest pin on the ratchet wheel 236 when the pawl is in its ratchet wheel advancing position as will be hereinafter referred to.

A similar drum idler plate 386 is disposed below the ratchet wheel 237 and is mounted on shaft 316 for free rotation about said shaft. A screw 389 projecting from the plate 386 is adapted to engage the free end of a

pawl 233, similar to pawl 232 and mounted for operation in the horizontal plane of the pins 1' to 24' and acts at certain times to prevent the pawl from engaging the nearest pin when the pawl is in its ratchet wheel advancing position. Idler plate 385 includes a rearwardly extending arm, the arm and plate 382 being interconnected by a link 390 so that the two move together about their respective shafts.

Pawls 232 and 233 are pivotally mounted adjacent the opposite ends of a double arm crank 230. Crank 230 is fixed to a shaft 220 which, as explained in my said patent, is oscillated at all times so that the pawls 232 and 233 constantly move back and forth relative to their associated ratchet wheels 236 and 237, a complete oscillation of the shaft (a back and forth stroke) occurring for each complete reciprocation, or at a frequency of every four rotations, of the needle cylinder. Pawls 232 and 233 are urged into position to contact pins 1 to 24 and 1', 24' on the pattern wheels 236 and 237, respectively, by spring 232b.

In the operation of the mechanism described above, and as explained in my said Patent No. 3,136,145, pawls 232 and 233, constantly move between forward positions to normally engage a pin 1 to 24 or 1' to 24' and retracted positions, as aforesaid, are prevented from engaging the pins except at certain times under the control of the pattern chain. Thus upon movement of the pattern chain and a lug thereon into a position to swing lever 372 to the left as shown in FIG. 1 plate 382 is swung to the left and, through the intermediary of the link 390 plate 386 is swung to the right, to remove screws 285 and 389, respectively, from the paths of their pawls and permit the pawls to drop behind pins on their respective ratchet wheels. When the pawls are moved through their return strokes by shaft 220 to retracted positions pattern drum assemblies L and R are rotated through one step, that is, for a distance equal in extent to the spacing between two pins. This pawling operation will continue to advance the drum assemblies at a frequency of one step for each four rotations of the needle cylinder as long as the lug of the pattern chain maintains lever 372 in its leftward position. Movement of the pattern chain lug out of contact with lever 372 causes lever 372 to swing to the right as viewed in FIG. 1 under the compulsion of spring 376 and hence to move plate 382 and plate 386 again into positions to hold the pawls out of ratchet advancing action. Hence this mechanism provides for the advancing of the pattern drum assemblies under the control of the pattern chain, both pattern drum assemblies however being rotated simultaneously and for uniform distances and at intervals as determined solely by the pattern chain.

In accordance with the instant invention auxiliary means are provided for rotating the pattern drum assemblies L and R independently of each other or together as may be desired under the control of means in part independent of the pattern chain. This mechanism includes arms 40 and 41 normally lying in approximately parallel relationship, one end of each arm being pivoted as at 42 to a bracket 43 carried by the bed plate 29. Arms 40 and 41 lie in opposite sides of a constantly rotating shaft 176, shown in my said Patent No. 3,136,145 and which as described therein makes one complete revolution for each four revolutions of the needle cylinder and which is known as the "quarter turn" shaft. A plate 44 is secured to shaft 176 for rotation therewith, plate 44 carrying one or more rollers 45, two being shown, for contact with striking edges 46 of arms 40 and 41.

The ends of arms 40 and 41 remote from their pivots 42 are pivotally connected to auxiliary pawls 47 and 48, respectively, by headed pivot pins 49 and 50 suitably passing through apertures in the pawls and threaded into the arms. Pivot pins 49 and 50 are extended below arms 40 and 41 for contact with stops 52 and 53 adjustably mounted on the bed plate 29 (FIGS. 2 and 3). The pins are normally held in contact with the stops, and the arms in

the parallel position illustrated in FIG. 1, by a tension spring 54 connecting the extending ends of the pins.

