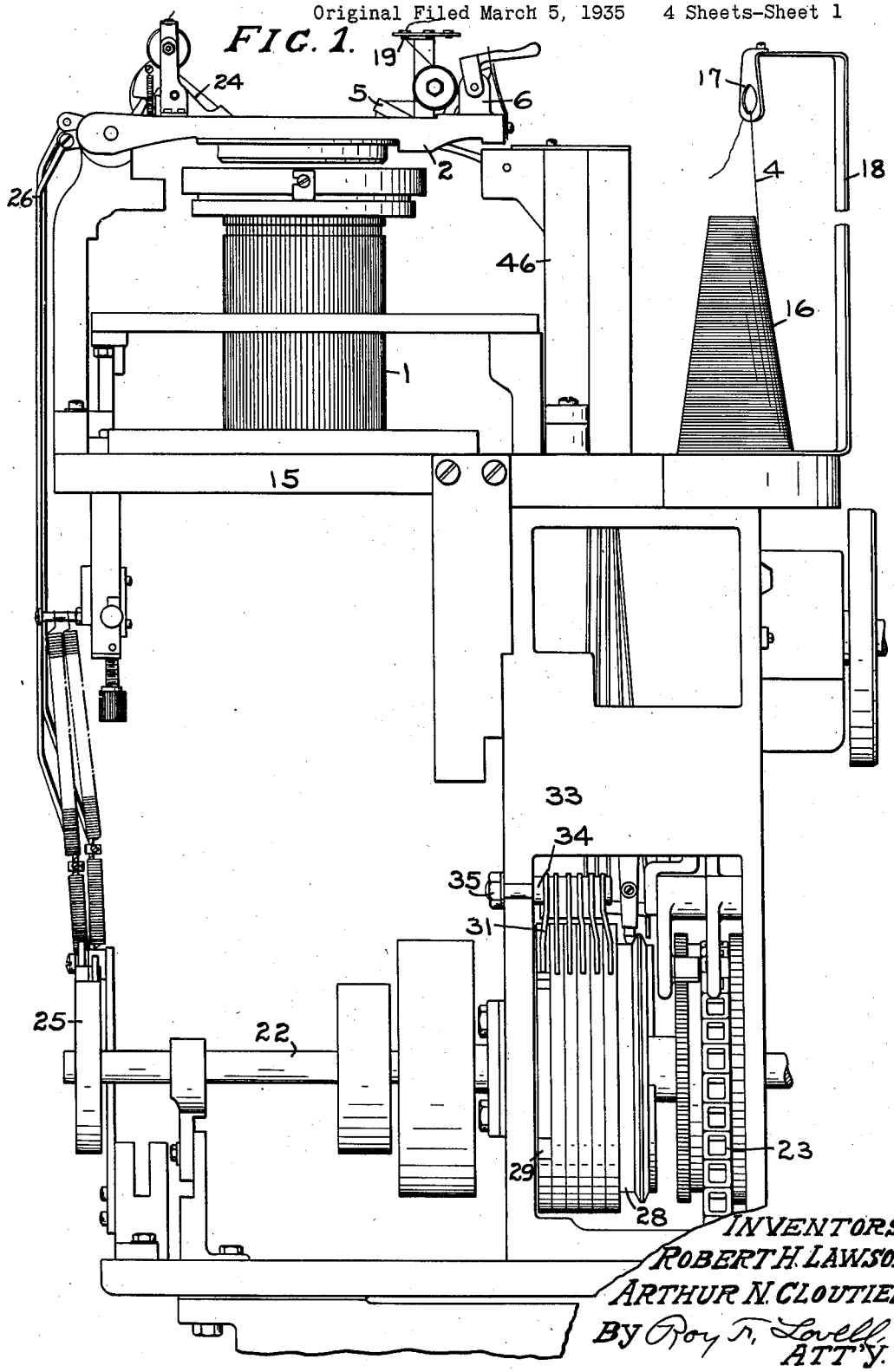
Aug. 1, 1939. R. H. LAWSON ET AL 2,168,224

KNITTING MACHINE FOR INCORPORATING AN ELASTIC THREAD OR YARN IN A FABRIC

Original Filed March 5, 1935 4 Sheets-Sheet 1

FIG. 1.



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Original Filed March 5, 1935 4 Sheets-Sheet 2

FIG. 2.

