United States Patent

Castelli

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[54] YARN FEEDING AND TENSIONING APPARATUS

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[51] **Int. Cl.** **B65h 17/32**

[58] **Field of Search** 226/97, 118, 195; 28/1.4

[56] **References Cited**

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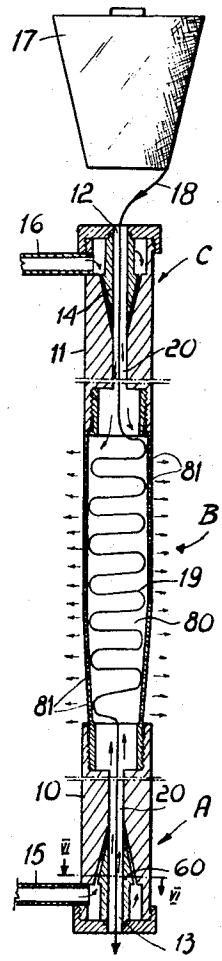
[57] **ABSTRACT**

A device for controllably guiding yarns in textile machines consisting of a hollow member through which the yarn is caused to pass by nozzle means which controllably supply compressed air into said hollow member.

2 Claims, 6 Drawing Figures



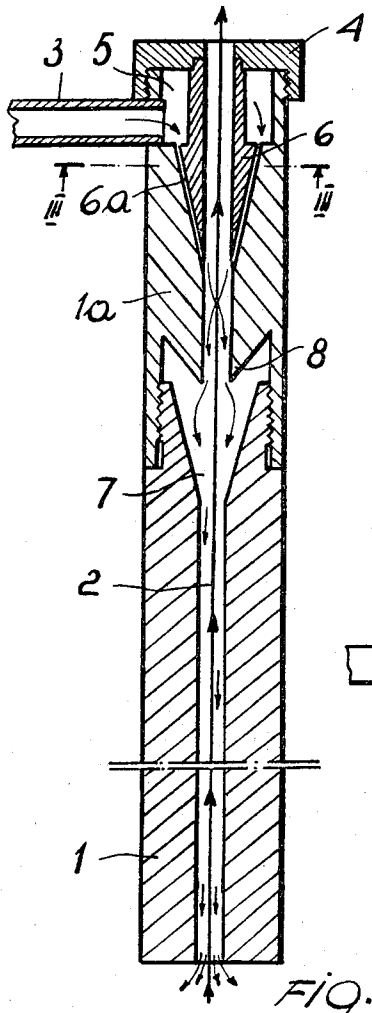


Fig. 1

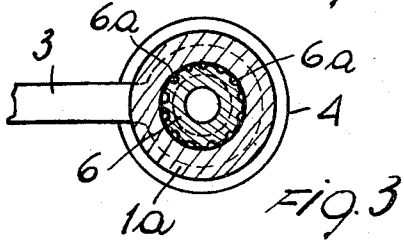


Fig. 3

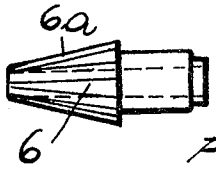


Fig. 2

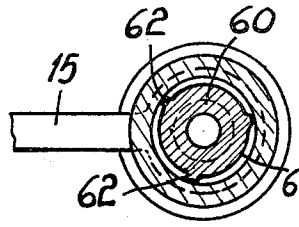


Fig. 6

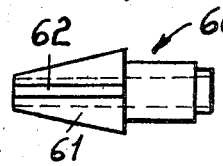


Fig. 5

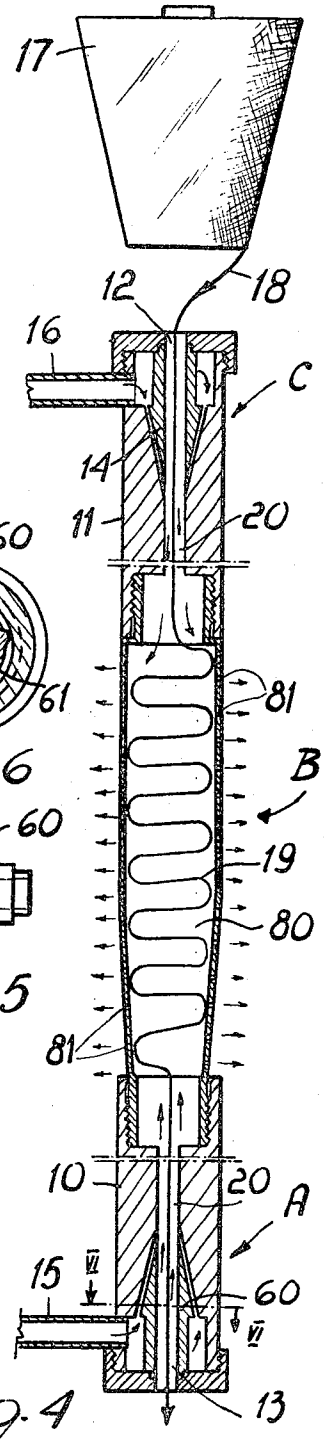


Fig. 4

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YARN FEEDING AND TENSIONING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a device for controllably guiding yarns and more particularly to a device for feeding and/or slide braking yarns particularly for use in textile machines such as straight looms of shuttle-less type or machines for spinning frames such as spoolers, winding frames, knitting machines and the like, but also suitable in all applications where a continuous and constant feeding and/or braking operation of the yarns is required.