Pawls 47 and 48 are similar and each includes an arm 60 supporting a pawl portion 61 for longitudinal adjustment thereon. Adjustability is obtained through the provision of a slot 62 in the pawl portion in which is received headed studs 63 threaded into the arm 60. The pawls carry heads 64 having extensions to normally contact the peripheries of ratchet wheels 236 and 237, respectively, the pawls being urged toward the ratchet wheels by tension springs 65.

Ratchet wheels 236 and 237 carry auxiliary ratchet plates 66 and 67, respectively, mounted above the pins of the ratchet wheels and suitably secured thereto in any convenient way by screws as shown in FIGS. 1 and 4. The ratchet plates 66 and 67 carry one or more teeth 68 and 69 projecting outwardly from the periphery of the ratchet wheels and in position when advanced into the path of reciprocation of the pawls 47 and 48 to be contacted by the pawls. The tooth, if only one is used, or the first of the teeth if more than one is employed, lies in the vertical plane common to the center of the shaft 300 or 316 and one of the pins 1 to 24 or 1' to 24'. If a plurality of teeth are employed they are suitably spaced apart a distance of an extent equal to one-half the extent of the distance between the pins, and the throw of the pawls 47 and 48 is adjusted so as to move the ratchet wheels and hence the pattern drum assemblies one-half the extent of the distance between the pins upon a ratchet advancing stroke of the pawls.

As will be recognized, the auxiliary drum assembly operating means described above can be employed to obtain moves of the drums in one or more intermediate steps at any point during the knitting cycle to effect additional control movements of the various instrumentalities of the machine. The plates 66 and 67 may carry as many teeth as desired for the additional moves and may be located at any point desired around the circumferences of the ratchet wheels. Furthermore as illustrated in FIG. 1 the pattern drums may have the added moves imparted thereto independently of each other by placing the ratchet plates at different locations on the two ratchet wheels. It is only necessary that the number of added ratchet teeth on each drum assembly be the same in order to bring the drums again into time at the end of the cycle of operation in preparation for the start of a new cycle. For example where added steps are required for only one drum, the same number of added steps will be provided for the other drum as idle moves thereof. The ratchet plate 66 or 67 may carry an odd number of teeth in which case, upon completion of the moves of the associated drum under the impetus of the auxiliary pawls, the pins 1 to 24 or 1' to 24' are left at points intermediate their normal positions. I such event the next return stroke of the pawl 232 or 233 irrespective of whether its associated idler plate is in pawl blocking position will turn the pattern drum assembly through an additional step to bring the assembly again into a normal position as the pawl will ride off the idler plate screw before it reaches a pin in its intermediate location. As mentioned above while two of the rollers 45 are shown for imparting movements to the pawls 47 and 48 to advance the drum assemblies at a frequency of two steps for each rotation of shaft 176 or for each four rotations of the needle cylinder a lesser or greater number of rollers 45 may be employed to change the frequency of operation of the pawls and drum assemblies. The auxiliary pattern control mechanism of the instant invention thus greatly increases the versatility of the machine by increasing the normal frequency of the movements of the drum assemblies from one step which is equal in extent to the distance between the pins on ratchet wheels 236 and 237 during each four rotations of the needle cylinder to an operating frequency during each four rotations of the needle cylinder in which the steps correspond to the number of rollers 45 and the distance of movement of each

step is equal in extent to one-half the distance between the pins on the ratchet wheels.

Having thus described my invention in rather full detail it will be understood that these details need not be strictly adhered to and that various changes and modifications may be made all falling within the scope of the invention as defined by the subjoined claims.

I claim:

1. In a knitting machine, pattern means therefor including a rotatable pattern drum assembly, first means for causing step-by-step movements through distances of one extent to said pattern drum assembly including a ratchet wheel located at a first level and having ratchet teeth of a first spacing, pawl means for cooperation with said ratchet to advance the same at certain times, and an auxiliary means for causing step-by-step movements through distances of an extent different than the movements caused by said first means to said pattern drum assembly at other times, said auxiliary means comprising a second ratchet means carried by said pattern drum assembly at a second level and having ratchet teeth of a second spacing, and a second pawl supported at said second level and in position to operatively contact said second ratchet means to advance the same at other times, and means for driving said last named pawl through ratchet advancing movements of a predetermined frequency.