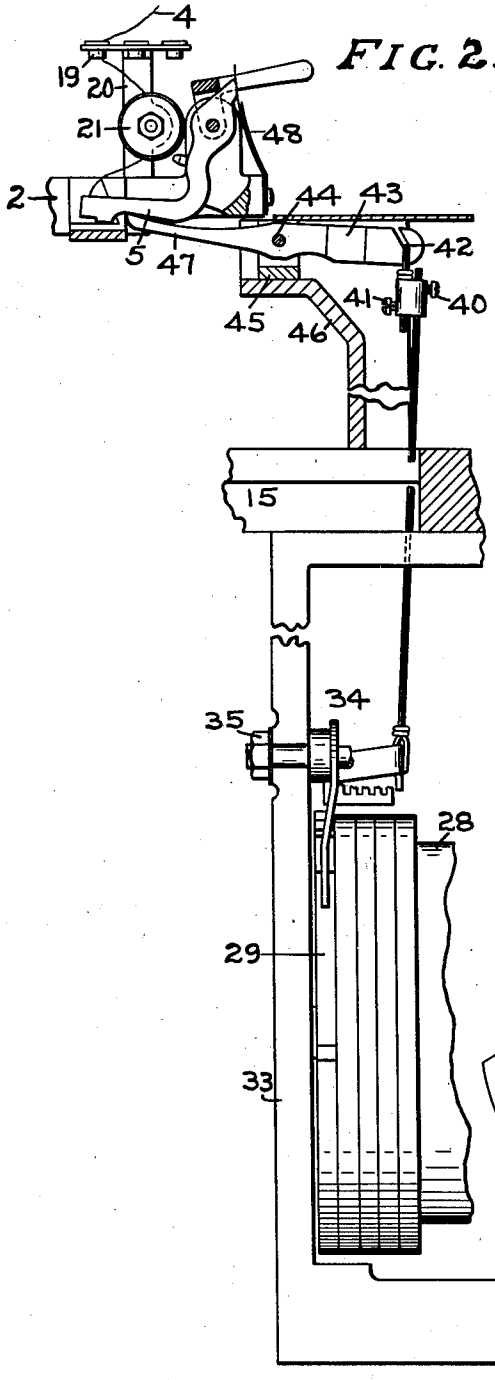
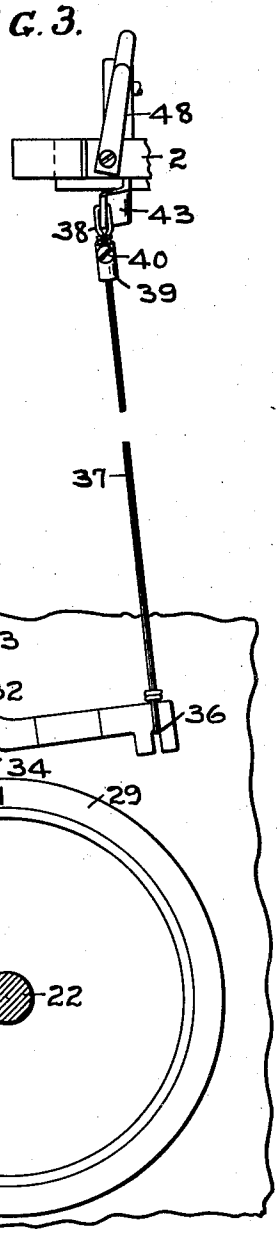


FIG. 3.



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Original Filed March 5, 1935 4 Sheets-Sheet 3

FIG. 4.

