Oct. 11, 1938. L. ROQUES 2,132,971

KNITTING FRAME FOR ELASTIC FABRIC HAVING UNEXTENSIBLE ZONES

Original Filed June 17, 1933 3 Sheets-Sheet 1

Fig. 1

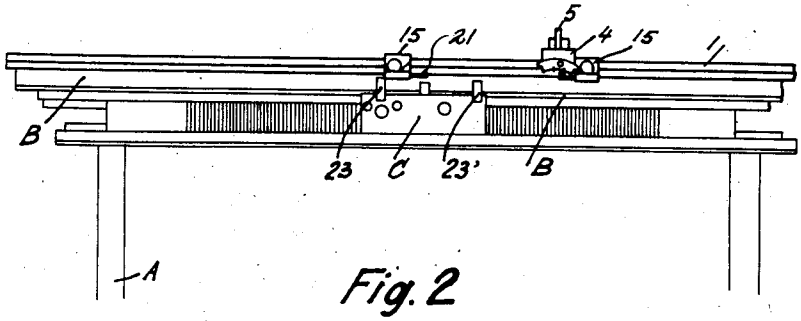
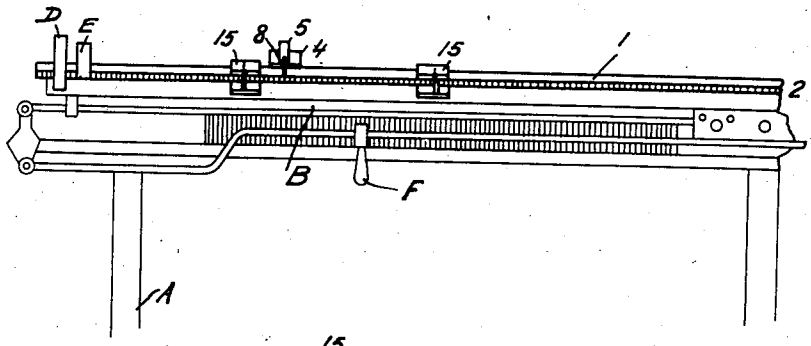


Fig. 2



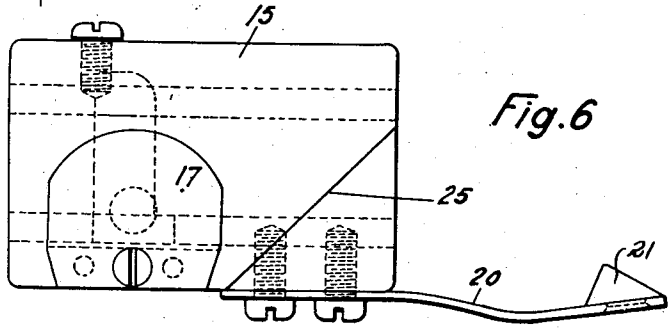
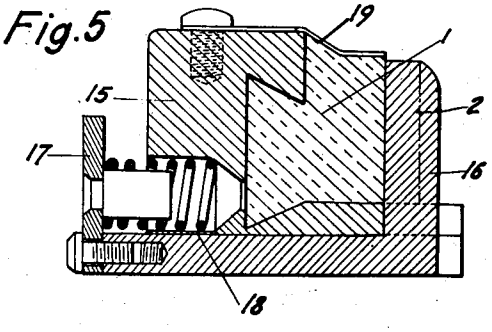


