Feb. 20, 1951 A. W. KENT 2,542,816

KNITTING MACHINE

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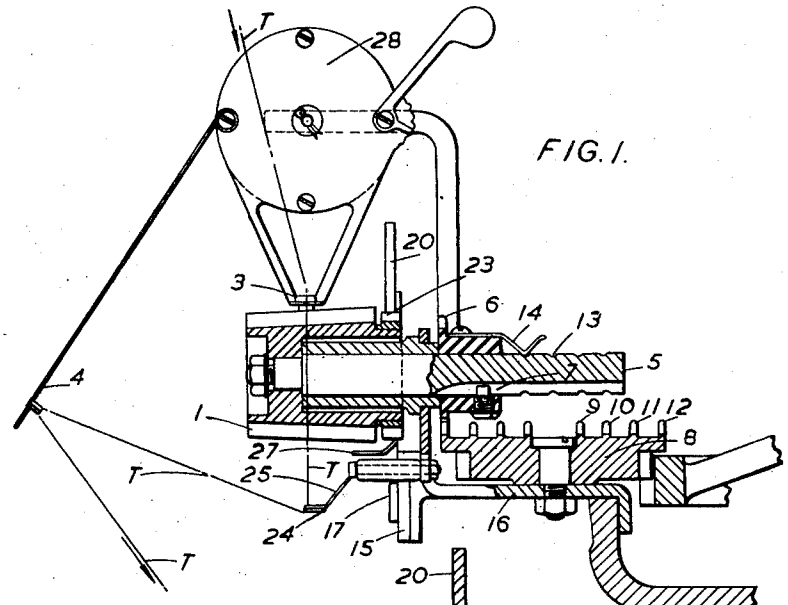


FIG. 1.

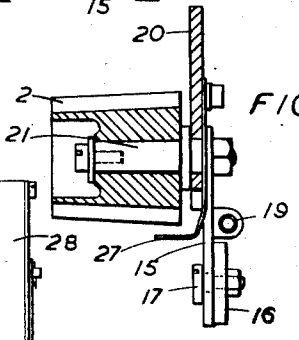


FIG. 2.

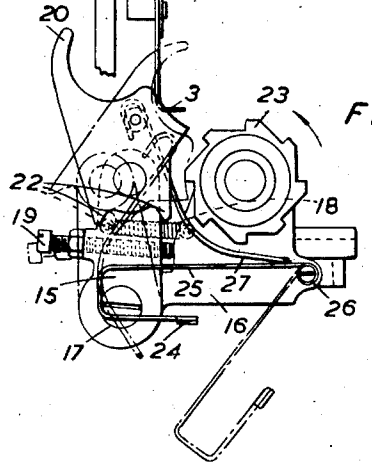


FIG. 3.

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FIG.5.

