

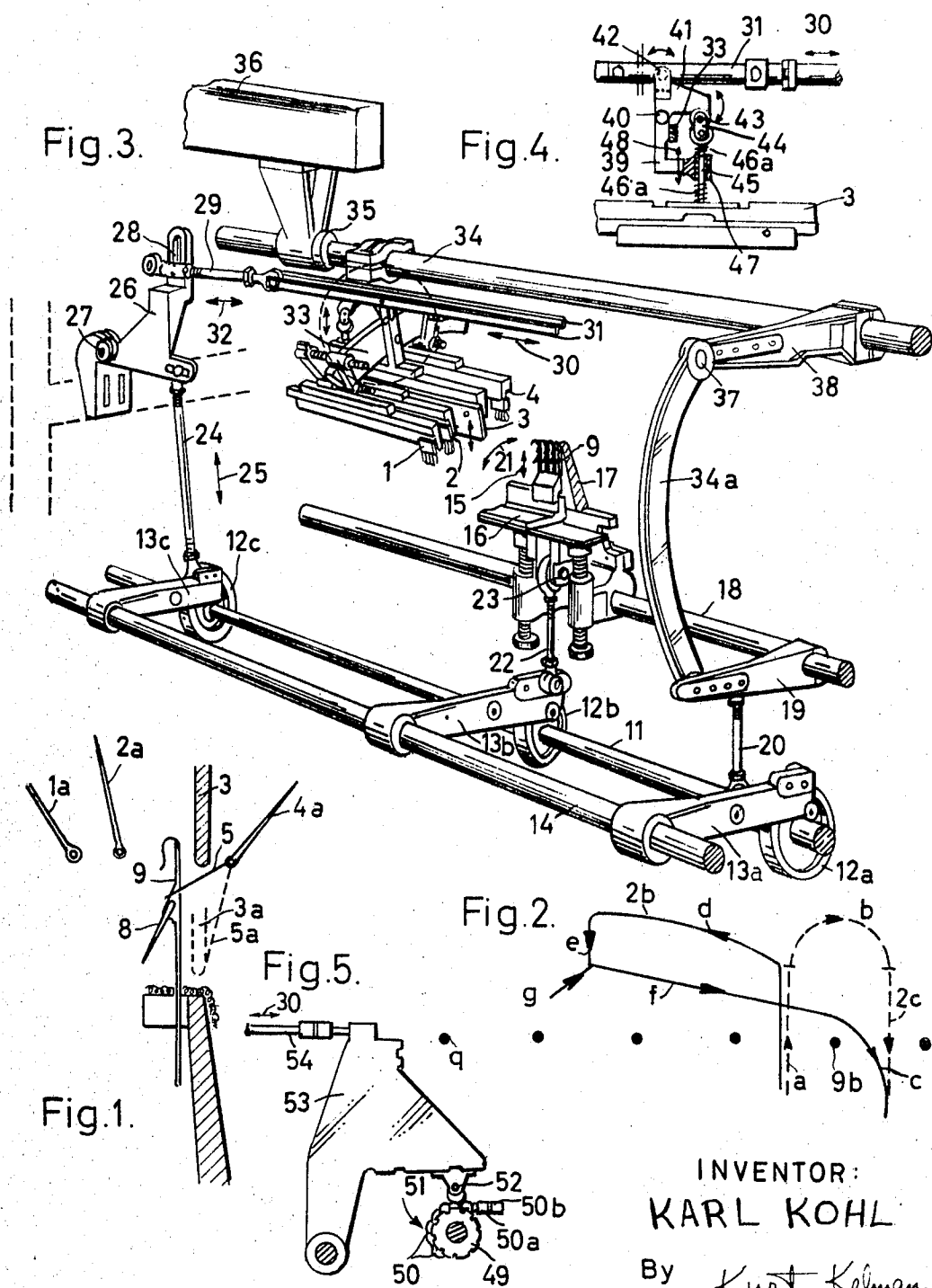
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K. KOHL

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RASCHEL KNITTING MACHINE AND METHOD OF OPERATING THE SAME

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INVENTOR:  
KARL KOHL

By *Kurt Kelman*  
AGENT

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**RASCHEL KNITTING MACHINE AND METHOD  
OF OPERATING THE SAME**Karl Kohl, Offenbacher Landstr. 20,  
Hainstadt am Main, Germany

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4 Claims

**ABSTRACT OF THE DISCLOSURE**

A raschel knitting machine having a fall plate and guide bars rearwardly and forwardly offset from the fall plate respectively, the yarn guides of the rearwardly offset guide bar being at least twice as far from the fall plate as those of the forwardly offset bar, and the former yarn guides moving longitudinally of the needle bar away from the associated needle before each overlapping movement, thereby permitting the guides of both guide bars to lap about the associated needles in the same direction.

