March 1, 1938. R. H. LAWSON ET AL 2,110,088

YARN FURNISHING DEVICE

Filed Dec. 27, 1935 3 Sheets-Sheet 1

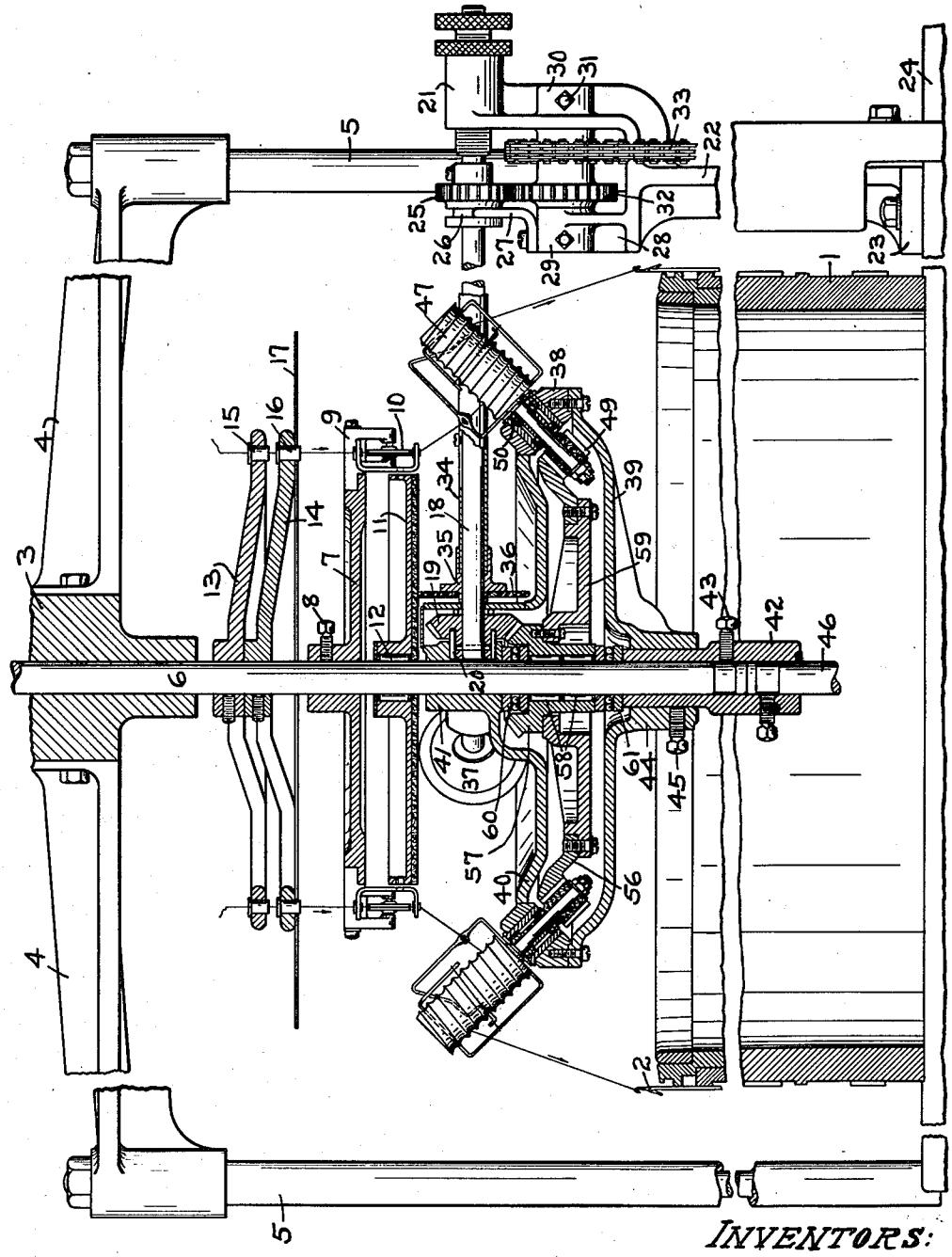


FIG. 1.

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FIG. 2.