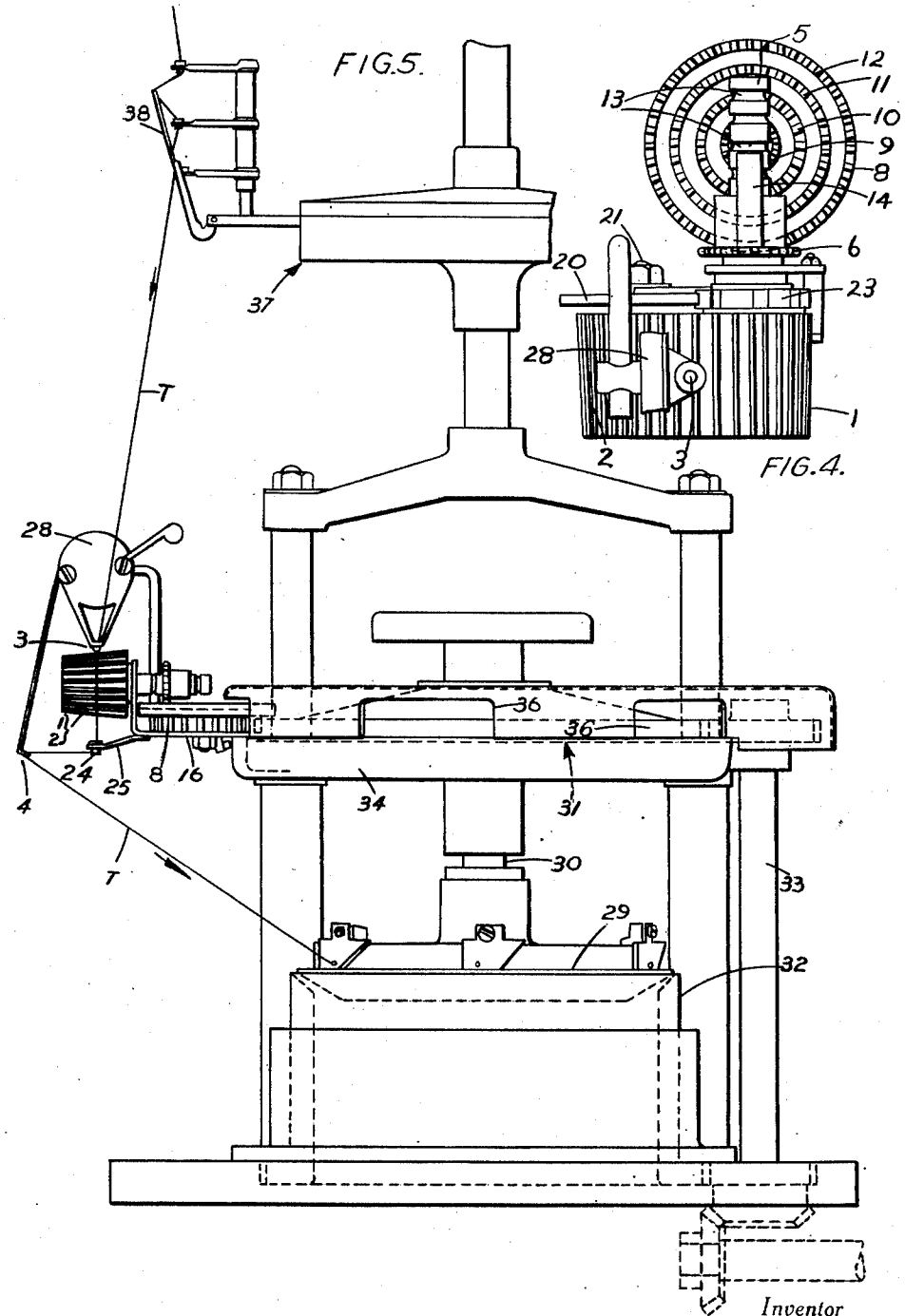


FIG.4.

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UNITED STATES PATENT OFFICE

2,542,816

KNITTING MACHINE

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11 Claims. (Cl. 66—132)

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This invention concerns yarn furnishing or feeding devices, such as are employed in knitting machines, of the type comprising two rotary furnishing members co-operating to feed the yarn between them, and the invention is especially concerned with that species of said furnishing device wherein means are provided for adjusting the linear rate of yarn feed for a given rotary speed of the furnishing members. For example, these furnishing members may be conical, their peripheries being either smooth or being provided with teeth which mesh together, and the feed adjustment may be effected automatically by displacing axially of the two members the location at which the yarn passes between them; alternatively or additionally, in the case of toothed furnishing members (whether parallel or conical) the adjustment in the rate of feed may be effected manually by varying the depth to which the teeth mesh together.

It is common practice to equip large diameter circular knitting machines having a plurality of feeding and/or knitting positions, with a device of this type at each position, all said devices being driven in unison. In order to increase the utility and scope of such a machine, it may be beneficial so as to arrange matters that the linear rate of feed as between one position and another may differ considerably. For example, the linear rate of feed at a position whereat knitting takes place will require to be substantially different from that at a position wherein the yarn is merely laid into the fabric and is not formed into knitted loops. Furnishing devices as heretofore fitted to such machines are not capable of meeting this requirement, and therefore an object of the present invention is the provision in a circular knitting machine of yarn furnishing devices which are adapted to meet this requirement and which are characterised by variable speed gear driving the rotary furnishing members. Thus, by adjusting the gear ratio of any selected one of the furnishing devices in a knitting machine of the character described the linear rate of feed of that device may be rendered substantially different from that of one or more of the remaining devices even although said devices may all be driven from a common driving means.

In circular rib knitting machines of the character described, having a rotary needle cylinder and a rotary needle dial (the expression "rib knitting machines" being employed herein to include interlock machines) it is known to drive the dial through one set of gearing and to drive

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the yarn furnishing devices through another set of gearing. The provision of these two drives unduly complicates the machine and increases the expense of manufacture thereof. Therefore, a further object of the present invention is the provision, in a circular knitting machine having a rotary dial, of improvements comprising the combination with gearing driving said dial and including a gear wheel rotating with it, of a plurality of yarn furnishing devices of the type specified and means driving them all from the said gear wheel.

