May 31, 1955 C. F. MEYER 2,709,350

HEATING ARRANGEMENT FOR THE CENTER BED OF FULL-FASHIONED KNITTING MACHINES

Filed March 8, 1951 3 Sheets-Sheet 1

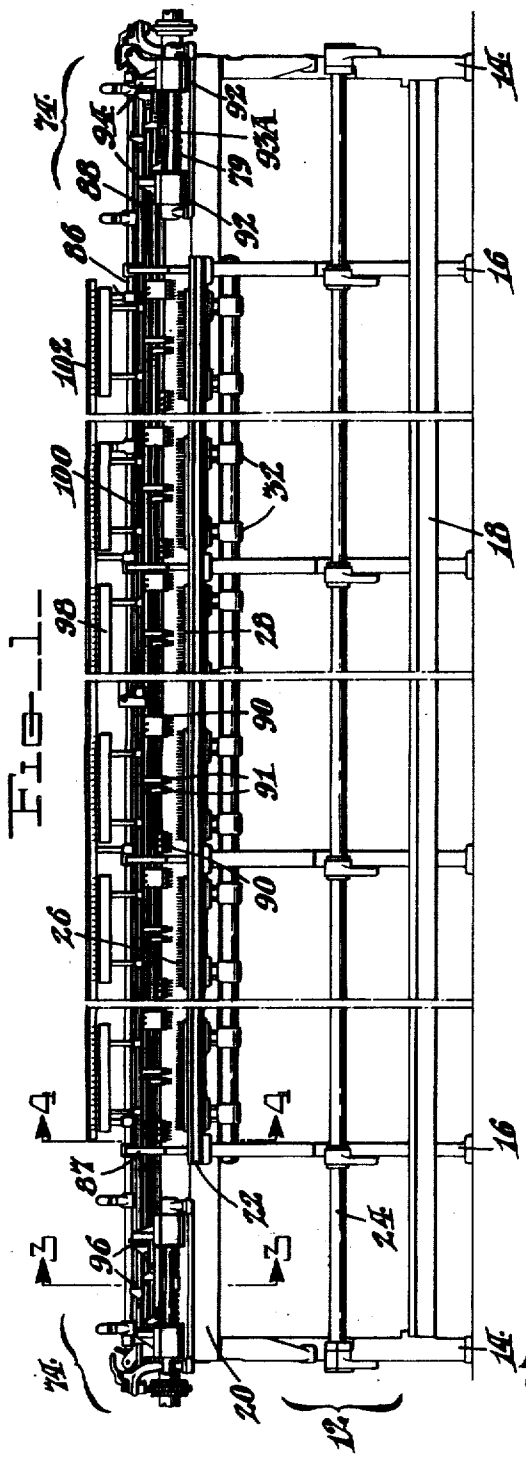


Fig. 1

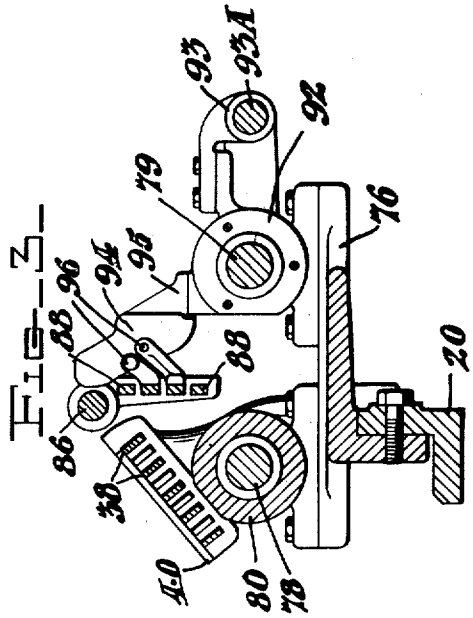


Fig. 2

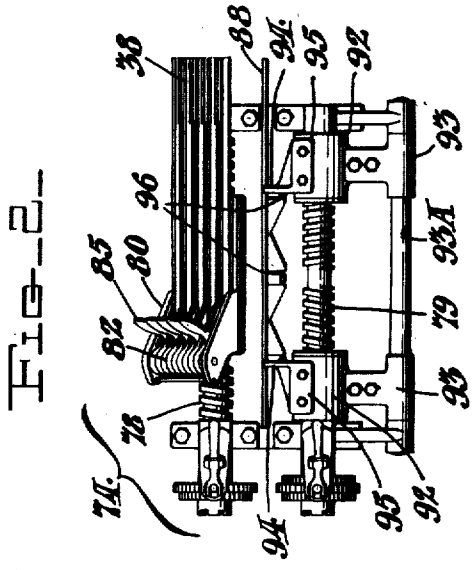


Fig. 2

