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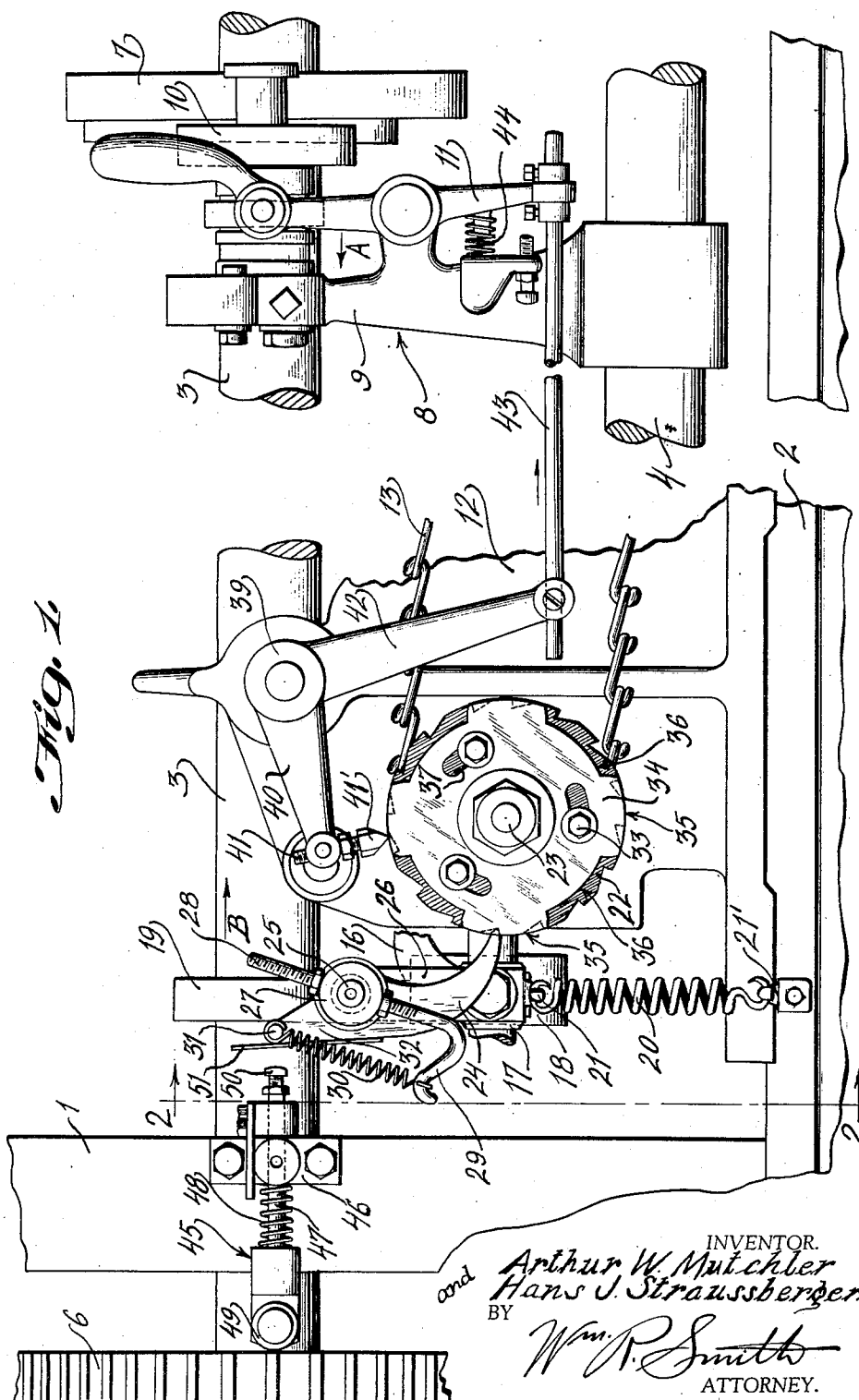
A. W. MUTCHLER ET AL

