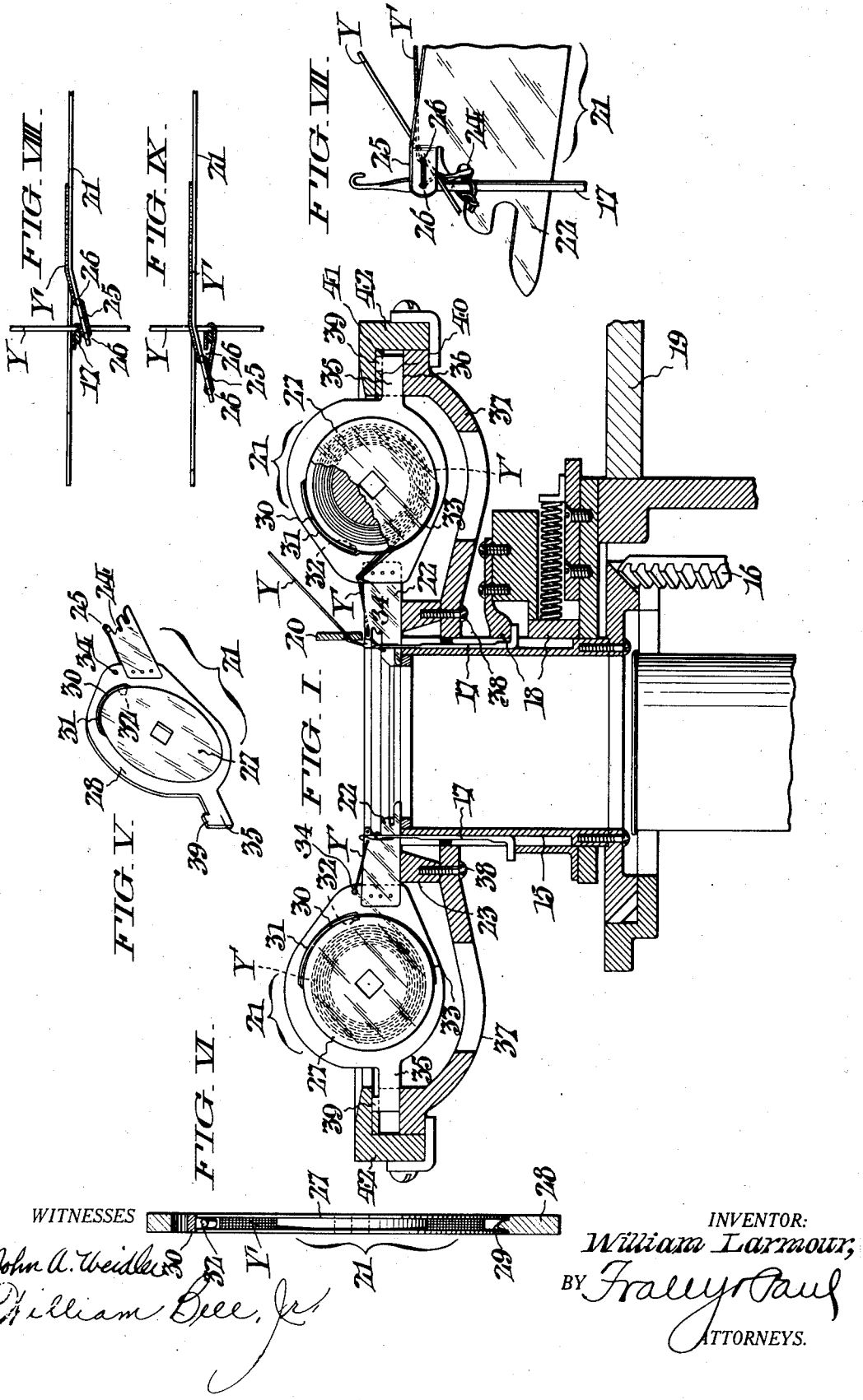
Aug. 30, 1932. W. LARMOUR 1,874,198

KNITTING MACHINE

Filed Feb. 19, 1930 4 Sheets-Sheet 1



WITNESSES

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KNITTING MACHINE