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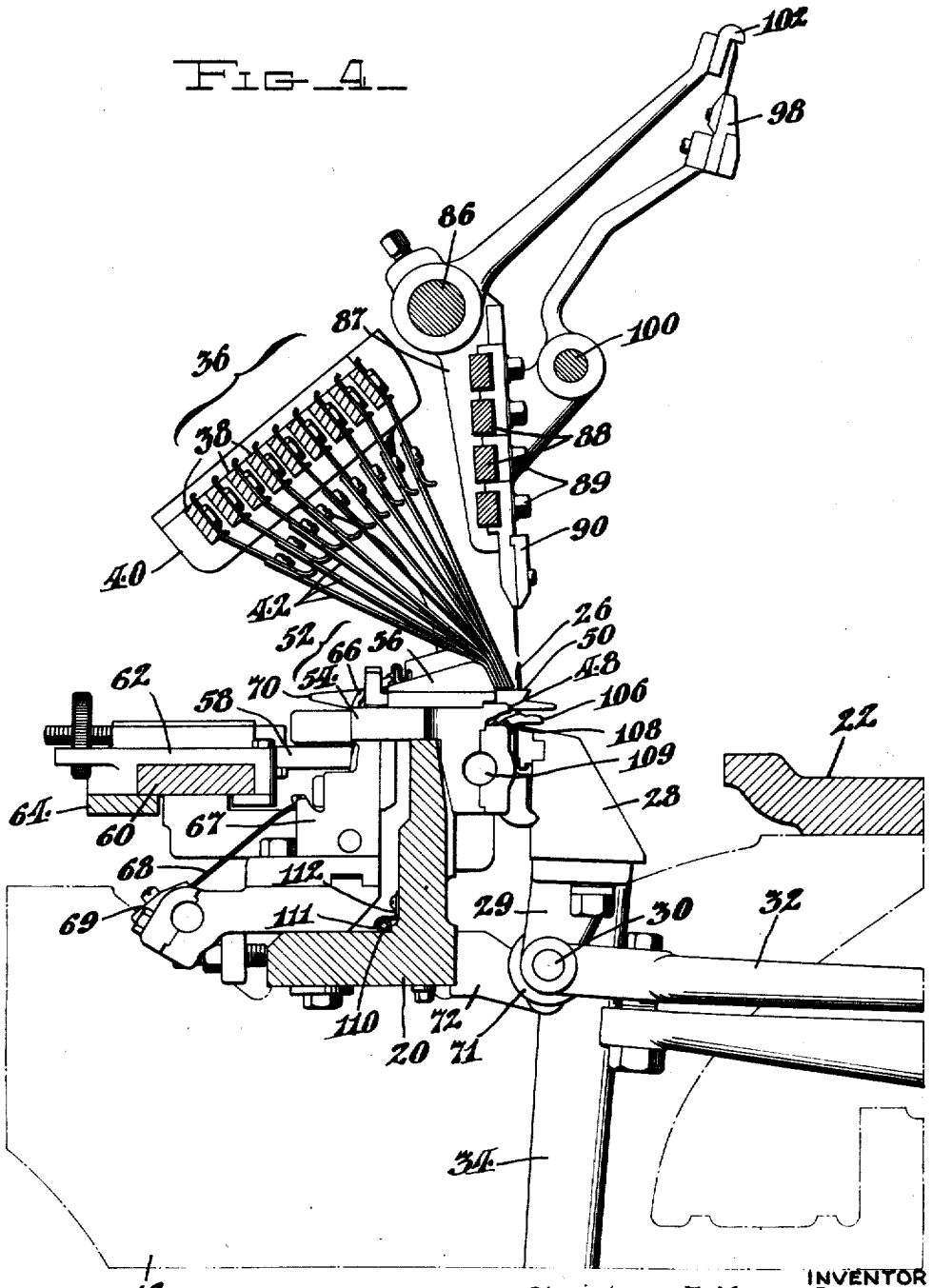
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Filed March 8, 1951 3 Sheets-Sheet 2

FIG. 4



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HEATING ARRANGEMENT FOR THE CENTER BED OF FULL-FASHIONED KNITTING MACHINES