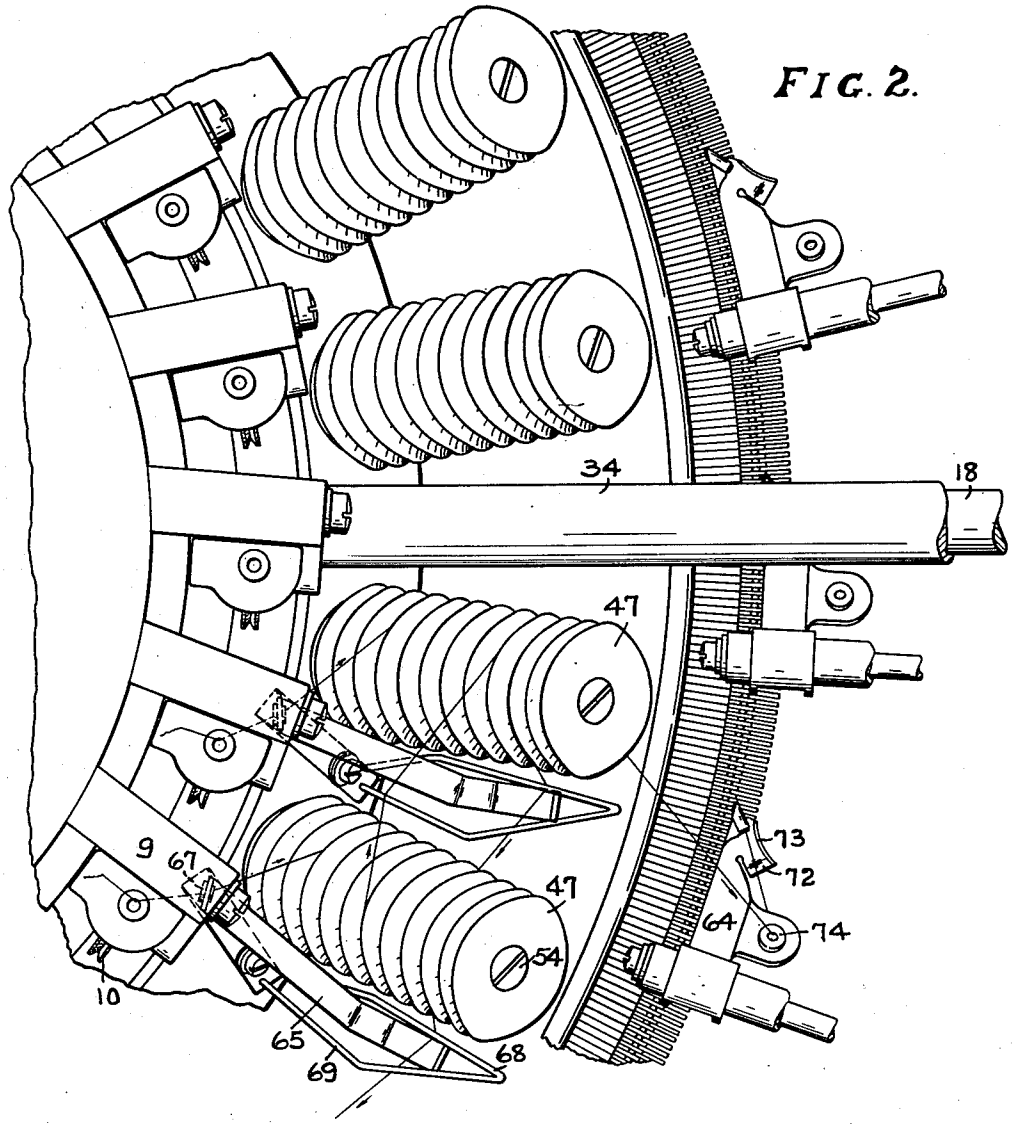


FIG. 5.

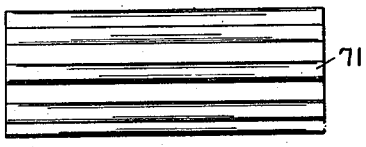
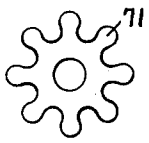


FIG. 6.



