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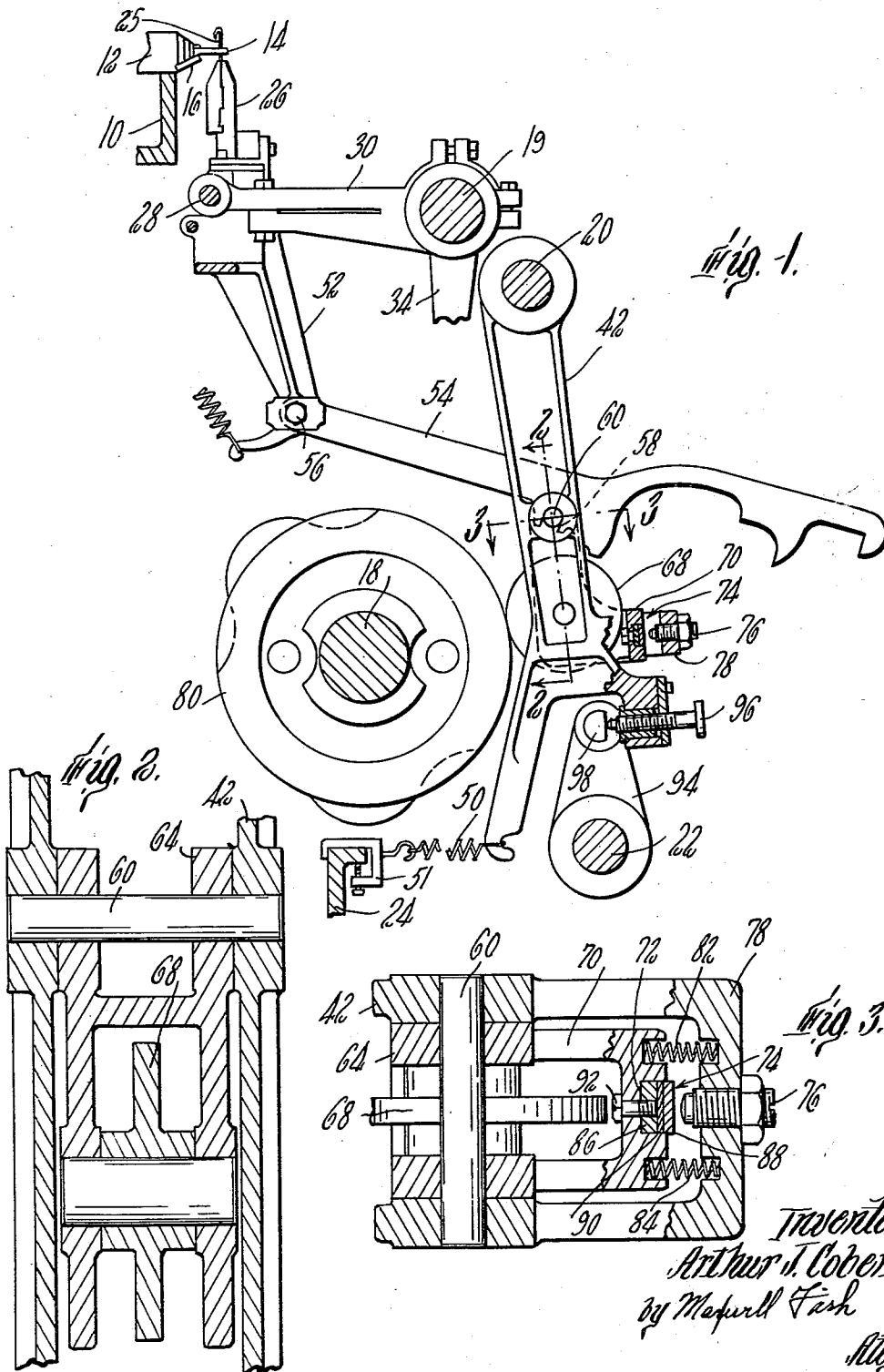
A. J. COBERT

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NEEDLE PRESS MOTION FOR STRAIGHT KNITTING MACHINES

Filed Sept. 19, 1960

2 Sheets-Sheet 1



Inventor
Arthur J. Cobert
by Maxwell Fash
Att'y.