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FIG. 5

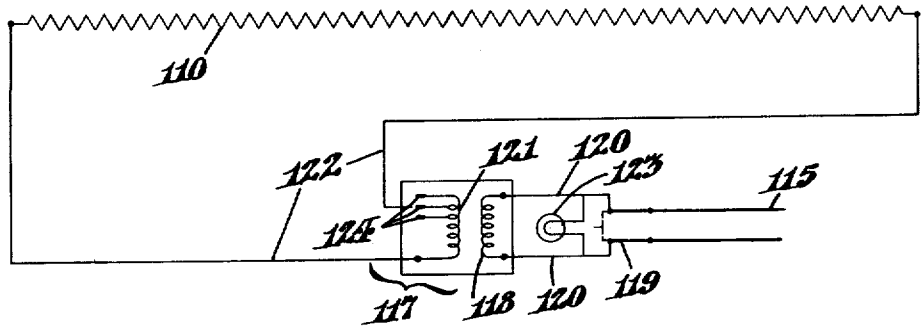
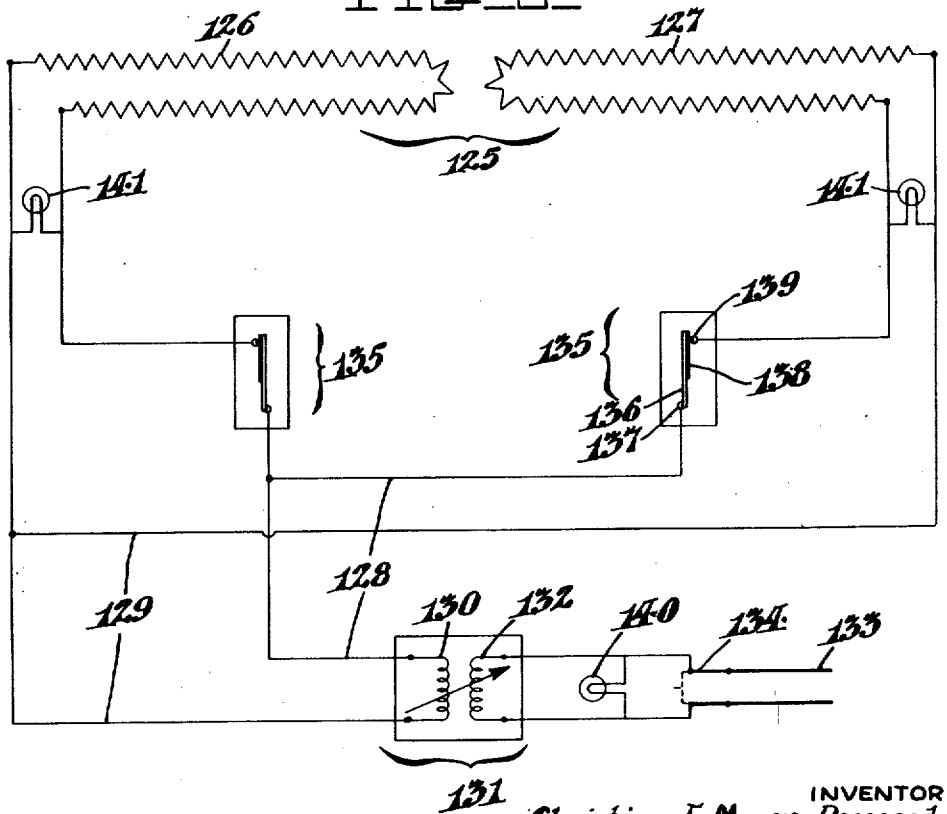


FIG. 6



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2,709,350

HEATING ARRANGEMENT FOR THE CENTER BED OF FULL-FASHIONED KNITTING MACHINES

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Application March 8, 1951, Serial No. 214,474

10 Claims. (Cl. 66—82)

The present invention relates to means for maintaining a predetermined relationship between the operating parts of a multi-section knitting machine and more particularly to maintain the relationship between the knitting elements and other parts of the machine which are affected by thermally induced movements of one or the other of the parts.

During the operation of multi-section full-fashioned knitting machines, the temperature of some of the cooperating parts increases over atmospheric temperature due to friction between such cooperating parts. This effect is important in that the parts directly affected by the increased temperature are caused to expand relative to other parts not affected by the temperature change, thereby changing the setting of the cooperating parts.

In machines having as many as thirty knitting sections, parts extending the full length of the machine, such as the center bed, will change approximately four thousandths of an inch (.004") in length for each degree of change in machine operating temperature over atmospheric or room temperature. Therefore, only a few degrees change in temperature will adversely affect the setting of the cooperating parts, particularly in the finer gauge machines.

Heretofore, attempts have been made to mechanically correct or compensate for expansion in the machine which adversely affects the relationship between the needles and sinkers and dividers but these attempts have not solved the problem. For example, in a patent to Zwicky, No. 2,366,227, of January 2, 1945, the needles are connected to the center bed of the machine in predetermined relation to the sinker-head, which is carried on the center bed, so that in any thermally induced movement of the center bed, the relationship between the needles and sinker-head will remain the same. However, other elements cooperating with the needles, such as narrowing and lace points, and the yarn carriers cooperating with the sinkers and dividers, cannot be connected to the center bed. Therefore, thermally induced movement of the center bed will directly affect the relationship between the needles and sinker-head on one hand and the narrowing and lace points and the yarn carriers on the other.

It is an object of the present invention to provide an apparatus for ensuring a substantially exact register between cooperating elements or instrumentalities throughout the length of the machine during operation of the machine.

A further object of the invention is to provide an apparatus for raising the critical frame member or members of a multi-section full-fashioned knitting machine to full operating temperature prior to operating the machine to knit fabric.

A still further object of the invention is to provide an apparatus for raising the critical frame member or members of a multi-section full-fashioned knitting machine to full operating temperature before starting the machine and for maintaining such temperature irrespective of interruptions in the operation of the machine.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiment of the invention shown in the accompanying drawings, the invention resides in the novel elements, features of construction and arrangement of parts in cooperative relationship as are hereinafter more particularly pointed out in the claims.

