March 29, 1966 K. I. J. ROSEN 3,243,091

YARN FEEDING EQUIPMENT

Filed March 4, 1963 3 Sheets-Sheet 1

Fig.1

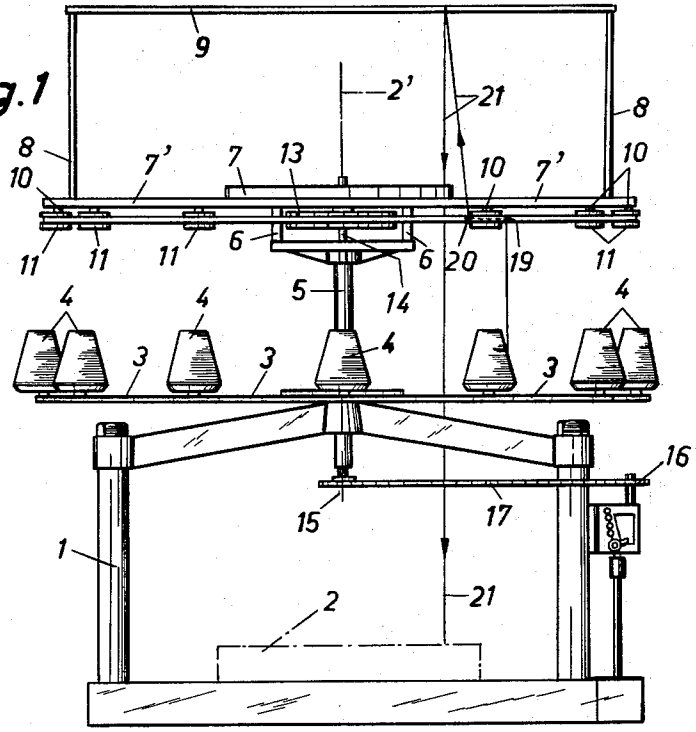


Fig.5

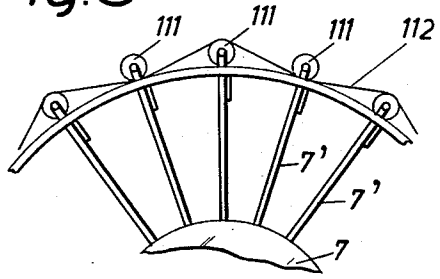


Fig.6

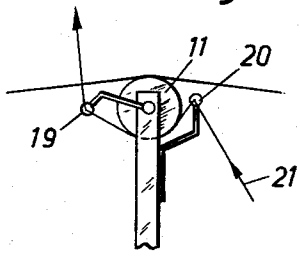
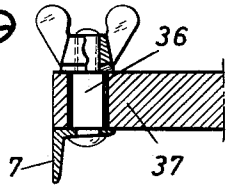


Fig.9



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March 29, 1966 K. I. J. ROSEN 3,243,091

