Sept. 10, 1935. H. A. SHIELDS 2,014,213

LATCH NEEDLE PATTERN ATTACHMENT

Filed Nov. 28, 1932 2 Sheets-Sheet 1

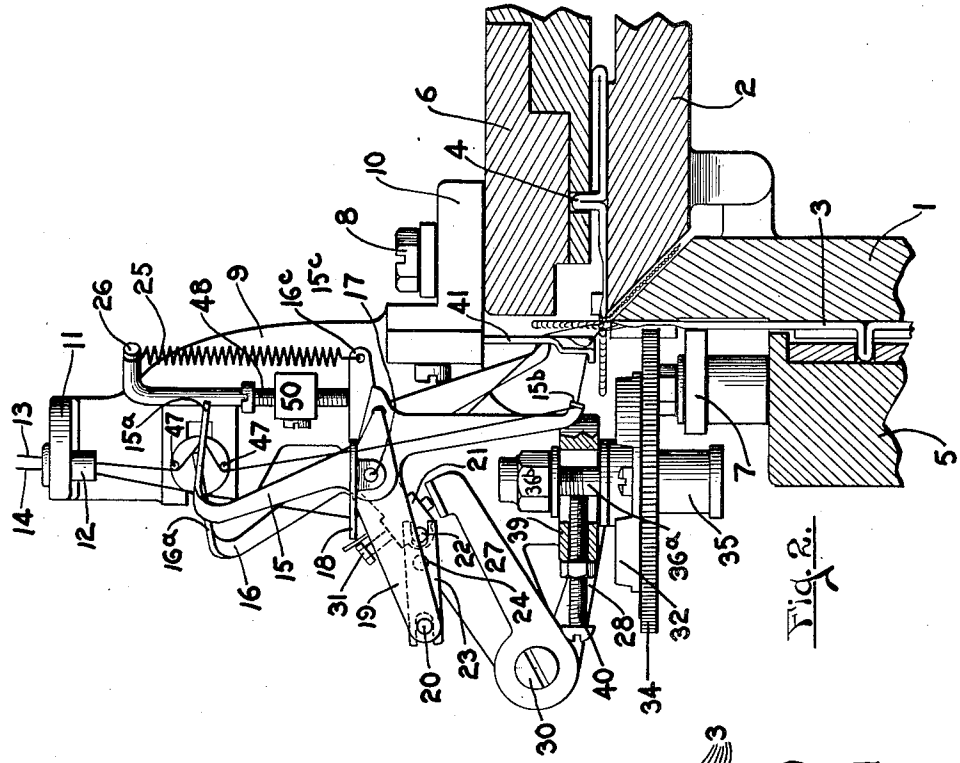


Fig. 2.