In the drawings:

Figure 1 is a front elevation of a full-fashioned knitting machine which has been equipped according to the present invention;

Fig. 2 is a plan view of a portion of the left end of the machine shown in Fig. 1;

Fig. 3 is a detail sectional view, on an enlarged scale, taken substantially on the line 3—3 of Fig. 1 and looking in the direction of the arrows;

Fig. 4 is a vertical sectional view, on an enlarged scale, of the upper part of the machine taken substantially on the line 4—4 of Fig. 1 looking in the direction of the arrows;

Fig. 5 is a wiring diagram illustrating one form of heating means which may be used in carrying out the present invention; and

Fig. 6 is a wiring diagram illustrating a second form of heating means which may be used in carrying out the invention.

In the drawings and description, only the means necessary to a complete understanding of the invention are specifically set forth; further information as to the construction and operation of other related, usual and well known knitting machine elements, mechanisms, etc., may be found in one or more of the following publications:

1. Pamphlet entitled Full-Fashioned Knitting Machines, published and copyrighted by the Textile Machine Works, Reading, Pennsylvania, in 1920.

2. Four catalogs entitled The "Reading" Full-Fashioned Knitting Machine Parts Catalog, published and copyrighted by the Textile Machine Works, in 1929, 1935, 1940 and 1947, respectively.

3. Booklet entitled The "Reading" High Production Full-Fashioned Knitting Machine, which, forming a supplement to the above noted 1940 Parts Catalog of the Textile Machine Works, is a publication of the Textile Machine Works, copyrighted by the latter in 1940.

4. Pamphlet entitled Knitting Machine Lectures, published by the Wyomissing Polytechnic Institute, Wyomissing, Pennsylvania, in 1935.

According to the present invention, the groups of elements or instrumentalities which cooperate in carrying out the functions of the knitting machine are initially adjusted to register when the machine is at operating temperature. This is accomplished by running the machine without yarn for several hours and then making the necessary adjustments. Thereafter, before beginning each production run of the machine or after each lengthy machine stoppage the machine is heated to the previously determined operating temperature to bring the cooperating instrumentalities again into register. The heating may be cut off as soon as this operating temperature is reached and the machine run started or automatic controls may be provided to operate the heating means whenever necessary to maintain the machine at its optimum operating temperature both during operation of the machine and when it is stopped.

The means according to the invention for bringing the machine up to operating temperature before starting production runs, and for maintaining it at such temperature, comprises preferably an electric heating unit which is arranged in contact with that longitudinal frame member of the machine which is principally utilized to support elements or instrumentalities concerned with the functioning of the machine. In full-fashioned machines, certain of the instrumentalities concerned with

the fashioning function of the machine are supported on a longitudinal member, namely the center bed, which also supports other instrumentalities concerned with the loop forming function. It is therefore of primary importance that the center bed be at the proper temperature prior to starting up the machine for a production run.

Referring to Figs. 1 and 4 of the drawings more in detail, there is shown therein a knitting machine of the full-fashioned type and comprising a frame-work **12** including transverse end frames **14**, transverse center frames **16** and longitudinal members of which a front beam **18**, a center bed **20** and a front bed or table **22** are shown. On frame **12** is mounted a main cam shaft **24** which is suitably geared to a motive power means (not shown). Shaft **24** carries the usual cams which are not shown herein as their operations effect the present invention only indirectly. Operated by suitable connections to cam followers arranged to cooperate with the cams on shaft **24** are various sets or groups of elements or instrumentalities, each set cooperating with one or more others in performing knitting, fashioning and lace formation in a usual manner.

In a full-fashioned knitting machine, generally vertical spring beard knitting needles **26** are mounted in alinement longitudinally of the machine in needle bars **28** (Fig. 1), there being one needle bar for each knitting section of the machine of which there are thirty or more in modern machines. Needle bars **28** are mounted on brackets **29** pivoted on pins **30** carried in horizontal arms **32**, two for each needle bar which operate to give the needles the vertical components of their motion while horizontal components of the needle motion are supplied by generally vertical arms or levers **34** one for each needle bar. Oscillating movements are imparted to levers **34** to rock the needle bars about pivots **30**. All the needle bars are in alinement so that the entire number of bars **28** may be taken together as forming a group or set of knitting elements or instrumentalities.

Cooperating with the needles **26** are yarn laying means **36** comprising a series of yarn carrier rods **38** slidably mounted in slots or grooves in brackets **40** fixed to center bed **20** in the usual manner. Yarn carrier rods **38** are reciprocated in slots in brackets **40** by means of friction boxes which are driven by a friction rod connected to and driven by a coulier mechanism of any known or convenient design (not shown). On each of rods **38** is fixed a yarn carrier **42** at the lower end of which is mounted a usual yarn delivery tube. As a preliminary to reciprocating a rod **38**, yarn for knitting is threaded from a yarn cone or other suitable source down through the yarn tube and the free end of the yarn fastened to a fixed point on frame **12**. As the rod **38** then moves back and forth, yarn is drawn from the yarn source under the influence of suitable moistening, tensioning and intermittently acting clamping means and fed along the needles **26** on the beard side thereof, that is, between the needles and a presser edge **48**. As the yarn is drawn from the tube it is kinked around the needles by sinkers **50**. The sinkers for each section are shown mounted, as usual in full-fashioned machines, in a sinker head **52** mounted on the center bed **20** and having a bed portion **54** and a cap **56** in which slots or tricks are provided in which the sinkers reciprocate at right angles to the vertical plane thru the needle rows.