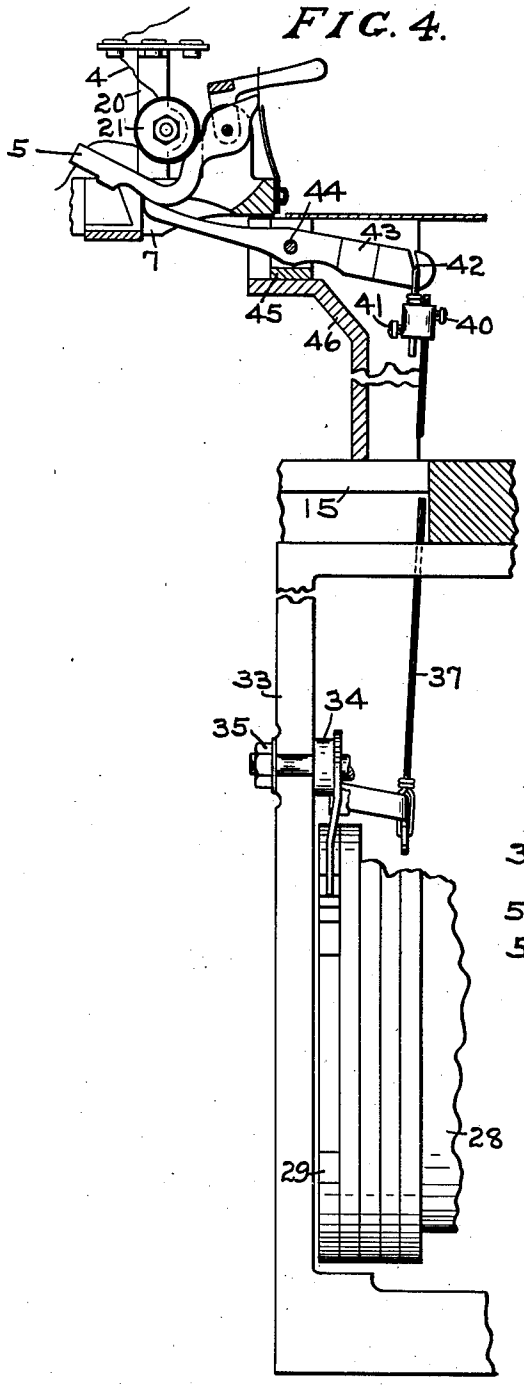


FIG. 5.

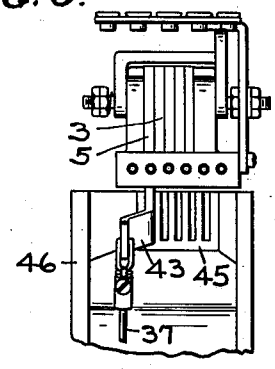
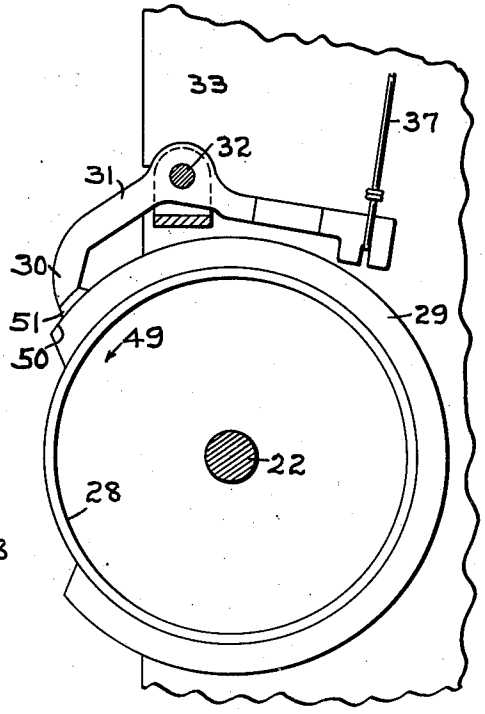


FIG. 5a.



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Original Filed March 5, 1935 4 Sheets-Sheet 4

FIG. 10.

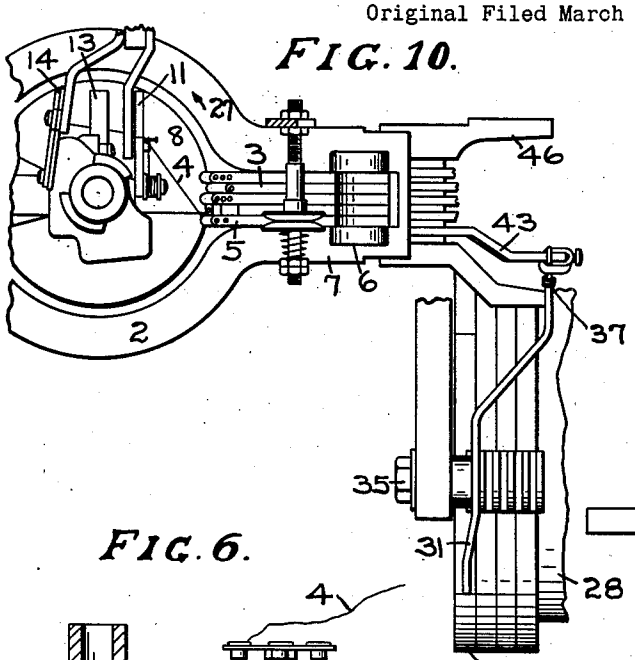


FIG. 9.