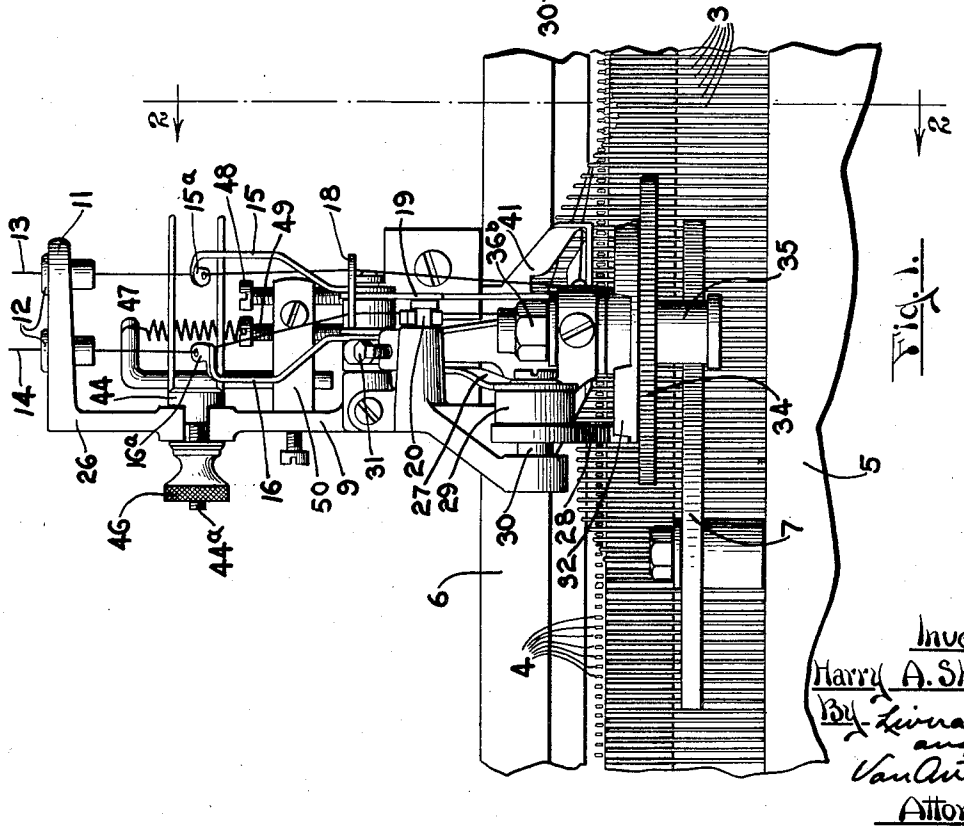


Fig. 1.

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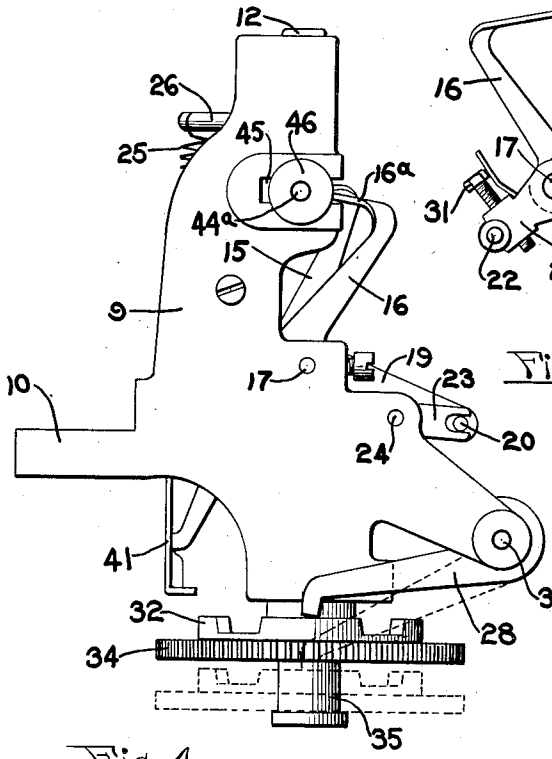


Fig. 4.

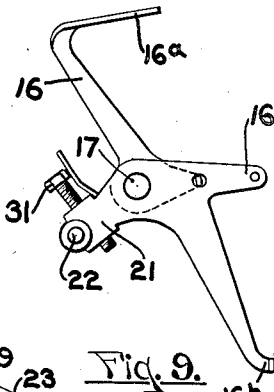


Fig. 9.

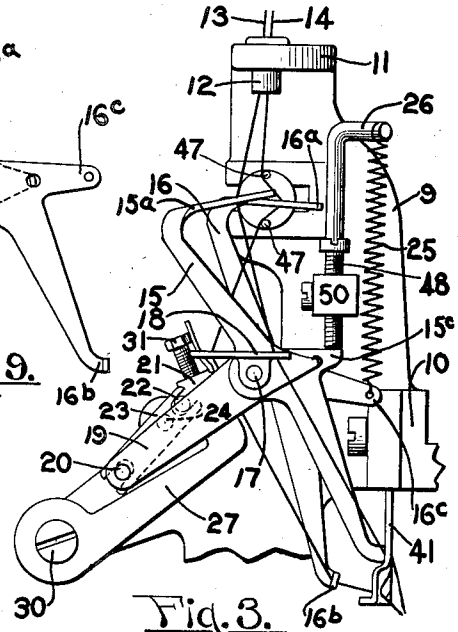


Fig. 3.

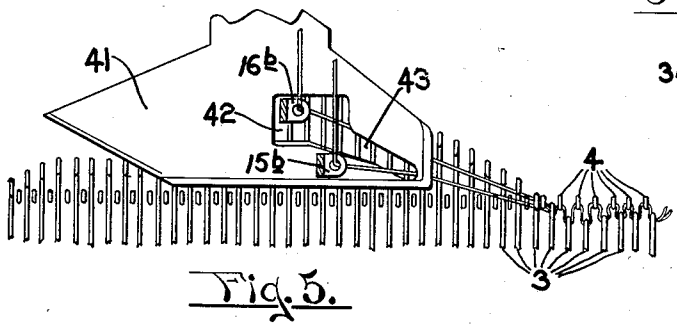


Fig. 5.

