Aug. 14, 1934. D. J. MAYER 1,970,242

KNITTING MACHINERY

Filed Oct. 10, 1932 3 Sheets-Sheet 1

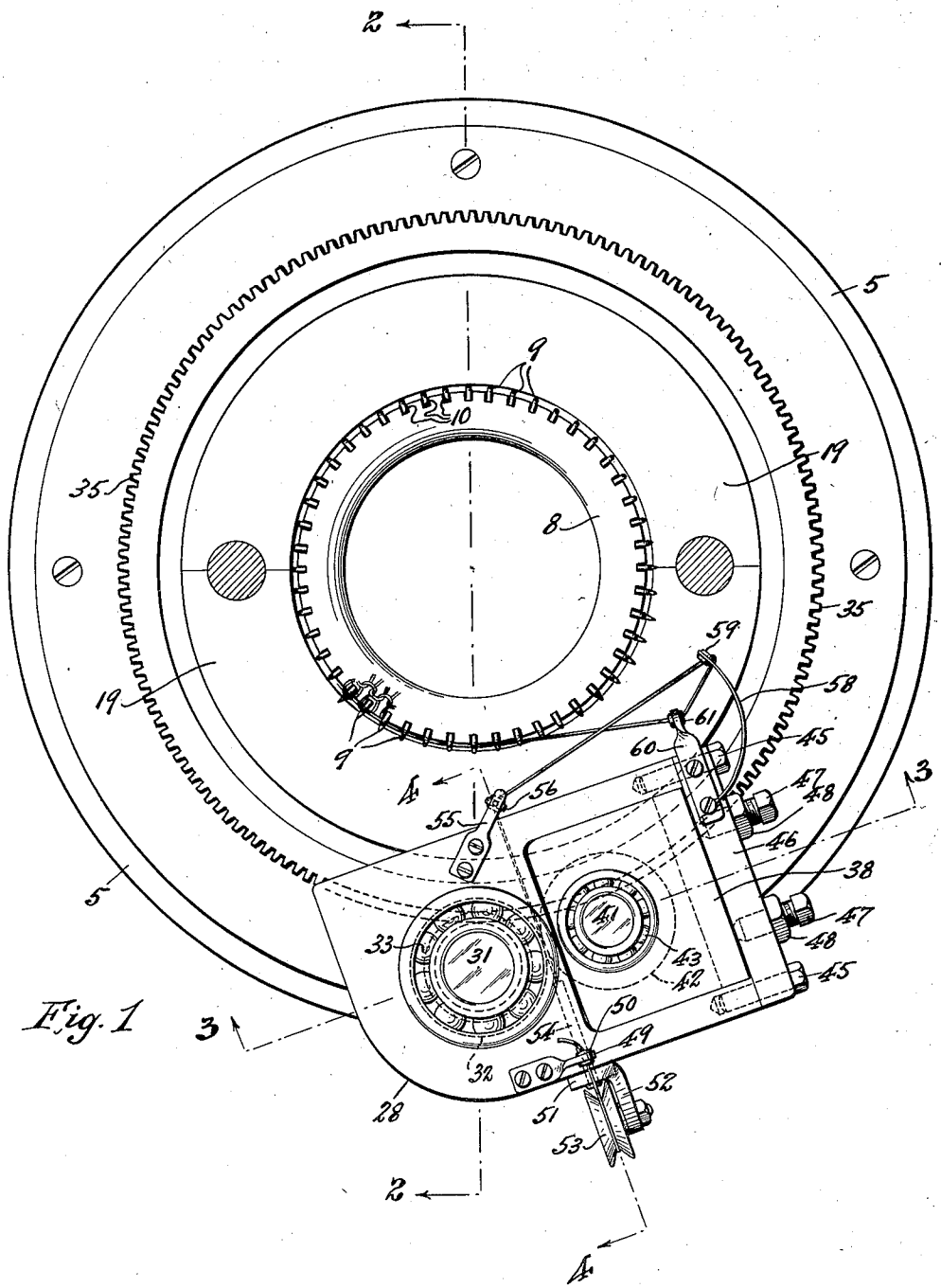


Fig. 1

INVENTOR
Daniel J. Mayer,
BY George D. Richards
ATTORNEY

Aug. 14, 1934. D. J. MAYER 1,970,242

KNITTING MACHINERY

Filed Oct. 10, 1932 3 Sheets-Sheet 2

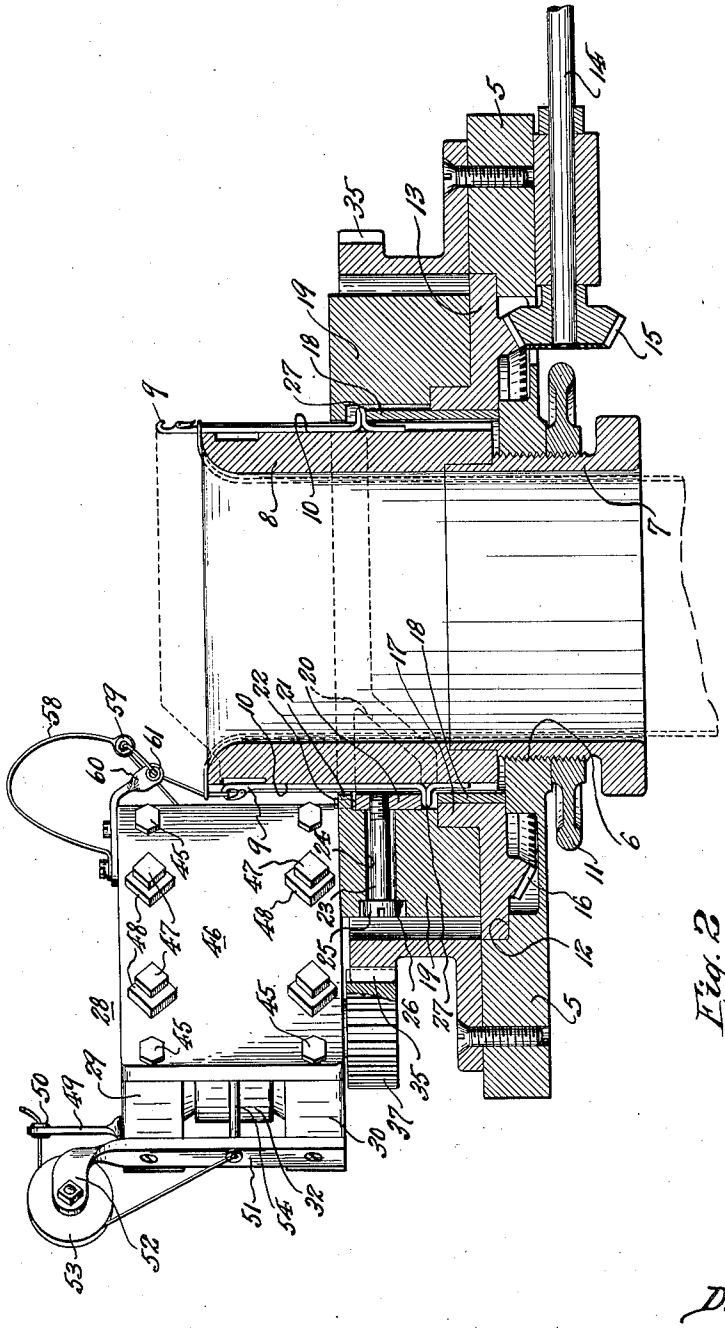


Fig. 2

INVENTOR
Daniel J. Mayer,
BY
George D. Richards
ATTORNEY

Aug. 14, 1934. D. J. MAYER 1,970,242

KNITTING MACHINERY

Filed Oct. 10, 1932 3 Sheets-Sheet 3

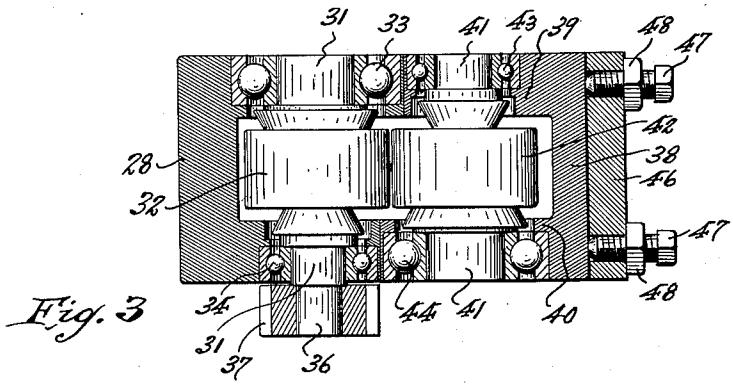


Fig. 3

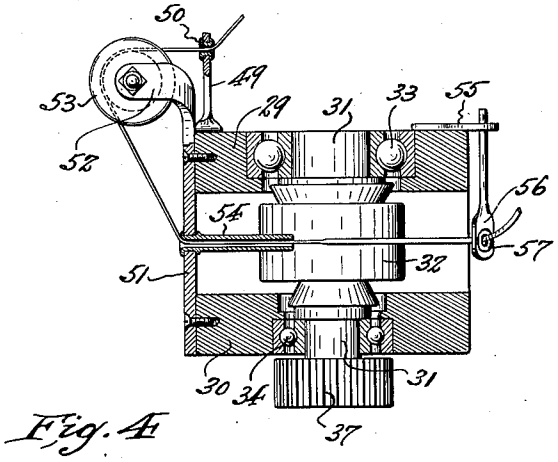


Fig. 4

INVENTOR
Daniel J. Mayer,
BY
Georges D. Richards,
ATTORNEY

Patented Aug. 14, 1934

1,970,242

UNITED STATES PATENT OFFICE

1,970,242

KNITTING MACHINERY

Daniel J. Mayer, Belleville, N. J., assignor to Metal Textile Corporation, West Orange, N. J., a corporation of Delaware

Application October 10, 1932, Serial No. 637,012

5 Claims. (Cl. 66—132)