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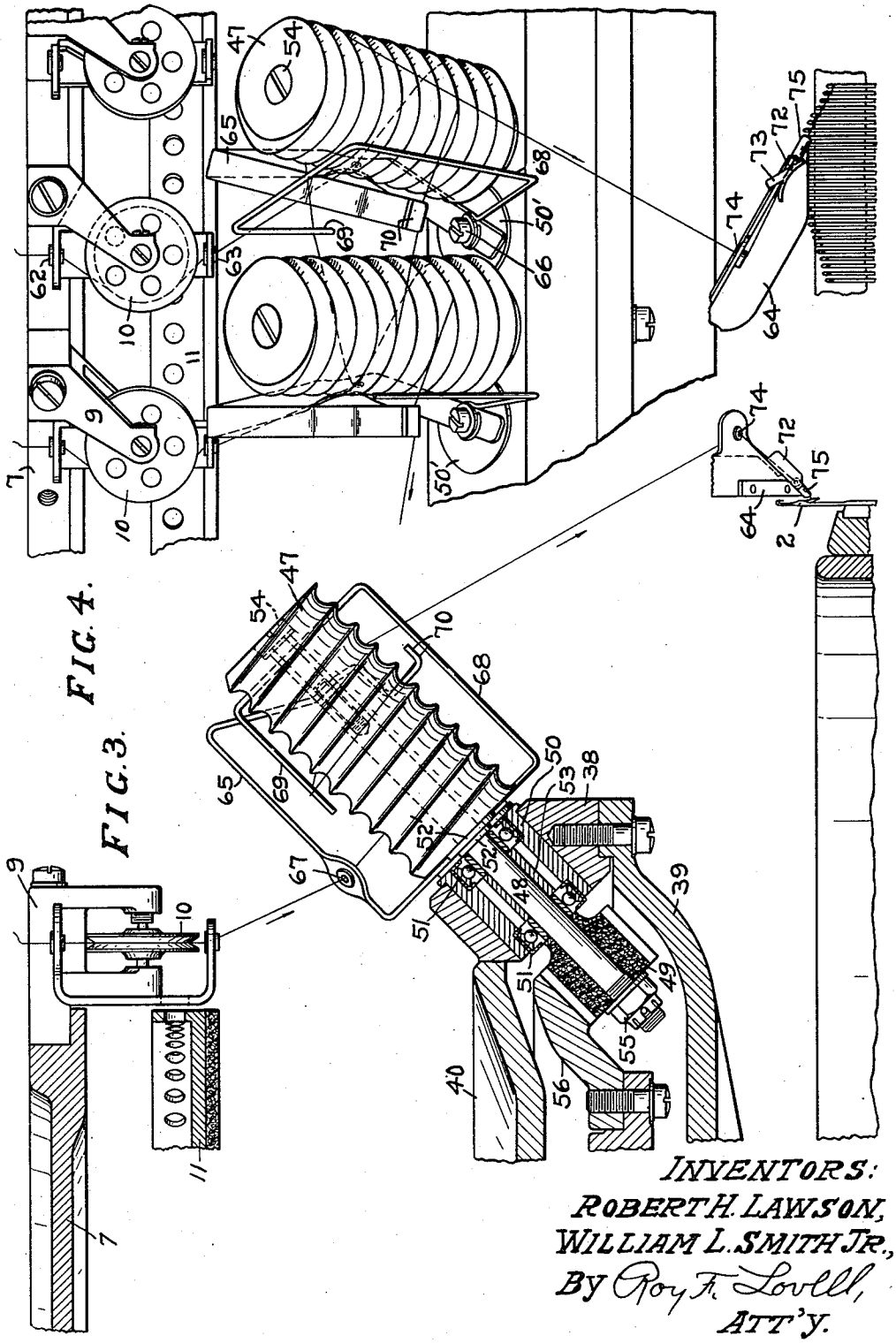


FIG. 4.

FIG. 3.

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UNITED STATES PATENT OFFICE

2,110,088

YARN FURNISHING DEVICE

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Application December 27, 1935, Serial No. 56,363
In Canada December 31, 1934

11 Claims. (Cl. 66—132)

This invention deals with improvements in a yarn furnishing device showing a mechanism similar to that disclosed and claimed in our copending United States application Serial No. 14,492, filed April 3, 1935. This case is a continuation as to all common subject matter of that United States application.