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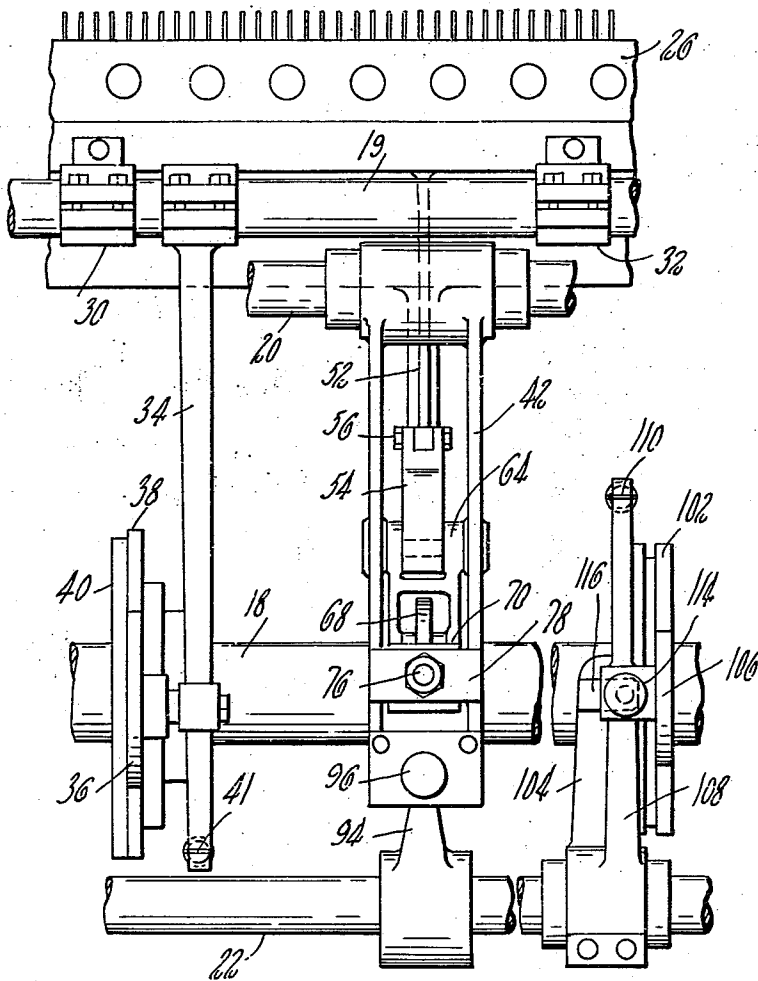


Fig. 4.

Inventor
Arthur J. Cobert
by Maxwell Fisk
Atty.

1

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NEEDLE PRESS MOTION FOR STRAIGHT KNITTING MACHINES

Arthur J. Cobert, Gentbrugge, Gand, Belgium, assignor, by direct and mesne assignments, to La Fabrique Nationale d'Arms de Guerre, Herstal-les-Liege, Belgium, a corporation of Belgium

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7 Claims. (Cl. 66—82)

The present invention relates to a needle press motion mechanism for straight knitting machines and more particularly to a needle press motion of this description which is well adapted for use in a multiple section flat full fashioned knitting machine.

It is a principal object of the invention to provide a novel and improved needle press motion for a straight knitting machine which is well adapted for a smooth and accurate operation at very high speeds and with a minimum of noise and vibration in the parts.