YARN FEEDING EQUIPMENT

Filed March 4, 1963 3 Sheets-Sheet 2

Fig.2

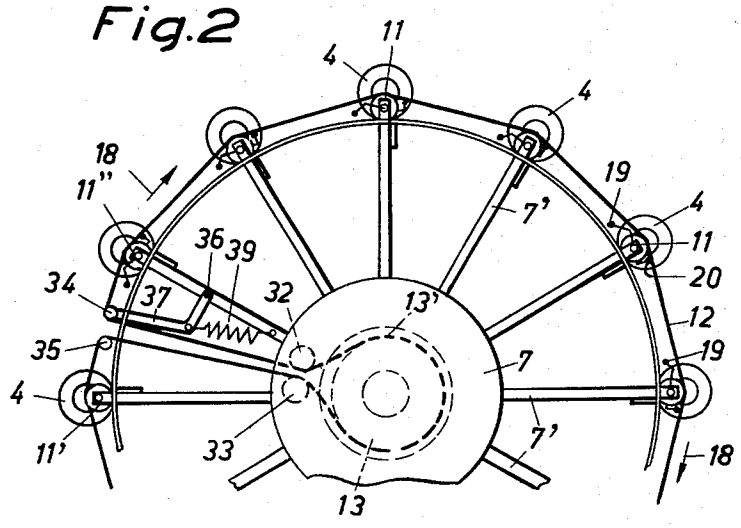


Fig.3

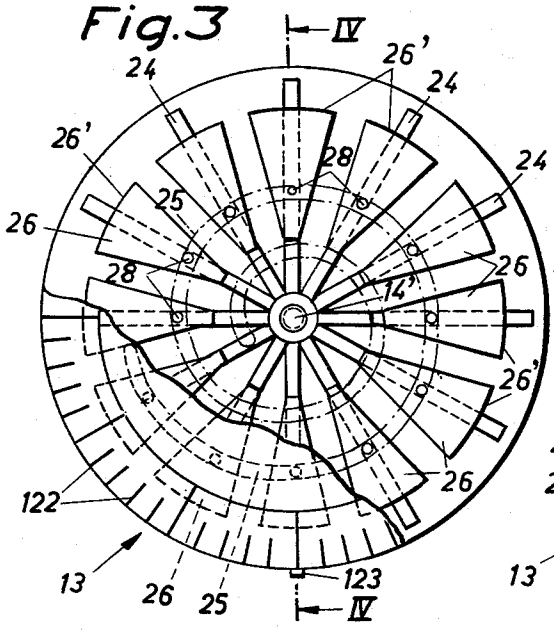
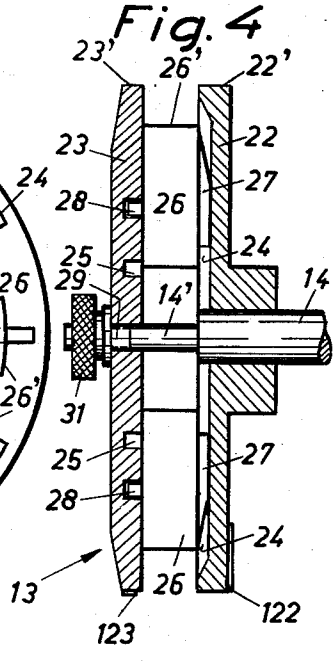


Fig.4



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March 29, 1966 K. I. J. ROSEN 3,243,091