In the drawings:

Fig. 1 is a sectional view taken through the vertical center line of a multi-feed knitting machine in which the invention has been illustrated;

Fig. 2 is a plan view showing a portion of the machine, four of the yarn engaging wheels being illustrated;

Fig. 3 is a sectional view showing a single yarn as it is guided to one of the furnishing wheels and thence to the needles;

Fig. 4 shows in elevation a pair of furnishing wheels and the corresponding yarn guides such as are shown in the previous figure;

Figure 5 shows in detail an alternate form of furnishing wheel; and

Fig. 6 is an end view of the wheel shown in Fig. 5.

The invention of this case has to do with mechanism which is an improvement over the original case mentioned above, and has the advantages of simplicity and more perfect action. According to the improved mechanism shown, it is only necessary to employ as many of the positively driven furnishing wheels as there are separate yarns being fed to the needles of the machine, this being brought about by an ingenious arrangement of guides wherein each wheel is used for two different yarns. A yarn is wrapped about one of the driven wheels, then passes to the adjacent wheel and back to the first before it is guided to the needles. At the same time another adjacent yarn is guided on to that second wheel, thence to a third wheel, back to the second wheel and then to the needles. Since it has been found much more satisfactory to pass the yarn about two adjacent wheels instead of making several turns about the same wheel, it may be seen that this form of invention provides for the most satisfactory method of feeding yarn under a minimum of tension and with an even tension, no matter what the demand for yarn may be at the needles from time to time.

In operation the furnishing wheels are positively rotated at a speed which must be at least equal to the maximum speed at which any yarn will have to be advanced, preferably the wheels are rotated considerably faster than this minimum speed necessary so that there is always a certain amount of slip between the yarn and surface of each wheel. It is possible to actually discontinue knitting of a particular yarn or yarns at certain feeds without stopping the rotation of any of the furnishing wheels nor disengaging the yarns from these wheels. Whenever that yarn is to be knitted again, it will be immediately available the instant the needles start to draw it and there will be no perceptible resistance offered to the drawing of said yarn over that which would be experienced while the yarn was actually feeding continuously to the needles. Notwithstanding variations in the amount of resistance offered to the withdrawal of yarn from the cone or other resistance between the cone and said wheel, the tension on all knitted yarns between the wheels and the needles will be constant and practically at a minimum.

Referring to the general view, Fig. 1, a needle cylinder 1 of the rotary type is shown although the invention is equally applicable to stationary cylinder machines. This cylinder carries independent needles 2 which may be of either the latch or spring beard type, and the needles would have cooperating therewith sinkers or like instrumentalities for assisting in the knitting of fabric. A hub 3 having oppositely disposed arms 4 attached thereto is maintained in a fixed central position above the cylinder being supported by a plurality of posts 5. A shaft 6 is clamped within hub 3 and extends downwardly along the vertical center line of the machine. While it has not been illustrated since it forms no important part of the invention, a creel would be supported by an upper extension of shaft 6 and there might be associated therewith certain stop motions and guides which are commonly employed with such multi-feed knitting machines.

This invention is applicable not only to multi-feed machines but also to machines feeding a single yarn and may be used with or without the yarn measuring wheels which have been illustrated as a part of the multi-feed knitting machine herein shown. A disc 7 is clamped by means of a set screw or other suitable connections to the shaft 6, this disc carrying a plurality of forked elements 9 within which have been arranged to rotate upon jewel bearings a series of light, grooved wheels 10. These wheels are driven by means of the yarns which engage them and have a plurality of openings therein which align with other similar openings which have been cut in a flanged disc 11 which is rotatable on suitable bearings or bushings 12 on

the shaft 6. This yarn speed indicating mechanism will not be described in greater detail in this case since the same forms the subject matter of our co-pending application Ser. No. 663,183 filed in United States, March 28, 1933. A pair of spiders 13 and 14 are clamped to said shaft above the yarn rotatable measuring wheel and have yarn guides 15 and 16 therein for guiding each of the yarns to its respective wheel 10. For the protection of these measuring wheels a disc 17 is also attached beneath the lower spider 14. This overhangs the said wheels and their adjacent parts so that lint or dirt is prevented from falling on the same from above.