Fig. 6

Fig. 5



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Fig. 3

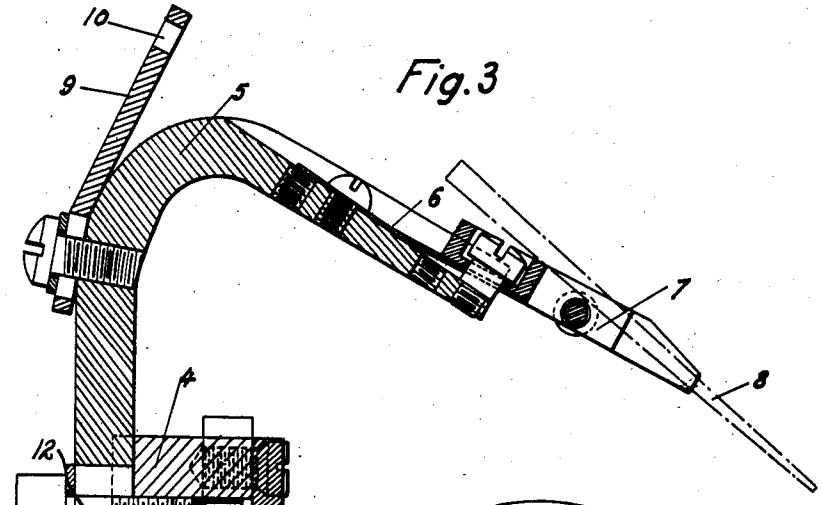
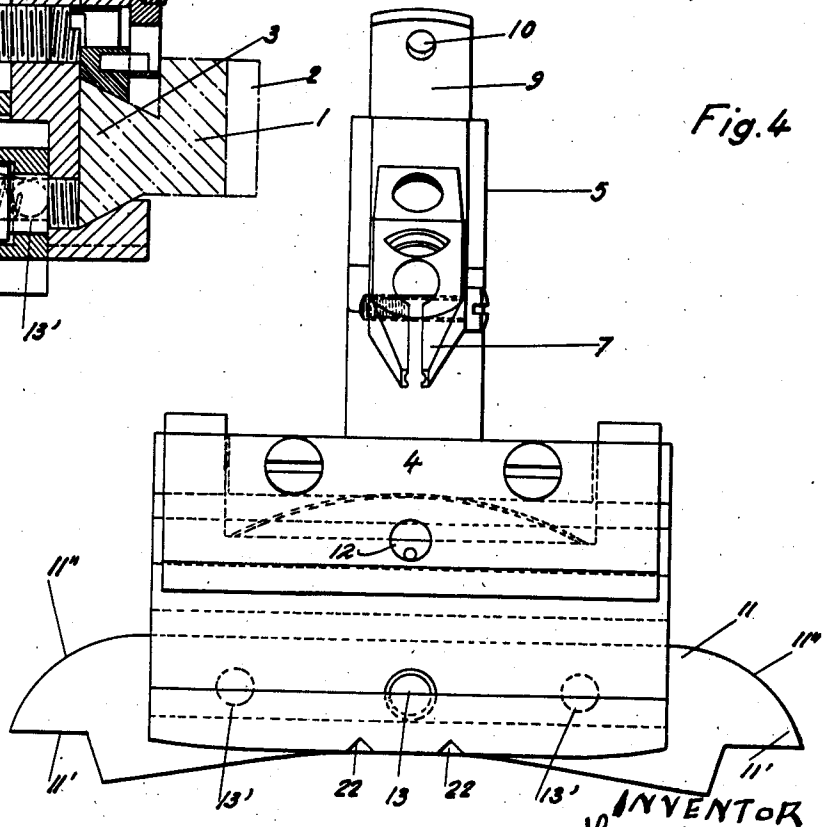


Fig. 4



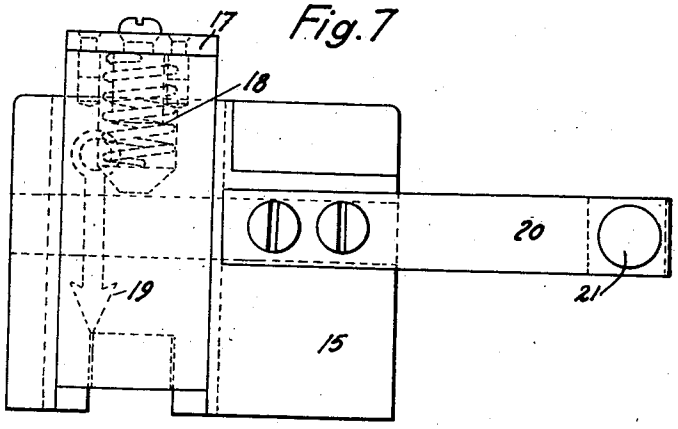
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Fig. 7