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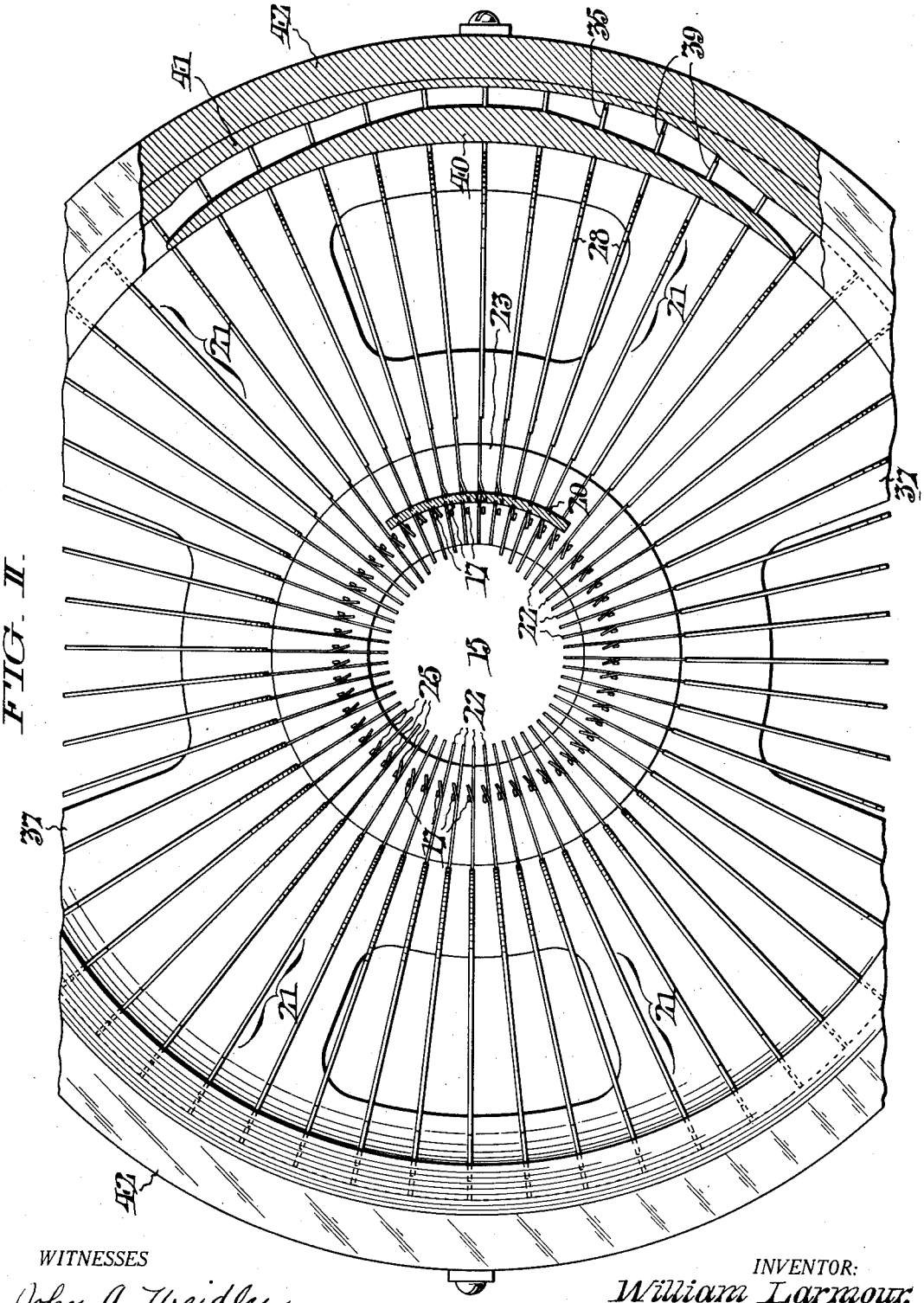


FIG. II.

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KNITTING MACHINE

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FIG. III.