It is more specifically an object of the invention to provide an improved construction and arrangement of the needle press lever including a pivoted extension thereof hereinafter referred to as the press cam lever having a cam follower roller which is held at all times in engagement with an associated needle press cam. The construction referred to provides for the independent support of the press lever by the regulator mechanism during the yarn laying operation, and thereafter the establishment of a solid operating connection between the press lever and the press cam actuated press cam lever substantially without shock or jar to the needle press assembly.

It is a further object of the invention to provide an improved construction and arrangement of the needle press mechanism adapted for use in a multiple section straight knitting machine which will insure an accurate control of the needle movement toward and away from the press in each of the individual knitting sections, and which is well adapted for individual regulation and adjustment of the forward and back positions of the needles with relation to the press at every stage of the knitting cycle upon each of the knitting sections along the length of the machine.

A feature of the invention consists in the provision of an improved needle press lever assembly which comprises for each knitting section a needle press motion unit providing in combination with a depending needle press lever, a horizontally disposed needle bar layout lever which connects the needle bar with the press lever, and a stitch regulator device arranged to limit inward movement of said press lever toward the cam shaft, of a press cam lever which is pivotally supported from the press lever and forms an extension of the press lever, a cam follower roller carried by said cam follower lever, opposed stop surfaces on the press lever and cam follower lever by means of which a solid operating connection is provided for moving the press lever outwardly with the cam follower lever under the influence of the press cam, and means biasing the cam follower lever at all times against the associated press cam of the machine.

A further feature of the invention consists in the provision of long wearing resilient striking and anvil stop surfaces between the press cam lever and press lever including a shock absorber device which will reduce to a minimum the noise and shock between the press lever and the associated, but independently moving, press cam lever.

The several features of the invention above described and as may hereinafter appear will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings in which:

2

FIG. 1 is a sectional view in left side elevation illustrating particularly the needle vertical and press motions of the machine, and including a stitch-regulating device adapted for effecting a regulation of the stitch formed by the individual knitting section;

FIG. 2 is a sectional view taken on a line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken on a line 3—3 of FIG. 1; and

FIG. 4 is a view in front elevation illustrating substantially the parts in FIG. 1 and in addition thereto a conventional form of regulator device controlling the angular position of the regulator shaft of the machine.

The invention is disclosed in the drawings as embodied in a flat full fashioned knitting machine only so much of the machine being illustrated, however, as believed necessary to illustrate the connection of the invention therewith. Elements of the machine illustrated include a longitudinally extending sinker rail 10 on which is mounted the usual sinker bed 12 providing support for individually movable sinkers 14 and a press edge 16 for the individual knitting section. Other elements of the machine include a machine cam shaft 18, a needle bar vertical motion support shaft 19, a needle bar press shaft 20, and a stitch-regulating shaft 22 extending along the length of the machine. One of lengthwise extending bottom rails which forms a part of the machine frame is indicated at 24.

In the drawings a single knitting section is shown which is duplicated in each of the 32 or more sections comprising the entire machine. Needles 25 are rigidly secured to a needle bar 26 which is mounted to turn on pivots 28 on the rearward end of two short horizontal needle support levers 30, 32 rigidly clamped to the needle bar support shaft 19. Rocking movements are imparted to the shaft 19 by means of one or more downwardly extending needle vertical motion cam levers such as that indicated at 34 having at its lower end a cam follower roller 36 arranged for engagement with the usual knitting and narrowing cams 38 and 40 on the cam shaft 18. A tension spring 41 attached to the lower end of lever 34 acts to bias the roller 36 against the cam 38 or 40.

In the illustrated construction a single needle bar 26, is shown having imparted thereto the usual forward and back movement with relation to the press edge 16 by means of a press lever assembly including a downwardly extending press lever 42 which is loosely supported to turn on the presser shaft 20 and is biased in a clockwise direction by means of a tension spring 50 connected at one end to the lower end of the press lever 42 and at its other end by means of a clamp 51 to the rail 24. The press lever 42 is in the form of a double lever consisting of two parallel arms or side walls connected together at intervals to form a rigid whole. The needle bar 26 is connected to swing in a forward and back direction with the needle press lever 42 by means of connections comprising a downwardly extending arm 52 secured to the under side of the needle bar and a horizontal needle layout lever 54 pivotally supported at 56 to the lower end of the arm 52 and having formed therein, a vertically disposed slot 58 arranged to engage a pin 60 extending between the two side walls of the press lever 42.