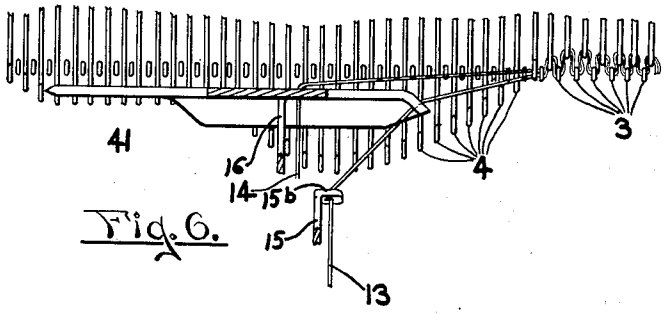


Fig. 6.

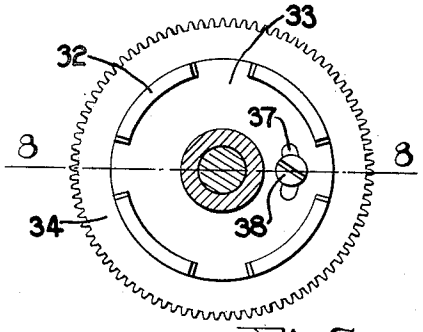


Fig. 7.

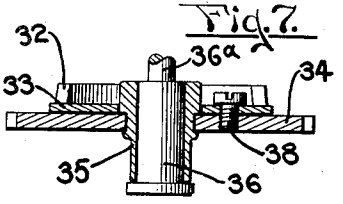


Fig. 8.

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2,014,213

UNITED STATES PATENT OFFICE

2,014,213

LATCH NEEDLE PATTERN ATTACHMENT

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Application November 28, 1932, Serial No. 644,575

8 Claims. (Cl. 66—137)

This invention relates to pattern attachments for knitting machines and its particular purpose is to provide an attachment by means of which a pattern may be knit into the fabric manufactured by a tubular latch needle knitting machine.

The device provides an invention by which two strands of yarn are guided into the needles of the knitting machine at each yarn feeding station so that the relative positions of the respective strands of yarn as they are fed into the needles and knit into the fabric thereby may be repeatedly changed during the knitting operation so that the different strands of yarn alternately appear upon the outer surface of the fabric at different locations and, the respective strands of yarn being of different colors or different kinds, a pattern is caused to appear in the finished product.

The invention provides a device of this kind which is most efficient and accurate in operation, durable, simple in construction, adjustable for operation under different conditions and also has various other new and useful features of construction and arrangement as hereinafter more fully described and particularly pointed out in the claims, reference being had to the accompanying drawings, in which,

Fig. 1 shows a portion of a conventional knitting machine with the pattern attachment of this invention applied thereto.

Fig. 2 is a cross section on the line 2—2 of Fig. 1 of the same part of the conventional knitting machine showing the pattern knitting attachment in side elevation thereof.

Fig. 3 is a side elevation of the upper portion of the pattern attachment showing the parts thereof moved to a different position than shown in Fig. 2.

Fig. 4 is a side elevation of the pattern attachment viewed from the opposite side than shown in Fig. 2.

Fig. 5 is an enlarged view of a series of needles of the knitting machine showing the needle guard having the throat through which the treads pass and also showing the eye ends of the yarn guide fingers in position with the strands of yarn passing through them and into the needles.

Fig. 6 is a plan view of the parts shown in Fig. 5.

Fig. 7 is a plan view of the drive gear and cam of the pattern attachment.

Fig. 8 is a sectional elevation of the same on the line 8—8 of Fig. 7, and

Fig. 9 is an elevation of one of the yarn guard fingers removed from the machine.

Like reference numbers refer to like parts in all the figures of the drawings.