2,057,046

CONTROL MECHANISM FOR THE LOOSE COURSE MOTION OF FLAT KNITTING MACHINES

Filed June 12, 1935

2 Sheets-Sheet 1



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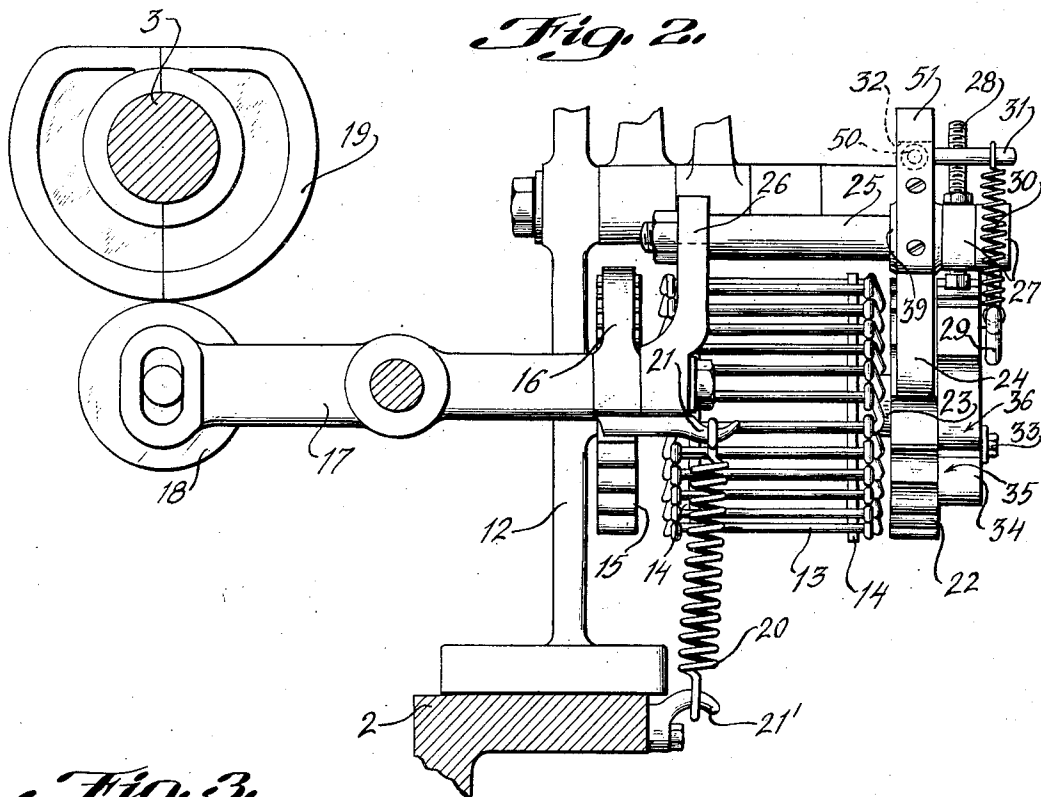


Fig. 3.

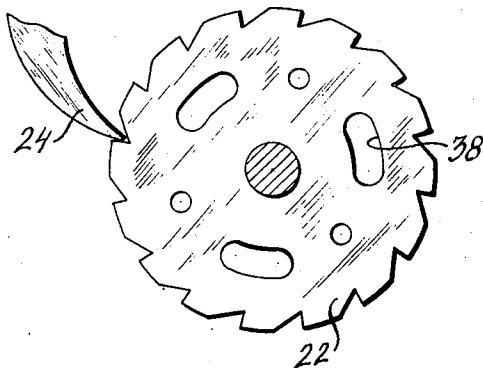
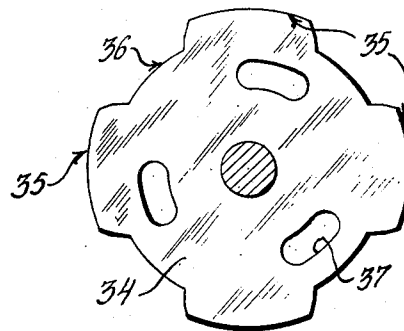


Fig. 4.