For drawing and measuring yarn, the sinkers are thrust forward seriatim very shortly after the yarn carrier fingers have passed them, the sinkers being shown fully forward in Fig. 4. For moving the sinkers forward, slur-cams **58** are provided, the slur cams being carried on slur-cam boxes **62** which are mounted to reciprocate on a slur-cam box bar **60** carried on the center bed **20**, the slur-cam boxes for the various knitting sections being connected to a connecting bar **64** forming part of and reciprocated by the usual coulier means. The slur-cams act against jacks **66** which are mounted in beds **67**, also

carried on the center bed, in position to transmit impulses to the sinkers. Jack springs **68** are provided in beds **69** which are supported on the center bed, the jack springs being adapted to hold the jacks and sinkers yieldingly in the positions assumed when the sinkers are substantially fully advanced and fully retracted in the sinker head. Alternating with the sinkers **50** in the sinker head **52** are the usual dividers **70**, the sinkers and dividers being advanced and retracted by a catch bar (not shown) in the usual manner, to complete the formation of each course of loops. With the sinker heads **52**, slur cam boxes **62** and jack beds **67** carried on the center bed **20**, any heat generated by cooperation between the parts of these units is transmitted to the center bed thereby causing it to expand lengthwise of the machine. Therefore, movement of the center bed **20** also causes the sinker heads **52** and other members carried thereon to move with the center bed.

In order to maintain the needles **26** of each needle bar **28** in registry with the sinkers **50** and dividers **70** of the associated sinker head **52**, the brackets **29** and pins **30** are provided with lost motion with respect to lever arms **32**. Pins **30** have end plate portions **71**, the plate portions of the pins for each needle bar facing each other and being engaged by screws (not shown) adjustably carried in a bracket **72** fixed to the center bed **20**. With this arrangement the needle bars will be positively moved with the center bed in any thermally induced movement. Only those parts of the means for maintaining the position of the needle bar relative to the center bed necessary to a complete understanding of the present invention, are shown herein. More complete details may be had by referring to the aforementioned Zwicky Patent No. 2,366,227.

Also mounted on center bed **20** at each end of the machine are narrowing heads **74**, as shown in Figs. 1 and 3. As shown in Fig. 3, each head **74** is carried on a flanged plate **76** having a depending flange bolted to the center bed **20**. The members and elements of which heads **74** are composed are therefore subject to the thermally induced movements in center bed **20**. The members and elements of each head **74** comprise a threaded spindle **78** and a threaded spindle **79**. Spindles **78** and **79** are operated by linkages and pawls (not shown) from cams on shaft **24**. The design and operation of such linkages being well understood they are not described or shown herein. Associated with each spindle **78** is a nut **80** (Figs. 2 and 3) on which are mounted end stops **82** against which carrier rods **38** abut at the ends of their yarn laying strokes. By turning the spindles **78**, the strokes of the carrier rods **38** are therefore varied to narrow or widen the fabric. Stops **82** are pivotally mounted on the nut **80** and certain of the stops at both ends of the machine are provided with handles **85** (Fig. 2) whereby the stops may be turned up out of the way to permit the carrier rods to be moved out of the knitting field when it is desired to place them out of action.

In point fashioning, one or more selvage loops are transferred in the proper direction from the needle or needles on which they were formed to others at the same time that the end stops are moved to vary the width of the fabric. For this purpose, a "narrowing" machine is provided comprising a front narrowing shaft **86** (Fig. 4) connected to which are brackets **87** on which are slidably mounted horizontal narrowing rods **88**. As the machine shown is assumed to be a "single unit" machine, i. e., one for making both the legs and feet of stockings, four rods **88** are shown all of which have connected thereto by bolts **89** either wide point combs **90** or narrow point combs **91** (Fig. 1). There are two wide combs for each knitting section, one for each selvage edge. The one for the left selvage is shown in Fig. 1 connected to the bottom rod **88** and the wide comb for the right selvage is shown connected to the second rod from the bottom one of the four rods. There are also two narrow combs for

each knitting section, the one for the left selvage being fastened to the rod next the bottom and the narrow comb for the right selvage being fastened to the top rod of the four. The narrow combs are placed at the centers of the knitting sections as shown in Fig. 1 when not in use. For moving said combs spindle **79** has oppositely threaded sections on which are nuts **92** which are prevented from rotating by collars or sleeves **93** mounted to slide longitudinally on fixed rod **93A** and parallel to the axis of spindle **79**. The collars **93** are fastened to the nuts **92** and therefore the nuts move along the axis of spindle **79** when the spindle is turned, the direction of movement of the nuts depending, of course, on the direction in which the spindle is turned.