The press lever 42 is provided with a downwardly extending extension pivotally connected thereto in the form of a press cam lever 64 which is similarly constructed with two separated side walls, but narrower in cross section to swing between the side walls of the press lever 42. The press cam lever 64 is pivotally supported at its upper end on the pivot pin 59. A transverse pivot pin mounted in the lower portion of press cam lever 64 serves as a bearing for a press cam follower roller 68. The press cam lever 64 is formed at its lower end with a laterally

projecting U-shaped part 70 which has formed therein a socket 72 to receive the elements of a shock absorbing stop 74. Said stop 74 is engaged by stop pin 76 screw threaded for adjustment into a U-shaped lateral extension 78 of the press lever 42. The press cam lever 64 is biased with relation to the press lever 42 to maintain the cam follower roller 68 in continuous contact with the associated needle press cam 80 on cam shaft 18 by means of two small compression springs 82, 84, each seated at its two ends in recesses formed respectively in the part 70 of the press cam lever 64 and in the lateral extension 78 of the press lever 42.

The shock absorbing stop 74 is composed of three elements, a disc 86 of soft metal which may, for example, be soft steel, an outside disc 88 of hardened and ground steel, and an intermediate disc 90 of a resilient material, for example, rubber which may be about 1/16" in thickness. The stop 74 comprising said three discs is supported in the socket 72 in the part 70 of cam lever extension 64 by means of a screw 92. The tip of the cooperating adjusting screw 76 is hardened to provide a long wearing surface for engagement with the shock absorbing stop 74.

The stitch regulating mechanism of the machine comprises the regulator shaft 22 which extends along the length of the machine and has secured thereto at each knitting section an upwardly extending regulator arm 94 arranged to engage behind and support the associated needle press lever 42 outwardly in the position shown in FIG. 1 during the loop measuring operation of the sinkers 14.

A fine adjustment of the stitch length regulation effected by the positioning movement of the regulating shaft 22 and regulating arm 94 is effected by means of a vernier screw 96 threaded through the lower end of the needle press lever 42 and adapted to engage against a pin 98 mounted on the regulating arm 94. It will be understood that identical fine stitch adjustment devices such as that described including the regulating arm 94, and vernier screw 96 are provided for controlling the forward and back position of the needle press lever at each knitting section along the length of the machine.

The angular position of the regulating shaft 22 is controlled during each yarn laying and sinker loop measuring portion of the knitting cycle in order to effect a simultaneous adjustment for loop length on each of the knitting sections by means of a loop regulating mechanism which may be of ordinary description.

Inasmuch as the loop regulating mechanisms by means of which the angular position of the regulating shaft 22 is controlled is well known in the art, this mechanism is shown only in a somewhat diagrammatic form in the drawings comprising a cam 102 on the main cam shaft 18 of the machine, and a loop regulating follower lever 104 which is loosely supported to turn on the regulating shaft 22 and its upper end carries a follower roll 106 for engagement with cam 102. A second stitch regulating lever 108 is rigidly secured to the regulating shaft 22 adjacent the cam lever 104 and is biased in a rearward or counterclockwise direction as viewed from the left side of FIG. 4 by means of a tension spring 110. The angular position of the lever 108 and regulating shaft 22 is determined by the engagement of a vernier screw 114 threaded to the lever 108 for engagement with an abutment 116 on the cam follower 104.