This invention relates to improvements in knitting machinery; and the invention has reference, more particularly, to a novel means for feeding the filament or strand to be knitted to the knitting needles of the machine, and which may also serve in connection with filaments or strands of metallic wire to flatten the same into a desired ribbon-like form as the same is delivered to the knitting needles.

Heretofore considerable trouble has been experienced in connection with the operation of knitting machines, especially when utilizing the same in the knitting of metallic fabrics, due to excessive tensions and strains upon the metallic filament or strand as drawn from the supply thereof by the somewhat jerky intermittent operation of the knitting needles, which frequently causes breaks, kinks or distortions resulting in holes or other imperfections in the finished fabric. Attempts have been made to reduce such trouble by easing the slip or movement of the metallic filament or strand by the use of oil or other lubricant, and by very careful selection of the metallic filament or strand to eliminate rough material which is easily subject to breaking even when a lubricant is used. This solution of the problem is not satisfactory, not only for the reason that it does not completely cure the trouble, but for the reason that the oil or other lubricant coats the finished fabric, tending, especially with metals such as copper, to tarnish the same, and consequently the oil or other lubricant must be removed from the finished fabric by chemical processes involving additional labor and expense.

As a solution for the above-mentioned and other difficulties attendant upon machine knitting, especially with metallic material, this invention has for its principal object to provide a novel feed roller mechanism adapted to assume the burden of drawing off the filament or strand to be knitted from the supply spools and thereupon feeding the same to the knitting needles at properly timed speed and in just the right amount to form a given knitted loop, whereby the filament or strand is smoothly supplied as fast as it is consumed by the knitting operations, and free from drag or strain, thus avoiding risk of breaks, kinks or other distortions resulting in imperfections in the finished product.