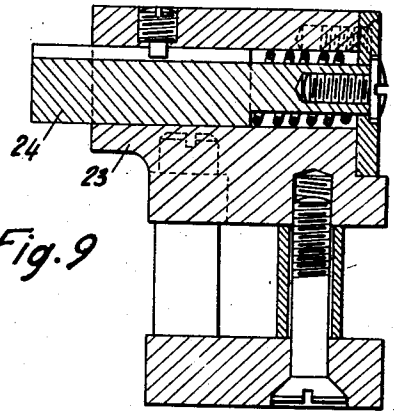


Fig. 9

Fig. 10

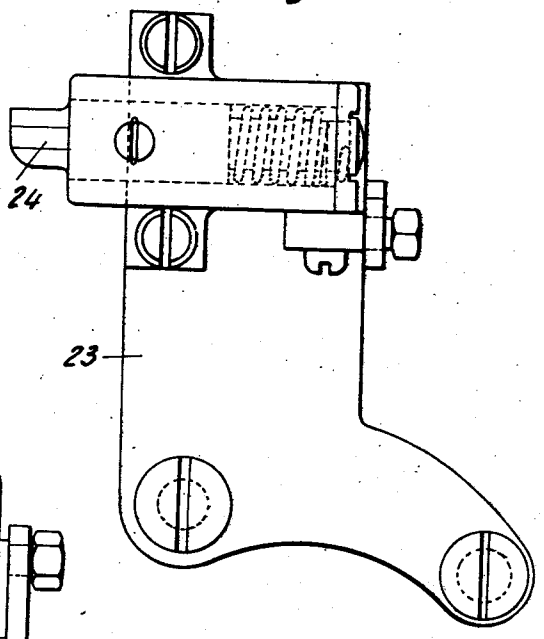
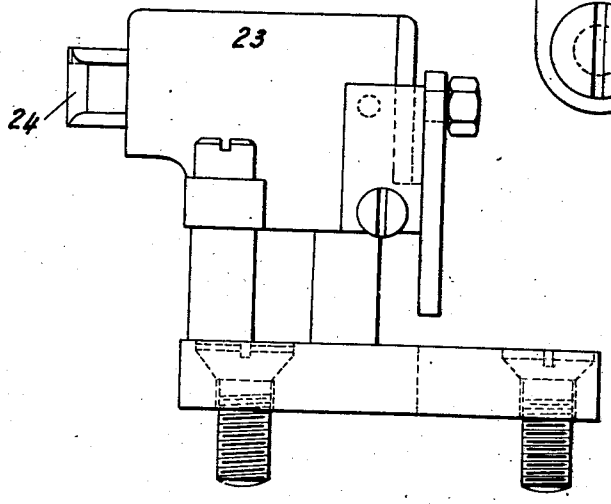


Fig. 8



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Patented Oct. 11, 1938 2,132,971

UNITED STATES PATENT OFFICE

2,132,971

KNITTING FRAME FOR ELASTIC FABRIC HAVING UNEXTENSIBLE ZONES

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Original application June 17, 1933, Serial No. 676,277, Patent No. 2,076,350. Divided and this application December 1, 1934, Serial No. 755,551. In France June 20, 1932

10 Claims. (Cl. 66—126)

The present application is a division of application Ser. No. 676,277, filed June 17th 1933, since eventuating in Patent No. 2,076,350 wherein is described a new product of a knitted, netted or textile nature with elasticity afforded in one direction. The present application is for the improved knitting frames for manufacturing the product described in said Patent No. 2,076,350.

The improvements according to the invention are to render an ordinary knitting machine applicable for knitting the kind of fabric object of my above indicated co-pending application, while maintaining the automatic character of the operation, without any appreciable supplemental working to the usual article, so that the final product may be solid and have perfect appearance and that the cost of said product may be sufficiently low for permitting an extended sale of the same.

The fabric according to my co-pending application comprises essentially an elastic thread running continuously through the fabric and an auxiliary non-elastic elasticity restricting or nullifying thread incorporated in the zone or zones desired to be rendered unextensible or substantially so. Briefly stated my present invention enables the manufacturer to readily incorporate this auxiliary non-elastic thread, and to vary the width and form of the zone wherein said auxiliary thread is included; to avoid sewing and restitching; to incorporate the necessary counteracting zones during the manufacture of the fabric; to maintain substantially the general appearance of an ordinary elastic knitted fabric or the like; to secure simplicity of construction and of the means and method of manufacture; and to obtain other advantages and results as may be brought out in the following description.

For this purpose the knitting machine is provided with a special auxiliary thread guide or tube holder adapted to deliver the auxiliary inelastic thread, said tube holder being reciprocated (like the tube holder delivering the thread of the knitting and the elastic weft thread), said reciprocating movement being limited by two stops which may be set at will in order that the non-elastic parts of the fabric may receive the desired position and width.