The needle press assembly above described operates in the following manner: During the thread-laying portion of the knitting cycle, the regulator lever arm 94 holds the press lever 42 at a predetermined position, so that the needles are held for a given size loop. There is at this time a gap between the stop disc 88 on the cam follower lever 64 and the stop screw 76 on the forward extension 78 of the press lever 42. The main spring 50 holds the press lever 42 in said regulated position, de-

termined by the engagement of the vernier screw 96 with the pin 98 on the regulating arm 94.

At the end of the thread-laying portion of the cycle, the press cam follower roller 68 engages a rise portion of its cam 80, thus moving the pivoted extension of press lever 42 which is press cam lever 64 to the right from the position shown in FIG. 1, and closing the gap between the stop disc 88 and adjustable stop screw 76, so that a solid operating connection is established between press lever 42 and the press cam lever 64. During continued rotation of the machine, the press lever 42 and press cam lever 64 move further to the right so that the regulating mechanism, including the regulator arm 94, become inoperative.

At the end of the stitch forming part of the cycle, the press cam follower 68 will ride onto the high portion of its cam 80, and the regulating arm 94 again moves to the right closing the gap between the regulating screw 96 and the stop pin 98, while at the same time, the stop screw 76 moves away from the stop surface 88. The gap thus established may be in the order of one-eighth inch which should be sufficient to allow for adequate regulation of the stitch regulating mechanism. It will be understood that the needle press motion is such that the press lever 42 will be very gently eased into engagement with the regulating arm 94 so that no special cushioning engagement is needed at this time. This is an entirely different situation from that encountered when the press cam 80 becomes operative at the stitch-regulating portion of the knitting cycle. The timing of the parts requires an extremely rapid rearward movement of the needles which takes place following the stitch-measuring portion of the cycle.

With this construction and arrangement of the needle press assembly, the shock and attendant vibration and noise which results, particularly during high speed operation of the machine, when the press cam picks up the press lever following stitch regulation, are greatly minimized. In accordance with the invention, the cam follower 68 remains at all times in contact with its cam 80, being held in this position by the operation of springs 82, 84. The stop disc 88 is well adapted to reduce the shock of contact to a minimum. The substantial lateral support afforded to the stop discs by their deep socket mountings 72 materially assists on the maintenance of the initial resiliency and original shape of the stop discs over a long period of repeated contact so that an accurate adjustment of the needle position can be maintained without necessity for frequent adjustment of the stop screw 76.

It will be understood that in its preferred form the invention contemplates the provision of individual needle press motion units comprising individual press cams, press levers, and associated press cam levers provided as pivoted press lever extensions for each knitting section of the machine. This construction has the specific advantage that an extremely accurate operation of the press mechanism is assured in which the individual stop arrangements provide for a minimum of vibration and shock and also for ease of individual adjustment at every point in the operation of the needle press motion.

The invention having been described what is claimed is:

1. In a straight knitting machine having a series of spring beard needles, a needle supporting bar, a press edge, and cooperating knitting instrumentalities, a cam shaft, a press cam on the cam shaft, and a support shaft, the combination of a needle bar support assembly on which the needle bar is moved toward and away from said press edge including, a needle press depending from said support shaft, means connecting said press lever to the needle bar for forward and back movement therewith, a press cam lever pivoted on the press lever and forming an extension of said press lever, means biasing said press cam lever about said pivot on the press lever continu-

5

ously against said press cam, and means operative upon movement of said press cam lever outwardly on said press cam to establish a solid operating connection between the press cam lever and press lever to move said press cam lever and press lever outwardly as a unit.