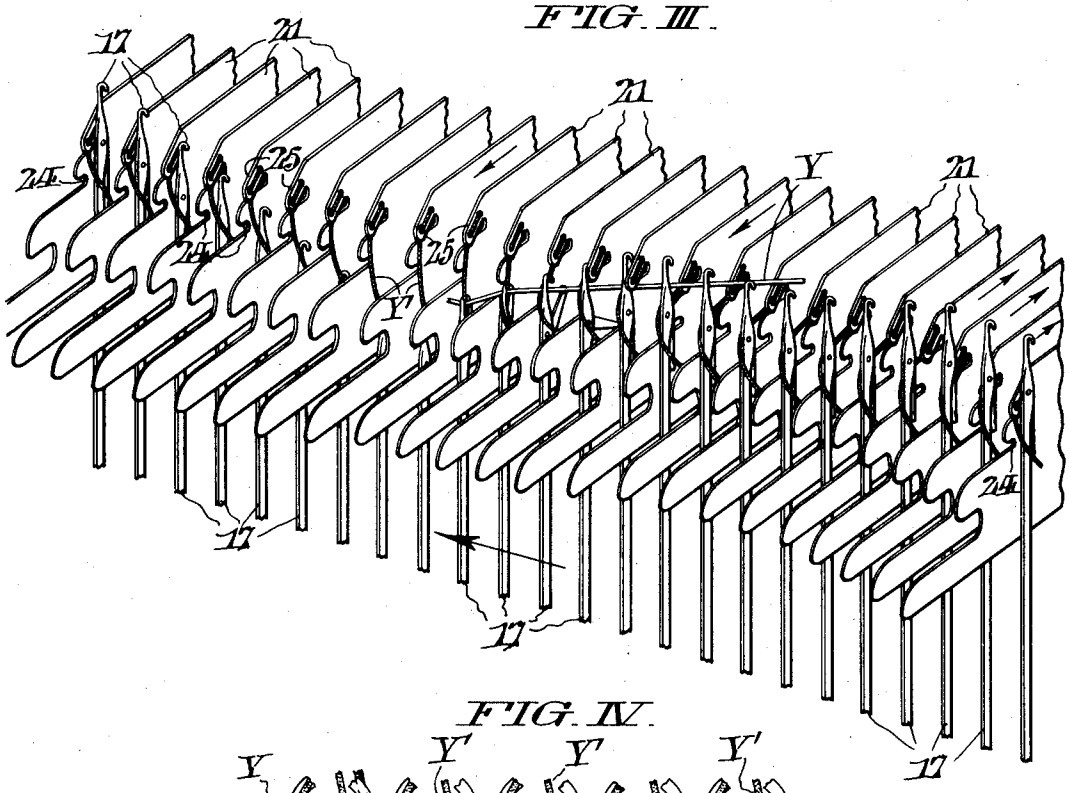
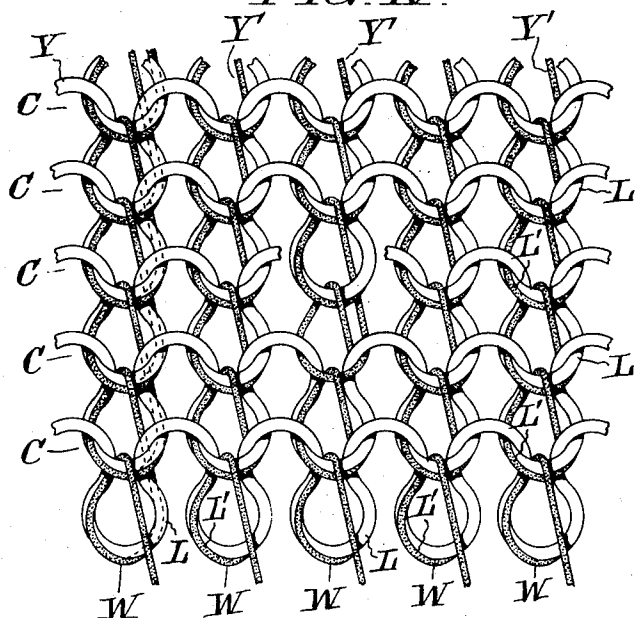


FIG. IV.



