

YARN FEEDING APPARATUS FOR CIRCULAR KNITTING MACHINES

FIELD OF THE INVENTION

The present invention relates to a yarn feeding apparatus
5 for circular knitting machines and particularly to a yarn
feeding apparatus for color-changing yarn feeding wheels of
circular knitting machines.

BACKGROUND OF THE INVENTION

Yarn feeding apparatus equipped with a yarn feeding
10 wheel plays an intermediary role between a circular knitting
machine and a yarn barrel. It mainly provides a smooth yarn
supply path during knitting operation of the circular knitting
machine and maintains a desired tensile strength of yarns. If
the tensile strength of the yarns is too strong the yarns are
15 easily broken. Too small tensile strength will result in
unsmooth yarn supply. In order for single circular knitting
machine to knit complex patterns, a great number of yarn
feeding wheels are needed to supply yarns.

A conventional yarn feeding apparatus, such as R.O.C.
20 patent No. I326725 basically includes a yarn feeding body, a
yarn feeding board coupled with the yarn feeding body and a
transmission shaft driven by the yarn feeding body. The
transmission shaft is fixedly coupled with at least one yarn
feeding wheel. The yarn feeding board has at least one yarn
25 inlet and at least one yarn outlet, and also has at least one

guiding unit. After the yarn passes through the yarn inlet, it threads through a yarn guiding eyelet at a distal end of the guiding unit, and then passes through the yarn outlet to be sent to the knitting machine for knitting. The guiding unit is
5 drawn by the yarn to move reciprocally on a motion track between a yarn supply position and a yarn supply stopped position. As the yarn is constantly in contact with the yarn guiding surface of the yarn feeding wheel between the yarn supply position and the yarn supply stopped position, and the
10 transmission shaft keeps rotating regularly, the yarn guiding surface constantly contacted by the yarn gradually wears off, hence the yarn feeding wheel has to be replaced frequently.

As mentioned above, if the transmission shaft continuously drives the yarn feeding wheel rotating even
15 when the yarn is stopped supplying, the yarn guiding surface made of plastic material still receives constant friction of the yarn and results in unnecessary wear.

SUMMARY OF THE INVENTION

The primary object of the present invention is to solve the
20 problem of the conventional technique with the yarn feeding wheel constantly driven by the transmission shaft to rotate even when the yarn is stopped supplying that results in excessive wear.

To achieve the foregoing object, the present invention
25 provides a yarn feeding apparatus for circular knitting

machines that includes a yarn feeding body and a transmission shaft driven by the yarn feeding body. The yarn feeding body includes at least one guiding unit which is drawn by a yarn to turn and move reciprocally on a motion track relative to the transmission shaft between a yarn supply position and a yarn supply stopped position. The invention is further characterized in that the transmission shaft is movably coupled with at least one yarn feeding wheel freely rotating against the transmission shaft, and also coupled with at least one transmission mechanism driven by the transmission shaft. The yarn feeding wheel has at least one wedge member corresponding to the transmission mechanism. The wedge member has a first position to separate from the transmission mechanism and a second position pushed by the guiding unit on the motion track to couple with the transmission mechanism to drive the yarn feeding wheel to rotate synchronously with the transmission shaft.

In one embodiment, the wedge member has a wedge portion to wedge in the transmission mechanism and an action strut pushed by the guiding unit. The guiding unit has a pressing section to push the action strut. The action strut has a drawing surface drawn by the pressing section to move the wedge member to the second position.

In one embodiment, the guiding unit has a pushing section to push the action strut and the action strut has a butting

surface butted by the pushing section to move the wedge member to the first position.

In one embodiment, the transmission mechanism includes a plurality of ratchets and the wedge portion is a detent
5 corresponding to the ratchets.

In one embodiment, the yarn feeding body further includes a friction plate in contact with the yarn feeding wheel regularly.