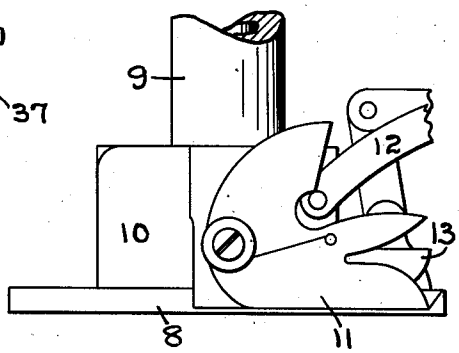


FIG. 6.

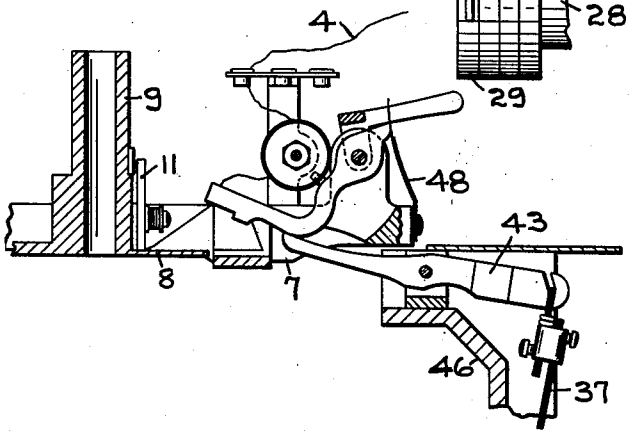


FIG. 7.

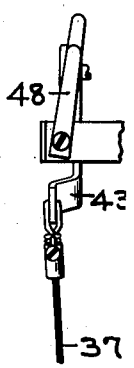
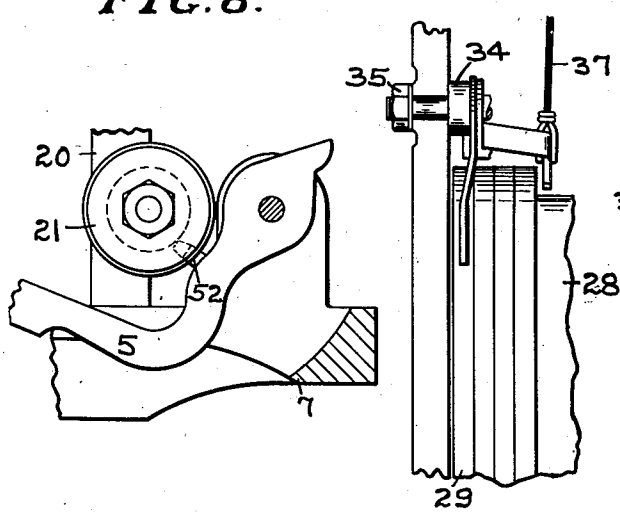
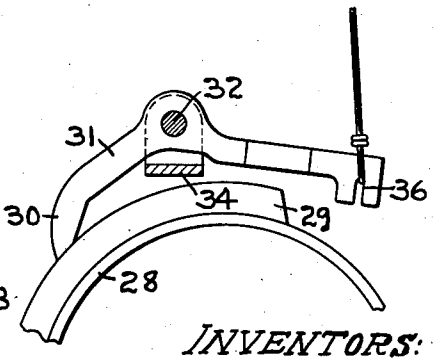


FIG. 8.





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UNITED STATES PATENT OFFICE

2,168,224

KNITTING MACHINE FOR INCORPORATING AN ELASTIC THREAD OR YARN IN A FABRIC

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Application March 5, 1935, Serial No. 9,450
Renewed July 26, 1938

12 Claims. (Cl. 66—134)

This invention relates to improvements in knitting machines and methods of knitting and especially to the knitting of fabrics such as stockings or half hose in which an elastic yarn or thread is incorporated during knitting. More specifically the invention relates to the knitting of an elastic or so-called garter top for stockings.

In the drawings:

Fig. 1 is a view in front elevation of so much of a knitting machine as pertains to the present invention;

Fig. 2 is a front elevational view, partly in section, showing a yarn guide for feeding the elastic yarn to the needles as well as connections for controlling the movements of the said yarn guide;

Fig. 3 is a view similar to Fig. 2 but in side elevation;

Fig. 4 is a view similar to Fig. 2, showing another phase of the knitting cycle;

Figs. 5 and 5*a* are elevational views similar to Fig. 3 but at the phase of the knitting cycle illustrated in Fig. 4;

Fig. 6 is a view similar to Fig. 4, showing a still later phase of the knitting cycle;

Fig. 7 is a side elevational view corresponding in phase to Fig. 6;

Fig. 8 is a fragmentary detail view partly in section and upon an enlarged scale showing the cooperation between the lever feeding the elastic thread to the needles and a disc tension for acting upon the said elastic thread;

Fig. 9 is a fragmentary detail view in elevation showing the mechanism for clamping the main and auxiliary yarns including the elastic yarn; and

Fig. 10 is a plan view of the mechanism specifically illustrated in Figs. 2–9 inclusive.

