March 22, 1938. F. MEIWALD 2,111,984

YARN KNITTING MACHINE

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Fig. 1

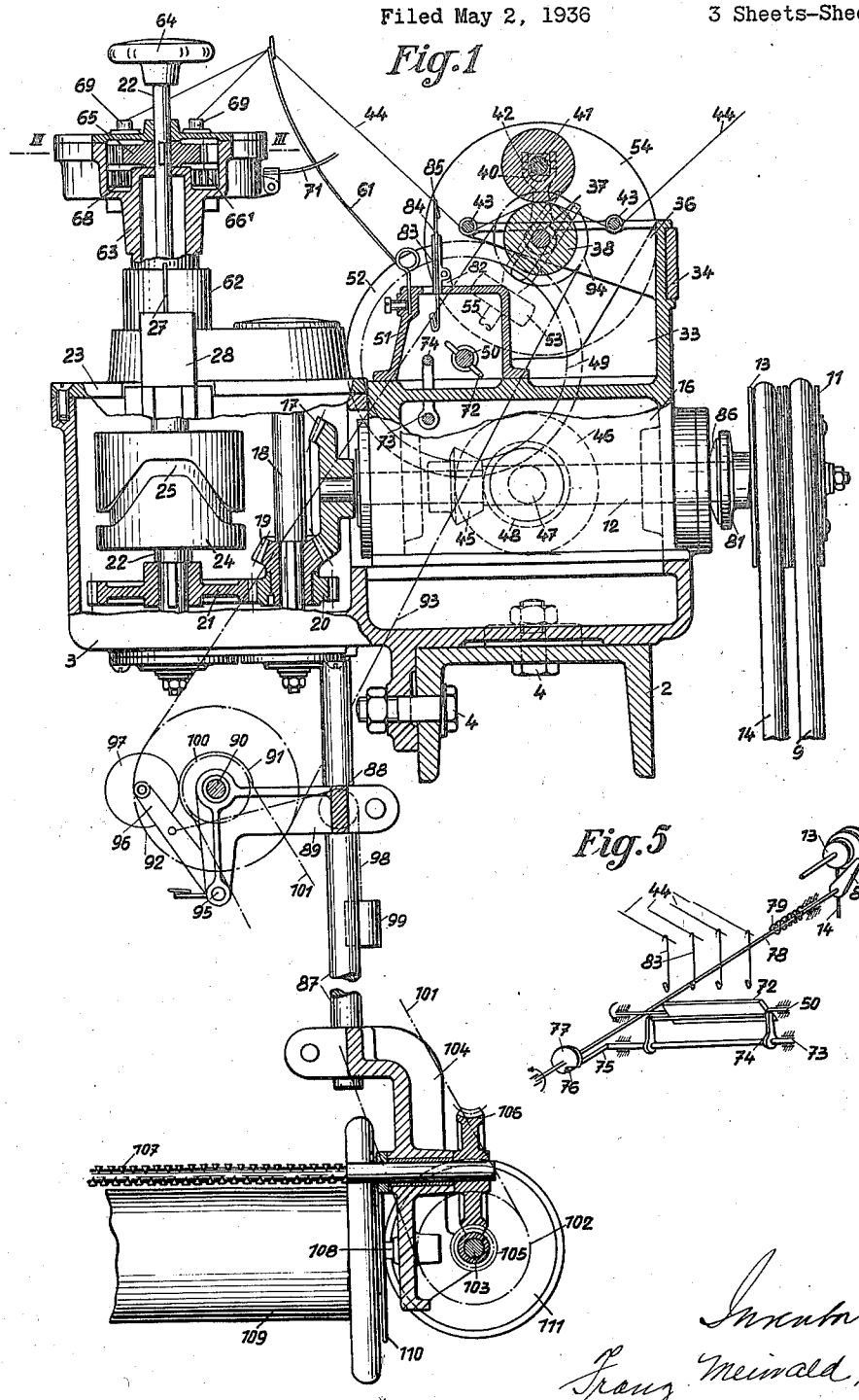


Fig. 5

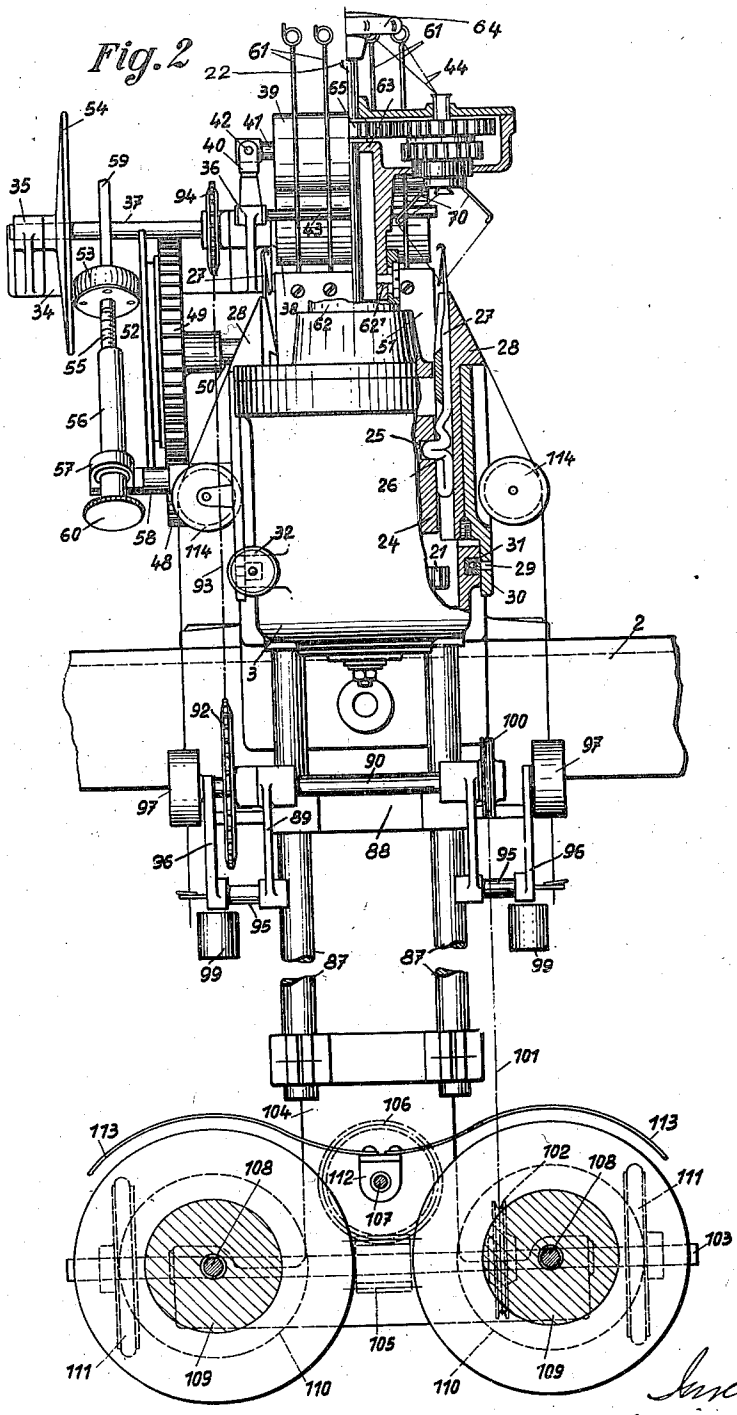