YARN FEEDING EQUIPMENT

Filed March 4, 1963 3 Sheets-Sheet 3

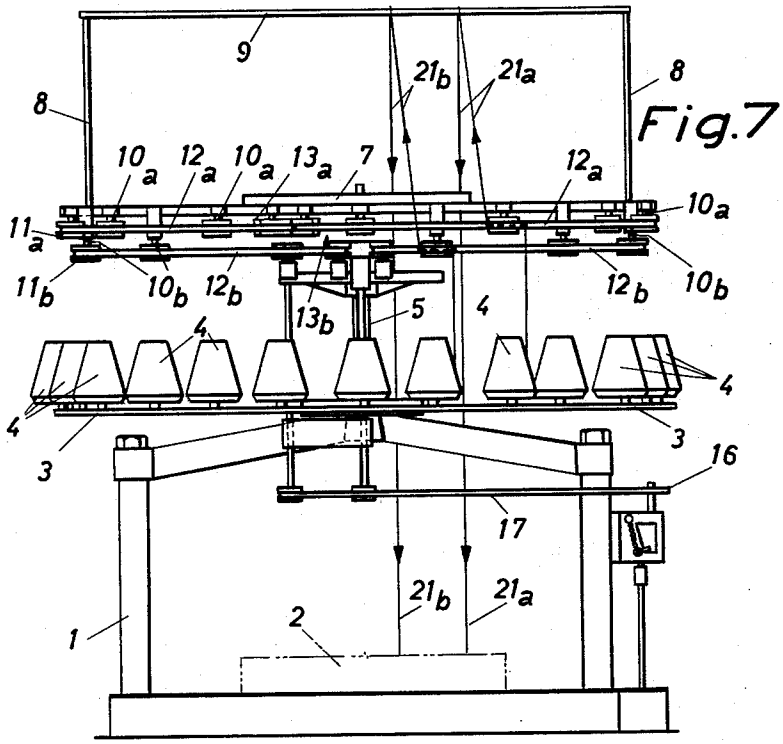


Fig.7

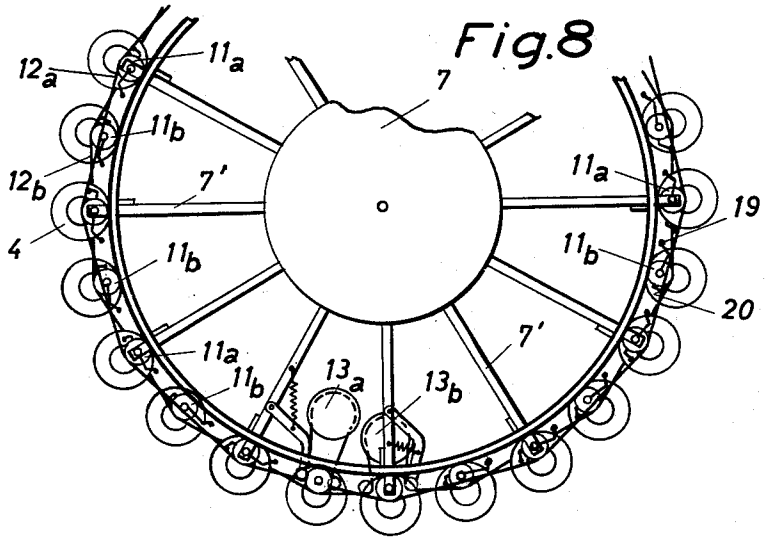


Fig.8

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3,243,091

YARN FEEDING EQUIPMENT

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Claims priority, application Germany, Mar. 8, 1962, R 32,235
11 Claims. (Cl. 226—188)

This invention has reference to a yarn feeding equipment for a knitting machine by which (reference being had to the U.S. patent application No. 85,646 now U.S. Patent 3,090,215) for the yarns of the feeding stations with an equal yarn consumption, there is arranged a feeding tape driven by a driving pulley.

Stitches of different sizes are knitted for different qualities, in particular at different stiffness of the knitted goods. The feeding speed of the yarn has to be varied according to the stitch size. In order to adjust the yarn feeder equipment in correspondence to these different requirements the feeding tape must be driven with varying speeds.

The invention has for its purpose to render possible a simple and cheap adjustment of different speeds of the feeding tapes. According to the invention this has been obtained thereby that for the forming of the operative circumference of the driving wheel resting against the feeding tape there are arranged adjustable sections, which are situated between two disks which are rotational relative each other and are attached to the shaft of the driving pulley. One of these disks is provided with radial guides and the other one with helical guides for the sections. In a simple manner it is hereby obtained that by means of a relative rotation of the two disks the radially adjustable sections are radially adjusted by means of the helical guides. As hereby these two guides are directed essentially almost perpendicularly to each other, there is not required any special arresting means but it is sufficient that the two disks are kept together by means of a screw nut on the pulley shaft.

In order to make it easy to determine the operative pulley diameter which has been adjusted by the relative angular position of the two disks relative each other, there may on the periphery of one of the disks be arranged a graduation corresponding to the diameter of the operative pulley periphery formed by the sections and on the other disk be arranged a mark for reading the adjusted diameter. Another possibility to obtain this purpose is to be seen in an arrangement in one of the disks of a preferably radial slot with a graduation. Through this slot, it is possible to observe directly the pulley periphery and to read the diameter on the graduation. It is advisable to provide one section with an index to be moved along the graduation. It is also possible to combine these two embodiments in such a way that a coarse reading can be obtained on the radial graduation and a fine reading on the periphery of one of the disks.

In order always to obtain a uniform tension in the feeding tape at all diameters obtainable with the driving pulley, it is possible to obtain this tension by means of a roller under the load of a spring. In order to make it possible to discouple the yarn feeding equipment when no controlled feeding of the yarn is desired, it is possible to arrange a catching device for the tension roller for the slackening of the feeding tape. It is thereby obtained that at the use of the yarn feeding equipment with a discontinuous feeding or at an elimination of a yarn feeding equipment, the yarn feeding equipment according to this invention does not have to be dismounted.