The machine to which the attachment of this invention is applied is of the conventional type known as a tubular latch needle knitting machine which has a rotating needle cylinder 1 and a rotating needle dial 2. Conventional latch needles 3 are slidably mounted in longitudinal grooves on the outer surface of the needle cylinder 1 and similar latch needles 4 are slidably mounted in radial grooves on the upper surface of needle dial 2. A fixed cylinder cam 5 surrounds the cylinder 1 to move the needles 3 thereon in a conventional manner and a fixed cam plate 6 located over the needle dial 2 performs a like function upon the needles 4. A fixed arc-shaped guide 7 is located close to the needles at each yarn feeding station to retain the needles 3 of the cylinder 1 in their respective grooves.

Knitting machines of this type are customarily provided with a plurality of yarn feeding stations spaced about the periphery at which stations the respective vertical and horizontal needles 3 and 4 are successively moved as the cylinder and dial rotate, to receive the yarn and to perform the knitting operation, and to manufacture plain fabric without pattern the strands of yarn are fed into the needles at these stations by fixed yarn guides. The present pattern attachment is substituted for the conventional fixed yarn guides and is attached to the cam plate 6 of the knitting machine by the same screw 8 as was originally used to attach the fixed yarn guides thereto.

The pattern attachment comprises a body 9 having a bracket portion 10 which engages the cam plate 6 and through which the screw 8 passes to attach the device to the knitting machine. The upper portion of the body has a horizontal extension 11 in which are mounted two fixed yarn guides 12 through each of which one of the respective strands of yarn 13 and 14 passes.

Two yarn guide fingers 15 and 16 are pivotally mounted upon the body 9 upon a single pivotal axis. A shaft or pivot pin 17 serves as the pivot mounting, and a fixed yarn guide 18 is supported on said shaft 17, said yarn guide 18 having two holes through which the respective strands of yarn pass. Each of the yarn guide fingers 15 and 16 has an upwardly extending arm having a substantially horizontal portion 15a and 16a which has an eye and a downwardly extending arm having an eye portion 15b and 16b. Although the upper and lower arms of each guide finger are made of separate parts for convenience in manufacture, these upper and lower arms of

each guide finger are joined together and moved as though they were integral and may be so considered.

The finger 15 has an outwardly extending lever 19 having a pin 20 thereon and the finger 16 has an outwardly extending lever 21 and pin 22 thereon. An oscillating lever 23 is pivoted between its ends at 24 and each of its respective ends is forked to embrace the respective pins 20 and 22. By this construction synchronous but opposite pivotal movement of the respective fingers 15 and 16 is caused to occur and the lengths between the respective arms 19 and 21 extend from their pivots and the relative location of the pivot 24 between the ends of the forked lever 23 is arranged so that the amount of reciprocation of each of the fingers 15 and 16 is substantially the same.

The pivoted finger 16 is moved in one direction by a spring 25 which is attached at its lower end to an extension 16c and at its upper end to a supporting arm 26 mounted on the frame of the machine. The finger 16 is moved in the opposite direction by a cam lever comprising the upper and lower arms 27 and 28. The upper and lower arms 27 and 28 of the cam lever are integrally joined by a hub 29 which hub is pivotally mounted on a pivot screw 30 extending from the frame of the machine. The arm 21 of the yarn guide finger 16 has an adjustable screw 31 which engages the moving end of the cam lever 27 and the moving end of the cam lever 28 rides upon a circular cam 32.

The cam 32 is in the nature of an annulus or series of segments mounted upon a base 33 which is supported upon a gear 34. The gear 34 has a hub 35 rotatably mounted upon a short vertical shaft 36 which is fastened to the frame of the machine. The base 33 of the cam 32 has a central opening through which the hub 35 extends and the base 33 may have a limited rotation about the hub upon the gear 34 it being provided with a segmental slot 37 through which a clamping screw 38 extends, said clamping screw being threaded into the gear 34. By this structure the cam 32 may be rotatably adjusted relative to the gear 34 within the limit of the length of the slot 37 and may be clamped to the gear in the desired adjusted position by the screw 38.

The gear 34 is arranged to be driven by engagement with the needles of the needle cylinder 1 or by engagement with the portions of such cylinder extending beyond the needles between the needle grooves therein. In some knitting machines of this type it is more convenient to engage the teeth of the gear 34 with the portions of the cylinder 1 which extend outwardly between needle grooves as generally shown in the present drawings but in other machines it is preferable to engage the teeth of the gear 34 directly with the needles to be driven thereby. Usually when driven by the portions of the cylinder between the grooves the gear should be in a higher position and when driven by the needles it should be in a lower position as illustrated by dotted lines in Fig. 4. In order to change the vertical position of the gear 34 it is merely necessary to provide a different hub 35 therefor on which the gear is mounted at the desired height. When the vertical position of the gear is altered the cam lever 28, which engages the cam 32 thereon, must also be changed so that it will properly engage the cam at the position where the gear is located.