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Fig. 2



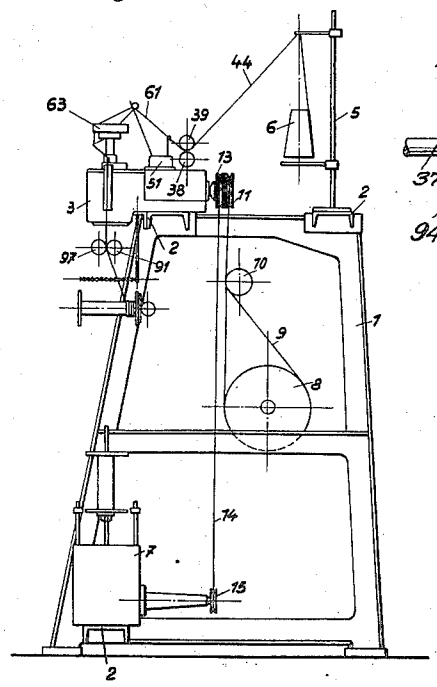
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Fig. 4



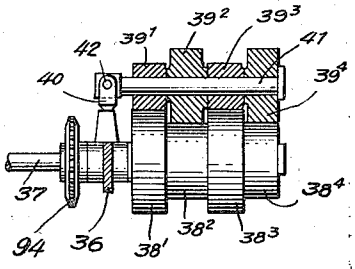
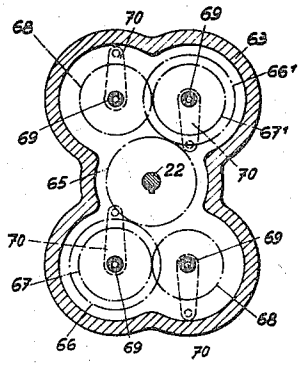


Fig. 6.