Another object of this invention is to provide a feed roller mechanism for knitting machines operative to flatten a round wire strand or filament, simultaneously with the feeding of the same, to thus convert the same into a flat or ribbon-like strand preparatory to the knitting thereof into the desired fabric.

Another object of this invention is to provide novel means in combination with the feed roller mechanism for adjusting the knitting mechanism to insure correct consumption of the strand or filament in correspondence with the rate of feed thereof by said feed roller mechanism.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of the various features of this invention are shown in the accompanying drawings, in which:—

Fig. 1 is a top plan view, in part, of a circular knitting machine equipped with the novel feed roller mechanism and other novel features according to this invention; Fig. 2 is a vertical section, taken on line 2—2 in Fig. 1, but showing the feed roller mechanism in elevation; Fig. 3 is a detail sectional view of the feed roller mechanism per se, taken on line 3—3 in Fig. 1; and Fig. 4 is another detail sectional view of the feed roller mechanism per se, taken on line 4—4 in Fig. 1.

Similar characters of reference are employed in the above-described views, to indicate corresponding parts.

Referring to said drawings, the principles and novel structural features of this invention are shown as applied to a circular knitting machine; the same comprising a base 5, which is usually supported upon legs or a suitable framework (not shown). Formed in said base is a central internally screw threaded opening 6, into which is threaded an adjusting sleeve 7, and upon the upper end of which is carried the vertical needle cylinder 8, the latter being thus subject to raising and lowering movements for adjusting the operative position of the needles 9 which are vertically movable in the guide channels or grooves 10 provided around the exterior surface of said needle cylinder 8. The cylinder 8 may be positively held against rotation in any suitable manner should this be desirable; there is, however, enough frictional resistance between sleeve 7 and cylinder 8 to prevent rotation of the latter after desired adjustment is made and during operation of the machine. Threaded upon said adjusting sleeve 7 is a jamb-nut wheel 11, adapted to be brought into engagement with the underside of said base 5, so as to lock said adjusting sleeve 7 in selected adjusted relation to the latter.

Formed in the top side of said base 5 is a bearing

recess 12 concentric to the vertical axis of said needle cylinder 8. Mounted to turn in said bearing recess 12 and about the needle cylinder 8 is a rotatable ring 13 which is driven from the driving-shaft 14 by a pinion 15 adapted to mesh with the bevel gear 16 with which the underside of said rotatable ring 13 is provided. Said rotatable ring 13 is provided at its inner periphery with an upstanding annular flange 17 to which is suitably secured the needle-raising and rest cam means 18. Affixed upon said rotatable ring 13 is a cam ring 19, which is preferably of the usual sectional form. Adjustably affixed to the interior face of said cam ring 19 is the needle stitch cam means 20. Preferably said needle stitch cam means 20 is subject to a limited amount of vertical adjustment upon and relative to said cam ring 19; and to this end the upper margin of the interior face of said cam ring 19 is provided with an overhang flange 21 disposed above the stitch cam means 20. Threaded vertically downward through said overhang flange 21 are adjustable positioning or stop screws 22 against which said stitch cam means 20 may be stopped in desired vertically adjusted position. One or more lock screws 23 extend through transverse slots 24 in said cam ring 19 so as to thread into said stitch cam means 20, whereby, when the latter is disposed in desired vertically adjusted position, said screws 23 may be tightened to engage their heads 25 against suitable seats 26 and thus operate to draw the stitch-cam means 20, when suitably adjusted, into bound relation to the cam ring 19 to thereby hold the same in such adjusted position. It will be obvious that the means for thus adjusting the stitch cam means is subject to a more or less wide range of variation as to form, and consequently the means above described for such purpose is intended to be merely illustrative, since any arrangement permitting the fixing of the stitch cam means 20 in adjusted connection with the cam ring 19 may be employed. The needles 9 are provided with the usual outwardly projecting projections or foot-portions 27 which are operatively engaged by the stitch and needle raising and rest cam means to effect the timed operative strokes of the needles in the usual manner.