**Background of the invention**

This invention relates to raschel knitting machines, and particularly to machines equipped with a fall plate arranged between the guide bar or guide bars which provide yarn for the ground fabric, and one or more guide bars which provide decorative yarns or the like.

Loops are laid about the needles of conventional raschel machines equipped with a fall plate in opposite directions by yarn guide respectively arranged in front of, and behind, the fall plate. This arrangement limits the range of patterns that can be produced. The drive mechanism, more specifically the cams, must be modified to permit two lapping movements while the needles are in the topmost position if it is desired to wrap both loops about the needle in the same direction. The modification cuts the output of the machine practically in half.

The primary object of the invention is a modified raschel knitting machine in which loops may be wrapped about needles by yarn guides located in front of, and behind, a fall plate either in the same direction or in opposite directions without impairing the efficiency of the knitting machine.

**Summary of the invention**

In one of its aspects, this invention mainly resides in a modification of the conventional operation of a raschel machine of the afore-described type in which the yarn guide rearwardly adjacent the fall plate moves rearwardly through the row of needles on the needle bed past the associated needle, moves thereafter longitudinally of the row away from the associated needle, and then longitudinally of the row toward the needle and past the same while still in the rear of the row of needles, and is ultimately moved forwardly through the row past the associated needle. The forward swinging movement of the yarn guide may begin before the longitudinal movement toward the needle is completed so that the yarn guide moves forwardly toward the row of needles while it moves longitudinally of the row toward the associated needle and past the same.

The apparatus for performing the method briefly outlined above includes the necessary arrangement of chain links on a pattern chain for the shogging motion of the yarn guide, as described above. Moreover, the rearwardly adjacent yarn guide is farther offset from the fall plate than the forwardly adjacent one so that the overlapping motion of the former is further delayed until the yarn

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guided by the forwardly adjacent yarn guide is safely below the needle latch.

Other features, additional objects, and many of the attendant advantages of this invention will readily be appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing.

**Brief description of the drawing**

In the drawing:

FIG. 1 shows a set of knitting implements of a raschel knitting machine of the invention in side elevation;

FIG. 2 diagrammatically illustrates the movements of a yarn guide in the machine of FIG. 1;

FIG. 3 shows the knitting machine of FIG. 1 in a fragmentary perspective view;

FIG. 4 shows a portion of the machine of FIG. 3 indicated by a circle in front elevation; and

FIG. 5 shows a portion of a pattern mechanism for the apparatus of FIG. 3 in side elevation, and partly in section.

**Description of a preferred embodiment**

Referring now to the drawing in detail, and initially to FIG. 1, there is shown a set of knitting implements of a raschel knitting machine including yarn guides 1a, 2a mounted on respective guide bars to the rear of a fall plate 3, and a yarn guide 4a mounted on a third guide bar in front of the fall plate. The yarn guides cooperate with a needle 9 having a rearwardly directed hinged latch 8. The fall plate 3 acts on a yarn 5 of the yarn guide 4a to depress the yarn 5 below the level of the latch 8, as shown at 5a, when the fall plate 3 moves toward the needle bed, not seen in FIG. 1, into the position shown in broken lines at 3a.

For the convenience of pictorial representation, the eyes of the yarn guides 1a, 2a, 4a and the fall plate 3 have been shown in FIG. 1 in widely spaced relationship, whereas they are actually closely bunched, and the spacing between the yarn guides 1a and 2a, and that between the fall plate 3 and the yarn guide 4a is not substantially greater than one thickness of a yarn guide. Contrary to conventional practice, however, the distance between the yarn guide 2a and the fall plate 3 is at least twice the spacing between the yarn guide 4a and the fall plate 3.

The fall plate 3 also has been shown in FIG. 1 in fully drawn lines in a position lower than that which it would normally occupy in the illustrated condition of the knitting elements. It is actually above the head of the needle 9 and practically outside of FIG. 1 when the yarn guides 1a, 2a, 4a and the needle 9 are in the illustrated position.