Fig. 3



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UNITED STATES PATENT OFFICE

2,111,984

YARN KNITTING MACHINE

Franz Meiwald, Vienna, Austria, assignor to Sinfra A. G., St. Gallen, Switzerland, a corporation of Switzerland

Application May 2, 1936, Serial No. 77,586
In Austria April 17, 1936

11 Claims. (Cl. 66—8)

This invention relates to a new and improved type of yarn knitting machine for the production of yarn knitted from two or more threads, and has for its object to simplify the construction and therefore to cheapen the building of such machines, as also to obtain advantages in connection with the operation of such machines.

The invention will be more readily understood if reference be had to the accompanying drawings forming part of this specification, and showing, by way of example, a form of construction embodying the present invention. In these drawings:

Fig. 1 is a side elevation of the essential part of the machine, shown partly in section.

Fig. 2 is a front elevation of the same, likewise partly in section.

Fig. 3 is a section taken on the line III—III of Fig. 1.

Fig. 4 shows the whole machine, in side elevation.

Fig. 5 is a diagrammatic representation of the arrangement of parts provided for the purpose of stopping the machine in the event of a thread breaking, and

Fig. 6 is a detail view of a modified thread feed.

Referring to Fig. 4 the framework of the machine consists of two similar trestles 1 and transverse members of U-section 2 to the uppermost of which, in front, there is screwed by means of screws 4 the casing 3 of the knitting head (Fig. 1). To the rear uppermost U-section transverse member 2 there is similarly secured the holder 5 for the supply bobbins 6. On the lower transverse member 2 there is mounted a thread twisting device of conventional design which is denoted in Fig. 4 by the reference numeral 7. The driving pulley, which may be driven by a motor in any desired manner, is denoted by 8. From this pulley a belt 9 leads, over a guide roller 10, to a cord pulley 11 which is loosely mounted on the main driving shaft 12 of the knitting head (Fig. 1).

The cord pulley 11 constitutes the one part of a friction clutch the other, axially displaceable, part of which consists of a second cord pulley 13 which, by means of a belt 14, drives the twisting device 7 through the intermediary of a pulley 15. On the casing 3 there is mounted a bearing member 16 serving to support the driving shaft 12. To this latter there is keyed, outside the bearing member 16, a bevel gear 17 which meshes with a bevel gear 19 that is fast on an intermediate shaft 18. The bevel gear wheel 19 is rigidly coupled to a spur wheel 20 which in its turn meshes with a spur wheel 21 on the shaft 22 pertaining to the knitting head. The shafts 18 and 22 are supported in the casing 3 and in a cover 23 of the latter, respectively.

Fast on the shaft 22 there is a cam cylinder 24 having in its periphery a cam groove 25 in which the feet 26 (Fig. 2) of the needles 27 engage. The effective parts of the needles (hook and tongue) are inwardly directed. There are only two needles used, and they are disposed diametrically opposite each other and guided vertically in needle beds 28. The needle beds 28 are arranged in the usual manner to be vertically adjustable and capable of being locked in position in the casing 3. The adjustment of the needle beds for the purpose of altering the length of the knitted loops is likewise effected in a known manner, by virtue of the arrangement that a pin pertaining to a sliding block engages in an oblique slot in the needle bed, while the said sliding block is adapted to be displaced by means of a screw spindle. In Fig. 2 this known arrangement is partly indicated, the pin being denoted by 29, the sliding block by 30, the screw spindle by 31, and the knob of the latter by 32.

The bearing member 16 is provided with a super-structure 33 to which there is attached a length of flat section iron 34 (Figs. 1 and 2) which carries two brackets 35, 36 for the supporting of a shaft 37. Fast on this shaft 37 there is a roller 38 above which there is provided a roller 39 which is supported on one side in a bearing upright 40 extending upwards from the bracket 36. The supporting of the roller 39 is effected with the aid of a shaft 41, which is pivotable about a pin 42 pertaining to the upright 40, so that the roller 39 can be lifted. The bracket 36 is provided with two stay-bolts 43 over which the four threads 44 coming from the supply bobbins, and disposed one behind the other in Fig. 1, are taken. These threads then travel between the rollers 38, 39.