The shaft 36, about which the gear 34 and cam 32 rotate, has an upwardly extending screw threaded extension 36a which extends through a slotted boss 39 which is a part of the frame 9 of the device and a nut 36b screwed onto the extension 36a clamps the shaft in its adjusted position. An adjusting screw 40 is screwed through the boss 39 and engages the extension 36a and may be used to accurately adjust the position of the gear 34 relative to the cylinder 1 to assure proper mesh of the teeth of the gear with either the needles 3 or the extensions between the needle grooves of the cylinder.

The lower ends 15b and 16b' of the yarn guide fingers, which have eyes therein, serve to guide the respective strands of yarn 13 and 14 through a needle guard 41 which needle guard is fixed to the frame of the device and which is provided with an opening or throat through which both strands of yarn pass. The opening or throat has a larger portion 42 shaped and located so that it will receive either of the lower ends 15b or 16b of the yarn guide fingers in inner position and the throat has a narrowed extension 43 communicating with the larger portion 42 and extending therefrom in the same direction as the yarn is led into the needles and is for the purpose of guiding the strand of yarn which passes through the yarn guide finger which is moved to outer position in a manner to cause said strand of yarn to lie outwardly relative to the strand of yarn which is being guided into the needles through the throat portion 42 by the yarn guide finger which is in inner position.

A yarn tension device is provided which consists of a base 44 mounted for sliding movement in a slot 45 in the frame 9 of the device and being clamped in the desired location in said slot by a nut 46 which is screwed onto the threaded extension 44a of said base. Two small rods 47 extend in vertically spaced relation from said base 44 and in position so that the eye portions of either the upper ends 15a and 16a of the yarn guide fingers will move between them when said ends are moved forwardly. The upper end of the yarn guide, which is in forward position, causes the strand of yarn passing through this respective guide to be flexed in contact with both of the rods 47 and also in the eye of the yarn guide so as to exert appreciable frictional resistance to its movement while the upper end of the yarn guide which is in outer position removes the yarn from contact with the rods 47 permitting it to travel directly through the yarn guide without imposing frictional resistance to such travel.

It may here be explained that the yarn guide finger, which has its upper end in forward position to engage its strand of yarn with the friction rods 47, has its lower end in outer position to pass its strand of yarn through the forward extension 43 of the throat of the yarn guide 41 which also imposes additional frictional resistance to movement of the yarn. Adjustment of the position of the friction rods 47 by moving the body 44 in the slot 45 alters the amount of tension which is frictionally imposed upon the yarn at this point.

Adjustable stop screws 48 and 49 are provided to be engaged by and limit the movements in one direction of the respective yarn guide fingers 15 and 16. These stop screws 48 and 49 extend through a support 50 fastened to the frame 9 of the device and are threaded through said support so that rotation of the screws will vary their positions axially.

The lower ends of the screws are engaged by

extensions 16c on the finger 16 and 15c on the finger 15 in the upward movements of these extensions to limit the movements of the respective fingers in the corresponding directions which adjustably limits the forward movements and positions of the lower ends 15b and 16b thereof.

Operation

The device is first attached to the knitting machine at the yarn feeding station thereof by removing the conventional yarn guide and attaching the pattern knitting yarn guide of this invention in its place. There are customarily a plurality of yarn guides on each knitting machine spaced at intervals about its periphery and, as heretofore explained, the device of this invention is provided with a bracket 10 by which it may be attached to the knitting machine by the same screw 8 as was originally provided to attach the conventional yarn guide thereto.

Threads or strands of yarn 13 and 14 are led from spools located above, two of such strands leading to each pattern attachment and said two strands being of different colors or different kinds. Each of the strands is passed through a respective guide 12, thence through one of the upper eyes of each respective yarn guide fingers 15 and 16, thence through the respective eyes of the fixed yarn guide 18, thence through the respective eyes in the lower ends of the yarn guide fingers and from there both strands of yarn are led through the throat of the yarn guide 41 into the needles which needles operate upon both strands of yarn when the machine is operated to knit the yarn into a tubular fabric.