The arrangement and the operation of said special tube holder show two particular features:

1. It has been observed that, for obtaining articles having no imperfections the elastic weft thread and the auxiliary inelastic thread should not be inserted simultaneously between both rows of needles of the knitting machine, but that it was preferable to throw in the auxiliary inelastic thread before the elastic weft thread; the auxiliary inelastic thread comes thus to lie first over the last row of knitted loops and the elastic weft thread comes then to its position in advance of (or behind) the auxiliary inelastic thread and exactly parallel to the latter without any risk of intermixing with it at any moment; the machine then effects the formation of a new row of loops which thus unites the elastic weft thread and the auxiliary inelastic thread in that portion of the fabric in which the latter has been placed by the special tube holder.

For realizing said advance of the auxiliary or special thread tube holder relatively to the tube holder for the elastic thread, which advance forms one characteristic of the invention, the special thread tube holder is actuated by two auxiliary tubes mounted on the movable carriage, which carries the locks of the machine on both sides of the tube adapted to actuate the tube holder for the elastic thread; during one of the strokes of the carriage, one of the auxiliary tubes acts on the special thread tube holder and shifts it forward with a certain advance relatively to the tube holder for the elastic thread, while during the other stroke of the carriage the other auxiliary tube acts and shifts the special thread tube holder always with a certain advance.

The special thread tube holder delivering the thread must be able, when stopped, to let pass freely the tube holders delivering the knitting thread and the elastic weft thread in order to ensure without trouble a normal operation of the knitting machine. For this purpose said special or auxiliary tube holder is made of a certain degree of elasticity so that it may yield during the passage of the other tube holders. But it may occur that this yielding of the special tube holder will not always be obtained exactly at the same plane; the special tube holder could be slightly set-off on one or the other side and then strike against one of the needles of the knitting machine which could thus break or be otherwise damaged. In view of avoiding said inconvenience, it will be advantageous to stop the special tube holder delivering the auxiliary thread on the division provided for a needle and to render said needle inoperative in each case. Said special tube holder can then yield always during the passage of the other tube holders without any risk of striking against a needle.

This arrangement of the special tube holder which is always stopped opposite the place of a needle which has been rendered inoperative is

not indispensable but it can form another characteristic of the invention; the simple consideration of a piece of knitted fabric shows immediately that said piece has been made with a knitting machine or any other machine comprising said characteristic feature.

The appended drawings are diagrammatic representations of a present preferred form of the invention which may be assumed thereby on a flat knitting machine, and in them,

Fig. 1 is an elevation of one side of the machine,

Fig. 2 is an elevation from the opposite side,

Fig. 3 is a cross section through the special tube holder for the non-elastic thread,

Fig. 4 is a front elevation of the special tube holder,

Fig. 5 is a cross-section of one of the stops for the tube holder,

Fig. 6 is a front elevation of the stop member,

Fig. 7 is an inverted plan view of the stop member,

Fig. 8 is a side elevation of one of the auxiliary tubes,

Fig. 9 is a vertical cross-section through the same; and,

Fig. 10 is a front elevation of said auxiliary tube.

In said drawings A is the frame of an ordinary flat knitting machine the needle beds of which are designated by B; C is the movable carriage carrying the locks, D and E the tube holders delivering the elastic weft thread and the knitting thread respectively.

On a bar 1, the cross-section of which is shown in Figure 3 and which comprises a rack 2 and a dove-tail slide rail 3, slides a driver 4 (see Figures 3 and 4) carrying a member 5 on which is mounted, through a spring blade 6, the clamping nose 7 of the auxiliary or special thread inserting tube 8; 9 is a thread guide provided with a hole 10 for the passage of the auxiliary or special inelastic.

Furthermore the driver 4 carries a tilter 11 pivotally mounted at 12 and provided with a notch 11' at each end; said tilter 11 is provided with recesses 13 in which are arranged balls 13', which are pushed constantly against the wall of the driver 4, by means of springs 14.

On the bar 1 are mounted, also slidably arranged, two stops 15 (see the detail Figures 5, 6 and 7) which may be stopped at any desired point of the length of said bar by means of a movable index 16 resting between the teeth of the rack 2 and actuated by a push button 17 (the outer head of which is "knurled") against the action of a return spring 18.