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2,057,046

CONTROL MECHANISM FOR THE LOOSE
COURSE MOTION OF FLAT KNITTING
MACHINES

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18 Claims. (Cl. 66—82)

The present invention relates generally to flat knitting machines, particularly adapted for the manufacture of full fashioned hosiery, and wherein is embodied means commonly referred to in the art as "the loose course motion mechanism" which acts during the normal operation of the knitting machine at certain points during the manufacture of the stocking to automatically displace the needle bar in relation to the presser edge thus regulating the length of the loops in the flat knitting of the stocking blank, to form so-called loose courses therein.

Usually the loose course motion functions to cause the formation of a course of loose loops at the starting of the stocking fabric whereby to facilitate the engagement of the latter with the hooks of the welt bar used for drawing the fabric from the knitting field while knitting the welt of a full fashioned stocking; at the finishing of the welt so that the same may be turned upon itself to provide the common double welt fabric; at the end of the heel tabs to assist in the looping operation; and for ornamental purposes well known in the art.

The invention specifically pertains to a mechanism devised to control the action of the loose course motion mechanism and contemplates the provision of means operatively associated with said loose course motion mechanism whereby the latter, in addition to its usual functions aforesaid, will be automatically adjusted to operative position at determined and regular intervals and will be selectively acted upon to remain in its adjusted position for a definite period during the knitting operation before returning to its neutral or inoperative position, so that a series of loose loop courses may be made to alternate with a series of tight loop courses throughout the length of the knitted blank or in certain desirable sections thereof.

It is the primary object of the invention to provide a mechanism capable of being easily and readily mounted upon the commonly known type of full fashioned hosiery knitting machine and conveniently associated with the loose course motion mechanism thereof without necessitating any material changes in the usual structure, said mechanism being adapted to act at regular intervals upon the working parts of the loose course motion mechanism to effect a lengthening of the loops of certain courses during the fabrication of the stocking blank in order to interpose groups of loosely knitted courses between groups of tightly knitted courses of the usual type for the purpose of imparting an increase in elasticity in

certain sections of the stocking, such as in the welt, knee, and foot portions, thus advantageously affording the desired stretchability of those stocking portions where stresses in wearing are usually the greatest.

Means have heretofore been devised to bring the loose course motion into operation during the laying of the thread on the needles to form loose courses alternating with tight courses, but such means chiefly consist of buttons attached to the pattern chain which forms a part of the knitting machine. This arrangement, however, has proven inadequate, and its efficiency and practicability are greatly impaired because, after a short period of use, the buttons, due to their relatively small size, become so worn that they fail to properly perform their duty, therefore requiring readjustment or replacement. Furthermore, by employing buttons on the pattern chain, it is necessary to change the relative position of each and every button whenever a change of pattern in the alternation of the loose and tight courses is desired or required which obviously consumes considerable time and necessitates skilled operatives. Also, since the pattern chain is especially provided for the purpose of performing certain particular functions, such as controlling the narrowing mechanism, operating the reinforced selvedge attachment, etc., the placing of loose course control buttons on said chain overburdens the same and renders its operation difficult and complicated.

It is, therefore, among the important features of the invention to provide a simple, yet efficient, mechanism capable of operating independently of the pattern chain to control the action of the loose course motion for the formation of loose courses in alternating relation with tight courses; to provide a mechanism wherein a removable pattern wheel having specially designed working surfaces constitutes the main element for controlling the action of the loose course motion mechanism, whereby said pattern wheel may be readily removed and replaced by another of a different design, thus making it possible to change the relative association of the loose and tight courses quickly and without the requirement of skill; and to provide a mechanism including a single main control element for the loose course motion which facilitates proper adjustment and eliminates wear and tear.