In one embodiment, the yarn feeding wheel has a
10 mounting surface hinged by the wedge member, a cover plate to cover the mounting surface and a gap between the cover plate and mounting surface to receive entry of the guiding unit.

In one embodiment, the yarn feeding wheel has at least
15 one yarn guiding surface, and the guiding unit has at least one yarn guiding ring corresponding to the yarn guiding surface to allow the yarn to thread through and guide the yarn to contact the yarn guiding surface.

In one embodiment, the yarn feeding wheel includes a first
20 yarn guiding surface and a second yarn guiding surface, and the guiding unit has a first yarn guiding ring corresponding to the first yarn guiding surface to allow the yarn to thread through and guide the yarn to contact the first yarn guiding surface, and the yarn feeding body includes an ancillary
25 guiding unit which has a second yarn guiding ring

corresponding to the second yarn guiding surface to allow the yarn to thread through and guide the yarn to contact the second yarn guiding surface.

The invention, through the guiding unit moving on the motion track to drive the wedge member hinged on the yarn feeding wheel to move against the transmission mechanism, the transmission shaft and yarn feeding wheel can be fully coupled and separated. Thus the problem that the yarn feeding wheel is constantly contacted by the yarn to result in wear even when the yarn is stopped supplying can be eliminated.

The foregoing, as well as additional objects, features and advantages of the invention will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

15 **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a perspective view of an embodiment of the invention.

FIG. 2 is a fragmentary schematic view of an embodiment of the invention.

20 FIG. 3 is a fragmentary side view of an embodiment of the invention.

FIGS. 4A and 4B are top views of an embodiment of the invention in continuous operating conditions.

FIG. 5 is a schematic view of another embodiment of the invention at a yarn supply position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to FIGS. 1 and 2 for an embodiment of the yarn feeding apparatus of the invention. It is adopted for use
5 on a circular knitting machine. The yarn feeding apparatus includes a yarn feeding body 10 and a transmission shaft 20 driven by the yarn feeding body 10. The yarn feeding body 10 includes a yarn feeding board 11 which is coupled with a guiding unit 30 and an ancillary guiding unit 31. The
10 transmission shaft 20 is movably coupled with at least one yarn feeding wheel 40 freely rotating against the transmission shaft 20. The yarn feeding wheel 40 includes a first yarn guiding surface 43 and a second yarn guiding surface 44. The yarn feeding board 11 includes a plurality of yarn inlets 111
15 and yarn outlets 112 threaded through by a plurality of yarns 50 (also referring to FIG. 5). The guiding unit 30 has a first yarn guiding ring 303 corresponding to the first yarn guiding surface 43 to allow the yarn 50 to thread through and guide the yarn 50 to contact the first yarn guiding surface 43. The
20 ancillary guiding unit 31 has a second yarn guiding ring 311 corresponding to the second yarn guiding surface 44 to allow the yarn 50 to thread through and guide the yarn 50 to contact the second yarn guiding surface 44. The yarn 50 draws the first yarn guiding ring 303 and second yarn guiding ring 311
25 so that the guiding unit 30 and ancillary guiding unit 31 turn

and move reciprocally on a motion track relative to the transmission shaft 20 between a yarn supply position and a yarn supply stopped position.

Please also refer to FIGS. 2 and 3, the transmission shaft
5 20 is coupled with a transmission mechanism 21 driven by the transmission shaft 20. In this embodiment, the transmission mechanism 21 includes a plurality of ratchets 211. The yarn feeding wheel 40 has a mounting surface 41 adjacent to the transmission mechanism 21. The mounting surface 41 is
10 hinged by at least one wedge member 42 corresponding to the transmission mechanism 21. The wedge member 42 has a wedge portion 421 to wedge in the transmission mechanism 21 and an action strut 422 pushed by the guiding unit 30. More specifically, the wedge portion 421 can be a detent
15 corresponding to the ratchets 211 to form wedging therewith. The guiding unit 30 has a pressing section 301 to contact the action strut 422 and a pushing section 302 (also referring to FIG. 4). The action strut 422 has a drawing surface 423 drawn by the pressing section 301, and a butting surface 424 butted
20 by the pushing section 302. In addition, in order to prevent dust or floss from accumulating on the mounting surface 41 to hinder movements of the transmission mechanism 21 and wedge member 42, the yarn feeding wheel 40 further includes a cover plate 45 to cover the mounting surface 41. The cover
25 plate 45 and mounting surface 41 are interposed by a gap 46

to receive the guiding unit 30.