As the feeding of the yarn by means of the yarn feeding equipment according to the invention is obtained thereby that the yarn is guided essentially in the longitudinal direction of the tape between the surface of the tape and that of a roller for the delinking of the tape which surfaces are pressed against each other, the tape preferably contacts part of the roller circumference. In case a very great number of feeders are arranged on a knitting machine, it is also advisable to use a plurality of rollers since if only one roller is used as a rule only two yarns can be fed. If in this case a great number of rollers must be used, the tape will contact only a very short part of the periphery of the rollers. In order to overcome these drawbacks, the invention also provides that the feeding tape contacts the different delinking rollers alternatively at the sides turned towards and away from the needle cylinder shaft. Due to this zig-zag arrangement of the feeding tape, also at a very great number of delinking rollers contact is obtained along a sufficiently long part of the periphery of each roller in such a way that a very good feeding of the yarn is obtained.

The yarn feeding equipment according to the invention also makes it possible to obtain a modification of the kind of yarn feeding and this very simply thereby that the yarn is not guided between the surfaces of the tape and the roller contacting each other but is laid around the side of the roller turned away from the tape. As thereby the feeding direction is reversed, the yarns must be fed in the opposite direction through the corresponding guides. This is of advantage especially when in a fabric an effect streak is to be knitted which requires a greater or smaller feeding speed.

Examples of a device in accordance with the invention will now be described with reference to the accompanying, partly diagrammatic drawings, in which:

FIGS. 1 and 2 show a diagrammatically simplified side elevation and a plan view, respectively, of the upper part of the knitting machine with a yarn feeding equipment according to the invention,

FIG. 3 is a plan view of the driving pulley of the yarn feeding equipment of the machine according to FIGS. 1 and 2 on an enlarged scale, the disk turned towards the viewer being broken,

FIG. 4 is a section on the line IV—IV in FIG. 3,

FIG. 5 is a partial plan view corresponding to FIG. 3 of a modified embodiment,

FIG. 6 is a view corresponding to the one shown in FIG. 5 of an embodiment of the yarn feeding equipment.

FIG. 7 is a side elevation of a second embodiment of the invention,

FIG. 8 a partly cut plan view corresponding to FIG. 7, and

FIG. 9 is a cross-sectional view with parts in elevation illustrating a detail.

The knitting machine shown in the drawings is provided with twelve feeder stations. A machine stand **1** with a needle cylinder **2** carries a support comprising twelve arms **3** for the yarn packages **4**. A tube **5** is arranged in the center of the stand **1**, said tube carrying on rods **6** a plate **7** having radially directed arms **7'**, said plate carrying rings **9** on upright rods **8**. The rollers **11** are rotatably mounted on pivots **10** directed vertically downwards from the arms of the plate **7**. The number of rollers **11** corresponds to the number of yarn packages **4**. These rollers **11** lead between their side guides an endless feeding tape **12** on a path about the shaft **2'** of the needle cylinder **2**. A driving pulley **13** is arranged for driving the feeding tape **12** and the pulley **13** is coaxial with the cylinder shaft **2'** and the feeding tape is laid in a loop **13'**.

The driving pulley **13** is attached to the upper end of a shaft **14** which is driven from the knitting machine by means of sprockets **15** and **16** and a chain **17** in such a way that the tape is running in the direction indicated by the arrows **18**.

On either side of each roller **11**, and positioned inwardly of the tape **12** are mounted guides **19, 20** of wire or similar means and this has been illustrated in FIG. 1 at one roller. By means of the wire guides **19, 20** the yarn **21** from the actual packages **4** is guided in such a way that it passes between the tape and the mantle surface of the roller **11** in the circumference of the roller. When the yarn **21** is fed by means of the feeding device it is guided over the ring **9** or in a hook attached to the same downwards to the needle cylinder **2**.

