

A Synchronous Yarn Feeding Device

The present invention relates to a synchronous yarn feeding device for a textile machine.

5 As is known in the art, yarn is delivered by means of a yarn feeding drum and a driving belt. Fig. 8 illustrates a typical conventional yarn feeding device. The drum 1 having a plurality of round bars 3 formed with a cage-shaped periphery is rotatably mounted on a yarn guide frame 5. A belt 2 presses the yarn 9 onto the smooth outer periphery of the drum, thereby continuing the yarn feeding operation by frictional force. On frame 5 a pair of porcelain eyes 8 are mounted for guiding the incoming yarn and the outgoing yarn, respectively. Eyes 8 guide the incoming yarn F or outgoing yarn under pressure of belt 2 so that yarn can be fed on or off the drum.

15 A drawback of prior art yarn feeding apparatus is that instability and inaccuracies may be introduced into the yarn feeding operation. As the amount of yarn fed on the drum is increased, the contact surface between the belt and the drum is decreased and the contact surface becomes irregular. Therefore, the driving belt 2 will have a different effect on the speed of the turning drum for each drum that it is in contact with. Moreover, these differences are not easily perceived by the operator, and thus cannot be corrected by adjusting any conventional means. The quality of weaved cloth is therefore degraded. Yarn breakage is increased and the profitability of production is decreased.

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We have sought to provide a synchronous yarn feeding device, which enables the rotation speed of each yarn feeding drum, the yarn feeding speed and the driving speed of belt to be synchronized, thereby making uniform the feeding speed and tension of each of the yarn strands pressed on each of respective yarn feeding drums by the same belt.

Accordingly, the present invention provides a yarn feeding device for use in a textile machine, the textile machine including a machine body and a frame fixed on the body, the yarn feeding device comprising:

a drum rotatably mountable on the frame;

a yarn guiding means movably mountable beside the drum on the frame;

a driving belt; wherein

the drum has a solid outer periphery with a first drum portion having an engaging means for engaging a corresponding portion of the driving belt, a second drum portion for receiving a portion of yarn being fed onto the drum, and a third drum portion for receiving a portion of yarn being fed from the drum when the yarn guiding means is operatively moved toward the third portion of the drum; and

the driving belt including a first belt portion having a second engaging means for cooperative engagement with the drum first portion and the first engaging means, and a second belt portion for pressing a portion of yarn against the drum second portion as a portion of yarn is fed onto the drum, whereby the yarn is fed onto the drum in synchronism with the rotation of the drum and the driving belt, wherein the first and second engaging means cooperate to maintain the position of the belt

second portion relative to the drum second portion while the yarn is being fed onto the drum.

5 In one embodiment, the synchronous yarn feeding drum preferably has an elastic body whereby the elasticity of said elastic body yields a relatively larger contacting surface for the yarn and a less slippery surface so that the yarn feeding operation will be more stable and accurate.

10 In another embodiment, the first engaging means comprises a plurality of protruding surfaces and the second engaging means comprises a plurality of engaging concave surfaces for complementary engagement with the protruding surfaces of the first engaging means.

15 In yet another embodiment, the second portion of the drum outer periphery comprises a rough surface whereby slippage of the yarn on the surface is inhibited.

The present invention is further illustrated in the accompanying drawings, wherein;

20 Fig. 1 is a front view of a first embodiment according to the present invention;

Fig. 2 shows a front view and cut-away view of a second embodiment according to the invention;

Fig. 3 is a perspective view of a third embodiment according to the present invention;

Fig. 4 is a representative cross-sectional view of the embodiments of the present invention;

Fig. 5 is a front view of a fourth embodiment according to the present invention.

Fig. 6 is an exploded view of the embodiment in Fig 5;

Fig. 7 is a cut-away view taken along line 10 -10 of Fig. 5; and

Fig. 8 shows a front view of a yarn feeding device of the prior art.

For the purpose of easy cross reference between the description of each of the preferred embodiments of the invention, the same reference labels are used to designate similar components of the various embodiments of the present invention.

The basic components of the synchronous yarn feeding device of the present invention comprise a yarn feeding drum, a driving belt, a yarn guiding frame, an incoming yarn guide eye and an outgoing yarn guide eye. For the purpose of simplicity, the yarn guiding frame and outgoing yarn guide eye are omitted in the drawings and description.

While the preferred embodiments of the present invention include projections or protrusions on the drum and corresponding holes or slots on the belt, alternate positioning/driving means can be provided on the drum or belt. For example, studs could be provided on the belt and holes provided in the drum. The important concept is that a first portion on the outer periphery of the drum is synchronously driven by the endless driving belt with the aid of the

positioning/driving means on both the drum and belt. In this manner, the yarn feeding drum of the present invention functions as a conventional driving pulley to drive the drum in addition to performing the function of feeding yarn. The drum of the present invention is directly and synchronously driven by the endless driving belt so that the yarn wound on the drum and further pressed thereon by the driving belt will be fed in synchronism with the driving speed of the driving belt with the aid of the driving/positioning means on the drum and belt.

Referring to Fig. 1, a first embodiment of the present invention is illustrated. A yarn feeding drum 10 is rotatably mounted on a frame (not shown). The outer periphery of drum 10 is a solid cylinder 100A. A plurality of positioning/driving means in the form of protrusions or studs 13 is located on a first portion of the outer periphery of cylinder 100A near the upper cover 12. In use the drum 10 is driven by a belt provided with corresponding positioning/driving means in the form of holes, each of the protrusions or studs 13 being sequentially engaged by the holes. Yarn feeding drum 10 is thereby driven synchronously by means of a driving belt.