Another meritorious feature of the invention resides in the provision of a mechanism of the character specified controlled in its operation by actuation of the knitting machine itself for syn-

chronized action therewith, whereby the operation of said mechanism to perform its intended function will not interfere with the usual operation of the machine.

5 The invention further aims to provide a mechanism capable of functioning to automatically actuate the loose course motion mechanism of a full fashioned hosiery knitting machine for the knitting of alternating groups of tight and loose 10 courses, said mechanism including means under control of the knitting machine to timely throw the former out of action, depending upon certain operations of the latter when it may become desirable to disrupt the function of the loop regulating mechanism.

15 The invention is further distinguished by the provision of a control mechanism for the loose course motion mechanism which receives its power from the usual pattern chain actuating mechanism, the driving of the former by the latter being periodically controlled in the shogging of the main cam shaft of the knitting machine.

20 Other important objects and advantages of the invention will be in part obvious and in part pointed out hereinafter.

25 In order that the invention and its mode of operation may be readily understood by those persons skilled in the art, we have, in the accompanying drawings, and in the detailed description based thereupon, set out a possible embodiment of the same.

In these drawings:

30 Figure 1 is a fragmentary front elevation of a portion of the knitting machine having our improved mechanism mounted thereon.

35 Figure 2 is a section taken on line 2—2 of Figure 1 with certain parts removed for the sake of clarity.

40 Figure 3 is an enlarged detail in elevation, showing the ratchet means for operating the improved mechanism.

Figure 4 is a view similar to Figure 3, illustrating one form of the loose course motion controlling pattern wheel.

45 Having more particular reference to the drawings, wherein like characters of reference will designate corresponding parts throughout, we have shown in Figure 1 a portion of a full fashioned hosiery knitting machine frame 1 having a front 50 beam 2 and wherein is rotatably mounted the main cam shaft 3 and the stitch regulating shaft 4. The main cam shaft 3 is rotated by means of a drive gear 5 secured to a portion of said shaft extending transversely and outwardly of the 55 frame 1.

Suitably fixed to a convenient section of the main cam shaft 3 is the usual loose course cam 7 adapted to act upon the ordinary leverage system adapted to impart the necessary movement 60 to the needle bar for causing the formation of a loose course. The construction of the loose course mechanism per se and its operation is well known in the art and, accordingly, it has not been shown herein. Since the loose course motion mechanism and its mode of operation will be readily 65 understood by persons skilled in the art and because they are not changed by the present invention, it is deemed that more detailed description thereof may be dispensed with.

70 Upon the stitch regulating shaft 4 is mounted the usual mechanism indicated in its entirety for convenience herein by the reference character 8, adapted to set the loose course motion in operation and including the cam lever 9 rotatably 75 carrying the roller 10 adjustable for engagement

with the loose course cam 7 of the main cam shaft, by actuation of the shifter 11 pivotally connected to the cam lever 9.

Conveniently disposed upon the front beam 2 adjacent the frame 1 is the main bracket 12 provided to support the driving means of the pattern chain 13, forming a part of the usual flat hosiery knitting machine. As will more clearly appear, upon reference to Figure 2 of the drawings, the pattern chain 13 is driven through the 10 medium of a sprocket wheel 14 rigidly connected to a ratchet 15 actuated by means of a dog 16 carried at the forward end of a rocking arm 17 which, in turn, carries at its other end a roller 18 associated with a dipping cam 19 affixed to 15 the main cam shaft 3. It will be noted that the roller 18 is urged in positive contact with the dipping cam 19 by means of a coil spring 20 having one extremity connected to the forward end of the rocking arm 17 as shown at 21 and 20 its other extremity connected to the front beam 2 as at 21'. Because of this arrangement it will be appreciated that at each revolution of the main cam shaft 3, the working edge of the cam 19 bearing upon the roller 18 will rock the arm 25 17 causing the dog 16 to advance the ratchet 15 step by step and, accordingly, rotate the pattern chain driving sprocket wheel 14.