The driving pulley **13** is provided with two disks **22** and **23** which can be rotated relatively each other and be fixed coaxially on the driving shaft **14**. The disks **22** and **23** are at their inner surfaces turned towards each other provided with radial guiding grooves **24** and a helical guiding groove **25**, respectively. The disk **22** with the radial grooves **24** is fixedly attached to the shaft **14** but the disk **23** is journalled on a tapering pin **14'** of the shaft **14**. Sections **26** shaped as sectors of a circle are arranged between the two disks **22** and **23**. Each section **26** is provided on its side turned towards the disk **22** with a radial groove **24** with a radially directed rib **27** and on its side turned towards the disk **23** with a helical groove **25** with a bolt **28**. The rib **27** and the bolt **28** are arranged for engagement in one radial groove **24** and the helical groove **25**, respectively. The sections **26** are all completely equal. Only the bolts **28** are at the different sections **26** arranged at different distances from the points of the sections **26** turned towards the pulley center in such a way that when the sections **26** are arranged beside each other in a correct succession for forming a circular disk the bolts will be arranged along a helical line, which corresponds exactly to the helical guide groove **25**. By a corresponding shape of the helical guide groove **25** and by correct arrangement of the sections **26** these bolts **28** in engagement with the helical guide **25** can be arranged in such a way that their preferably cylindrical external surfaces **26'**, turned away from said points form essentially a circle. If now simultaneously the ribs **27** engage the radial guide groove **24**, the sections **26** will by means of this engagement always be retained in the angular position shown in FIG. 2 and could be displaced only radially along the disk **22** when the disk **23** is rotated relatively the disk **22**, so that the bolts **28** are entered into the other range of the helical groove **25**. So as to keep the whole driving pulley **13** together one end of the bolt **14'** is provided with a thread **29** on which a knurled nut **31** is screwed.

So as to prevent the feeding tape **12** from resting over a great range of the circumference of the rollers **11'** and **11''** there are arranged two further delinking rollers **34** and **35** about which the tape **12** is laid. By a change of the distance between these rollers **34** and **35** the tension of the tape is controlled and the whole feeding equipment can be put out of function if desired.

So as to ensure for all diameters of the circumference **13'** of the driving pulley **13** formed by the external surfaces **26'** an essentially constant tension in the feeding tape **12**, a tension roller **34** is arranged on an arm **37** journalled about a shaft **36**, the feeding tape being fed to said roller **34** about delinking rollers **34** and **35** corresponding to the rollers **34** and **35**. By the force of a spring **39** which is attached to the arm **37** and has a tendency to turn this arm in counter-clockwise direction, the feeding tape **12** is kept under tension. At an increase of the diameter of the operative circumference **13'** the roller **34** can be moved in clockwise direction according to FIG. 2 and thus the tension of the feeding tape **12** will be essentially constant.

At the connection of the driving pulley **13** the sections **26** are first arranged on the horizontal disk **22** in such a way that the bars **27** engage the radial guide grooves **24**. The succession of the sections **26** is hereby chosen in such a way that the bolts **28** will be arranged along a helical line. It is advisable to arrange the sections **26** in such a way that they will be in mutual contact with their side surfaces. Thereupon the disk **23** is attached to the bolt **14'** in such a way that the bolts **28** engage the helical guide groove **25**. When the disk **23** according to FIG. 4 is rotated in counter-clockwise direction, the sections **26** will be moved radially outwards. In this way, the operative circumference of the driving pulley **13**, defined by the external borders **26'**, may be adjusted as desired within limits defined by the helical guide groove **25**. In case the desired operative pulley circumference has been adjusted, the knurled nut **31** is screwed onto the thread **29**, so that the sections **26** are clamped between the disks **22** and **23**. A small pressure is hereby sufficient, as due to the self locking of the helical guidance no automatical adjustment of the sections **26** can take place.

So as to make it as easy as possible to read the operative diameter of the adjusted driving pulley **23**, there is on the circumference **23'** of the disk **23** arranged an index **123**. On the circumference **22'** of the disk **22** there is arranged a scale **122**. When the mark is read on the graduation at the circumference **23'** opposite the circumference **22'**, it is in such a way possible to read the adjusted, operative diameter of the driving pulley **13**.

As in the shown embodiment it is for the total adjustment of the sections **26** required a rotation of more than 360°, the disk **22** can comprise a transparent material so that the position of the sections **26** can always be determined on a radial graduation which indicates the diameter of the operative circumference. However, it is also possible to provide in the disk **22** a radial groove with a graduation by means of which it is possible to read the position of the sections **26**.

In order to slacken the feeding tape **12** so as to put the controlled yarn feeding out of function when the same is not required, it is only necessary to swing the arm **37** against the action of the spring **39** in clockwise direction. A catch **36** may be arranged for holding the tape in untensioned position, said catch retaining the arm **37** in this position.