2. In a knitting machine, pattern means therefor including a rotatable pattern drum assembly, first means for causing step-by-step movements of one distance and of one frequency to said pattern drum including a ratchet wheel located at a first level, and pawl means for cooperating with said ratchet wheel to advance the same at certain times, a second ratchet means carried by said pattern drum assembly at a second level, a constantly rotating member, contact elements carried by said member at a point remote from the center of rotation thereof, a pivoted lever arm including a follower portion in position to be contacted by said contact elements for swinging movement of said lever arm about said pivot, and a pawl supported by said lever arm at a point remote from said pivot and at a level and in a position to operatively contact said second ratchet means to advance said pattern drum assembly step-by-step in movements of a different distance and of a different frequency than the movements caused by said first means at other times.

3. In a knitting machine, pattern means therefor including a pattern chain, a rotatable pattern drum assembly, first means for causing step-by-step movements of one distance and of one frequency to said pattern drum assembly at intervals under the control of said pattern chain, and an auxiliary means for causing step-by-step movements of a different distance and of a different frequency than the movements caused by said first means to said pattern drum assembly, said auxiliary means comprising a ratchet means carried by said pattern drum assembly and extending for a portion only of the periphery thereof, a constantly rotating member, contact elements carried by said member at a point remote from the center of rotation thereof, a pivoted lever arm including a follower portion in position to be contacted by said contact elements for swinging movement of said lever arm about said pivot, and a reciprocable pawl supported by said lever at a point re-

mote from said pivot and in a position adjacent the periphery of said pattern control drum and located to contact said ratchet means when the latter is moved into the path of reciprocation thereof by said first means.

4. In a knitting machine, pattern means therefor including a rotatable pattern drum assembly, a first means for causing step-by-step rotation of said pattern drum assembly through steps of one extent at predetermined times, and an auxiliary means for causing step-by-step rotation of said pattern drum assembly through steps of another extent at other times, said first means comprising a first pawl, a first means for continuously reciprocating said first pawl, and a ratchet wheel having ratchet teeth of a first spacing adapted to be engaged by said first pawl, and said auxiliary means comprising a second pawl, a second means for continuously reciprocating said second pawl at a predetermined frequency, and ratchet means having ratchet teeth of a second spacing carried by said ratchet wheel and movable therewith into cooperative relationship with said second pawl by said first means.

5. In a knitting machine, pattern means therefor including a pattern chain and a rotatable pattern drum assembly, a first means for causing step-by-step rotation of said pattern drum assembly at intervals under the control of said pattern chain, and an auxiliary means for causing step-by-step rotation of said pattern drum assembly, said first means comprising a first pawl, a first means for continuously reciprocating said first pawl at a predetermined frequency, and a ratchet wheel adapted to be engaged by said first pawl, and said auxiliary means comprising a second pawl, a second means for continuously reciprocating said second pawl at a predetermined frequency different than the frequency of reciprocation of said first pawl, and ratchet means carried by said ratchet wheel and movable therewith into cooperative relationship with said second pawl by said first means.

6. In a knitting machine, pattern means therefor including first and second pattern drum assemblies, a first means for jointly imparting step-by-step rotation by steps of one extent to said pattern drum assemblies, and an auxiliary means for imparting step-by-step rotation by steps of another extent to said pattern drum assemblies independently of each other, said first means comprising a first pawl for each said pattern drum assemblies, a first means for continuously reciprocating said first pawls, and ratchet wheels having ratchet teeth of a first spacing for each said pattern drum assemblies adapted to be engaged by said first pawls, and said auxiliary means comprising a second pawl for each said pattern drum assemblies, a second means for continuously reciprocating said second pawls at a predetermined frequency, and ratchet means having ratchet teeth of a second spacing carried by each pattern drum assembly and movable into cooperative relationship with its respective second pawl by said first means.

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