In accordance with the present invention, a second ratchet wheel 22 is preferably mounted 30 to rotate freely upon the end of the stub 23 projecting from the pattern chain sprocket wheel 14. Said ratchet wheel 22 is operated by a dog 24 movably engaged upon a stub shaft 25 supported in position by means of a bracket 26 35 affixed to and extending from the rocking arm 17 for movement therewith.

Also received upon and secured to the stub shaft 25 is a pair of collars 27, one of which carries a radially extending pin 28 and the other 40 a hook-like member 29, the latter engaging one end of a coil spring 30, having its other end connected to a pin 31 projecting laterally from an extension 32 formed integrally with the dog 24 and disposed in diametrically opposed relation 45 with the ratchet engaging extremity thereof. In this manner, it will be understood that the coil spring 30 normally acts to urge the dog 24 in positive engagement with the associated ratchet 22 to assure accurate and proper operation 50 thereof.

Adapted to be rigidly but detachably connected to one face of the ratchet 22 by means of bolts 33, or like fastening elements, is a specially designed pattern wheel or cam 34 having 55 series of alternating projections and depressions 35 and 36 respectively positioned radially of said pattern wheel 34 for the purpose to be fully described hereinafter.

The pattern wheel or cam 34 is preferably devised for relative adjustment with its associated 60 ratchet 22 and for that purpose they may be provided with a plurality of spaced arcuate slots 37 and 38 respectively adapted to receive the securing bolts 33.

Mounted for oscillating movement upon the main bracket 12 adjacent the ratchet and pattern wheel assembly is a bell crank lever 39, one 65 arm 40 of which carries a threaded stem 41 having a cam shaped head 41' disposed to ride over the peripheral cam edge of said pattern wheel 34. The other arm 42 of the bell crank lever 39 engages the free extremity of the shifting rod 43 having its opposite extremity connected to the shifter 11 of the loose course mo- 75

tion mechanism 8. In this connection, it will be noted that the cam shaped head 41' is maintained in constant contact with the working surface of the pattern wheel 34 by action of a spring 44 normally pushing the shifter 11 towards one of its positions, thus exerting a pull on the shifting rod 43 to cause the bell crank lever 39 to assume a position which yieldably forces said cam shaped head 41' in a direction towards said pattern wheel 34.

From the foregoing description, it will be understood that upon rotation of the main cam shaft 3, the dipping cam 19 engaging the roller 18 will rock the arm 17 and thus cause the dog 24 to move up and down for actuating the ratchet wheel 22 step by step. Since the pattern wheel 34 is rigidly secured to the ratchet wheel 22, said pattern wheel will rotate with the latter and act to control the bell crank lever 39 and through its action on the shifter 11, by means of the shifting rod 43, will set the loop regulating or loose course motion mechanism to perform its intended function.

In practice, the projections 35 of the pattern wheel 34 are made to cause the loose course mechanism to assume its active position for lengthening the loops of the course being knitted, whereas the depressions 36 in said pattern wheel are intended to allow the return of the loose course mechanism to its inactive or neutral position. Therefore, as long as the cam shaped head 41' of the pin 41 is in riding contact with said projections 35, the bell crank lever 39 through the shifting rod 43 will draw a shifter 11 against the action of the spring 44 to bring the roller 10 over the loose course cam 7 as illustrated in Figure 1 of the drawings. However, as soon as the pin cam shaped head 41' registers with a depression 36 of the pattern wheel 34, said pin will fall within the latter, allowing the spring 44 to displace the shifter 11 in the direction indicated by the arrow A, thus disengaging the roller 10 from the cam 7 whereby ordinary knitting of tight loop courses will be resumed since the loose course motion mechanism is then inactive.