19 is an arrow marking the position of the stop along the bar 1; 20 is a spring blade secured to or integral with the stop and the cog 21 of which engages one of the notches 22 of the driver 4 at the end of the strokes. The workman has only to press onto the push button 17 for releasing the movable index 16 from the teeth of the rack 2 and permitting it to shift the stop 15 and bring the latter to another position on the bar 1 in order to obtain any new desired position and any new desired width for the required non-elastic part of the knitted fabric.

The teeth of the rack 2 correspond to the gauge of the machine and each position given to one or both stops 15 corresponds to a position of the driver 4 at the end of its stroke in which the thread inserting tube 8 is exactly in the vertical alignment of a needle of the machine.

The driver 4 is shifted through two auxiliary tubes 23—23' mounted on the movable carriage C. Each such tube comprises (see detail Figures 8, 9 and 10) a spring piston 24 which comes to rest into one of the notches 11' of the tilter 11 and pushes the notch forward and therefore also the tilter when the workman acts on the carriage C in the ordinary manner by means of the handle F. When the driver 4 comes against the stroke limiting stop 15, the rounded back 11'' of the other end (or fore end) of the tilter comes to rest under the cut edge 25 of the back side of said stop and is gradually lowered while lifting the back end of the titler until the piston 24 is released from the notch 11' of said latter end.

The driver 4 then comes to rest and the carriage C may continue its stroke until the loops have been formed on the whole length of the fabric which comprises elastic parts on each side of a non-elastic part (in an elastic waist-band for example).

When the carriage C is returned in the opposite direction by the workman, the other tube (23 or 23') acts on the notch 11' of the lowered branch of the tilter 11 and pushes the latter together with the driver against the other stop 15; the fore branch of the tilter is then also lowered against the cut edge 25 of said stop, which thus releases the piston 24 from the tube 23 or 23' and permits the carriage C to continue its stroke and pass over the driver 4 which is stopped.

Obviously it is easy, according to the present invention, to transform an ordinary flat knitting machine of any type in order to render the same capable of making pieces of elastic fabric comprising a non-elastic part.

Said improvements to a flat knitting machine according to the invention do not interfere with the normal operation of the machine which can be set at will, without any taking off of its members, for making either entirely elastic fabrics in the ordinary manner or elastic fabrics comprising non-elastic parts according to the invention.

For passing from the manufacture of the elastic fabric comprising an unextensible part to the manufacture of elastic fabric without unextensible part, it suffices to push one of the stops 15 to one end of the needle bed on the one or on the other side together with the thread inserting tube 8; in fact the knitting machine generally comprises at each end of the same a neutral part without needle, so that shifting is possible.

What I claim is:

1. In a machine for forming a knit elastic fabric having a looped thread and an elastic thread passing through the loops of said looped thread, and in combination with a knitting mechanism including a reciprocatory carriage and means operated thereby for inlaying the elastic thread in the loops of the looped thread throughout the length of the fabric, of means operated by the carriage in the fabric forming action for passing an inelastic thread in parallel relation with the elastic thread through the loops of the looped thread, and means operable to throw the latter-named means into and out of action at predetermined points in the travel of the carriage for inlaying the inelastic thread within a predetermined zone portion of the fabric to restrict the elasticity of the elastic thread in said zone portion.

2. In a machine for forming an elastic fabric

having a looped thread and a longitudinally extending elastic thread passing through the loops of said looped thread, a knitting mechanism including a reciprocatory carriage operating in the fabric forming action for passing an inelastic thread parallel with the elastic thread through the loops of the looped thread within a predetermined zone portion of the fabric to restrict the elasticity of the elastic thread in said zone portion, and means for regulating the action of the aforesaid means to start and stop the same at spaced points in the travel of the carriage to govern the inlaying of the inelastic thread and the extent of the inelastic zone portion to be formed thereby in the length of the fabric.

3. A flat bar knitting frame for forming a knitted fabric having elastic sections and inextensible sections, comprising a movable carriage, thread guides for delivering a knitting thread and an elastic weft thread, a tube holder for an inextensible thread to be inserted in the loops of the knitting thread in advance of the elastic thread, two auxiliary tubes on the movable carriage, said latter tubes actuating the tube holder from one limit to the other of the fabric section to be rendered inextensible, means for stopping the tube holder for inextensible thread always in line with a needle at each border of the inextensible zone, and means for rendering the needle inoperative for so long a time as the tube holder shall be stopped in line with said needles.