To the driving shaft 12 there is secured, within the casing 16, a bevel gear wheel 45 which meshes with a bevel gear 46 attached, within the casing 16, to a shaft 47 to which there is secured, outside the casing 3, a gear wheel 48 which meshes with a gear wheel 49 fast on a shaft 50 supported in a cover-shaped casing 51. The gear wheel 49 forms a friction wheel 52 which co-acts, through an intermediate wheel 53, with a friction wheel 54 which is fast on the shaft 37. The intermediate wheel 53 is idly rotatable on the smooth free end of a screw spindle 55 which is screwed into a sleeve 56 rotatably mounted in a bearing 57 secured to a pin 58 projecting from the casing 16. The

intermediate wheel 53 is prevented from moving longitudinally on the spindle 55. The parts 56, 55, 53 are guided by means of a fork 59 which embraces the shaft 37 and is loosely mounted on the intermediate wheel 53. For the purpose of adjusting or shifting the spindle 55 a knob 60 is provided on its lower end which projects from the bearing 57.

To the cover-like casing 51 there is secured for each of the four threads a wire spring 61 the end of which is formed into an eyelet for the passage of the thread. The cover 23 is provided with a sleeve 62 in which there is firmly seated a bearing housing 63 which accommodates gearing for the operation of the thread guides. The housing 63 is adapted to be locked by means of a set-screw 62' in any position to which it may be vertically adjusted in the sleeve 62. The shaft 22 of the knitting head is passed through the sleeve 62 and the housing 63, and is fitted with a knob 64 at its upper end. To the shaft 22 there is keyed a gear wheel 65 (Figs. 1 to 3) which meshes with two diametrically opposed gear wheels 66, 66' (Fig. 3) which are rigidly coupled to smaller gear wheels 67, 67' which are disposed therebeneath and which mesh with gear wheels 68, 68' The gear wheels 66, 66', and 68, 68' are supported in the housing 63. The axles on which these wheels rotate are formed of tubes 69 through which the four threads coming from the eyelets on the wire springs 61 pass. Each of the gears 67, 67', and 68, 68' is provided with a thread guide 70, and in the position of the parts shown in Figs. 2 and 3 the two guides of each adjacent pair point in opposite directions. To the housing 63 there are secured forks 71 of wire which embrace the wire springs 61 and hold these latter fast against lateral displacement.

Within the cover-like casing 51 there is attached to the shaft 50 a plate 72 having two wings (Figs. 1 and 5). In the bearing member 16 there is provided a pin 73 which is disposed parallel to the shaft 50, and on which there is pivotally mounted a stirrup-shaped member 74. The pin 73 is provided with an arm 75 which engages a shoulder 76 on a disc 77 secured to a shaft 78 mounted in the casing 16. The shaft 78 is stressed by a torsional spring 79 which constantly strives to turn this shaft in the direction indicated by the arrow in Fig. 5, it being prevented however from doing so by the engagement of the arm 75 against the shoulder 76 on the disc 77. The shaft 78 is provided at one end with an arm 80 which, on rotation of the shaft, can bear against an inclined surface 81 (Fig. 1) on the movable part 13 of the friction clutch, and displace the clutch member against the action of a plate spring 86. The cover-like casing 51 is provided, in pivoted bearings 82, with four sleeves 83 in which there are slidably mounted wire members 84 of the upper ends of which are bent or doubled over to form hooks 85 with which the wire members are freely suspended on the threads 44. The lower ends of the wire members 84 are thickened by being repeatedly folded on themselves.

To the housing 3 there are secured two downwardly extending stay-bolts 87 on which there is arranged to be slid and locked in position a bearing member 88 having two arms 89 in which there is mounted a shaft 90 which is provided at its free ends with rollers 91. The shaft 90 is driven from the shaft 37 by means of sprocket wheels 94 and 92 and chain 93. On pins 95 on the arms 89 there are pivoted arms 96 on which there are mounted rollers 97 which bear against the rollers 91 in response to the action of a weight 98 suspended on a flexible tension member 99. The shaft 90 is fitted with a cord pulley 100 which drives, through the intermediary of a cord 101 and a further cord pulley 102, a shaft 103. This shaft 103 is mounted in a bearing member 104 which is adapted to be slid and locked in any desired position on the stay-bolts 87. The shaft 103 is provided midway with a worm 105 which engages in a worm wheel 106 attached to a cross-threaded spindle 107 supported at one end in the bearing member 104. In this bearing member there are further mounted two stay-bolts 108 to which winding bobbins 109 may be fitted. The stay-bolts 108 are fitted with friction wheels 110 which are adapted to be driven by friction wheels 111 on the shaft 103. On the cross-threaded spindle 107 there is adapted to travel a sliding block 112 which can be moved to and fro in a known manner on rotation of the spindle, by virtue of its engagement in the grooving of the spindle. To the sliding block 112 there are secured bifurcated thread guides 113 which partly embrace the winding bobbins 109, and which extend to both sides of the block 112 and spindle 107. In Fig. 2 the two prongs of each of these thread guides coincide, so that they are seen as one.