It is to be particularly noted that the pattern wheel 34 is so constructed that it will act to cause the knitting of a series of several succeeding courses of loose loops alternating with a series of several courses of tight loops. The construction of the pattern wheel illustrated in the drawings is adapted to act upon the loose course motion mechanism in the manner heretofore described to form two courses of loose loops between every two courses of tight loops. However, it is to be understood that the configuration of the pattern wheel 34 may be varied to change the numerical relationship of the tight and loose loop courses so that any number of succeeding courses of one type may be made in a series, as preference or necessity may dictate. Since the pattern wheel 34 may be readily removed, it will be appreciated that the change in the mechanism to provide for the change in the alternation of the loose and tight courses may be effected without difficulty or skill.

Attention is particularly called to the fact that the ratchet wheel 22 is rotated one step for each revolution of the main cam shaft 3 whereby one course of loops is produced, and since the pattern wheel is formed in such a manner as to hold the roller 10 in aligned relationship with the loose course cam 7 during a predetermined number of revolutions of the cam shaft and release the roller

during a certain number of subsequent revolutions of said cam shaft, the knitting of a desired number of loose and tight courses in alternating series is positively assured.

At times (for instance, during the narrowing operation of the knitting machine,) it may become desirable or necessary to disrupt the function of the loose course motion mechanism and for that purpose there is provided a tappet arrangement, indicated in its entirety upon the drawings by the reference character 45, supported in position by means of a bracket 46 on the frame 1 adjacent the drive gear 6 of the main cam shaft 3.

The tappet arrangement comprises a rod 47 slidably mounted in the bracket 46 and normally urged towards the circumferential face of the gear 6 by means of a coil spring 48. One end of the rod 47 carries a roller 49 directly engaging the gear 6 while the other end carries an adjustable stop 50 disposed in alignment with a finger 51 affixed to the dog 24 of the loose course control mechanism of this invention.

In this manner, it will be understood that when the main cam shaft is shogged and moved longitudinally in the direction indicated by the arrow B to set the knitting machine for the narrowing of the fabric, the drive gear 6 will force the rod 47 of the tappet 45 to come in contact with the finger 51 and accordingly pivot the dog 24 so that the latter will disengage the ratchet 22. Upon reference to the drawing, it will appear that the movement of the dog 24 to its ratchet disengaging position is limited by reason of the pin 31 coming in contact with the pin 28, the latter being rigidly carried in the path of movement of the former by one of the collars 27 on the stub shaft 25. Of course, it will be understood that in this disengaged position the dog 24 will fail to actuate the ratchet 22.

It is pointed out that because our improved device, as previously described, has no rigid engagement with the usual pattern chain 13, the same operate independently of one another so that both may perform their particular functions without mutual interference.

Manifestly, the construction shown and described is capable of considerable modifications and those modifications which come within the scope of the sub-joined claims are to be considered within the spirit of the invention.

What we claim is:

1. In combination with the main cam shaft, the drive gear thereof, the pattern chain drive mechanism, and loose course motion mechanism of a full fashioned knitting machine, a pattern wheel operated by said drive mechanism, link mechanism having an operative connection with said loose course motion mechanism and periodically actuated by said pattern wheel, and means operated by said drive gear for interrupting the drive connection between said drive mechanism and said pattern wheel in the shogging of said cam shaft.

2. In combination with the main cam shaft, the drive gear thereof, the pattern chain drive mechanism, and loose course motion mechanism of a full fashioned knitting machine, a pattern wheel operated directly off of said drive mechanism, link mechanism having an operative connection with said loose course motion mechanism and periodically actuated by said pattern wheel, and means operated by said drive gear in the shogging of said cam shaft for interrupting

the drive connection between said drive mechanism and said pattern wheel.