In Fig. 1 so much of a knitting machine is shown as is necessary properly to illustrate the invention, the knitting machine, for illustrative purposes, being shown as similar to that shown in the Hemphill Patent 933,443, September 7, 1909. The needle cylinder 1 is preferably of a rotary type, the cams (not shown) for actuating the needles (not shown) being stationary. Carried by the latch ring 2 are a series of yarn guides 3, Fig. 10, the yarn guide for feeding the elastic yarn 4 to the needles being specially designated by the numeral 5, all the yarn guides 3 being pivotally mounted between upstanding ears 6 carried by an extension or mouth piece 7 of the latch ring 2. The yarn guides 3 with the exception of the elastic yarn guide 5 are controlled in any suitable manner, the movements of the guides and the control of the needles depending upon the character of fabric to be knitted. As this invention is particularly concerned with the incorporating of an elastic thread or yarn, further description of the operation of the other yarn guides and of the needles will be omitted. The so-called binder plate 8 is carried by the latch ring in any convenient manner and is located within the circle of needles in the usual manner, the said plate 8 having an upstanding supporting post 9 and a bracket 10 to which is pivotally connected an automatically actuated clamp 11, movements being imparted to the said clamp 11 by automatic operation of an arm 12. Also carried by or mounted upon the plate 8 is a loosely mounted auxiliary clamp 13 and on the other side thereof (in the direction of rotation of the needles) is an automatically operated yarn severing mechanism 14. On an extension of the so-called circular base 15 is mounted a bobbin 16 which carries the elastic thread 4, said elastic thread passing through an eyelet 17 carried by an upstanding bracket 18 and passing from there through a second eyelet 19, the latter being carried by an upstanding bracket 20 mounted upon the latch ring 2. From the eyelet 19 the elastic thread passes between opposed discs 21 constituting a so-called disc tension, the thread from there passing through the yarn lever 5 and to the needles. The cams controlling the various operations of the knitting machine are mounted upon a rotary cam shaft 22 carried by the frame in the usual manner, the movements of the shaft, as usual, being controlled by a pattern chain 23. At the left-hand side of the machine, Fig. 1, is located at least one yarn guide 24 through which a yarn or yarns is or are fed to dial and cylinder needles if and when rib fabric is being knitted. The movements of the guide or guides 24 is or are controlled by cams carried by a disk or drum 25 fast on shaft 22, the connections, including links 26, causing the guide or guides 24 to be moved to and from feeding position at the proper times.

When knitting on machines like that shown in the Hemphill patent and illustrated in the several figures of these drawings, the needles move, during circular knitting, continuously in the direction of the arrow 27, Fig. 10, and when a yarn guide 3 is elevated to an inactive position, the yarn passing through the said guide is carried in the direction of the arrow by the last needle knitting the same under clamp 11 which is autotomatically open or elevated at that time. Continued rotation of the needles also carrying the yarn under the loosely mounted clamp 13 and

under an elevated blade of the yarn severing mechanism 14. Thereafter restoration of the clamp 11 and movable blade of the yarn severing mechanism to their original positions severs the yarn and clamps the end thereof between the lower edge of the clamp 11 and the upper surface of the recessed plate 8. When, thereafter, the said yarn is to be again knitted by the needles the said yarn guide moves down to a feeding position and after the leading needles have knitted the yarn continued rotation of the said leading needles withdraws the end held between the clamp 11 and the plate 8.