In the known rib knitting machines just mentioned, it has heretofore been customary to mount the yarn furnishing devices at a substantial height above the dial and to provide, between them and the dial, a stop motion including yarn detectors which operate on the yarns at the delivery side of the furnishing devices and serve to stop the machine, and/or to place in train such other operations (such for example as the displacement of the stitch cams) as will avoid a press-off, when any yarn detector detects that its associated yarn is broken. It is thought desirable, however, that the yarn furnishing devices should occupy a position considerably lower than that which is customary, and indeed the use of a dial-driving gear for driving them will in general involve their location at a level which is very little above that of the dial. This location renders it impossible to position the known stop motion at the delivery side of the furnishing device and it becomes necessary to position it at the supply side of said devices between the latter and the bobbins from which they draw their yarns. As a result, although this stop motion will then be capable of detecting and operating in consequence of a yarn breakage at the supply side of said device it is not, unless further precautions are taken, capable of detecting a yarn breakage at the delivery side of said devices. This will readily be appreciated when it is pointed out that if the yarn breaks between a yarn furnishing device and the needles the said yarn is still gripped by the furnishing members of that device and is drawn by them under tension from the supply bobbin with the result that the associated detector of the stop motion engages a taut and correctly running yarn. In order to overcome this difficulty the present invention, as viewed from a further aspect, provides a yarn furnishing device of the type specified having a yarn detector located at the delivery side thereof to detect a broken yarn and means operable upon response of the detector to separate the rotary furnishing

members and to cause them to relax their grip on the yarn. Since the broken yarn is thus released by the furnishing device it is capable of evoking a response from the detector of a stop motion located at the supply side of the device. Therefore, according to a still further feature of the present invention a circular knitting machine is provided with a plurality of yarn furnishing devices of the type specified, a stop motion including yarn detectors operable upon the yarns at the supply side of the said devices, other detectors operable on the yarns at the delivery side of the said devices, and means operable by each of said other detectors to cause the associated device to relax its grip upon detection of a breakage in the associated yarn whereby the associated detector of the stop motion is rendered operative.

The foregoing and other features of the invention set out in the appended claims are incorporated in the construction which will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a section through the yarn furnishing device, taken in a vertical plane in which the axis of one of the rotary furnishing members lies, while

Figure 2 is a section taken in a vertical plane containing the axis of the other furnishing member;

Figure 3 is a front elevation, with the two furnishing members omitted for the sake of clarity;

Figure 4 is a plan view;

Figure 5 illustrates the application of the device to a cylinder and dial machine.

In a preferred embodiment the yarn furnishing device comprises two tapered gear wheels 1, 2 meshing together. The yarn 1, is fed through the nip between them and being engaged by the meshing teeth (whereof the depth of mesh varies along the wheels), is drawn off at a predetermined linear rate. At the supply side it passes to the nip through an eye 3 which is movable along the nip and at the delivery side it passes through a dropper or other device 4 which, being displaceable by the tension of the running yarn according to whether the machine consumes the yarn at a greater or less linear rate than that at which the device furnishes it, operates to shift the eye 3 along the nip so as to vary the rate of yarn delivery in known manner.

By way of example only, the eye 3 is shown depending from a swinging damper 28 movable by dropper 4.

The furnishing wheel or feed wheel 1 is driven through variable speed gearing (change-speed gearing) affording a selection from among a plurality of ratios. For this purpose, the said wheel 1 is provided with an elongated spindle 5 to which a pinion 6 is slidably connected at 7 so as to be engaged selectively with any one of a series of crown gears provided at an end face of a driving pinion 8. Each crown gear consists of a ring of teeth and the number of teeth in the crown gears differs so that the requisite choice of ratios is afforded. Conveniently four crown gears 9, 10, 11, 12 are provided.

In order that the sliding pinion 6 may be retained in the selected position, any suitable releasable detent may be provided. Conveniently the spindle 5 is formed with spaced annular grooves 13 appropriate to the various positions and the sliding pinion is provided with a spring finger 14, plunger, or the like, arranged to engage these grooves.

One of the two feed wheels 1, 2 is movable laterally. Conveniently there is an adjustment which determines the depth of mesh and therefore affords an adjustment for the linear rate of yarn feed. For this purpose, one wheel (e. g. wheel 2) may be mounted on a lever or bracket 15 pivoted to the base plate 16 at 17 the attitude of which lever 15 is adjustable by screw stop 19 against the action of a spring 18 serving to urge the two wheels 1, 2 into mesh.