3. In combination with the main cam shaft, the drive gear thereof, the pattern chain drive mechanism, and the loose course motion mechanism of a full fashioned hosiery knitting machine, a pattern wheel, a pawl for operating said pattern wheel operated directly by said chain drive mechanism, a tappet operated by said drive gear in the shifting of said cam shaft for interrupting the operative connection between said pawl and said pattern wheel, and means establishing an operative connection between the pattern wheel and said loose course motion mechanism.

4. In combination with the main cam shaft, the drive gear thereof, the pattern chain drive mechanism, and the loose course motion mechanism of a full fashioned hosiery knitting machine, a pattern mechanism consisting of a pattern device, a drive element for said device operated directly by said pattern chain drive mechanism, a spring pressed tappet engaging the said drive gear to be actuated in the shogging of said main cam shaft for disconnecting said drive element from said pattern device, and a link mechanism having a member thereof operatively associated with said pattern device and having an operative connection with said loose course motion mechanism.

5. In combination with the main cam shaft, the drive gear thereof, the pattern chain drive mechanism, and the loose course motion mechanism of a full fashioned hosiery knitting machine, a pattern control mechanism consisting of a rotatably mounted pattern wheel, a ratchet wheel connected thereto, a pawl for actuating said ratchet wheel and operatively connected to said pattern chain drive mechanism, a slidably mounted tappet bearing against said drive gear and operated thereby in the shogging of said main cam shaft for disconnecting said pawl from said ratchet, a pivot bell crank lever having one limb operatively associated with said pattern wheel and a rod connecting the other limb of said lever with said loose course motion mechanism.

6. In combination with the main cam shaft, the drive gear thereof, and the loose course motion mechanism of a full fashioned knitting machine, a pattern device having operative connection with said loose course motion mechanism for actuating the same, means associated with said pattern device and normally functioning to transmit movement thereto, and means operated by said drive gear in the shogging of the main cam shaft for disassociating the movement transmitting means from the pattern device, thus interrupting its function.

7. In combination with the main cam shaft, the drive gear thereof, and the loose course motion mechanism of a full fashioned knitting machine, a pattern device, a link mechanism periodically acted upon by said pattern device and connected to the loose course motion mechanism for actuating the same, means associated with said pattern device and normally functioning to transmit movement thereto, and means operated by said drive gear in the shogging of the main cam shaft for disassociating the movement transmitting means of the pattern device, thus interrupting its function.

8. In combination with the longitudinal shiftable main cam shaft and the loose course motion mechanism of a full fashioned knitting machine:

a pattern device having operative connection with the loose course motion mechanism and actionable for operating the latter; a mechanism associated with said pattern device and normally functioning to actuate the same; means carried by the main cam shaft to shift therewith; and a displaceable member supported in the path of movement of said means to be displaced thereby when shifted with the main cam shaft from one to the other of its positions, said member being disposed to be brought into engagement, when so displaced, with said pattern device actuating mechanism to disrupt the function thereof.

9. In combination with the longitudinal shiftable main cam shaft and the loose course motion mechanism of a full fashioned knitting machine: a pattern device having operative connection with the loose course motion mechanism and actionable for operating the latter; a mechanism associated with said pattern device and normally functioning to actuate the same; an element carried by the main cam shaft to shift therewith; and a tappet supported in the path of movement of said element to be displaced thereby when shifted with the main cam shaft from one to the other of its positions, said tappet being disposed to be brought into engagement, when so displaced, with the said pattern device actuating mechanism to disrupt the function thereof.

10. In combination with the longitudinal shiftable main cam shaft and the loose course motion mechanism of a full fashioned knitting machine: a pattern device having operative connection with said loose course motion mechanism and actionable for operating the latter; a pawl associated with said pattern device and normally functioning to actuate the same; an element carried by said main cam shaft to shift therewith; and a tappet supported in the path of movement of said element to be displaced thereby when shifted with the main cam shaft from one to the other of its positions, said tappet being disposed to be brought into engagement, when so displaced, with said pawl to disrupt the function thereof.