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KNITTING MACHINE

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FIG. X.

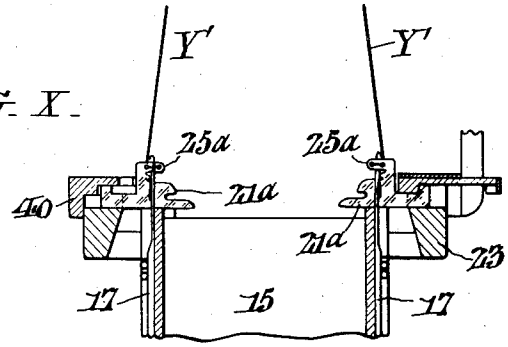
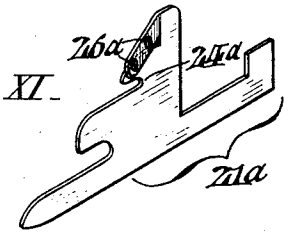


FIG. XI.



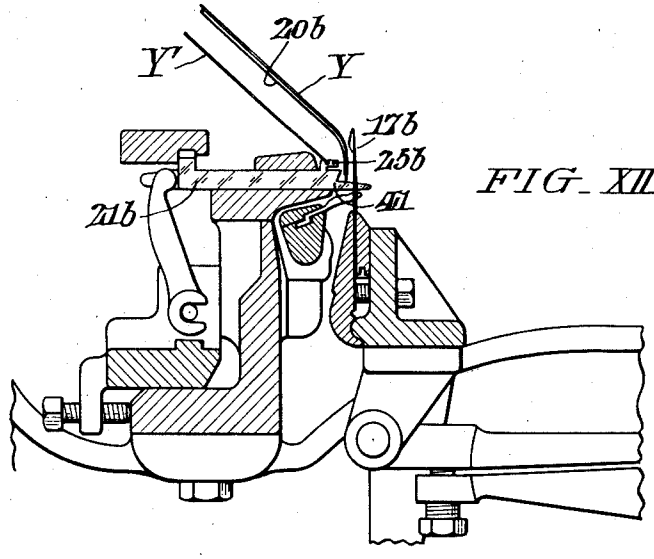
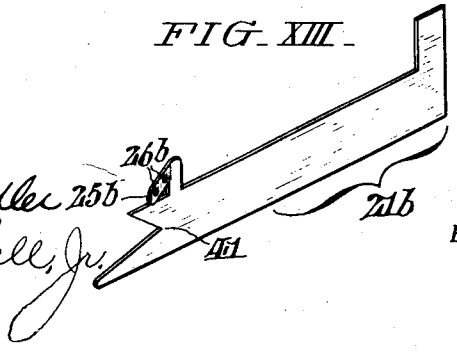


FIG. XII.

FIG. XIII.



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UNITED STATES PATENT OFFICE

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KNITTING MACHINE

Application filed February 19, 1930. Serial No. 429,550.

This invention relates to knitting machines, and has reference more particularly to machines for producing anti-ravel and striped fabric such as shown and described in a co-pending application, Serial Number 429,549 filed by me concurrently herewith.

In the fabric of the application supra, longitudinally extending chains of loops, formed from as many separate auxiliary yarns, serve to continuously interlock the horizontal courses of the body loops of the fabric formed from a main yarn with incidental production of pin stripe effects when main and auxiliary yarns of contrasting shades or colors are employed in the knitting.

The main objects of my present invention are to enable production of ravel-proof knitted fabric having the above indicated characteristics, in a rapid and economic manner; and to attain this desideratum through provision, in connection with both circular and flat knitting machines, of simple and reliable mechanism suitable for the purpose.

Other objects and attendant advantages will be manifest from the detailed description and attached drawings, wherein Fig. I shows an axial sectional view of the knitting head of a circular knitting machine conveniently embodying my invention.

Fig. II is a fragmentary plan view of the knitting head with parts thereof broken away and other parts in section.