The braking of the yarns is at present effected by means of equipment including sliding blocks or shoes which are connected to springs or similar means arranged to press on the yarn and to control the sliding thereof. Such devices are used per example in straight shuttle-less looms, in which the weft yarn wound on a respective reel is drawn by a mobile yarn nipper or another equivalent system and passed through the said braking devices thereby preventing over-feeding due to inertia sliding movement of the weft yarn before the beater is moved.

Such known devices have some drawbacks among which the yarn rubbing and then the wear of the same should be mentioned. Quite often in the said devices the yarns are broken, thus causing troublesome interruptions in the production activity, particularly when thin yarns or low tenacity yarns are used.

Furthermore the known devices, while causing a substantial friction to occur on the yarns, limit the strokes of the nippers or other means for inserting the weft yarn and then do not permit fabrics having a width higher than a determined value to be produced.

Also the known systems for feeding the yarn give the yarn undesirable stresses and sometimes can also break the yarn. The known devices may then be adapted only with difficulty to yarn feed speed variations.

SUMMARY OF THE INVENTION

The main object of the present invention is that of substantially eliminating the above-mentioned drawbacks encountered in the known devices, by providing a device for feeding and/or slide braking of yarns through which the yarn stress is reduced to a minimum and no slide friction on the yarns takes place. Another important object of the invention is that of conceiving a feeding and/or braking device which gives the yarn less tension relatively to the known types, thus allowing a higher insertion speed, and is automatically adapted to variations also instantaneous of the feed speed.

Another object of the invention is that of conceiving a feeding and/or braking device in which even yarns of low tenacity can be used.

Another object of the invention is that of conceiving a device which causes no tension variations passing from rough to slippery yarns.

Still another object of the invention is that of providing a device which permit to obtain a more regular production relatively to the known types especially due to the constant tension given to the yarn fed through this device.

Another object of the invention is that of conceiving a device which does not require periodical cleaning as in the known types.

Another object of the invention is that of providing a device in which ready adjustment of the yarn tension can be attained with the possibility of passing from a count to another without adjustment variations.

Another object of the invention is that of providing a device permitting to produce fabrics of higher width than those obtainable with the known systems in use at present.

According to the invention there is provided a device for controllably conveying yarns in textile machines, spinning frames and the like, characterized in that it comprises a tubular member having a yarn inlet and, spaced therefrom, a yarn outlet, means defining a cavity inside the said tubular member connecting the said yarn inlet to said yarn outlet, at least one nozzle means externally connected to a pressure fluid source and arranged to supply such pressure fluid to the said cavity, thereby providing a stream within said cavity which acts upon the yarn insertable therethrough.

BRIEF DESCRIPTION OF THE DRAWING

Further characteristics and advantages of the invention will better appear from the following detailed description of a few preferred, not exclusive embodiments of the invention illustrated by way of indicative not limiting example in the accompanying drawing, in which:

FIG. 1 is a diagrammatic longitudinal section view of a first embodiment of the invention;

FIG. 2 is a side view of an element of the same device;

FIG. 3 is a section taken along lines III—III in FIG. 1;

FIG. 4 is a diagrammatic longitudinal section view of another embodiment;

FIG. 5 is a side view of a modified embodiment of the element shown in FIG. 2;

FIG. 6 is a section taken along lines VI—VI in FIG. 4.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIGS. 1 to 3 there is described a device for braking only. It comprises a fixed body in the form of tubular member 1 through which the yarn 2 on which a braking action is to be applied, is caused to pass axially. The tubular member 1 is connected, by means of threading per example, to a second tubular member 1*a* to which a conduit 3, connected to a compressed air source, such as a compressor, terminates.

The tubular member 1*a* is closed by a bottom element 4 which is axially bored to permit the passage of the yarn 2, such bottom element delimiting an annular cavity 5 communicating with the conduit 3. Co-axially to the tubular member 1*a* and inside thereof there is secured a frusto-conical member 6 (FIGS. 1 and 2), which is provided in its surface with a plurality of grooves 6*a* arranged to define passages for compressed air (FIG. 3). The member 6 has also an axial bore through which the yarn 2 may pass and after mounting the same is inserted into a corresponding frusto-conical cavity formed inside the tubular member 1*a*, in such a manner as to define the said passages for the compressed air.

By the connecting zone between the tubular members 1 and 1*a* an expansion space or chamber 7 is provided having a frusto-conical configuration and arranged to decrease the pressure of the compressed air in such location. The configuration of the expansion chamber 7 defines a nozzle-like element 8 at the central portion of the member 1*a*.