A gear 34 of proper diameter and having the proper number of teeth to make the desired pattern with a hub 35 attached thereto is selected and the desired cam 32 and base 33 thereof is mounted upon the selected gear and attached thereto by the screw 38 and this assembly of gear, cam and hub is placed upon the shaft 36, which is mounted upon the boss 39 and adjusted in the slot thereof so that the teeth of the gear will properly mesh either with the extensions on the cylinder 1 between the needle slots thereof or with the needles 3 on the cylinder, such adjustment being facilitated by the adjusting screw 40 and the shaft 36 is then clamped in adjusted position by the nut at 36b.

Other parts of the device are then adjusted for proper operation. The cam arm 28 rests upon the cam 32 and when it engages a depression of said cam it permits forward movement of the lower end 16b of the cam finger 16, said cam finger being moved in that direction by the spring 25 and therefore the stop screw 49 is properly adjusted to limit the movement of the finger 16 so that its lower end, when in inner position will be properly located with respect to the throat portion 42 and the needles. When the cam arm 28 engages a raised portion of the cam 32, the cam finger 16 is moved to opposite position and, by action of the forked lever 23, the finger 15 is moved so that its lower end 15b is in inner position. This inner position of the lower end 15b of the finger 15 is adjusted by means of the adjusting screw 31 on the extension 21 of the finger 16 which engages the moving end of the upper cam arm 27 and when this adjusting screw 31 is properly adjusted to move the lower end of the finger 15 inwardly to its proper location when the cam arm 28 is on a rise of the cam 32 the stop screw 48 is adjusted to engage the extension 15c of the finger to limit movement of said finger in that direction.

The friction device, having the rods 47, is adjusted by movement in the slot 45 to a position where the desired amount of frictional resistance to movement of the strands of yarn is applied.

After these adjustments have been made the knitting machine is put into operation and the rotating cylinder causes rotation of the gear 34 and cam 32 thereon. The cam 32, in this rotation, alternately raises and lowers the cam arm 28 and likewise the cam arm 27 which reciprocates the yarn guide finger 16 on its pivot and, by means of the forked lever 23, causes a like but opposite reciprocation of the yarn guide finger 15.

After the yarn feeding pattern attachments have been properly adjusted as described and the knitting machine is put into operation two strands of yarn are drawn from each attachment into the needles by rotation thereof and the cams of the knitting machine move the needles in the conventional way to knit the yarn into a tubular fabric. The strands of yarn are pulled by rotation of the needles through the throat portion 42 and extension 43 thereof from the lower ends 15b and 16b of the guide fingers in a direction corresponding to the direction in which the extension 43 leads from the throat portion 42 and at all times the lower end of one yarn guide finger is in inner position in or close to the throat portion 42 and the eye thereof relatively close to the needles so that the yarn which is led therefrom assumes a position close to the shanks of the vertical needles while the lower end of the opposite guide finger is moved outwardly a considerable distance away from the needles and the strand of yarn leading therefrom is pulled into the extension 43 of the throat which causes it to assume a position outwardly located with respect to the other strand of yarn. The two yarn guide fingers thus lay the respective strands of yarn in the needles with one of the strands outwardly located relative to the other and the strands of yarn are knit into the fabric by the needles in these relative positions and the strand which was laid in the needles outwardly is the one which will appear on the outer surface of the fabric.

To insure the proper positioning of the strands of yarn the one which is to lie in outer position has frictional resistance to its movement imposed upon it both by the friction device having the rods 47 and by frictional engagement with the ends of the extension 43 through which it passes which frictional resistance or tension forcibly pulls and holds it outwardly while the needles act upon both strands.

Since the yarn guide fingers alternately change their positions and reverse the positions of the strands of yarn which are led from them into the needles the two respective strands, which are of different kinds or different colors, alternately appear upon the surface of the fabric to form a pattern thereon and an infinite number of different patterns or designs may be made by changing either the cam 32 or the gear 34 or both of them. The operation of each pattern attachment may be adjusted to synchronize with that of other pattern attachments on the same machine so that the yarn charge produced thereby will properly correspond with the yarn charge produced by the other attachments all working upon the same piece of fabric to produce a continuity of the design by adjusting the cam 32 on the gear 34. This adjustment is made by loosening the screw 38 and slightly rotating the cam relative to the

gear. It is intended that such adjustment is for minor changes only since the segmental slot 37 is relatively short, and that greater changes in adjustment in this respect are made by unmeshing the gear from the needles or cylinder extensions and rotating the gear to approximately the proper position and then meshing its teeth with the driving members.