The drive of the parts of the machine for which the drive is taken from the pulley 8 is through the train comprising the cord pulley 11 and the clutch part 13, driving shaft 12, and gear wheels 17, 19, and 21, to the shaft 22 of the knitting head, with the result that at each revolution of the cam cylinder 24 the needles are raised and lowered twice. Through the train of gears 45, 46, 48, 49, and the friction gearing 52, 53, and 54 the shaft 37, and with it the thread feeding means (rollers 38 and 39), are driven. The drive for the withdrawing means (rollers 91 97, on the shaft 90) is taken from the shaft 37 by means of the chain drive comprising the elements 94, 93, and 92. The rotation of the shaft 90 is transmitted, through the cord drive 100, 101, 102, to the shaft 103, and consequently to the cross-threaded spindle 107 and to the winding bobbins 109.

As can be seen from Fig. 1, the four threads 44 are withdrawn from the supply bobbins 6 by the conveyor rolls 38, 39, and travel through the eyelets of the wire springs 61, the tubes 69, and the eyelets of the thread guides 70, which feed the threads in pairs to the two needles in the following manner. To each needle there are fed two threads, the first at the first raising of the needle, and the second at the second raising of the needle during one revolution of the cam cylinder 24. This purpose is served more particularly by the position of the thread guides shown in Fig. 3 which of course only shows one of the phases of the constantly changing position during the cycle of the machine. The knitted yarns produced in this manner are withdrawn by the withdrawing means 91, 97, passing thereby over the oblique surfaces at the upper end of the needle beds shown in Fig. 2, and over guide rollers 114 which are mounted on the needle beds. The entire knitting operation and the withdrawing of the yarns is visible, which constitutes a particular advantage of the form of construction according to the invention. From the withdrawing rollers 91, 97 the yarns travel on to the winding rolls 109, for which purpose they pass through the bifurcated thread guides 113 and become uniformly wound on the rolls

109 in consequence of the reciprocating movement of the thread guides secured to the sliding block 112.

If it is desired to twist the yarn, the spooling device is taken off, the belt 14 fitted over the cord pulleys 13 and 15, and the yarn taken to the twisting device 7 of conventional design.

By means of the friction transmission gearing 52, 53, 54, both the rate of feed of the threads (and with it the length of the loops) and also the speed of the withdrawing means can be regulated. For this purpose the spindle 55 is rotated by means of the knob 60, whereby the position of the intermediate wheel 53 relatively to the friction wheels 52 and 54, and therefore also the speed of rotation of the shafts 37 and 90, are altered simultaneously.

In order to alter the vertical adjustment of the thread guides 70 to allow for the use of needles of different length, the set-screw 62' is slackened and tightened up again after alteration of the setting of the bearing housing 63.

On the breaking of a thread the wire member 84 suspended therefrom by its hook 85 loses its hold, with the result that it slides down in its sleeve 83 and comes with its thickened end in the path of movement of the plate 72. In consequence of the pivoted mounting of the sleeve 83 this wire member is then pushed aside by this plate 72, thereby pivoting the stirrup-shaped member 74 (Figs. 1 and 5), so that the arm 75 comes out of engagement with the shoulder 76 and the shaft 78 is rotated in the direction indicated by the arrow in Fig. 5 by the action of the spring 79, with the result that the arm 80 is pressed against the inclined surface 81 and disengages the part 13 of the clutch. Thus on the breaking of one of the threads the entire machine is stopped. The clutch is of course also capable of being disengaged independently of the described automatic stop motion.