4. In a knitting machine for knitting a continuous elastic fabric having an inelastic portion, the combination with a knitting mechanism for forming a looped thread, and including a thread guide for inlaying an elastic thread in the loops of the looped thread throughout the length of the fabric of an auxiliary thread guide for inlaying an inelastic thread in the loops of the looped thread in parallel relation to and simultaneously with the inlaying of the elastic thread therein by the elastic guide, a reciprocatory carriage for simultaneously moving said guides, and means for throwing said auxiliary thread guide into and out of action at spaced points between the limits of opposite carriage strokes independently of the action of the elastic thread guide, whereby to inlay the auxiliary inextensible thread with the elastic thread in the loops of a predetermined portion of the fabric only, said means comprising a tilting engaging device on the carriage having opposite extending engaging arms, spaced engaging members on the carriage arranged on opposite sides of the auxiliary thread guide for engagement with the respective arms of the tilting engaging device, and stop devices arranged at predetermined points on opposite sides of the carriage in the direction of its strokes, said stop devices operating to tilt the engaging device to shift the arm thereof which is in engagement with an engaging member on the carriage in one stroke direction of the carriage out of engagement with said arm and to shift the other arm of said engaging device into position to be engaged by the other engaging member on the carriage in the opposite stroke direction of the carriage.

5. In a knitting machine for knitting a continuous elastic fabric having an inelastic portion, the combination with a knitting mechanism for forming a looped thread, and including a thread guide for inlaying an elastic thread in the loops of the looped thread throughout the length of the fabric of an auxiliary thread guide for inlaying an inelastic thread in the loops of the looped thread in parallel relation to and simultaneously with the inlaying of the elastic thread therein by the elastic thread guide, a reciprocatory carriage for simultaneously moving said guides, and means for throwing said auxiliary thread guide into and out of action at spaced points between the limits of opposite carriage strokes independently of the action of the elastic thread guide, whereby to inlay the auxiliary inextensible thread with the elastic thread in the loops of a predetermined portion of the fabric only, said means comprising a tilting engaging device on the carriage having opposite extending engaging arms, spaced engaging members on the carriage arranged on opposite sides of the auxiliary thread guide for engagement with the respective arms of the tilting engaging device, and stop devices arranged at predetermined points on opposite sides of the carriage in the direction of its strokes, said stop devices operating to tilt the engaging device to shift the arm thereof which is in engagement with an engaging member on the carriage in one stroke direction of the carriage out of engagement with said arm and to shift the other arm of said engaging device into position to be engaged by the other engaging member on the carriage in the opposite stroke direction of the carriage.

6. In a knitting machine for knitting a continuous elastic fabric having an inelastic portion, the combination with a knitting mechanism for forming a looped thread, and including a thread guide for inlaying an elastic thread in the loops of the looped thread throughout the length of the fabric of an auxiliary thread guide for inlaying an inelastic thread in the loops of the looped thread in parallel relation to and simultaneously with the inlaying of the elastic thread therein by the elastic thread guide, a reciprocatory carriage for simultaneously moving said guides, and means for throwing said auxiliary thread guide into and out of action at spaced points between the limits of opposite carriage strokes independently of the action of the elastic thread guide, whereby to inlay the auxiliary inextensible thread with the elastic thread in the loops of a predetermined portion of the fabric only, said means comprising a tilting engaging device on the carriage having oppositely extending engaging arms, yieldingly mounted spring pressed engaging members on the carriage arranged on opposite sides of the auxiliary thread guide for engagement with the respective arms of the tilting engaging device, and stop devices arranged at predetermined points on opposite sides of the carriage in the direction of its strokes, said stop devices operating to tilt the engaging device to shift the arm thereof which is in engagement with an engaging member on the carriage in one stroke direction of the carriage out of engagement with said arm and to shift the other arm of said engaging device into position to be engaged by the other engaging member on the carriage in the opposite stroke direction of the carriage.