A shaft 18 carrying a beveled pinion 19 at its inner end is supported for rotation on a bushing 20 at that end, and in a bracket 21 at the opposite or outer end. Bracket 21 is formed as an extension of a vertical post 22 fixed at its base 23 to the circular base of the machine indicated at 24. Shaft 18 has a spur gear 25 fixed thereto which has a hub formed with a groove 26 which is engaged in a forked element 27 for the purpose of maintaining said gear 25 in proper position along the shaft 18. Post 22 has an extension 28 which is formed into a bearing 29 for one end of a short spindle, the other end of that spindle being supported in a corresponding bearing 30 formed in bracket 21. This spindle is clamped in position by means of suitable set screws 31 and has a spur gear 32 and a sprocket which is engaged by chain 33 mounted for rotation upon a common hub. The chain 33 is engaged by another sprocket (not shown) which drives that chain, gears 32, 25 and shaft 18 at a speed bearing a particular ratio to the speed at which the needle cylinder of the machine is driven. It is from this spindle 18 that the master disc for the measuring device and also the yarn furnishing wheels are to be driven. Spindle 18 has a sleeve 34 slidable thereon but restricted to rotate therewith and this sleeve carries a hub 35 and a fiber friction disc 36. This disc 36 drives the master disc 11 thru engagement with the corresponding friction element on the under side of that disc. The sleeve 34 may be adjusted along the spindle 18 so that said disc 11 will be driven at predetermined speeds which correspond to different numbers of courses per inch in the finished fabric. For any one of these settings the yarn will be feeding at the proper rate when the apertures in its measuring wheel 10 rotate in synchronism with those in the outer flange of master disc 11. A pair of comparatively frictionless supporting wheels 37, only one of which is shown, are arranged at intervals of 120 degrees to assist disc 36 in supporting disc 11.

A casing is made up of an annular section 38, a lower section 39 and a top portion 40 which has a hub 41 formed centrally thereof which encompasses the shaft 6. A sleeve 42 is adjustably clamped along the lower end of shaft 6 by means of set screw 43, and a hub 44 extends downwardly from the lower section 39 and is in turn adjustably clamped to the outside of sleeve 42 by set screw 45. The sleeve 42 also has an extension 46 clamped therein which extends downwardly to support other essential parts of the machine. The annular part of the casing is bored out at equally spaced intervals to accommodate a suitable bearing for a series of spindles which carry the yarn engaging wheels 47. As before stated, these spindles and attached yarn furnishing wheels may vary in number according to the number of feeds which are spaced about the knitting machine.

Referring to Figs. 1 and 3, it will be seen that each spindle 48 has attached to rotate therewith its yarn furnishing wheel 47 and also at the inner end within the casing a small driving pinion 49. This pinion is preferably made from some suitable fibrous material so that the gears will run as quietly as possible. A sleeve 50 is tightly inserted within each of the spaced apertures in section 38 and carries the outer races of two ball bearings 51 upon which spindle 48 is free to turn. Each pair of these sleeves is retained by a washer 50' which is clamped over the flanged outer ends of said sleeves. The inner races of these bearings are clamped to spindle 48 between a collar 52, spacer 53 and a pinion 49. The wheel 47 is fixed upon the other end of said spindle by means of a screw 54 which holds it clamped against a second collar 52'. When a nut 55 has been tightened against the outer end of pinion 49, the pinion and bearing assembly are clamped as a unit upon that spindle and may be inserted or removed at will in their respective apertures, in section 38.

The series of pinions 49 are to be driven by one common ring gear 56 which is attached to a beveled gear 57 which rotates upon bushing 58 by means of an intervening or connecting disc 59. This gear 57 is driven by means of pinion 19 and the two are maintained in the proper driving relationship by means of a ball thrust bearing 60 resting upon the upper end of gear 57 and supporting the top section of the casing 40 which in turn supports the inner end of shaft 18 upon which is fixed pinion 19. Another ball thrust bearing 61 is seated upon the upper end of sleeve 42 and supports gear 57 and its hub in the proper vertical position. This position may be adjusted by loosening set screw 43 and moving sleeve 42 axially of its shaft. A separate adjustment is provided by means of which ring gear 56 and the pinion 49 may be properly meshed, this adjustment being brought about by loosening set screw 45 and raising or lowering the lower section of the casing until said gears mesh as desired. This casing provides a substantially oil tight enclosure for the gears and by means of the adjustments which have been described these gears run with a minimum of friction and without unnecessary noise. The furnishing wheels 47 are driven at a fixed speed which bears a definite ratio to the speed of other parts of the machine, the surface or peripheral speed of the furnishing wheel being at least as great as the maximum speed at which yarn will be drawn, and preferably, this speed will be quite a bit greater than the maximum speed at which yarn will be drawn. When we refer to speed of the furnishing wheels, the peripheral speed of the same is meant.