I claim:

1. The combination with a knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, two yarn guide fingers pivoted to said frame and each having an eye in its movable end, means actuated by a moving part of said knitting machine for oppositely oscillating said respective fingers about their pivots in a manner to move each arm into close proximity with the needles of the knitting machine and oppositely out of such proximity, a fixed yarn guide attached to a fixed portion of said knitting machine and located close to the needles thereof and having a throat into proximity with which the moving end of each of said yarn guide fingers is alternately moved, and said throat having an extension, which throat extension extends from the main portion of the throat in the same direction as the direction of movement of the needles of the knitting machine and the end of said throat extension being located farther from the needles than the main portion of the throat.

2. The combination with a knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, two yarn guide fingers pivoted on said frame and each having an eye in its movable end, a gear mounted to rotate upon a vertical axis, means for changing the vertical position of said gear on its axis whereby said gear may be caused to mesh either with the needles of the cylinder of the knitting machine or with portions of said cylinder, a cam moved by said gear, and means actuated by said cam and imparting opposite oscillatory movement to the respective yarn guide fingers.

3. The combination with a knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, two yarn guide fingers pivoted to said frame, and each having an eye at its movable end, means actuated by a moving part of said knitting machine for oppositely oscillating said yarn guide fingers, two strands of yarn, one strand passing through an eye in the movable end of each respective yarn guide finger, means integral with each of said yarn guide fingers extending from the opposite side of their respective pivots, a second eye in each of said last mentioned integral means, the two strands of yarn passing through these second eyes, two spaced relatively fixed elements located at opposite sides of the paths of said second eyes for imposing resistance to movement of the yarns at predetermined times.

4. The combination with a knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, two yarn guide fingers each pivoted between its ends to said frame, an eye in each respective end of each of said fingers, means actuated by a moving part of said knitting machine for oppositely oscillating said yarn guide fingers whereby the lower end of each finger is moved inwardly to close proximity with the needles of the knitting machine and outwardly out of such proximity, and a tension member fixed to said frame in a position where it will be engaged by strands of yarn passing through the eye in the upper end of each of said fingers when each finger is moved with its lower end out of proximity with said needles, said tension member acting to impose resistance to longitudinal movement of said yarn.

5. The elements in combination defined in claim 4 in which said tension member is adjustable in a manner to vary the resistance to movement of the yarn imposed by it.

6. The combination with a knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, a first and a second yarn guide finger pivotally mounted on said frame, an eye at the moving end of each of said fingers, means actuated by a moving part of said knitting machine for imparting oscillation to said first finger in a manner to move its end having an eye therein inwardly into close proximity with the needles of said knitting machine and outwardly out of such proximity and means actuated by movement of such first finger for imparting corresponding but opposite movement to said second finger, said last mentioned means including a lever having its ends slotted and being pivoted intermediate its ends, said pivot being parallel to the pivots of the said fingers.

7. The combination with a knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, a first and a second yarn guide finger pivoted to said frame and each having an eye in its movable end, a gear rotatably mounted on said frame and rotated by a moving part of said knitting machine, a cam actuated by said gear, a cam arm pivoted to said frame and actuated by said cam, adjustable means on said first yarn guide finger engageable with said cam arm and serving to move said first finger by actuation of said cam arm in one direction of its oscillation, yieldable means connected to said first finger to move the same in the opposite direction of its oscillation, means actuated by movement of said first finger serving to impart corresponding but opposite movement to said second finger and stop means for one of said fingers.

8. The combination with knitting machine of a device of the class described comprising, a frame attachable to said knitting machine, two yarn guide fingers movably mounted on said frame and each having an eye in its movable end, means actuated by a moving part of said knitting machine for oppositely moving said respective fingers in a manner to move each arm, a fixed yarn guide attached to a fixed portion of said knitting machine, said yarn guide having a throat into which the moving end of each of said yarn guide fingers is alternately moved, said throat serving to guide the yarn when the eye carrying the same is located its greater distance therefrom and said yarn extending directly from its respective eye to the needles when the eye is in said throat.

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