For transmitting the motions of nuts **92** to combs **90** and **91**, nuts **92** have flanges **95** fixed thereon. The flanges have wing sections **94** adapted to act as dogs to push the rods **88** in the direction of their lengths. This is accomplished by the flat vertical faces of the sections which lie transverse to the axis of the spindle **79** in axial alinement with contact screws **96** which are fixed to the rods **88**. The contact screws **96** for the rods on which the wide combs **90** are fastened contact with both sides of wing sections **94** in a usual manner (not shown), so that the wide combs are moved positively with the nuts **95**. The narrow combs **91** are normally laid out in the center of each knitting section and the rods therefor are provided with one contact screw **96** for engaging only one side of the wing sections **94**, the screws being about midway between the nuts **92** (Figs. 1 and 2) when the narrow combs are not in use. When the narrow combs are to be used they are manually moved so that their screws **96** are in contact with the wing sections **94** and are moved by the wing sections and the wide combs in the usual manner to form the well known diamond toe narrowings. The rods **88** are split at approximately the center of the machine so that the narrowing combs **90** and **91** for half the knitting sections are controlled from the left head **74** and the combs for the other half of the machine from the right narrowing head. It will be seen that the rods **88**, being set some distance from the fixed portions of the frame **12**, are affected only slightly, if at all, by temperature changes in the parts or members of the framework **12** including the center bed **20**. However, as nuts **92** and wing members **94** for moving the rods **88** are mounted on the center bed **20**, thermally induced movements of the center bed will be directly transmitted to the rods **88** through the nuts thereby affecting the relationship between the combs **90** and **91** and needles **26**.

The thermally induced movement of the center bed is cumulative, that is, it gradually increases starting at the center of the machine and extending toward the ends thereof, so that the greatest movement is at the ends of the machine. The extent of movement in the full length of the center bed **20** of a thirty section machine is equal to approximately 4 thousandths of an inch for each degree of increase from room temperature to operating temperature of the machine. In practice, it has been found that the finer gauge machines may increase from 4 to 20 degrees in temperature above room temperature when operating. Therefore, a 10 degree increase in operating temperature will cause the center bed to expand or increase in length 40 thousandths of an inch or 20 thousandths of an inch at each end of the machine. Actually then, each narrowing head will move 20 thousandths of an inch away from the center of the machine which will carry the carrier rod end stops **82** and the nuts **92** for the narrowing point rods **88** outwardly the full movement of the center bed.

With the needle bars **28** expanding directly with the center bed **20** and sinker head **52** the needles will be kept in correct registry with the sinker head, and the end needle bar will receive the greatest movement and the movement of each needle bar toward the center of the machine will be proportionately less. However, the carrier rod stops and the stops for the narrowing point rods will move the full extent, which will maintain the end needle bar and sinker head in substantially correct registry with the yarn carriers **42** and narrowing point combs **90** and **91**. On the other hand, each sinker head and needle bar toward the center of the machine being moved proportionately less, the misregistry between the needles and points and the yarn carrier and the sinker head becomes proportionately greater until at the knitting section adjacent the center of the machine, the parts will be substantially the full 20 thousandths of an inch out of registry.

Also, mounted on the brackets **87** on the front narrowing shaft **86** are picot or lace point bars **98** of which there is one for each knitting section, the bars being pivotally mounted on a rod **100** (Figs. 1 and 4) carried in forwardly projecting portions of brackets **87**. When out of use, bars **98** are turned up and fastened in a position in which the points are covered by a rail **102** shown as supported directly on the front narrowing shaft **86**. When the point bars **98** are to be used to transfer loops for making picot or lace courses, they are swung down so that they may engage the knitting needles to pick loops therefrom and then transfer the loops to adjacent needles. At such times as point bars **98** are in use, fashioning points in combs **90** and **91** are in inactive position as shown in Fig. 1, the relation and operation of the point bars and combs being fully shown and described in a patent to Held, No. 2,242,070, issued May 13, 1941. The rod **100** for bars **98** may be shifted for lace forming operations either from the center or an end of the machine by any of the well known lace point shifting devices shown in the aforementioned "Reading" parts catalogs. It will be seen that the picot bars **98** are far removed from the center bed so that little, if any, of the heat generated in the center bed will be transmitted to the rod **100**. Therefore, expansion of the center bed will affect the initial registry between the needles and points of the bars **98**. As hereinbefore set forth, the end knitting section receives the greatest movement and each section toward the center of the machine proportionately less. Where the rod **100** is controlled from the center of the machine, the misalignment of the needles **26** and lace points is the greatest at the end sections and proportionately less toward the center of the machine. Where the rod **100** is controlled from the end of the machine by mechanism carried on the center bed **20** the greatest misalignment of the lace point and needle will occur at the center of the machine.

Other elements which cooperate with the needles in knitting fabric are knockover bits **106** which are shown in Fig. 4 as mounted in beds **108** which are pivotally mounted on the sinker beds **54** of the sinker heads **52** on an axis indicated at **109**. The knockover bits **106** are arranged in the same vertical planes intermediate the needles as the sinkers and dividers, there being as many such bits as there are sinkers and dividers combined. The knockover bits being supported from the sinker beds are therefore moved equally with this bed as the center bed moves in response to changes in its temperature. This being so any adjustment bringing the sinkers and needles into exact register will also do the same for the knockovers and these elements therefore need no individual attention so far as keeping them in proper registry is concerned.