The lever 15 has a transmitter in the form of a thrust lever 20, pivoted to it to move about the spindle 21 of wheel 2 and the thrust lever is movable on lever 15 within limits determined by stop mechanism 22, towards and away from a rotary separator in the form of a ratchet wheel 23 connected to the other feed wheel 1 (to which the drive is applied). Thus, if the lever 20 is permitted to swing until it engages the ratchet 23, rotation of the latter acts through lever 20 to thrust the bracket 15 outwards and to separate the two feed wheels so that they release the yarn 1. Such movement is produced by the breakage of the yarn at the delivery side of the furnishing device, between the latter and the needles. For this purpose, the yarn runs from between the two feed wheels 1, 2 through an eye 24 on a pivoted dropper or detector 25 and thence to the feed-adjusting dropper 4 already mentioned. The second dropper 25 supports, near its pivot 26, a wire or other strut 27 protruding from the lever 20. Therefore, if the yarn breaks at the delivery side of the furnishing device dropper 25 falls and frees the wire or strut and permits the thrust lever 20 to swing under gravity or the influence of a spring to engage the ratchet wheel 23. Thereby, the feed wheels are separated as already described until they are no longer in mesh. As a result, if a stop motion is provided at the supply side of the furnishing device the broken yarn, being no longer held taut by the grip of the feed wheels 1, 2, is capable of actuating the stop motion to stop the machine.

The furnishing device may be re-set by raising the dropper 25 by hand and by pulling the lever 20 away from the ratchet wheel 23.

Furnishing devices according to this invention are preferably applied to a multi-feeder rib knitting machine in the following manner. As shown in Fig. 5, the dial 29 of this machine is mounted on a vertical shaft 30 the upper end of which is adjustably connected to a large diameter gear wheel 31 which is driven in timed relation with the cylinder 32 by means of a vertical drive shaft 33 disposed exteriorly of the latter. This gear wheel 31 is enclosed in a suitable casing 34 and the yarn furnishing devices are mounted at the required locations on the rim of this casing which, at each such location, is cut away so that the driving pinion 8 of the furnishing device providing thereat may be engaged with the dial gear 31. One furnishing device is shown in Fig. 5, but the cut-out portions 36 of the gear casing 34 indicate the locations of some of the other devices. It will be understood, of course, that in addition to the detectors 24, 25, there is a stop motion 37 of any known or approved kind including detectors 38 operable upon the yarns T before they reach the furnishing devices. Such a stop motion, being well known, requires no further illustration or description herein; for one example reference may be made to British Patent Specification No. 591,773.

Having now particularly described and ascertained the nature of the said invention and in

what manner the same is to be performed, I declare that what I claim is:

1. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position, and a common gear for driving all said devices, each of which devices comprises two rotary furnishing members cooperating to feed the yarn between them, and for each device toothed change-speed gearing affording a choice among plurality of predetermined ratios for driving the furnishing members from the common gear, which change-speed gearing comprises a plurality of concentric driving gears having a differing number of teeth, a spindle for one of the furnishing members, a driven pinion displaceable along the spindle into mesh with any selected one of the driving gears, a driving connection between the pinion and the spindle, and means locating the pinion in its selected position.

2. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position, and a common gear for driving all said devices, each of which devices comprises two rotary tapered, toothed furnishing members that mesh together and cooperate to feed the yarn between them, and for each device toothed change-speed gearing affording a choice among plurality or predetermined ratios for driving the furnishing members from the common gear, which change-speed gear comprises a plurality of concentric driving gears having a different number of teeth, a spindle for one of the furnishing members, a driven pinion displaceable along the spindle into mesh with any selected one of the driving gears, a driving connection between the pinion and the spindle, and means for locating the pinion in its selected position.

3. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position, and a common gear for driving all said devices, each of which device comprises two rotary furnishing members cooperating to feed the yarn between them, a yarn detector at the delivery side of the furnishing members for responding to breakage in the yarn and means operable, upon response of the detector, for shifting the furnishing members apart and, for each furnishing device, toothed change speed gearing affording a choice among a plurality of predetermined ratios for driving furnishing members from the common gear.

4. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position, and a common gear for driving all said devices, each of which devices comprises two rotary furnishing members cooperating to feed the yarn between them, and for each device toothed change-speed gearing affording a choice among plurality of predetermined ratios for driving the furnishing members from the common gear, which change-speed gearing for each device comprises a plurality of driving gears and a driven pinion displaceable into mesh with any selected one of them.

5. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position, and a common gear for driving all said devices, each of which devices comprises two rotary furnishing members cooperating to feed the yarn between them, and, for each device, toothed change speed gearing affording a choice among a plurality of predetermined ratios for driving the furnishing members from the common gear.

6. A machine according to claim 5 wherein each device comprises a detector, at the delivery side of its furnishing members, for detecting a broken yarn, a transmitter normally held in inoperative position by the detector but movable to operative position upon response of the detector, and a rotary member coupled to one of the furnishing members for acting on the operative transmitter to produce separation of the furnishing members.

7. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position, and a common gear for driving all the devices, each of which devices comprises two rotary toothed yarn furnishing members rotatable with their teeth in mesh to feed the yarn between them, toothed change-speed gearing affording a choice among a plurality of predetermined gear ratios for driving one of the said members from the common gear, a mounting on which the other furnishing member is movable out of mesh with the first member, spring means for urging the two members together, a stop for determining their approach, a detector responsive to a breakage in the yarn, a rotary separator rotating with the first member, and mechanism operable by the separator upon said response of the detector to shift said other furnishing member out of mesh.

8. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a rotary dial for knitting instruments, gearing driving said dial, a gear wheel rotating with the dial, a yarn furnishing device at each position each of which devices comprises two rotary furnishing members cooperating to feed the yarn between them and, for each device, toothed change speed gearing affording a choice among a plurality of predetermined ratios for driving the furnishing members from the gear wheel.

9. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position each of which devices comprises two rotary furnishing members cooperating to feed the yarn between them and a spindle for one of said members, and a common gear for driving all said devices, and for each device toothed change speed gearing affording a choice from among a plurality of predetermined ratios for driving the furnishing members from the common gear, wherein the gearing for each device comprises a crown wheel having its axis at right angles to the axis of the spindle, and affording a plurality of concentric rings of teeth, the number of teeth in the rings differing; a driving pinion slidable along the spindle into engagement with any selected ring of teeth and

for thereby affording a selection among a plurality of gear ratios, a driving connection between the pinion in each of its positions and the spindle, a detent for locating the pinion in its selected position, means mounting the yarn furnishing members for separation to release the yarn, a toothed separator upon the spindle, a detector for acting on the yarn at the delivery side of the yarn furnishing device and for responding to a yarn breakage, and a transmitter movable, upon response of the detector, into engagement with the separator teeth and for thereby causing the separator in its rotation to separate the furnishing members.

10. A machine according to claim 5 wherein each furnishing device comprises a device, responsive to changes in yarn tension, for regulating the rate of feed to counteract these changes by shifting the point at which the yarn passes between the furnishing members, a plurality of concentric crown gears driven in unison by the common gear, a spindle for one of the furnishing members, a driven pinion displaceable along the spindle into mesh with any selected one of the crown gears, a driving connection between the pinion and the spindle, readily-releasable means for locating the pinion in its selected position on the spindle, a mounting for one of the furnishing members on which the latter is movable to disengage its teeth from those of the other member, spring means for urging the two members together, an adjustable stop for adjustably determining their approach, a detector at the delivery side of the furnishing members for responding to a breakage in the yarn, and mechanism, operable upon response of the detector, for positively shifting the movable furnishing member to disengage its teeth from those of the other member.

11. In a circular knitting machine of the type in which yarn is fed at a plurality of circumferentially-spaced feeding positions around the machine, the combination of a yarn furnishing device at each position and a common driving gear for driving all said devices, each of which devices comprises two rotary, toothed, yarn furnishing members rotatable with their teeth in mesh to feed the yarn between them, change speed gearing affording a device among a plurality of ratios for driving one of the furnishing members of that device from the common driving gear, a mounting on which the other furnishing member is movable out of mesh with the first member, spring means for urging the two members together, a stop for determining their approach, a detector responsive to a breakage in the yarn, a rotary separator rotating with the first mentioned furnishing member for shifting the other member to the yarn releasing position when rendered operative, a movable transmitter movable between an inoperative position and an operative position in which it is engaged by the separator and establishes a connection from the latter for moving the said other furnishing member to the yarn releasing position, and a connection between the detector and the transmitter for holding the transmitter in the inoperative position except upon descent of the detector.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
424,295	Haslam	Mar. 25, 1890
855,316	Hurley et al.	May 28, 1907
1,064,280	Beede	June 10, 1913
1,171,363	Stansfield	Feb. 8, 1916
1,536,181	Ide	May 5, 1925
1,562,829	Howie	Nov. 24, 1925
1,589,794	Drumheller	June 22, 1926
1,606,012	Wilson	Nov. 9, 1926
2,018,290	Stromberg	Oct. 22, 1935
2,023,515	Chatfield	Dec. 10, 1935
2,124,104	Chatfield	July 19, 1938
2,182,295	Lebocey	Dec. 5, 1939
2,247,244	Lawson	June 24, 1941
2,247,245	Lawson	June 24, 1941
2,432,685	Sawyer	Dec. 16, 1947