2. In a straight knitting machine having a series of spring beard needles, a needle supporting bar, a press edge, and cooperating knitting instrumentalities, a cam shaft, a press cam on the cam shaft, a support shaft, and a regulator shaft extending lengthwise of the needle series, the combination of a needle support assembly on which the needle bar is movable toward and away from said press edge, including a needle press lever depending from said support shaft, a needle layout lever connecting the needle bar with said press lever, a stitch regulator device comprising a regulator arm attached to the regulator shaft, and stop surfaces interposed between said regulator arm and press lever to establish a stitch regulating position of the press lever and needles actuated thereby, a press cam lever pivoted on the press lever and forming an extension of said press lever, and a press cam follower roller supported by said press cam lever, spring means biasing said press cam lever and follower about said pivot on the press lever continuously against said press cam, and opposed relatively adjustable stop surfaces on said press lever and press cam lever operative upon movement of said press cam lever outwardly under the influence of said press cam to engage said stop surfaces to move said press lever outwardly from said stitch regulating position.

3. A needle press motion for a straight knitting machine having a press edge, a series of spring beard needles, a needle bar, a cam shaft, a presser shaft extending lengthwise of the machine, and a press cam on the cam shaft, which comprises in combination, a needle press lever depending from said support shaft, means connecting said press lever to the needle bar for effecting forward and back movements of the needle bar toward and away from the press edge, a press cam lever pivoted on the press lever and forming an extension thereof, means biasing said press cam lever about said pivot on the press lever continuously against said press cam, stitch regulating means including a stop surface that positions the press lever and needle bar in the stitch regulating position, and means operative upon movement of said press cam lever outwardly upon said press cam to engage said press cam lever against said press lever for movement therewith including a shock absorbing device interposed between said press cam lever and press lever.

4. A needle press motion according to claim 3 in which the shock absorbing device between said press cam lever and press lever comprises a stop screw mounted for adjustment on one of said levers and a resilient stop member mounted in the other of said levers comprising a hardened steel top contact member, and an underlying member of a resilient material.

5. A needle press motion according to claim 3 in which the shock absorbing device between said press cam lever and press lever comprises a stop screw mounted for adjustment on one of said levers and a resilient stop member recessed in the other of said levers comprising a

6

hardened steel top contact disc, and an underlying disc of a resilient material, and a bottom disc of a hard material supporting said underlying disc.

6. In a multiple section flat full-fashioned knitting machine having a plurality of knitting sections, a cam shaft, and a support shaft each extending along the length of the several knitting sections, each said section comprising a spring needle bar, a press edge, and cooperating knitting instrumentalities, the combination of an individually adjustable needle press motion unit for each of the several knitting sections comprising for each knitting section a separate needle press cam on said cam shaft, a needle press lever depending from said support shaft, means connecting said press lever to the needle bar for forward and back movement therewith, a press cam lever pivoted on the press lever and forming an extension of said press lever, spring means biasing said press cam lever about said pivot on the press lever continuously against said press cam, and opposed relatively adjustable stop surfaces on said press lever and press cam lever providing for each knitting section an individual operating connection between said press cam lever and press lever when said levers are moved outwardly on said cam adapted for adjustment to vary the limits of forward and back movement of the needles.

7. In a multiple section flat full-fashioned knitting machine having a plurality of knitting sections, a cam shaft, a support shaft and a regulator shaft each extending along the length of the several knitting sections, each said section comprising a spring needle bar, a press edge, and cooperating knitting instrumentalities, the combination of an individually adjustable needle press motion unit for each of the several knitting sections comprising for each knitting section a separate needle press cam on said cam shaft, a needle press lever depending from said support shaft means connecting said press lever to the needle bar for forward and back movement therewith, a stitch regulator device comprising a regulator arm attached to the regulator shaft, and stop surfaces interposed between said regulator arm and press lever to establish a stitch regulator position of the press lever and needles actuated thereby, a press cam lever pivoted on the press lever and forming an extension of said press lever, spring means biasing said press cam lever about said pivot on the press lever continuously against said press cam, and opposed relatively adjustable stop surfaces on said press lever and press cam lever providing for each knitting section a solid operating connection between said press cam lever and press lever so that said levers are moved outwardly from said stitch regulating position on said cam as a unit, said adjustment of said solid connection acting to vary the limits of forward and back movement of the needles.

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