The mechanism which operates the guide bars 1, 2, 4, respectively carrying the guides 1a, 2a, 4a, the fall plate 3, and the needle 9 is shown in FIGS. 3 to 5. Referring initially to FIG. 3, there is seen the main cam shaft 11 of the knitting machine which is rotated continuously during operation of the machine. It carries eccentric cams 12a, 12b, 12c. As will presently become apparent, the cam 12a causes swinging motions of the guide bars 1, 2, 4, of the fall plate 3, and of the needle bar 16 on which the needles 9 are mounted, as shown by the arrow 21. The cam 12b causes the longitudinal reciprocating movement of the needles 9 indicated by the double arrow 15, and the cam 12c causes the fall plate 3 to move approximately vertically toward and away from the needle bed 16.

The cams 12a, 12b, 12c oscillate respective arms 13a, 13b, 13c which are pivotally mounted on a stationary shaft 14. The needle bar 16 and the associated trick plate 17 are movable in the direction of needle elongation on a shaft 18 and perform their swinging movement when the shaft 18 is turned back and forth by an arm 19 con-

nected to the arm 13a by a push rod 20. The needle bar 16 and the trick plate 17 are raised and lowered by a push rod 22 hinged to the arm 13b and connected to the needle bar 16 by a pivot 23.

A push rod 24 hingedly attached to the arm 13c moves longitudinally in the direction of the arrow 25 when the arm 13c is oscillated by the cam 12c, and thereby swings a rocker 26 attached to the stationary machine frame by a pivot 27. A slotted arm 28 of the rocker 26 is connected by a hinged link 29 to two parallel rails 31 mounted in the machine frame in a manner not shown in detail for longitudinal reciprocating movement in the direction of the arrow 30 when the link 29 is moved by the rocker 26, as indicated by the arrow 32.

The guide bars 1, 2, 4 are longitudinally slidable on a hanger 33 which is fixedly attached to a rocking shaft 34 mounted in bearings 35 on the machine frame 36. The shaft 34 is moved in unison with the shaft 18 by an arm 38 connected to the arm 19 on the shaft 18 by a pivot 37 and a link 34a.

The mechanism which causes the up-and-down movement of the fall plate 3 when the rails 31 are reciprocated is shown in more detail in FIG. 4. A pivot 40 on a bracket 39 attached to the hanger 33 secures a rocker 41 to the hanger 33. One end 42 of the rocker is received between the two rails 31 and hingedly connected to the same. Another end 43 of the rocker 41 is connected by a link 44 to the upper end of a rod 45 which is guided for approximately vertical movement in a bore 47 of the bracket 39. The fall plate 3 is attached to the lower end of the rod 45 and is normally held in an intermediate position by two helical compression springs 46a mounted on the rod 45 between the bracket 39 and the link 44 and the fall plate 3, respectively. When the rails 31 are longitudinally reciprocated by the cam 12c, the rocker 41 swings in a vertical plane on the pivot 40, and the fall plate 3 moves up and down, as indicated by the arrow 48.

Each of the guide rails 1, 2, 4 is moved longitudinally on the carrier 33 by a pattern mechanism of which only one is illustrated in FIG. 5. A pattern drum 49 common to the several mechanisms is driven by a chain drive in synchronization with the cam shaft 11 in a conventional manner (not shown in the drawing). It has as many circumferential grooves as there are guide rails, each groove receiving a pattern chain 51, only partly shown in the drawing. The links 50, 50a, 50b of the chain, which differ in their height, are scanned during chain movement by a roller 52 on a shogging lever 53 connected to the associated guide rail by a rod 54 which moves back and forth in the direction 30 as the roller 52 travels over the chain 51.

The illustrated machine produces a ground or basic fabric from the yarns guided by the bars 1, 2 and provided with a decorative pattern by yarn supplied from the guides 4a of the yarn guide 4. The swinging motions of the several knitting implements are conventional, and so are the shogging movements of the yarn guides 1 and 4.

The chain 51 associated with the guide bar 2 arranged in the rear of the fall plate 3 causes the bar 2 to move in a lapping pattern diagrammatically shown in FIG. 2. Several needles 9 are indicated by circles. Each yarn guide 2a on the guide bar 2 moves in a path represented by a solid line 2b in steps beginning with a backward swinging motion a, followed by an endwise movement d toward the left, away from the needle 9b, as viewed in FIG. 2, which is then stopped until the portion e of the forward swinging movement is completed. When the yarn guide 2a reaches the position g, still in the rear of the needles 9, it is quickly moved to the right, past the needle 9b while it continues its forward swinging movement c, thereby performing the overlapping movement f, with a delay which permits the yarn 5 of the yarn guide 4a to be moved by the fall plate 3 to the position 5a (FIG. 1) below the latch 8 before the overlapping movement of the yarn guide 2a begins. The relatively wide spacing of

the guide bar 2 from the fall plate 3 facilitates such operation.