11. In combination with the longitudinal shiftable main cam shaft and the loose course motion mechanism of a full fashioned knitting machine: a pattern device having operative connection with said loose course motion mechanism and actionable for operating the latter; a pawl associated with said pattern device and normally functioning to actuate the same; an element carried by said main cam shaft to shift therewith; and a spring pressed tappet normally urged in bearing contact with said element to be moved thereby for disrupting the function of said pawl.

12. In combination with the longitudinal shiftable main cam shaft and the loose course motion mechanism of a full fashioned knitting machine: a pattern device including a pattern cam and a ratchet wheel for rotating the same, said pattern device having operative connection with the loose course motion mechanism and actionable for operating the latter; a pawl associated with the ratchet wheel and normally functioning to actuate the same; an element carried by the main cam shaft to shift therewith; and a slidably mounted tappet bearing against said element to be displaced thereby when shifted with the main cam shaft from one to the other of its positions, said tappet being disposed to be brought into en-

gagement, when so displaced, with said pawl for disengaging the same with the ratchet, to disrupt the function thereof.

13. In a full fashioned knitting machine, in combination with the loose course motion mechanism, the pattern chain mechanism, and the pawl mechanism for operating said pattern chain mechanism: means for operating said loose course motion mechanism; a pawl connected to the pattern chain pawl mechanism to move therewith for actuating the loose course motion mechanism operating means; and means operable to disrupt the action of said pawl without affecting the action of the pattern chain pawl mechanism.

14. In a full fashioned knitting machine, in combination with the loose course motion mechanism, the pattern chain mechanism, and the pawl mechanism for operating said pattern chain mechanism: a pattern wheel for operating said loose course motion mechanism; a pawl connected to the pattern chain pawl mechanism to move therewith for actuating said pattern wheel; and means operable to disrupt the action of said pawl without affecting the action of the pattern chain pawl mechanism.

15. In a full fashioned knitting machine, a pattern chain mechanism, a loose course motion mechanism, a rocking lever, a pawl carried by said lever and acting on the pattern chain mechanism to transmit movement thereto, an extension projecting from said lever, a second pawl carried by said extension and positioned for engagement with the loose course motion mechanism for actuating the same, and means operable to disrupt the action of said second pawl without affecting the action of the first mentioned pawl.

16. In a full fashioned knitting machine, a pattern chain mechanism provided with a ratchet wheel, a loose course motion mechanism including a pattern cam and a ratchet wheel rigid therewith, a rocking lever, a pawl carried by said lever and

acting on the pattern chain ratchet wheel to transmit movement thereto and thus actuate the pattern chain mechanism, an extension projecting from said lever, and a second pawl carried by said extension and positioned for engagement with the pattern cam ratchet wheel to advance the pattern cam and thus operate the loose course motion mechanism.

17. In a full fashioned knitting machine, a pattern chain mechanism provided with a ratchet wheel, a loose course motion mechanism including a pattern cam and a ratchet wheel rigid therewith, a rocking lever, a pawl carried by said lever and acting on the pattern chain ratchet wheel to transmit movement thereto and thus actuate the pattern chain mechanism, an extension projecting from said lever, a second pawl carried by said extension and positioned for engagement with the pattern cam ratchet wheel to advance the pattern cam and thus operate the loose course motion mechanism, and means under control of the pattern chain mechanism and operable to disrupt the action of said second pawl without affecting the action of the first mentioned pawl.

18. In a full fashioned knitting machine having a pattern chain mechanism, and a ratchet device therefor, said device including a rocking lever and a pawl carried thereby for movement therewith to operate the pattern chain mechanism: a loose course motion mechanism and a control mechanism therefor comprising a pattern cam, a ratchet wheel rigid with said cam, a pawl associated with said ratchet wheel and mounted onto the rocking lever to be actuated thereby for advancing the pattern cam, and a link mechanism between the pattern cam and the loose course motion mechanism for controlling the operation of the latter.

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