An arrangement according to the invention and shown in the drawings whereby the cooperating elements and instrumentalities, initially adjusted when the machine is at operating temperature, may again be brought to a condition of accurate register at the start of a production run comprises a heating element **110** placed in contact with the center bed **20** and extending substantially the length of the center bed. As previously pointed out the elements are principally mounted on the center bed and therefore it is subject to heat generated by the several

phases of the knitting operation. For the purposes of the invention, it is usually desirable that the heating element generate heat substantially uniformly along its length and to this end it has been found most convenient that it operate by electricity, although the invention is not necessarily so limited and other types of heating devices may be used. As shown, element **110** is a resistor in the form of a cable comprising a conducting core having a protective sheath **111** insulated from the core and is held against the surface of center bed **20** by suitable means such as clips **112**, as shown in Fig. 4. The conducting core is preferably of uniform resistance throughout its length, so that it will supply heat uniformly lengthwise of the bed plate.

Cable **110** is connected to an electrical power circuit **115**, and is impressed with the voltage required to produce the desired heating effect by a transformer **117**, the primary **118** of which is connected to circuit **115** by a switch **119** and leads **120** and the secondary **121** of which is connected to the ends of cable **110** by leads **122**. A pilot light **123** is connected to the leads **120** between the switch **119** and transformer **117** to indicate that switch **119** is closed and the heating element in operation. The secondary **121** of the transformer has a plurality of taps **124** to vary the voltage passing through the coil **111** and to the cable **110** and thereby vary the heat transmitted to the center bed **20**.

In preparing for the operation of a knitting machine equipped as in Fig. 5, one of the leads **122** is connected to the one of taps **124** adapted to supply electrical current at a voltage to heat the machine, and especially its center bed, at a convenient rate. The switch **119** having been left open at the end of a machine run, is closed sufficiently in advance of machine operation to bring the machine up to approximately full operating temperature by the time the next production run is to be begun. When the machine is started the switch **119** may be opened, the heat generated during the knitting operation then holding the machine at full operating temperature and thereby maintaining a critical frame member such as the center bed at its expanded length to keep the elements or instrumentalities in register.

In most cases, as for instance as shown in Fig. 5, the heating element **110** comprises a single section of cable but other arrangements may be employed. For example, in Fig. 6 there is shown an arrangement **125** which comprises two heating elements or resistors **126** and **127**, each intended to extend half the distance along the portion of the center bed **20** occupied by the knitting sections instead of the entire distance, as in the arrangement of Fig. 5. Elements **126** and **127** are connected in parallel across leads **128** and **129** which are connected to the opposite poles of the secondary **130** of a variable transformer **131** the primary **132** of which is connected to a power circuit **133** containing a switch **134**. Each branch of lead **128** connected to an end of element **126** or **127** contains a thermostat **135** which is in contact with the center bed **20** or similar longitudinal member subject to expansion due to thermal changes in use. The thermostats are adjusted so that when the center bed **20** reaches the operating temperature of the machine and the elements are in exact register, one or the other or both of thermostats **135** will operate to open its circuit. When the temperature drops below the machine operating temperature, thermostats **135** will again close the circuits to bring the parts up to operating temperature. The switch **134** therefore may remain closed at all times. The thermostats **135** are shown as being of the bi-metallic type arranged to act as a make and break switch and comprising a metallic strip element **136** permanently in contact with a binding post **137** which is permanently connected to lead **128**, and a second metallic strip element **138** fixed to element **136**. The strip element **138** has a higher coefficient of thermal expansion than element **136** and, when the temperature of the bi-metallic strip drops below a certain point the differential contraction characteristics of the two strip elements causes the bi-metallic strip to bend and contact post **139** to thereby close the circuit. When the temperature of the machine reaches operating temperature, the differential expansion characteristics of the strip elements cause the bi-metallic strip to again straighten out and hence break contact with the post **139** and open the circuit.

With the arrangement of Fig. 6, after closing the switch **134**, the circuits through the thermostats **135** and heating elements **126** and **127** will maintain the center bed at a predetermined temperature irrespective of the number and length of machine stoppages. Therefore, the machine is always in condition for operation and the parts are always in register. The arrangement shown in Fig. 6 has the further advantage that the heating elements **126** and **127** may operate independently of each other where either half of the machine requires more time to bring it up to operating temperature. In order to indicate when the circuit through the switch **134** is closed a light **140** is connected in the circuit between the switch and the transformer **131**. Lights **141** are also connected across the leads **128** and **129** between each element **126** and **127** and its controlling thermostat **135** to indicate when the elements are in operation.