Fig. III is a perspective view showing the manner of cooperation between the needles and associate instrumentalities or web holders whereby the auxiliary yarns are fed individually to the needles concurrently with the main or body yarn.

Fig. IV is a diagrammatic view showing the texture of the ravel proof fabric produced by the machine.

Fig. V is a perspective view of one of the auxiliary yarn feeding instrumentalities.

Fig. VI is a cross sectional view of one of the instrumentalities and drawn to a larger scale.

Fig. VII is a fragmentary perspective view to supplement Fig. III and show more clearly how the auxiliary yarns are fed to the individual needles concurrently with the serving of the main or body yarn to them.

Fig. VIII is a diagrammatic plan view of the parts illustrated in Fig. VII.

Fig. IX is a view, similar to Fig. VIII, showing the parts in different relative positions incident to feeding of the main and auxiliary yarns.

Fig. X is a sectional view, like Fig. I, of a circular knitting machine embodying a modification of my invention.

Fig. XI is a perspective view of the modified type of auxiliary yarn feeding instrumentality used in the organization of Fig. X.

Fig. XII is a fragmentary cross sectional view of a flat knitting machine embodying my invention; and,

Fig. XIII is a perspective view of the auxiliary yarn instrumentality employed in the flat knitting machine of Fig. XII.

To facilitate understanding of my invention, I will first briefly describe, by reference to Fig. IV of these illustrations, the texture of the ravel-proof fabric with the production of which the present improvements are concerned. As shown, the body of the fabric is knit as a plain web from a main or body yarn which is indicated as being white, and designated by the letter Y. The several horizontal courses C, it will be noted, are continuously interlocked by loops L′ of chains which extend longitudinally of the fabric and which are formed from as many separate auxiliary yarns Y′, these being distinguished from the main yarn Y in the drawings by stippling. It will be further observed that the chain loops L′ are interknitted only with the loops L which constitute the lengthwise rib of needle wales W so that the natural lateral elasticity of the fabric is left unimpaired.

In the circular knitting machine depicted in Figs. I and II, the needle cylinder 15 is continuously rotated by bevel gearing 16 with impartation of up and down movement to the needles 17 by cams 18 on the stationary bed plate 19, and formation of plain fabric from the main or body yarn Y which is directed to said needles through the eye of a stationary guide 20. Cooperating with the needles 17 incident to formation of the fabric loops as

just explained, are transversely reciprocating instrumentalities 21, whereof one is shown in perspective in Fig. V. The forward end portions 22 of these instrumentalities 21 are of thin sheet metal and supported for sliding movement between the needles 17 in the radial guide grooves of the usual sinker head 23 at the top of the needle cylinder 15; and said end portions are suitably profiled to function in the capacity of web holders in a well known way, the web holding notches being indicated at 24. Above the notch 24, the end portion 22 of each instrumentality 21 is formed with an angularly-directed forwardly projecting finger 25 which is pierced at 26, 26 (see Fig. VII) to direct an auxiliary yarn Y′, as hereinafter more fully explained, to the corresponding needle 17 concurrently with feeding to the latter of the main yarn Y. In each instance, the auxiliary yarn Y′ is supplied from a rotary bobbin 27 carried within the hollow of the enlarged circular holder portion 28 of the instrumentality 21. This bobbin 27 has the form of a flat spool and is retained through engagement of its peripheral groove with an inwardly projecting circumferential flange 29 that extends half way around the opening in the holder portion 28 of the instrumentality 21, (see Fig. VI), such engagement being maintained through cooperation of a spring finger 30, which, at one end, is anchored in an internal concentric recess 31 of said holder portion, and at its other end formed with a projection 32 to engage the peripheral groove of the bobbin 27 at a point diametrically opposite the aforementioned retaining flange 29. The holder portion 28 of each instrumentality 21 is furthermore cut away as at 33 (Fig. I) to provide a clearance so that the bobbin 27 may be released from engagement with the flange 29 against the pressure of the spring 30 and removed for the purposes of replenishing the yarn Y′. Enroute to the eyes 26 of the finger on the end portion 22 of the instrumentality 21, the yarn Y′ is directed through a guide eye 34 in the holder portion as shown in Figs. I and V. The rearward tail projections 35 of the instrumentalities 21 engage radial grooves in the circumferential shoulder 36 of a downwardly dished annulus 37 which is secured, by means of screws 38 to the bottom of the sinker head 23 so as to revolve with the needle cylinder 15. Upward butts 39 on the tail projections 35 of the instrumentalities 21 are acted upon by a cam 40, 41 on a ring 42 (Fig. II) superposed on the annulus 37 and held against rotation after the manner of an ordinary sinker cap ring by means not shown. As shown, the cams 40, 41 are suitably configured to impart the necessary radial movement to the instrumentalities 21 incident to cooperation of the latter with the needles 17 in forming fabric loops.