Please refer to FIGS. 4A and 4B for an embodiment of the invention in operating conditions. When the guiding unit 30 does not supply the yarns 50, the wedge member 42 is located
5 at a first position without wedging in the transmission mechanism 21, and the transmission shaft 20 rotates idly against the yarn feeding wheel 40. When the guiding unit 30 is drawn by the yarns 50 to move to the yarn supply stopped position, the guiding unit 30 is moved along the motion track
10 and drives the drawing surface 423 via the pressing section 301 towards the transmission shaft 20, and the wedge portion 421 is coupled with the transmission mechanism 21 as shown in FIG. 4A. Meanwhile, the wedge member 42 is located at a second position to wedge in the transmission mechanism 21 to
15 drive the yarn feeding wheel 40 to rotate synchronously with the transmission shaft 20; next, the ancillary guiding unit 31 (referring to FIG. 2) is drawn by another yarn 50 to move from the yarn supply stopped position to the yarn supply position. Hence by drawing the guiding unit 30 through merely one
20 yarn 50, the yarn feeding wheel 40 can be driven by the transmission shaft 20, thus sensitivity of controlling the yarn feeding wheel 40 via the yarn 50 is enhanced. When the guiding unit 30 stops supplying the yarn 50, both the guiding unit 30 and ancillary guiding unit 31 are no longer drawn by
25 the yarn 50, thus can be moved from the yarn supply position

to the yarn supply stopped position via a returning force. When the guiding unit 30 is moved along the motion track, the pushing section 302 drives the butting surface 424 moving away from the transmission shaft 20 so that the wedge portion 5 421 is separated from the transmission mechanism 21 as shown in FIG. 4B. Meanwhile, the wedge member 42 is located at the first position without wedging in the transmission mechanism 21 and cannot drive the yarn feeding wheel 40 to rotate synchronously with the transmission shaft 10 20, hence the transmission shaft 20 rotates idly against the yarn feeding wheel 40. Moreover, in order to stop rotating of the yarn feeding wheel 40 in short period after the wedge member 42 has separated from the transmission mechanism 21, the yarn feeding body 10 further has a friction plate 13 in 15 contact with the yarn feeding wheel 40 regularly.

In the aforesaid embodiment, the yarn feeding body 10 includes the guiding unit 30 and ancillary guiding unit 31; however, the invention also can achieve the same effect by providing merely single guiding unit. Please refer to FIG. 5 for 20 the yarn supply position according to another embodiment of the invention. In this embodiment, the yarn feeding wheel 40 has a first yarn guiding surface 43 and a second yarn guiding surface 44. The yarn feeding body 10 includes a guiding unit 30a which has a first yarn guiding ring 303a and a second yarn 25 guiding ring 311a respectively corresponding to the first yarn

guiding surface 43 and second yarn guiding surface 44 to allow the yarn 50 to pass through and guide the yarn 50 to contact the first yarn guiding surface 43 or the second yarn guiding surface 44. When the yarn feeding wheel 40 starts
5 supplying the yarn 50, the guiding unit 30a is drawn by the yarn 50 to move from the yarn supply position to the yarn supply stopped position, and the wedge member 42 is driven by the guiding unit 30a to move along the motion track to couple with the transmission mechanism 21, and further drive
10 the yarn feeding wheel 40 to rotate synchronously with the transmission shaft 20. When the yarn feeding wheel 40 stops supplying the yarn 50, the guiding unit 30a is no longer drawn by the yarn 50, and can be moved from the yarn supply position to the yarn supply stopped position through a
15 returning force. The guiding unit 30a is moved along the motion track to push the wedge member 42 to separate from the transmission mechanism 21.