A yarn is drawn from the supply through the guides 15 and 16, then through guides 62 and 63 passing about one of the measuring wheels 10 between these guides last mentioned, then about one of the furnishing wheels 47 shown at the right of Fig. 4, from that wheel to the adjacent one at the left of the same figure and back again to the original wheel from which the said yarn passes to a conventional guide or feeding finger indicated at 64, Figs. 3 and 4. It is to be understood that a yarn might be drawn directly from the cone or supply without engaging any measuring wheels since the invention is in no way dependent upon measuring wheels of the type shown or of any other type. The yarn

may pass directly from the furnishing wheel to a yarn guide such as 64 or the equivalent thereof, or it may be drawn thru a tension of any of the usual types before being taken at the needles. Since each furnishing wheel accommodates two separate yarns and each yarn passes from one wheel to the adjacent wheel, it is necessary to provide a guiding means which will function to positively keep the separate yarns from engaging each other in which event they will become entangled. It is also necessary, or at least desirable from a standpoint of operation, to keep these yarns from sticking to the furnishing wheels in case there should be any oil on them or for any other reasons, there should be a tendency of the yarn to adhere to the wheel instead of passing directly therefrom to the next wheel. An angular guiding element indicated by numeral 65 is attached between each of the furnishing wheels by means of a suitable connecting bolt or screw 66. This angular element has an eyelet 67 on the rear portion thereof through which the yarn or strand is led as it first passes on to the lower part of one of the said wheels 47. Another wire guiding element is attached between each of the furnishing wheels of the same screw 66 and has a vertical portion 68 extending in front of said wheels and another portion 69 extending substantially parallel to the front portion 68, but located to the rear side of said wheel. As the yarn makes its first pass about the right hand furnishing wheel, Fig. 4, it is positively guided from that wheel by the wire element 68, then is maintained at a definite elevation about half way up the said furnishing wheel by a hooked portion 70 which is formed integrally with the guiding element 65. The strand then passes about the mid-portion of the left-hand roll before mentioned, then about guide 69 to the top of the wheel which was first engaged, then to a suitable yarn feeding finger 64 and the needles. The function of the angular guide 65 is to guide one of the yarns on to the lower end of the roll which it is to engage first, then to the central portion of the second roll and then to the top of the first roll so that no interference by the separate yarns which pass about the same roll or wheel will be experienced. The wire element which has parallel portions 68 and 69 merely serves to strip the strand from each roll as it passes to the next, thus preventing sticking of a strand to its roll or in the case of a strand breaking, will prevent the broken end from winding up about one of the furnishing wheels before the machine can be stopped.

It is possible to use furnishing wheels which have cylindrical surfaces, but for more positive separation of yarns passing about the same wheel, it has been further desirable to provide those wheels with helical projections or threads such as have been illustrated in Figs. 2, 3 and 4. In Figs. 5 and 6 we have shown a modification of the furnishing wheels which would prevent sticking of the yarn to the said wheel without the assistance of any stripping element. This wheel has flutes 71 which extend longitudinally thereof and the yarn is engaged by the outer surface of the flute. The space or break between flutes prevents a yarn from adhering to the wheel as it has a tendency to do if smooth unbroken surfaces are presented to that yarn. These rolls or wheels may be made of any suitable size, the proportions shown in the drawings being found to serve satisfactorily in actual practice; further, many materials may be used such as the various metals, wood, or some one of the various fibrous materials. The latter have been found preferable since they are light and serviceable and the surface thereon may be smooth and presents about the proper amount of friction to the yarn which is being engaged or snubbed thereabout for purposes of feeding.