Incident to operation of the machine, the main yarn Y is taken by the needles 17; and a plain body fabric is produced, the instrumentalities 21 cooperating after the manner of ordinary web holders. Due to an initial inward movement of the instrumentalities 21 induced by the cam 41 just as the needles 17 are descending to take the main yarn Y, it will be seen from Figs. III, VII and VIII, that the auxiliary yarns Y′ are passed by the angularly directed fingers 25 to one side of the needles 17, whereby said auxiliary yarns are laid crosswise of the main yarn Y beneath the needle hooks. After the needles 17 have descended below the level of the fingers 25, the instrumentalities 21 are advanced still further by the cam 41, to the position shown in Fig. IX, to engage the fabric within their notches 24 and to hold it as the needles 17 rise subsequently to take new yarn. Incident to such further advance of the instrumentalities 21 it will be particularly observed from Figs. III and VIII that the fingers 25 are moved over the tops of the needles 17. Upon ensuing retraction of the instrumentalities 21, the yarns Y′ are passed to the opposite side of the needles 17. Thus, with each reciprocation of the instrumentalities 21, the auxiliary yarns Y′ are wrapped around the coordinated needles 17 with assurance of positive feeding of said yarns to them. Repetitions of the described cycle obviously result in the formation and interknitting of chain loops of the auxiliary yarns Y′ with the loops formed on the needles 17 in the regular way from the main yarn Y and in production of the ravel-proof fabric described in connection with Fig. IV.

By reference to Fig. IV once more, it will be noted that the chain loops L′ of the auxiliary yarns Y′ overlie only one side of the rib or needle wale loops L at the face of the fabric, this being due to the definite feeding of said auxiliary yarns crosswise of the main yarn Y as above explained. Thus, with the use of main and auxiliary yarns Y, Y′ of contrasting colors it is possible through my present invention, to secure sharply defined ornamental pin stripe effects in the fabric in addition to safeguarding said fabric against ravelling.

In the modification shown in Figs. X and XI, the instrumentalities 21*a* have the form of ordinary web holders except for the addition of fingers 25*a* for directing the auxiliary yarns Y′ to the needles for incorporation into chain loops. The instrumentalities 21*a* can therefore be substituted in any circular knitting machine for the usual web holders and operated by the original web holder actuating cams in the cap ring provided that slight changes are made in the configuration of such cams to predetermine the two stage inward movement of the instrumentalities 21*a* described in connection with the previous em-

bodiment. Suitable provisions are of course necessary for supporting the auxiliary yarn Y′ supply bobbins above the needle cylinder 15. Such changes and additions are however within the province of any skilled knitting machine mechanic and it has therefore been deemed unnecessary to show them in the drawings. All the corresponding parts of the machine in Fig. X are designated by the same reference numerals which were employed in Figs. I to IX.

A flat knitting machine may be readily adapted to the purposes of my invention by replacing the usual sinkers and dividers with instrumentalities such as delineated at 21*b* in Figs. XII and XIII. These instrumentalities 21*b* are provided, as shown, with forwardly extending angularly directed fingers 25*b* above their web sinking notches 41 to serve the auxiliary yarns Y′ to the needles 17*b* incident to sinking of the main yarn Y fed by the carrier 20*b* in the usual manner.