The novel feed roller mechanism according to this invention is fixedly mounted upon the top of the cam ring 19 so as to travel around the needle cylinder 8 therewith, said feed roller mechanism being so arranged as to, in part, overhang the base 5 outwardly of said cam ring. In the drawings, and for the purpose of simplifying the illustration of the invention, but a single feed roller mechanism is shown as adapted for a single feed machine; it will be obvious, however, that for multiple feed machines the stitch and needle raising and rest cam means will be multiplied according to the number of feeds employed, and likewise the number of feed roller mechanisms will be increased accordingly. The feed roller mechanism comprises a suitably shaped main housing 28 including vertically spaced upper and lower walls 29 and 30 respectively. Supported by its journals 31 in bearing openings of said walls 29—30, so as to lie between the latter for rotation about a vertical axis is a driven roller 32. Preferably the journals 31 are supported by suitable anti-friction bearings, such as the ball-bearing sets 33—34 respectively mounted in the upper and lower walls 29 and 30 of said housing 28. The means for driving the driven roller 32 comprises a stationary ring gear 35 which is fixed upon the base 5 exteriorly of and concentric to said cam ring 19. The lower journal of said driven roller 32 is provided with an extension 36 exteriorly projecting beneath the housing 28, and fixed on this extension 36 is a pinion 37 which meshes with said stationary ring gear 35. As the cam ring 19 turns about the needle cylinder, the housing 28 with the roller 32 will be carried around therewith, and the pinion 37 will be rotated as it travels around said ring gear 35, thus imparting rotary motion to the roller 32. Adjustably movable in said housing 28 toward said driven roller 32 is a movable bearing frame 38 including vertically spaced upper and lower walls 39 and 40 respectively. Supported by its journals 41 in bearing openings of said walls 39—40, so as to lie between the latter for rotation about a vertical axis is an idler feed roller 42 which opposes and cooperates with said driven roller 32. Preferably the journals 41 of said idler roller 42 are supported by suitable anti-friction bearings, such as the ball-bearing sets 43—44 respectively mounted in the upper and lower walls 39 and 40 of said bearing frame 38. Connected with forward end of said housing 28, by bolts 45 or other suitable fastening means, is a backing plate 46 which is thus arranged behind said bearing frame 38. Threaded through said backing plate 46 are adjustable thrust screws 47 which are utilized to thrust and position said bearing frame 38 so as to support the feed roller 42 in operative spaced relation to the driven feed roller 32. Said thrust screws 47 are provided with jamb nuts 48 to engage the exterior face of said backing plate 46 to thereby lock the thrust screws 47 in desired adjusted position.

Associated with said feed roller mechanism are filament or strand guiding elements for leading the material to be knitted from a source of supply to the feed rollers 32—42 and thence in connection with tensioning means into operative relation to the knitting needles 9 of the machine. Illustrative of a suitable arrangement of such guiding and tensioning means, the same comprise a guide post 49 suitably fixed upon the upper side of the housing 28 adjacent to its outer side, and provided with a guide eye means 50, preferably made of a good wear resistant material such as porcelain, agate or the like. Suitably secured across the outer side of said housing 28 is a bridge plate 51 having at its upper end an outwardly off-set bracket arm 52 upon which is rotatably supported a grooved guide wheel 53. Supported by said bridge plate 51 is a tubular guide member 54, the inner end of which terminates adjacent to the nip of the feed rollers 32—42. Suitably fixed upon the upper side of the housing 28 adjacent to its inner side is a bracket 55 by which is supported a guide arm 56 provided with a suitable guide eye means 57. Fixed upon the housing 28 adjacent to the forward end of the same is an upstanding resilient or spring tensioning arm 58 provided at its free end with guide eye member 59, and fixed upon the housing 28 below said tensioning arm 58 is a bracket 60 in the inwardly off-set free end of which is arranged a guide eye member 61. The strand or filament of material to be knitted is led from a suitably supported supply spool (not shown) to the guide eye means 50, said supply spool being preferably supported by a bracket carried by the rotatable cam mechanism, passing thence over the guide wheel 53 through the tubular guide member 54 by which it is led to pass between the feed rollers