By way of comparison, FIG. 2 also shows in broken lines the path 2c which would be traveled by the yarn guide 2a in a conventional raschel knitting machine, the swinging steps respectively arranged in front and in the rear of the fall plate, that one of the guide bars perform its overlapping movement from the right to the left if the other guide bar makes overlapping movements from the left to the right, and vice versa. The range of patterns capable of being produced on a raschel knitting machine of the invention is thereby greatly increased by simple means and without loss of machine capacity.

The invention prevents the yarn of the ground fabric from reaching the needle shaft in the immediate neighborhood of the decorative yarn 5, thus permitting both yarns to be wrapped about the needle 9 in the same direction without any supplemental devices other than those described above which permit the knitting machine to operate at its full rated speed.

While three guide bars and the associated yarn guides have been illustrated in the drawing, it will be appreciated that the invention is applicable to all raschel knitting machines having at least one guide bar and the yarn guides thereof offset from the fall plate in a rearward and forward direction respectively. If there are two or more guide bars on each side of the fall plate, it will be appreciated that the spacing or offset of the yarn guide closest to the fall plate on the rear should be greater than that of the yarn guide closest to the fall plate in a forward direction.

It should be understood, therefore, that the foregoing disclosure relates only to a preferred embodiment of the invention, and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not depart from the spirit and scope of the appended claims.

What is claimed is:

1. A method of operating a raschel knitting machine having an elongated row of needles with rearwardly directed latches, a fall plate, and a first yarn guide and a second yarn guide normally associated with each needle, said first yarn guide being offset rearwardly from said fall plate, and said second yarn guide being offset forwardly from said fall plate, said yarn guides being swung jointly forwardly and rearwardly transversely of said row of needles and being moved longitudinally of said row relative to the associated needle for forming yarn loops about the same, the yarn loop formed by said second yarn guide being depressed below the latch of the associated needle by said fall plate, while the fall plate and said second yarn guide are forwardly offset from said row; the improvement in the moving of said first yarn guide which comprises:

- (a) moving said first yarn guide in a first step past the associated needle rearwardly through said row of needles;
- (b) thereafter moving said first yarn guide in a second step longitudinally of said row away from said associated needle;
- (c) moving said first yarn guide longitudinally of said row toward said associated needle and past the same in a third step while said first yarn guide is still in the rear of said row; and
- (d) ultimately moving said first yarn guide past said needle forward through said row in a fourth step;
- (e) said loop being depressed by said fall plate during said steps of said first yarn guide.

2. In a method as set forth in claim 1, moving said first yarn guide forwardly toward said row while moving the same longitudinally of said row toward said associated needle and past the same.

3. In a raschel knitting machine having a needle bar elongated in a predetermined direction; a longitudinal row of needles on said bar; a latch on each needle directed

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transversely of said direction and rearwardly; a first guide bar and a second guide bar elongated in said direction; a longitudinal row of yarn guides on each guide bar, respective yarn guides on each bar being associated with said needles; a fall plate interposed between said rows of yarn guides in such a manner that the yarn guides on said first guide bar are rearwardly offset from said fall plate, and the yarn guides on said second guide bar are forwardly offset from said fall plate; swinging means for jointly swinging said guide bars and said fall plate alternately forward and rearward transversely of said direction so that said yarn guides pass between said needles; fall plate operating means for causing said fall plate to depress yarn guided by yarn guides on said second guide bar below the latches of said needles; and shogging means for moving said guide bars longitudinally relative to said needle bar and to each other, the improvement in the shogging means for said first guide bar which comprises:

- (a) means for moving each yarn guide on said first guide bar away from the associated needle in said direction in response to each rearward swinging movement of said first guide bar, and for thereafter moving said first yarn guide in said direction toward said associated needle and past the same before the sub-

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sequent forward swinging movement of said first guide bar by said swinging means;

- (b) the yarn guides on said first guide bar being substantially farther offset from said fall plate than the yarn guides on said second guide bar, the spacing of said yarn guides on said first guide bar from said fall plate being sufficient to permit the overlapping motion of said first guide bar to be delayed until yarn guided by yarn guides on said second guide bar is depressed below the latches of the associated needles.

4. In a machine as set forth in claim 3, the offset of the yarn guides on said first guide bar from said fall plate being at least twice the offset of the yarn guides on said second guide bar from said fall plate.

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