After an elastic yarn, such as the yarn 4, has been fed to the needles during the knitting of a sufficient number of courses to constitute an elastic top, or for any other purpose, the guide 5 is elevated by rotation of the drum 28 upon which is rigidly mounted a cam row 29, the latter being in line with the toe 30 of a lever 31 pivoted at 32 to the upright portion of the frame specially designated by the numeral 33 and through the instrumentalities of a bracket 34 fastened to the upright 33 as by means of a screw or bolt 35. The end of the other arm of the lever 31 is notched as at 36 and within the notch is fixed a link 37 the upper end of which is adjustably fastened to a short companion link 38 as by means of a collar 39 and set screws 40, 41. The link 38 in turn is seated in a notch 42 of a lever 43 pivoted at 44 to ears of a plate 45 and thereby to a so-called yarn lever box 46 which is mounted upon the circular base 15. The other end 47 of the lever 43 engages under the lever 5 in the customary manner and when raised causes elevation of the said lever 5 against the tension of a leaf spring 48, the latter being fastened to the latch ring 2 in the usual manner. As hereinbefore stated rotation of the drum 29 in the direction of the arrow 49, Fig. 3 causes the toe 40 of the lever 31 to move up and rest upon the cam 29 at 50, one move of the drum 28 serving to effect the said movement of the toe 30 which occurs at the completion of the incorporation of the elastic thread. As hereinbefore indicated, rotation of the last needle knitting or engaging the elastic yarn 5 carries the said yarn under the clamps 11 and 13 and into the yarn severing mechanism 14. During the knitting of a stocking or other article it is frequently desirable to change yarns and to effect the change of yarns it is necessary to elevate the clamp 11, the loosely mounted clamp 13 then being the only means for temporarily retaining the non-knitting yarns until the clamp 11 is again restored to the yarn clamping position shown in Fig. 9. Now ordinary yarns do not tend to withdraw from the loosely mounted clamp 13 even when the automatically actuated clamp 11 is in an elevated position, but the elastic yarn being knitted under some tension exerted by the tension discs 21, when released by the automatically actuated clamp 11, tends to withdraw from the loosely mounted clamp 13 and to overcome this tendency the yarn guide 5 is specially actuated in the manner now to be described.

After the yarn 4 has been carried under the clamp 11 (which holds the same with sufficient force to prevent the said yarn from pulling back through the clamp) and before the automatically actuated clamp 11 is again elevated for the withdrawal of some other yarn, it is desirable that a slack be produced in the yarn 4 which slack releases the tension of the yarn 4 and robs the yarn 4 of a tendency to withdraw from under the clamp 13 which at that time alone serves to retain the withdrawn yarn 4. It is for the purpose of providing a slack in the yarn 4 that a supplemental cam 51 is mounted upon the cam row 29. Any time after the guide 5 has been elevated by the toe 30 resting upon the cam 29 at 50 and before the clamp 11 is again elevated, the drum 29 is given another move in the direction of the arrow 49 which causes the toe 30 first momentarily to rest upon the cam 51 and then in the same move of the drum 28, to drop onto the surface of the cam 29. The aforesaid movement imparted to the toe 30 of the lever 31 causes the guide 5 to move to the position shown in Figs. 4, 5a which movement in turn causes a thin and preferably knife-edged lug 52, Figs. 6 and 8, to wedge itself between and separate the discs 21 thereby relieving the yarn from the tension exerted by the said disc and permitting the aforesaid movement of the yarn lever 5 to the position in Figs. 4 and 5a freely to draw additional yarn 4 from the bobbin 16. The additional yarn drawn from the bobbin 16 in the manner just described produces sufficient slack in the yarn 4 to rob the said yarn of its tendency to withdraw from the clamp 13 which alone would not prevent withdrawal of the tensioned yarn 4.

For purposes of illustration the slack in the yarn 4 is shown as produced by an extra or added movement of the yarn guide 5 through which the said yarn 4 passes from the source of yarn supply to the needles; however, it is evident that the yarn guide itself is not necessarily involved in a means or mechanism for effecting the desired purpose, e. g., the slack could be produced as by a positively driven feed wheel or wheels around or between which the yarn could pass, the roll or rolls in such case serving as a positive feeding means for the said elastic yarn.

Although a latch ring has been shown and described, the invention is in no wise limited to the use of latch needles as spring needles or so-called latchless needles may be used.

Although the particular character of fabric in which the elastic yarn 4 is to be incorporated is immaterial, preferably, the said elastic yarn is incorporated in a rib fabric; the elastic yarn may, however, be incorporated in a plain knitted, i. e., non-rib, fabric.

The elastic yarn is, preferably, occasionally knitted into the fabric as, for example, when the yarn is first introduced to the needles and when it is withdrawn from feeding relation with respect to the needles although said reference to the places where the said elastic yarn is preferably knitted into the fabric is not intended to preclude the knitting of the elastic yarn at other places. Furthermore, it is not essential that the yarn be knitted at any of the wales or in any of the courses of the fabric, so long as it is frictionally retained as by passing between adjacent wales of the fabric; and, in such a case, if the mere frictional engagement of the yarn 4 by adjacent wales of the fabric between which the yarn passes is not sufficient, the elastic may be tied or otherwise fixed in position at some of the wales of the fabric.