32—42 so as to be gripped thereby. Upon issuing from the feed rollers 32—42 the strand or filament is passed through the guide eye means 57 and thence through the guide eye member 59 of the tensioning arm 58 to the guide eye member 61 from which it extends to the needle cylinder 8 so as to be held subject to operative engagement by the knitting needles 9 as actuated by the cam mechanism of the machine and as the feed roller mechanism travels around the needle cylinder 8 in company with said cam mechanism.

From the above description it will be understood that, during the operation of the machine, the feed rollers 32—42 will not only be carried around the needle cylinder 8 but will also be smoothly and continuously driven, so that as they grip the strand or filament to be knitted, the same will be continuously drawn off the supply spool thus avoiding the jerky or intermittent movement of said strand or filament, as is the case when the pulling of the same is accomplished only by the knitting strokes of the needles, while at the same time just the right amount of said strand or filament is fed to form each successive stitch, sufficient slack being allowed for and tensionally controlled by the tensioning arm 58.

The feed roller mechanism, so far as its feeding functions are concerned, is adapted to operatively feed a filament or strand of any kind of material. It is especially useful however in connection with the feeding of a metallic filament or strand in the knitting of metallic fabrics.

In addition to its feeding function, the feed roller mechanism may also be utilized to flatten a round wire filament or strand into a flat or ribbon-like form, where such form is desirable in the knitted metallic fabric to be produced. For such additional work the feed rollers are preferably made of hardened steel, and would receive round wire from the supply spool and as they drew the same from the latter, to feed proper amounts thereof in correspondence to the requirements of the stitch-forming operations of the knitting needle 9, would flatten such round wire into the desired ribbon-like form prior to delivery thereof to said knitting needles. Owing to the fact that the feed rollers are operated at low surface speed, as compared with the operation of flattening rolls as heretofore used in wire rolling machines independent of knitting machines, the novel combined feed and flattening rollers according to this invention may be constructed much lighter in weight and yet possess more durability and longer life in use. In so using the feed roller mechanism, a material saving is effected, since round wire is much cheaper than flat wire. Another advantage due to the comparatively slow speed at which the round wire strand or filament is flattened is the fact that the resultant ribbon-like strand can be made much brighter because excessive temperatures are not generated, as is the case when flattening round wire at normal high rolling mill speeds. High temperatures generated with high speed flattening rolls have a tendency to break down the burnished surfaces of the rollers in a relatively short time, consequently requiring frequent regrinding and burnishing of the rolls. In the instant case, the comparatively slow speed feed rollers are not subject to excessive temperatures and consequently the effective life of the rollers is substantially prolonged and the burnished surfaces maintained over substantially longer intervals of time.

The ability to use the feed rollers of this invention for wire flattening at the same time has other advantages. For example, it avoids necessity of spooling up in advance supplies of flat or ribbon-like wire, and permits the use of spooled round wire which is much more readily spooled than is the flat or ribbon-like wire. When flat or ribbon-like wire is spooled, the traverse motion must be extremely precise, otherwise with a slight shortening of the traverse cam by reason of wear, the ribbon catches under the body of the spooled ribbon and the flange of the spool, this in itself being the cause of many breaks with resultant waste, when using the spooled ribbon to feed knitting machines. Then too spooled flat or ribbon-like wire, when quantities thereof are spooled up in advance and stored, is likely to tarnish and lose its original brilliancy even though the storage period be comparatively short. By virtue of the instant invention, however, the round wire is flattened practically at the same time as the fabric is knitted and consequently the fabric is of brighter appearance as delivered from the machine.