As a conclusion, the yarn feeding apparatus according to the invention includes a transmission mechanism driven by
20 the transmission shaft, and the transmission shaft is movably coupled with at least one yarn feeding wheel, and the yarn feeding wheel has at least one wedge member to wedge in the transmission mechanism, hence the yarn feeding wheel can rotate idly against the transmission shaft corresponding to the
25 guiding unit at the yarn supply stopped position, and rotate

synchronously with the transmission shaft at the yarn supply position, thereby rotation of the yarn feeding wheel can be controlled independently. It provides significant improvements over the conventional techniques.

5 While the preferred embodiments of the invention have been set forth for the purpose of disclosure, modifications of the disclosed embodiments of the invention as well as other
embodiments thereof may occur to those skilled in the art. Accordingly, the appended claims are intended to cover all
10 embodiments which do not depart from the spirit and scope of the invention.

What is Claimed is:

1. A yarn feeding apparatus for circular knitting machines, comprising a yarn feeding body and a transmission shaft driven by the yarn feeding body, the yarn feeding body
5 including at least one guiding unit drawn by a yarn to turn and move reciprocally on a motion track relative to the transmission shaft between a yarn supply position and a yarn supply stopped position;
wherein the transmission shaft is movably coupled with at
10 least one yarn feeding wheel which freely rotates against the transmission shaft, the transmission shaft being coupled with at least one transmission mechanism driven by the transmission shaft, the yarn feeding wheel including at least one wedge member corresponding to the transmission
15 mechanism, the wedge member including a first position to separate from the transmission mechanism and a second position pushed by the guiding unit on the motion track to couple with the transmission mechanism to drive the yarn feeding wheel to rotate synchronously with the transmission
20 shaft.
2. The yarn feeding apparatus of claim 1, wherein the wedge member includes a wedge portion to wedge in the transmission mechanism and an action strut pushed by the guiding unit.
- 25 3. The yarn feeding apparatus of claim 2, wherein the guiding

- unit includes a pressing section to push the action strut, the action strut including a drawing surface drawn by the pressing section to move the wedge member to the second position.
4. The yarn feeding apparatus of claim 2, wherein the guiding unit includes a pushing section to push the action strut, the action strut including a butting surface butted by the pushing section to move the wedge member to the first position.
5. The yarn feeding apparatus of claim 1, wherein the transmission mechanism includes a plurality of ratchets, the wedge portion being a detent corresponding to the plurality of ratchets.
6. The yarn feeding apparatus of claim 1, wherein the yarn feeding body further includes a friction plate in contact with the yarn feeding wheel regularly.
7. The yarn feeding apparatus of claim 1, wherein the yarn feeding wheel includes a mounting surface hinged by the wedge member, a cover plate covering the mounting surface and a gap formed between the cover plate and the mounting surface to receive entry of the guiding unit.
8. The yarn feeding apparatus of claim 1, wherein the yarn feeding wheel includes at least one yarn guiding surface, the guiding unit including at least one yarn guiding ring corresponding to the yarn guiding surface to allow the yarn to thread through and guide the yarn to contact the yarn guiding surface.

9. The yarn feeding apparatus of claim 1, wherein the yarn feeding wheel includes a first yarn guiding surface and a second yarn guiding surface, the guiding unit including a first yarn guiding ring corresponding to the first yarn guiding surface to allow the yarn to thread through and guide the yarn to contact the first yarn guiding surface; the yarn feeding body including an ancillary guiding unit which includes a second yarn guiding ring corresponding to the second yarn guiding surface to allow the yarn to thread through and guide the yarn to contact the second yarn guiding surface.