As was stated above, it is possible and sometimes may be found desirable to place a tension such as a disc tension of suitable nature between the feeding wheels and the yarn guide 64. This tension provides for steadying the yarn which would otherwise be fed between these two points with almost no tension at all in the same. This tension should preferably be adjustable and will be more desirable with some materials than with others; rubber yarn such as Lastex may be one class of yarn which will be knitted better if a slight amount of tension is applied just prior to being taken at the needles. The yarn guide 64 has been provided with a curved guiding plate 72 which has a flange 73 at one edge thereof. This serves to steady the yarn to some degree as it is being fed between an eyelet 74 and another eyelet 75 just prior to being engaged in hooks of needles. In case it is desired to knit the rubber yarn or any other yarn under considerable tension, it is possible to apply that tension between the furnishing wheels and needles where all yarn feeding can be regulated to feed with the same and an invariable tension therein.

The yarn furnishing device has been illustrated as applied to a multi-feed machine and is particularly useful with that class of knitting machines, but it is not intended to limit the use of our mechanism to such machines since they may be used with single feed machines such as the common knitting machines used for manufacturing hosiery. In fact, the invention may be applied to new classes of textile machinery wherein it is desired to feed a strand or filament under a minimum or fixed amount of tension and under a constant tension, even though the strand or filament is to be drawn from a supply at varying rates and under different conditions. The materials which it is possible to feed may be any of the usual textile materials which have been twisted into the form of yarns or thread such as cotton, wool or silk, either natural or artificial. Any of the unusual materials which are used to form fabrics or articles of a textile nature such as fine metallic strands or rubber strands, either covered or uncovered, may also be worked upon. It has been found that these rubber or elastic yarns are fed under a practically constant and predetermined amount of tension by the furnishing wheels herein disclosed. The problem of feeding such rubber threads is a very difficult one since the rubber tends to stick at the cone as it is drawn from the same and stretches to a degree, then is relaxed suddenly as it is released at the cone. This causes very uneven fabric if no positive feeding means is provided and all the feeding devices which have been previously employed will take care of feeding at only one particular speed unless an adjustment is made which necessitates stopping of the machine, changing the provision for feeding at the previous rate to some other, then starting up again. Such devices could not be employed where the rubber was to be fed at varying rates of speed, for example, when knitting and floating. With this device the rubber or any other yarn is fed under very slight tension, also under constant tension, no matter what the rate of con-

sumption of the yarn is, without any change of speed at which the furnishing wheels are rotated. Of course, the wheels must be rotated at a speed equal to the greatest rate of feeding speed which is desired. In actual operation there is also a certain amount of slip between the strand being fed at the surface of the furnishing wheels about which it is passed or snubbed. In case no yarn is being drawn by the needles or other consuming elements of the textile machine the strand will loosen up about the two rapidly rotating, feeding wheels and will not be engaged with sufficient frictional force to impart any appreciable tendency to draw said yarn from the supply. The instant some yarn is demanded, it will be tightened about said wheels and they will immediately feed that yarn at the desired speed. All this may go on with respect to one particular yarn without in any way affecting those adjacent yarns which may pass about the same furnishing wheels, since they may be snubbed more or less tightly and will feed at the desired rate. In the same way varying conditions at the supply or at other points prior to the engagement of yarn with the furnishing wheels will affect the positiveness with which those yarns will be snubbed about the wheels and fed so that such varying conditions will not be transmitted directly to the fabric forming elements to detract from the quality of fabric knitted.

The invention has been described with reference to a multi-feed knitting machine, and for purposes of illustration has been shown more or less specifically. The disclosure is to be considered as illustrative only and we do not intend to limit the scope of the invention except as expressed in the claims.

We claim:

1. A multi-feed knitting machine having in combination a plurality of yarn supplies and knitting instrumentalities for knitting said yarns into a fabric, yarn furnishing means including positively driven yarn engaging elements rotated at a speed in excess of the maximum speed at which yarn is to be advanced, the number of rotated elements being equal to the number of yarns being fed to the said instrumentalities, means for guiding each yarn about an element and from that element to the next and back to the first whereby each yarn is passed about a pair of adjacent rotated element before being fed to the instrumentalities.