From the standpoint of its feeding operation, the feed roller mechanism of the instant invention is so arranged that the speed of the rollers 32—42 is timed to supply to the knitting needles just the amount of filament or strand as will be taken up by the stitch-forming operations of the needles and according to the size of stitch loop desired to be provided in the finished fabric. In order to adjust with nicety the operative relation of the knitting mechanism to the lead of filament or strand to be engaged by the needles, the needle cylinder 8 may be raised or lowered, as may be desirable, by releasing the jamb-nut wheel 11 and then turning the adjusting sleeve 7 up and down relative to the cam ring 19; and, furthermore, the needle stitch cam 20 may be adjusted upon the cam ring 19 to slightly increase or decrease the stitch-forming strokes of the needles 9 as may be necessary. It will therefore be obvious that there are several factors involved in making ready the machine so as to insure that a correct quantity of filament or strand is fed to the knitting mechanism, viz., providing feed rollers 32—42 of a selected diameter; providing a ratio of driving gear transmission calculated to drive the rollers at proper speed; and finally, vertically adjusting the needle cylinder relative to the cam ring, and adjusting the needle stitch cam relative to the cam-ring as may be required.

I am aware that many changes could be made and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, and consequently it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. The combination in a knitting or like machine of a pair of cooperating rollers between which a wire strand to be knitted is engaged and by which the same is both drawn from a source of supply thereof and flattened to ribbon-like form and thereupon fed to the machine at a speed substantially equivalent to the rate of consumption thereof, means for driving one of said rollers, and means for adjusting the other roller toward and from the driven roller, said latter means being adapted to maintain said rollers in selected spaced relation one to another according to the thickness of ribbon desired.

2. The combination in a knitting or like ma-

chine of a pair of combined metallic strand feeding and flattening rollers, means for guiding said strand from a supply source to said rollers, means for guiding said strand from said rollers, said latter means including an elastic tensioning arm, means for driving one of said rollers, and means for adjusting the other roller toward and from the driven roller, said latter means being adapted to maintain said rollers in selected spaced relation one to another according to the thickness of ribbon desired.

3. In a circular knitting machine, in combination, a base, a needle cylinder supported by said base, vertically reciprocable needles mounted on said cylinder, a rotatable cam ring mechanism, needle rest cam means carried by said cam ring mechanism, needle stitch cam means carried by said cam ring mechanism, a housing supported upon and movable with said cam ring mechanism, combined metallic strand feeding and flattening rollers journaled in said housing, a stationary ring gear on said base, one of said rollers having a pinion engaged with said ring gear whereby the same is driven when carried around said needle cylinder with said cam ring mechanism, and means for adjusting the other roller toward and from said driven roller, said latter means being adapted to maintain said rollers in selected spaced relation one to another according to the thickness of metallic ribbon desired.

4. In a circular knitting machine, in combination, a base, a needle cylinder vertically adjustable relative to said base, vertically reciprocable needles mounted on said cylinder, a rotatable cam ring mechanism having needle actuating cam means including an adjustable needle stitch cam, a housing supported upon and movable with said cam ring mechanism, combined metallic strand feeding and flattening rollers journaled in said housing, means for driving said rollers, means for guiding said strand from a supply source to said rollers, means for guiding said strand from said rollers to said needles, and said latter means including an elastic tensioning arm.

5. In a circular knitting machine, in combination, a base, a needle cylinder vertically adjustable relative to said base, vertically reciprocable needles mounted on said cylinder, a rotatable cam ring mechanism having needle actuating cam means including an adjustable needle stitch cam, a housing supported upon and movable with said cam ring mechanism, combined metallic strand feeding and flattening rollers journaled in said housing, a stationary ring gear on said base, one of said rollers having a pinion engaged with said ring gear whereby the same is driven when carried around said needle cylinder with said cam ring mechanism, means for adjusting the other roller toward and from said driven roller, said latter means being adapted to maintain said rollers in selected spaced relation one to another according to the thickness of metallic ribbon desired, means for guiding said strand from a supply source to said rollers, means for guiding said strand from said rollers to said needles, and said latter means including an elastic tensioning arm.

DANIEL J. MAYER.