The apparatus of the present invention and its advantages will be readily understood by those skilled in the art from the foregoing description but for purposes of convenience, they will be briefly summarized as follows:

The apparatus according to the present invention functions to bring into registry the parts which cooperate in carrying out the functions of knitting, fashioning and/or making lace openings by rapidly bringing the machine temperature to that encountered in a continuous production run. The apparatus comprises a heating element, preferably but not necessarily of an electrical character, in contact with the framework of the machine and especially in contact with a portion of the framework of the machine such as the center bed which is subject to expansion due to an increase in temperature when the machine is in use and which supports at least one group of elements or instrumentalities which cooperates with another group not supported thereby to carry out functions of the machine.

Of course, the improvements specifically shown and described by which the referred to results are obtained, can be changed and modified in various ways without departing from the invention herein disclosed and hereinafter claimed.

What is claimed is:

1. The combination in a multi-section full-fashioned knitting machine of a longitudinally extending center bed member, a plurality of instrumentalities supported thereon, other instrumentalities for cooperation with said first mentioned instrumentalities and arranged in accurately adjusted position relative thereto when said member is at full operating temperature but relatively out of adjustment when said member is at lower temperatures, and heating means associated with the member adapted when operated to bring said member to said full operating temperature.

2. In a multi-section full-fashioned knitting machine having a longitudinal center bed member extending over substantially the length of the sections of the machine and knitting elements supported by said member in accurately spaced relationship at machine operating temperature with each other and with cooperating elements supported by other machine members, the combination with said members and elements of means associated with said center bed member for bringing it to machine operating temperature before starting the operation of the machine.

3. In a multi-section full-fashioned knitting machine having a center bed structure extending over substantially the length of the sections of the machine and knitting elements supported by said structure in accurately spaced

relationship with each other and with cooperating elements supported by other machine members, the combination with said structure, elements and members of a heating unit associated with said center bed structure for raising the temperature thereof to within predetermined limits whereby the heat generated in operation of the machine may maintain it within said limits to avoid substantial effects of thermal expansion and contraction.

4. In a multi-section full-fashioned knitting machine having a center bed structure extending over the length of the sections of the machine and knitting elements supported by said structure in accurately spaced relationship with each other and with cooperating elements supported by another machine member, the combination with said structure, elements and member of an electrical heating unit extending in contact with said structure over substantially its entire length and adapted to generate heat uniformly along its length in contact with said structure.

5. In a multi-section full-fashioned knitting machine, the combination of a center bed structure extending the length of the machine, a series of elements connected to said center bed, a second series of elements, means for supporting said second series of elements in accurately adjusted relationship with said first series of elements, and temperature increasing means associated with said center bed and adapted and arranged when operated to initially heat said center bed to a predetermined range.

6. In a multi-section full-fashioned knitting machine, the combination of a center bed structure extending over substantially the full length of the machine, a series of elements connected to said center bed, a second series of elements which cooperate in a given relationship with said first series of elements, a support for said second series of elements, and temperature control means associated with said center bed for heating the center bed to within a given temperature range prior to operation of the machine.

7. In a multi-section full-fashioned knitting machine, the combination with a longitudinally extending center bed member, a group of instrumentalities supported thereon, a second group of instrumentalities arranged in accurately adjusted position relative to said first group when said member is at full operating temperature, such relative adjustment of the instrumentalities being adversely affected by the displacement of the member induced by variations in its temperature, an electric type heating unit extending substantially the entire length of said member and a thermostatically operated switch in the circuit of said heating unit to control the operation of said unit and cause it to maintain said member at a substantially constant temperature.

8. In a multi-section full-fashioned knitting machine, the combination of a center bed subject to thermal changes during the operation of the machine, elements connected to said center bed, other elements arranged in accurately spaced relationship and cooperating with said first elements, a machine member on which said other elements are supported and which is relatively free of thermal changes in use, a heating unit associated with said center bed, and a thermostat on said center bed controlling the operation of said heating unit to keep the center bed at substantially a given temperature and thereby isolate it and the elements thereon against thermal expansion and contraction.

9. For use in a multi-section full-fashioned knitting machine having a longitudinal center bed member extending over substantially the length of the knitting sections of the machine, and elements supported by said member in accurately spaced relationship with each other and with cooperating elements supported by other machine members, when said machine is at operating temperature, an elongated heating element for mounting on said center bed member to extend therealong for a plurality of said knitting sections, and means for securing said heating element in such position on said member whereby said member may be heated to machine operating temperature before starting the machine.

10. For use in a multi-section full-fashioned knitting machine having a longitudinal center bed member extending over substantially the length of the knitting sections of the machine, and elements supported by said member in accurately spaced relationship with each other and with cooperating elements supported by other machine members, when said machine is at operating temperature, an elongated heating element for mounting on said center bed member to extend therealong for a plurality of said knitting sections, means for securing said heating element to said center bed member and means for controlling the operation of said heating element whereby said center bed member may be heated to machine operating temperature before starting the machine.

References Cited in the file of this patent

UNITED STATES PATENTS

2,372,019	Saftlas	Mar. 20, 1945
2,618,138	Peel et al.	Nov. 18, 1952

FOREIGN PATENTS

160,730	Switzerland	June 1, 1933