7. In a knitting machine for knitting a continuous elastic fabric having an inelastic portion, the combination with a knitting mechanism for forming a looped thread, and including a thread guide for inlaying an elastic thread in the loops of the looped thread throughout the length of the

fabric, of an auxiliary thread guide for inlaying an inelastic thread in the loops of the looped thread in parallel relation to and simultaneously with the inlaying of the elastic thread therein by the elastic thread guide, a reciprocatory carriage for simultaneously moving said guides, and means for throwing said auxiliary thread guide into and out of action at spaced points between the limits of opposite carriage strokes independently of the action of the elastic thread guide, whereby to inlay the auxiliary inextensible thread with the elastic thread in the loops of a predetermined portion of the fabric only, said means comprising a tilting engaging device on the carriage having opposite extending engaging arms provided with inclined end portions having notches, spaced engaging members on the carriage arranged on opposite sides of the auxiliary thread guide for engagement with the notches of the respective arms of the tilting engaging device, and stop devices arranged at predetermined points on opposite sides of the carriage in the direction of its strokes, said stop devices having resilient guide members to engage the ends of the coacting arms of the tilting engaging device and inclined surfaces to engage the inclined surfaces of said arms and operating to tilt the engaging device to shift the arm thereof which is in engagement with an engaging member on the carriage in one stroke direction of the carriage out of engagement with said arm and to shift the other arm of said engaging device into position to be engaged by the other engaging member in the opposite stroke direction of the carriage.

8. In a knitting machine for knitting a continuous elastic fabric having an inelastic portion, the combination with a knitting mechanism for forming longitudinally extending looped threads, and a thread guide for inlaying an elastic thread in the loops of the looped thread throughout the fabric of a rack bar having teeth spaced in gaged relation to the needles of the knitting mechanism, an auxiliary inelastic thread guide movable with the elastic thread guide for inlaying an inelastic thread in the loops of the looped thread with the inlaying of an elastic thread therein by the elastic thread guide, a reciprocatory carriage for simultaneously moving said thread guides, engaging members on the inelastic thread guide and carriage connectible and disconnectible for coupling said guide to and uncoupling it from the carriage for movements with the carriage on each of its opposite strokes, and adjustable stop devices on opposite sides of the inelastic thread guide for uncoupling said engaging members at a predetermined point in the travel of the carriage in each direction and setting said devices for coupling engagement during the travel of the carriage in the reverse direction, said stop devices having members for locking engagement with selected teeth of the rack gaged with respect to certain needles, whereby indicated needles may be removed or rendered inactive at points determining the end margins of the inelastic portion formed by the inlaying of the inelastic thread.

9. The combination with a knitting mechanism for knitting a continuous elastic fabric having an inelastic portion, said fabric being formed of a looped thread and an elastic thread inlaid in the loops of the looped thread, and said mechanism including a guide for elastic thread, of means coacting with said guide for inlaying an inelastic thread in the loops of the looped thread parallel with the elastic thread along a predetermined portion of the fabric, said means comprising an auxiliary guide for the inelastic thread cooperating with the elastic thread guide to simultaneously inlay said threads, a reciprocating carriage for moving said guides simultaneously for such inlaying of the threads, and means for disconnecting the inelastic thread guide from the carriage at predetermined points in the travel of the carriage means for discontinuing the action of said guide and the inlaying of the inelastic thread, whereby the continued movement of the elastic thread guide for continued independent inlaying of the elastic thread in the further travel of the carriage means is permitted.

10. The combination with a knitting mechanism for knitting a continuous elastic fabric having an inelastic portion, said fabric being formed of a thread having rows of loops and an elastic thread inlaid in the loops of the looped thread, and said mechanism including a guide for elastic thread, of means coacting with said guide for inlaying an inelastic thread parallel with the elastic thread in the loops of the looped thread along the predetermined portion of the fabric, said means comprising an auxiliary guide for the inelastic thread arranged in advance of and cooperating with the elastic thread guide to simultaneously inlay said threads, a carriage means for moving said guides simultaneously for such inlaying of the threads, means for disconnecting the inelastic thread guide from the carriage at a predetermined point in its travel for discontinuing the travel of said inelastic thread guide and the inlaying of the elastic thread, whereby the continued movement of the elastic thread guide for continued independent inlaying of the thread is permitted, and a resilient mounting for the auxiliary guide adapting said guide to be engaged by and moved out of the path of the elastic thread guide in the continued travel of the elastic thread guide when the travel of the inelastic thread guide is discontinued.

LOUIS ROQUES.