The terms and limitations before mentioned in the foregoing description are by way of illustration only and not for the purpose of limiting the invention to the precise details of construction or methods of operation recited, it being the intention not to limit the claims except as determined by the specific limitations in the claims themselves.

We claim:

1. A knitting machine having therein knitting instrumentalities and means including a yarn

guide for feeding an elastic thread to the instrumentalities for incorporating it into a fabric, a supply from which the elastic yarn is to be drawn and tension means through which it is passed before being taken by the instrumentalities whereby said elastic yarn will be knitted under tension, cam means for moving said yarn guide to a non-feeding position and a yarn clamp for retaining said elastic yarn when it has been withdrawn from the instrumentalities, means on the yarn guide for acting on the tension means to nullify its effect on the yarn, and other cam means for imparting to said yarn guide after tension has been removed from the yarn, an additional movement whereby slack yarn will be drawn from the supply.

2. A knitting machine having therein knitting instrumentalities and means including yarn guides for feeding yarns, a yarn guide for feeding an elastic thread to the instrumentalities for incorporating it into a fabric, a supply from which the elastic yarn is to be drawn and tension means through which it is passed before being taken by the instrumentalities whereby said elastic yarn will be knitted under tension, cam means for moving said yarn guide to a nonfeeding position and a yarn clamp for retaining the main yarns and said elastic yarn when withdrawn from the instrumentalities, means on the yarn guide for acting on the tension means to nullify its effect on the yarn, and other cam means for imparting to said yarn guide after tension has been removed from the yarn, an additional movement whereby slack yarn will be drawn from the supply.

3. A knitting machine having therein knitting instrumentalities and means including yarn guides for feeding yarns and a guide for feeding an elastic thread to the instrumentalities for incorporating it into a fabric, a supply from which the elastic thread is to be drawn and tension means through which it is passed before being taken by the instrumentalities whereby said elastic thread will be fed under tension, cam means for moving said elastic thread guide to a non-feeding position and a yarn clamp for retaining the main yarns and said elastic thread when withdrawn from the instrumentalities, means on the elastic thread guide acting on the tension means to nullify its effect on the elastic thread, and other cam means for imparting an additional movement to said guide after tension has been removed from the yarn whereby slack yarn will be drawn from the supply.

4. A knitting machine having therein knitting instrumentalities and means including yarn guides for feeding yarns, a guide for feeding an elastic thread to the instrumentalities for incorporating it into a fabric, a supply from which the elastic thread is to be drawn and tension means through which it is passed before being taken by the instrumentalities whereby said elastic thread will be fed under tension, cam means for moving said elastic thread guide to a non-feeding position and a yarn clamp for retaining the main yarns and said elastic thread when withdrawn from the instrumentalities, means on the elastic thread guide for acting on the tension means to nullify its effect on the thread, and other cam means for imparting an additional movement to said elastic thread guide after tension has been removed from the thread whereby slack thread will be drawn from the supply.

5. A knitting machine having therein knitting instrumentalities and means including yarn guides for feeding yarns and a guide for feeding an elastic thread to the instrumentalities for incorporating it into a fabric, a supply from which the elastic thread is to be drawn and tension means through which it is passed before being taken by the instrumentalities whereby said elastic thread will be fed under tension, cam means for moving said elastic thread guide to a non-feeding position and a yarn clamp for retaining the main yarns and said elastic thread when withdrawn from the instrumentalities, means on the elastic thread guide acting on the tension means to nullify its effect on the elastic thread.

6. A knitting machine having therein knitting instrumentalities and means including yarn guides for feeding yarns, a guide for feeding an elastic thread to the instrumentalities for incorporating it into a fabric, a supply from which the elastic thread is to be drawn and tension means through which it is passed before being taken by the instrumentalities whereby said elastic thread will be fed under tension, cam means for moving said elastic thread guide to a non-feeding position and a yarn clamp for retaining the main yarns and said elastic thread when withdrawn from the instrumentalities, means on the elastic thread guide for acting on the tension means to nullify its effect on the thread.