Another possibility of controlled feeding of yarn by means of the disclosed yarn feeding equipment is shown diagrammatically in FIG. 6.

FIG. 6 shows a part of FIG. 2 on an enlarged scale. Here the yarn is led in the opposite direction through the guides **19, 20** as illustrated with the arrows on the line **21** representing the yarn, and is on the outside laid around the roller **11**. This gives a possibility to put out of function the controlled yarn feeding equipment at all or at certain chosen feeders and to replace this with a required auxiliary feeder which can be required e.g. when a fabric is to be knitted with an effect streak or the like.

FIG. 5 shows how an increased contact of a feeding tape **112** can be obtained on rollers **111** corresponding to the rollers **11** thereby that the feeding tape rests alternatively on the sides of the rollers **111** turned towards or away from the cylinder shaft **2'**. This kind of tape guiding is of special advantage when the knitting machine has a very great number of feeders and the delinking rollers **11** or **111** are arranged very close to each other.

In a modified embodiment, instead of one feeding tape, two tapes **12*a*** and **12*b*** can be arranged as illustrated in FIGS. 7 and 8. It is hereby possible to use different feeding tapes, **12*a*** and **12*b***, respectively, for different yarns **21*a*, 21*b***, respectively, said tapes **12*a*, 12*b*** having different speeds so that it thereby is made possible to knit different kinds of fabrics. Thus, by means of two feeding tapes it is possible to knit the kind of knitting known under the denomination "Double jersey" by which two different kinds of yarn have to be fed with different speeds.

The tape or tapes can act on the yarn just before it has left the package or just before it reaches the feeding station. Different additional methods then have to be used.

What I claim is:

1. In a yarn feeding equipment in which for the yarns

of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections.

2. In a yarn feeding equipment for knitting machines with a feeding tape to feed yarns to feeders with equal yarn consumption, said feeding tape moved by means of a driving pulley, two feeding tapes, means for driving said two feeding tapes individually, means for adjusting individually the speeds of said two tapes, said two tapes being arranged so as to make it possible to use different feeding tapes with different feeding speeds for different yarns in order to make it possible to knit different kinds of knittings.

3. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, said disk with the radial guides being stationarily attached to the shaft of said driving pulley and said disk with the helical guides being rotationally but fixably attached to said shaft.

4. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, said disk with the radial guides being stationarily attached to the shaft of said driving pulley and said disk with the helical guides being rotationally but fixably attached to said shaft, a screw nut arranged on said shaft for keeping together said two disks.

5. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to drive said feeding tape at a predetermined speed, two disks between which said sections are arranged, one of said disks being fixed to said driving shaft having radial grooves in which protruding parts of said sections are engaged whereby the section always will rotate with the same speed as the driving shaft but allowing radial adjustments of the sections by rotating the other disk which has a helical groove holding the sections at a predetermined circumference through protruding pegs in said sections engaged in the helical groove.

6. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, said helical guides comprising a helical groove in one of said disks and a bolt on each one of said sections for engagement with said groove, said bolts on the sections arranged with a pitch corresponding to the helical groove.

7. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, the circumference of one of said disks carrying a graduation corresponding to the diameter of the operative pulley circumference formed by said sections, the other one of said disks carrying a mark for reading the adjusted diameter.

8. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, a preferably radial groove with a graduation being arranged in one of said disks for indicating of the diameter of the operative pulley circumference.

9. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, a spring loaded tensioning roller arranged for giving essentially the same tension in said feeder tape for all diameters of said driving pulley.

10. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, a spring loaded tensioning roller arranged for giving essentially the same tension in said feeder tape for all diameters of said driving pulley, a catch arranged for the tensioning roller so as to slacken the feeding tape.

11. In a yarn feeding equipment in which for the yarns of feeders with equal yarn consumption there is arranged a feeding tape to be driven by means of a driving pulley on a driven shaft, radially adjustable sections arranged for forming an operative circumference of said driving pulley to rest against said feeding tape, said sections arranged between two disks which are rotational relative to each other and adapted to be fixedly attached to the shaft of said driving pulley, one of said disks provided with radial guides and the other one with a helical guide for said sections, said feeding tape contacting the delinking pulleys alternatively on the surfaces turned towards and away from said driving rollers.

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