Fig. 2 illustrates a second embodiment of the present invention, wherein the outer periphery of the yarn feeding drum 10 has a sawtooth configuration indicated at 100B. A plurality of protrusions or studs 13 is disposed on the periphery of the drum 10 and achieve the same goal as the protrusions or studs described above.

A third embodiment of the present invention is illustrated in Fig. 3.

A plurality of projections 13A is formed on a first portion of the drum 10. A first portion of a belt 20 is formed with a plurality of respective cutout slots 21A, whereby the slots 21A engage the projections 13A of the drum with the yarn 30 being pressed between a second portion 22 of the belt 20 and a second portion 102 of the drum to enable precise feeding of yarn.

Fig. 4 illustrates the cooperation between the positioning/driving means on both the drum and the belt. A first portion 101 of the drum is provided with a plurality of equally spaced protrusions 13. The protrusions are sequentially engaged by respective holes or slots in driving belt 20, thus enabling the drum 10 to rotate synchronously with belt 20. Yarn 30 is pressed upon the outer periphery of the drum 10 by driving belt 20 and thus fed synchronously with the drum 10 and belt 20 to provide a precisely fed supply of yarn.

Figs. 5 to 7, illustrate a fourth embodiment of the present invention. In order to provide a relatively larger and slip resistant contact surface on drum 10 for the yarn, a resilient body 50 is disposed to cover the second portion 102 of the drum. In the embodiment shown in Figs. 5 to 7, the second portion 102 of the outer periphery of the drum 10 is provided with a resilient body 50 such that the resilient body, while being contacted by driving belt 20, will become flatter and thinner, thus providing a relatively large contact surface with driving belt 20. Thus, the contact surface between yarn 30 and the outer periphery of the drum 10 will be larger and more slip resistant. The resilient body 50 can be formed with a plurality of protruding portions 51 interposed with a plurality of concave portions 52, as shown

in Figs. 6 and 7.

The resilient body 50 is shown with the drum 10 of the embodiment shown in Fig. 1. Other embodiments of drum 10 may also be arranged with the same resilient body 50, if desired.

Fig. 7 illustrates the yarn feeding arrangement in which the apparatus of the embodiment of Figs. 5 and 6 are employed. Slipping or movement of the yarn 30 is inhibited by the contact of yarn 30 with the protruding portions 51 of body 50. Contact with portions 51 increases the stability and precision of the yarn feeding operation that is synchronous with the rotation of drum 10.

Fig. 6 illustrates a detailed construction of the fourth embodiment of the present invention. A plurality of protrusions 13 is provided on upper disk 12 below which are disposed a plurality of grooves 18 on body 111. A bearing 114 is inserted into a central opening (not shown) in upper cover 12. A resilient body 50 fits around the outer periphery of body 111. A plurality of protruding walls 57 located within the inner surface of resilient body 50 fits into grooves 18 of body 111. A plurality of protruding poles 16 on a lower disk 15 fits into respective holes (not shown) on the upper disk 12, thereby fixing the upper and lower disks together. The upper surface of a third portion 103 of disk 12 engages resilient body 50. Resilient body 50 is thereby bound between the upper and lower disks 12 and 15. An easily manufactured and firmly constructed synchronous yarn feeding drum is thereby provided.

In summary, the present invention provides a synchronous yarn feeding device with a drum comprising a positioning/driving means including, for example, a plurality of equally-spaced protrusions, and a belt comprising a positioning/driving means including, for example, a plurality of respective holes. The yarn is pressed upon a second portion of the drum and is fed in synchronization with the rotation of the yarn feeding drum and the driving belt. The productivity of textile machines and the quality of product are both greatly enhanced.

CLAIMS:

1. A yarn feeding device for use in a textile machine, the textile machine including a machine body and a frame fixed on the body, the yarn feeding device comprising:

a drum rotatably mountable on the frame;

a yarn guiding means movably mountable beside the drum on the frame;

a driving belt; wherein

the drum has a solid outer periphery with a first drum portion having an engaging means for engaging a corresponding portion of the driving belt, a second drum portion for receiving a portion of yarn being fed onto the drum, and a third drum portion for receiving a portion of yarn being fed from the drum when the yarn guiding means is operatively moved toward the third portion of the drum; and

the driving belt including a first belt portion having a second engaging means for cooperative engagement with the drum first portion and the first engaging means, and a second belt portion for pressing a portion of yarn against the drum second portion as a portion of yarn is fed onto the drum, whereby the yarn is fed onto the drum in synchronism with the rotation of the drum and the driving belt, wherein the first and second engaging means cooperate to maintain the position of the belt second portion relative to the drum second portion while the yarn is being fed onto the drum.



2. A yarn feeding device as claimed in claim 1, wherein the first engaging means comprises a plurality of protruding surfaces and the second engaging means comprises a plurality of engaging concave surfaces for complementary engagement with the protruding surfaces of the first engaging means.

3. A yarn feeding device as claimed in claim 1, wherein the first engaging means comprises a plurality of studs and the second engaging means comprises a plurality of holes for interlocking engagement with the studs.

4. A yarn feeding device as claimed in claim 3, wherein the holes are provided at one side of the driving belt.

5. A yarn feeding device as claimed in any of claims 1 to 4, wherein the second portion of the drum outer periphery comprises a rough surface whereby slippage of the yarn on the surface is inhibited.

6. A yarn feeding device as claimed in any of claims 1 to 4, wherein the second portion of the drum outer periphery comprises an elastic body.



7. A yarn feeding device as claimed in claim 1, wherein the second drum portion and the second belt portion provide the feeding yarn with substantially even surface to surface contact between the inner surface of the belt and the outer surface of the yarn to provide uniform yarn tension at each discrete point of outgoing yarn fed from the belt and drum during yarn feeding operation.

8. A yarn feeding device substantially as herein described with reference to Figures 1 to 7 of the accompanying drawings.