7. In a knitting machine, means for interchangeably feeding yarns to the needles, yarn clamping and severing means for the said yarns when they are temporarily withdrawn from feeding relation with respect to the needles, other means for feeding a relatively elastic yarn to some, at least, of the needles, during a plurality of courses, means for withdrawing the said elastic yarn from feeding relation with respect to the needles, said yarn clamping means retaining the said elastic yarn so as to permit it readily to be fed again to the needles, after the knitting of the said plurality of courses has been completed, and tension relieving means for acting upon the elastic yarn after the said yarn is in the clamp and prior to subsequent opening of the clamp to avoid the possibility of the said elastic yarn withdrawing from the retaining means aforesaid.

8. A circular knitting machine having a rotary needle cylinder, means for interchangeably feeding a plurality of yarns to the needles of the knitting machine and for feeding a relatively elastic yarn to some, at least, of the needles during the knitting of a plurality of courses as to effect the knitting of a garter top in a stocking or half hose, tensioning means operatively located between the elastic yarn supply and the guide by which the said elastic yarn is fed to the needles, means for clamping and severing yarns withdrawn from feeding relation with respect to the needles, in combination with means for imparting a movement to the elastic yarn guide to effect the withdrawal of the elastic yarn from feeding relation with respect to the needles, and means for thereafter imparting an additional movement to the said yarn guide, the last movement of the elastic yarn guide relieving the elastic yarn from the tension theretofore exerted thereon by causing additional elastic yarn to be drawn from the source of supply while held in said clamping means.

9. A knitting machine having a rotary needle cylinder, means for clamping and severing yarns when they are withdrawn from feeding relation with respect to the needles, said means including an automatically operated clamping means and a supplemental clamp for temporarily retaining the ends of withdrawn yarns when the automati-

cally actuated clamp is in a non-clamping position, means for feeding a plurality of yarns to the needles one of which is relatively elastic, means for tensioning the elastic yarn while it is being incorporated in the fabric, means for stopping the feeding of the elastic yarn to the needles, means then relieving the elastic yarn from tension while held by the automatically operated clamping means so that a subsequent movement of the automatically actuated clamp to a non-clamping position will not result in the withdrawal of the said elastic yarn from the supplemental clamp.

10. A circular knitting machine having a rotary needle cylinder, means for interchangeably feeding a plurality of yarns to the needles of the knitting machine and for feeding a relatively elastic yarn to some, at least, of the needles during the knitting of a plurality of courses as to effect the knitting of a garter top in a stocking or half-hose, tensioning means operatively located between the elastic yarn supply and the guide by which the said elastic yarn is fed to the needles, means for clamping and severing yarns withdrawn from feeding relation with respect to the needles, in combination with means for imparting a movement to the elastic yarn guide to effect the withdrawal of the elastic yarn from feeding relation with respect to the needles, means movable with the said yarn guide, and means for imparting an additional movement to the said yarn guide while held in the clamp thereby acting upon the tensioning means for the elastic yarn to relieve the tensioning imposed upon the elastic yarn.

11. A circular knitting machine having a rotary needle cylinder, means for interchangeably feeding a plurality of yarns to the needles of the knitting machine and for feeding a relatively elastic yarn to some, at least, of the needles during the knitting of a plurality of courses as to effect the knitting of a garter top in a stocking or half hose, tensioning means operatively located between the elastic yarn supply and the guide by which the said elastic yarn is fed to the needles, means for clamping and severing yarns withdrawn from feeding relation with respect to the needles, in combination with means for imparting a movement to the elastic yarn guide to effect the withdrawal of the elastic yarn from feeding relation with respect to the needles, and means for thereafter imparting an additional movement to the said yarn guide while the yarn is held in the yarn clamping means, said yarn guide having a lug thereon whereby the last movement of the elastic yarn guide will relieve the elastic yarn from tension theretofore exerted thereon by causing additional elastic yarn to be drawn from the source of supply.

12. In a knitting machine, means for interchangeably feeding yarns to the needles, yarn clamping and severing means for the said yarns when they are temporarily withdrawn from feeding relation with respect to the needles, other means for feeding a relatively elastic yarn to some, at least, of the needles, during a plurality of courses, means for withdrawing the said elastic yarn from feeding relation with respect to the needles, said yarn clamping means retaining the said elastic yarn so as to permit it readily to be fed again to the needles, after the knitting of the said plurality of courses has been completed, and tension relieving means for acting upon the elastic yarn after the said yarn is in the clamp and prior to subsequent opening of the clamp including a cam drum, a cam thereon for effecting the withdrawal of the said elastic yarn and for thereafter imparting an additional movement to the elastic yarn thereby to pull more elastic yarn from the source of supply for the purpose of relieving the said elastic yarn from tension.

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