Having thus described my invention, I claim:

1. In a knitting machine, a series of needles; and a complemental series of independently movable sliding instrumentalities to cooperate with the needles in knitting fabric, said instrumentalities each embodying an apertured laterally directed portion for serving individual yarns to the respectively coordinated needles.

2. In a knitting machine, a series of needles; and a complemental series of independent sliding instrumentalities reciprocative transversely between the needles and cooperating with them in knitting fabric, said instrumentalities each embodying an apertured laterally directed angular projection for serving individual yarns to the respectively coordinated needles.

3. In a knitting machine a series of needles; and a complemental series of independently movable web holder instrumentalities to cooperate with the needles incident to knitting of fabric, said web holder instrumentalities each embodying an apertured finger with guide eyes for serving individual yarns to the respectively associated needles.

4. In a knitting machine, a series of needles; a feed to serve a main yarn to all of the needles; and a complemental series of individually associated sliding instrumentalities to cooperate with the needles in knitting fabric, said instrumentalities embodying angularly-directed forwardly-projecting fingers with eyes for serving individual auxiliary yarns to the respectively coordinated needles.

5. In a knitting machine, a series of needles; a feed to serve a main yarn to the needles; and a complemental series of sliding instrumentalities to cooperate with the needles in knitting fabric, said instrumentalities each embodying a forwardly-projecting apertured finger to concurrently serve individual auxiliary yarns to the respectively coordinated needles.

6. In a knitting machine, a series of needles; a feed to serve a main yarn to the needles; and a complemental series of web holders to cooperate with the needles in knitting fabric, said web holders embodying angularly-directed upper forwardly-projecting fingers having guide eyes to concurrently direct individual auxiliary yarns to the respectively coordinated needles.

7. In a knitting machine, a series of needles; a feed to serve a main yarn to the needles; and sliding instrumentalities with angularly-directed apertured fingers for laying individual auxiliary yarns crosswise of the main yarn into the hooks of the needles for formation into loops concurrently with said main yarn.

8. In a knitting machine, a series of needles; and a complemental series of independent sliding instrumentalities reciprocative transversely between the needles and cooperating with them in knitting fabric, said instrumentalities having forwardly-extending angularly-directed fingers with guide eyes adapted, incident to inward movement, to feed individual yarns to respectively coordinated needles.

9. In a knitting machine, a series of needles; and a series of independently movable sliding instrumentalities to cooperate with the needles in knitting fabric, each such instrumentality embodying an interior flange affording rotary support for an individual supply of yarn and an apertured guide finger to direct the yarn from said supply to the coordinated needle.

10. In a knitting machine, a series of needles; and a series of independently movable sliding instrumentalities to cooperate with the needles in knitting fabric, each such instrumentality embodying an enlarged circular holder portion with a sectional flange affording peripheral guidance for a frictionally restrained revolvable yarn supply bobbin and also having an upper apertured finger to direct the yarn from the bobbin to the individually associated needle.

11. In a knitting machine, a series of needles; and a series of independent transversely sliding web holder instrumentalities to cooperate with needles incident to knitting of fabric, each such web holder instrumentality carrying an individual supply of yarn and having a laterally-directly forward projection with a guide eye to direct the yarn from the supply to the individually coordinated needle.

12. A web holder instrumentality to cooperate with individual needles of knitting machines, said instrumentality having a web holding notch, and a yarn guide finger with a

guide eye projecting forwardly at level above the web holding notch.

13. A web holder instrumentality to cooperate with individual needles of knitting machines, said instrumentality having a web holding notch, and an angularly-directed forwardly-projecting yarn guide finger with a guide eye at a level above its web holding notch.

14. A sliding instrumentality to cooperate with individual needles of a knitting machine in forming fabric loops, said instrumentality embodying an upper apertured projection to direct a yarn to the coordinated needle, and means removably sustained in said instrumentality carrying a supply of such yarn.

15. A sliding instrumentality to cooperate with individual needles of a knitting machine in forming fabric loops, said instrumentality embodying an angularly-directed apertured finger to direct a yarn to the coordinated needle, and a rotatable bobbin removably retained within the instrumentality carrying a supply of such yarn.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 17th day of February, 1930.

WILLIAM LARMOUR.