2. A multi-feed knitting machine having in combination yarn supplies and instrumentalities for knitting yarn into a fabric, yarn furnishing means including a plurality of positively driven feeding rollers equal in number to the number of yarns to be fed, means for guiding each yarn to one end of a roller, to the central portion of the adjacent roller and back to the other end of the first and thence to the instrumentalities whereby each yarn is advanced by frictional engagement with two rollers but wherein the total number of rollers does not exceed the number of separate yarns being fed.

3. A multi-feed knitting machine having in combination yarn supplies and instrumentalities for knitting said yarns into a fabric, yarn furnishing means interposed between said supplies and instrumentalities including a series of positively driven rollers about which yarn is to be passed for frictional engagement with said rollers, the number of rollers being equal to the total number of yarns which are to be fed and means associated with said feeding rollers for guiding yarns to one roller between adjacent pairs of rollers and from the second roller of a pair and for stripping the yarn from the rollers.

4. A method of furnishing yarn from supplies to knitting instrumentalities of a knitting machine including the steps of rotating a series of furnishing elements equal in number to the number of yarns to be fed, at a speed greater than that at which any of the yarns to be furnished is to be advanced, wrapping two yarns about each element in such a manner that each yarn passes about one element and from that element to the next and back to the original and then guiding each yarn to the knitting instrumentalities.

5. In a knitting machine of the type described, the combination of yarn supplies, instrumentalities for knitting said yarn into a fabric and furnishing means interposed between the supplies and instrumentalities including a series of yarn engaging elements rotated at a speed in excess of that at which yarns are to be fed, said means being so constructed and arranged that each yarn will be passed about two adjacent furnishing elements and that each element will serve to advance two different yarns, and means between the elements for guiding and keeping separate the said yarns.

6. A yarn furnishing device for knitting machines of the type described including a series of rotated yarn engaging and advancing elements, a master driving gear by which each of the rotated elements is to be driven, a casing enclosing said master gear and the driven ends of the said rotated elements, said casing being constructed in two parts, one part determining the position of the gear and the other part determining the relative position of the elements, and means for varying the relative position of the parts of the casing to vary the operating engagement of the gear and the driven elements.

7. A yarn furnishing device for knitting machines of the type described including a series of rotated yarn engaging and advancing elements, a master driving gear by which each of the rotated elements is to be driven, a casing enclosing said master gear and the driven ends of the said rotated elements, said casing being constructed in two parts, one part determining the position of the gear and the other part determining the relative position of the elements, a spindle passing through both parts of the casing, one part of the casing being relatively fixed with respect to the spindle and the other part being movable along the spindle and to and from the first part of the casing to vary the engagement of the gear and driven elements.

8. A yarn furnishing device for a knitting machine of the type described including a series of rotated yarn engaging and advancing elements, a master driving gear meshing with and rotating each of the elements, another gear fixed to the master gear and a driving pinion meshing therewith for driving the master gear, a spindle upon which the master gear is adapted to rotate and a casing mounted upon said spindle and enclosing all of said gears and elements, a sleeve adjustable along the length of said spindle and fitting within part of said casing, means between the casing and sleeve for adjusting the position of the casing along the sleeve whereby the engagement of the gear and pinions can be varied without disturbance of the engagement of the second mentioned gear and its driving pinion.

9. In a knitting machine, a yarn supply and instrumentalities for knitting yarn into a fabric,

furnishing means interposed between said supply and instrumentalities including a yarn engaging and advancing roller about which the yarn is wrapped, and means for rotating said roller at a speed greater than that at which the yarn is to be advanced, said roller being of general cylindrical shape but having its surface broken by a series of axially extending grooves to prevent sticking of the yarn to the surface of the roller.

10. In a knitting machine, a yarn supply and instrumentalities for knitting yarn into a fabric, furnishing means interposed between said supply and instrumentalities including a yarn engaging and advancing roller about which the yarn is wrapped, and means for rotating said roller at a speed greater than that at which the yarn is to be advanced, said roller being constructed substantially as a cylinder and having a series of flutes extending along its yarn engaging surface.

11. In a knitting machine, a yarn supply and instrumentalities for knitting yarn into a fabric, furnishing means interposed between said supply and instrumentalities including a yarn engaging and advancing roller about which the yarn is wrapped and means for rotating said roller at a speed greater than that at which the yarn is to be advanced, said roller being constructed in substantially cylindrical form and having a surface of helical conformation.

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