Since the knitting head constitutes an independent unit or assembly it can also be fitted to existing thread machines. It will be understood that the invention is not restricted to the concrete embodiment described and illustrated by way of example, but can be appropriately modified within the scope and spirit of the invention. Thus for example in place of two needle beds there could also be provided one single needle bed or more than two needle beds. The two threads fed to one needle may be fed thereto at different speeds, for which purpose the conveyor rollers 38, 39 may either be subdivided, and their parts adapted to be driven at different speeds, or made of stepped design with the retention of a common drive.

As shown in Figure 6, this modification may comprise a plurality of stepped rolls $38'$, 38^2, 38^3, and 38^4 on the shaft 37, which shaft and the parts 36, 40, 41, 42, and 94 are the same as illustrated in the main views of the drawings. The stepped rolls $39'$, 39^2, 39^3, and 39^4 are mounted to idle on the shaft 41 and are in peripheral contact respectively with the rolls $38'$, 38^2, 38^3, and 38^4. It therefore follows that the revolutions caused by the differences in the diameter of the last mentioned rolls may result in imparting different speeds to the threads engaged thereby.

I claim:

1. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, said needles being arranged in a plurality of banks, a set of revoluble thread guides supported above each bank of needles, and drive means driving said cam cylinder and thread guides.

2. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, said needles being arranged in a plurality of banks, a set of revoluble thread guides supported above each bank of needles, the thread guides of each set each having a driven gear fixed thereto, a driving gear centrally of the gears of each set and meshing with the driven gears, and drive means driving the cam cylinder and central gears.

3. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, said needles being arranged in a plurality of banks, a set of revoluble thread guides supported above each bank of needles, the thread guides of each set each having a driven gear fixed thereto, a driving gear centrally of the gears of each set and meshing with the driven gears, and drive means driving the cam cylinder and central gears, said drive means including a shaft whereon said cam cylinder and driving gear are mounted.

4. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, said needles being arranged in a plurality of banks, a set of revoluble thread guides supported above each bank of needles, the thread guides of each set each having a driven gear fixed thereto, a driving gear centrally of the gears of each set and meshing with the driven gears, drive means driving the cam cylinder and central gears, said drive means including a shaft whereon said cam cylinder and driving gear are mounted, and a hand wheel on the upper end of said shaft.

5. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, fabric feeding rolls below said cam cylinder for drawing the knitted fabric downwardly, a main drive shaft, frictional gearing connecting the main drive shaft with the feed rolls, said frictional gearing including a driving disk, a driven disk parallel to the driving disk and eccentric thereto, an idler between said disks, and idler adjusting means to vary the position of said idler radially with respect to said disks.

6. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, fabric feeding rolls below said cam cylinder for drawing the knitted fabric downwardly, a main drive shaft, pairs of feed rollers for the several threads constructed and arranged to feed the several threads at individual linear speads, and frictional gearing

connecting the main drive shaft with the feed rolls.

7. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, fabric feeding rolls below said cam cylinder for drawing the knitted fabric downwardly, a main drive shaft, stepped thread feed rollers feeding threads to said guides, each step of the rollers driving an individual thread, and frictional gearing connecting the main drive shaft with the feed rolls.

8. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold said needles for reciprocating movements, said needles being arranged in a plurality of banks, a set of revoluble thread guides supported above each bank of needles, drive means driving said cam cylinder and thread guides, a vertically adjustable casing supporting said thread guides above said needles, and means securing said casing in adjusted position.

9. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles arranged in a plurality of banks surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging said cam groove, guide means to hold said needles for reciprocating movements, a set of thread guides situated above each bank of needles, and driving means to actuate said cam cylinder.

10. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles surrounding said cylinder arranged in a plurality of banks and parallel to the axis thereof, feet on said needles engaging in said groove, means for holding said needles for reciprocating movements, a set of thread guides situated above each bank of needles, thread feeding rolls for controlling the feeding speed of the thread and the length of the stitches, means for driving the cam cylinder and feed rolls, and tension equalizing devices arranged between said thread guides and said feed rolls.

11. In a yarn knitting machine, a rotating cam cylinder having an external cam groove, a multiplicity of needles arranged in a plurality of banks surrounding said cylinder and parallel to the axis thereof, feet on said needles engaging in said groove, guide means to hold the needles for reciprocating movements, a set of thread guides situated beyond each bank of needles, thread feeding rolls for controlling the feeding speed of the thread and the length of the stitches, a main drive shaft for driving the cam cylinder, gearing connecting the main drive shaft with the feed rolls, and tension equalizing devices arranged between said thread guides and said feed rolls.

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