The conduit 3 for the compressed air is mounted in such a manner as the air flow is directed in a direction contrary to that of the sliding movement of the yarn 2. In FIG. 1 the smaller arrows indicate the air flow path, while the larger arrows indicate the sliding direction of the yarn.

The operation of the braking device described above is as follows:

The compressed air from the compressor through the conduit 3 arrives into the annular cavity 5, from where it flows along grooves 6*a* of the frusto-conical member 6. Small jets of compressed air are thus formed inclined towards the device axis and in a direction contrary to that of the yarn sliding. The said jets of compressed air cross each other forming a closure for the air, which is adapted to prevent the same from flowing towards the bore in the bottom element 4. With this arrangement the compressed air is completely directed towards the expansion space 7, where, due to volume increase, a pressure drop occurs which causes a sucking effect of the air, the latter being caused to flow along the cavity of the tubular member 1 towards the outlet at the end where the yarn 2 is inserted.

By suitably adjusting the pressure of the air, i.e. by varying the compressed air delivery, the desired braking action on the

yarn 2 is obtained, since the compressed air as already stated, flows in a direction contrary to the feeding direction of said yarn 2.

In FIG. 4 there is illustrated the device arranged as feeder and brake of the yarn.

With reference to such Figure the unit A is substantially equivalent to the embodiment described with reference to FIGS. 1 to 3.

Unit B, which will be better described hereinafter, has the function of collecting, if necessary, the yarn fed in excess, while unit C is a feeder proper.

Unit A could be structurally equal to that described in FIG. 1, but it was found that the expansion space 7 in FIG. 1 can be omitted. Furthermore the nozzle of braking air, instead of consisting of a frustoconical sleeve 6 in FIG. 1, provided with a plurality of grooves 6*a*, it advantageously consists of a sleeve member 60 co-axial with the cavity or hole 20 in the tubular member 10 and has an outer frusto-conical surface completely smooth. In order to form the orifice of the nozzle spacers 62 are provided on the frusto-conical sleeve 60. These spacers can be of insert structure connecting the spacers 62 to one another or they can be in the form of ribs integral with the sleeve 60 and projecting from the smooth surface 61.

Portion B is connected to portion A, such as by screw means. The portion B has a collection chamber or space 80 where the yarn fed in excess and having a diameter substantially greater than the passage or longitudinal cavity 20 is collected. The inner diameter of the space 80 is greater than the inner diameter of the cavity 20 and slightly decreases towards the braking portion A of the device. At the surface thereof, portion B is provided with evenly spaced outlet apertures 81 for discharging the compressed air.

Portion C forms the feeder proper and includes a tubular member 11 connected to portion B by threading. The feeder proper has at the inlet 12, a nozzle-like formation 14, equal to the nozzle 60 at the outlet 13 of the yarn.

The nozzles 60 and 14 are connected to a compressed air source, not shown, through unions 15 and 16. In FIG. 4 the supply reel 17 is also shown.

The operation of the feeding and braking device is as follows:

Compressed air enters the nozzle 14 and is blown into the nozzle 14 in the direction towards the yarn collecting space 80, as a jet, the air acting on the yarn 18 and drawing it towards the space 80 while the same is unwound from the reel 17. The yarn is then caused to pass through the space 80, where it may be collected in the shape of coils 19, in case of a variation in the feeding speed required by the textile machine to which the device is applied. From the collecting space 80, the yarn 18 passes through the braking unit A, flowing towards the outlet 13 due to the action of the textile machine on the yarn, but in counter flow to the air jet formed by the nozzle 60 connected to the compressed air source through the union 15. The braking effect of the jet from the nozzle 60 within the braking portion A of the device determines the tension in the yarn in a manner described above. The compressed air is discharged through the holes 81.

As may be realized, the described device is automatically and istantaneously adapted to all possible variations of yarn feedings, due to the function of the planum chamber for compensation of the collecting chamber or space. The feeding unit C is so arranged that by drawing the yarn 18 from the reel 17 it is always regular and in tension even when variation in the feed occurs. By adjusting the pressure of the air sent to the nozzles, the dragging speed of the yarn may also be adjusted. In practice very good results have been attained with a pressure of the air ranging from 0.5 to 2 Atm.

The inner diameter of the drawing tube of the yarn preferably varies according to the type of the yarn from 2 mm. to 5,5 mm. The diameter of the collecting chamber 80 of the yarn also varies according to the type of the yarn from 7 mm. to 14 mm. If the yarn is thin, a less diameter is used and in this way the coil which is formed in the store is smaller and the twisting of the yarn is prevented.

In a practical embodiment the feeding unit had a length of 60 cm, the collecting unit B was 50 cm. long and the braking unit A was 60 cm. long.

The device according to the invention is advantageously applied to straight shuttle-less looms and is mounted downstream the reel of the weft yarn, so that the same yarn is suitably braked during the sliding movement caused by the movable nipper or by other means for drawing the yarn. The action of the compressed air provides a constant and even braking action on the weft yarn 2 without however giving the same undesired tensions causing the braking of the yarn. The device also provides the return of the yarn possibly advanced in excess due to inertia effects (the action of the device is such the yarn is caused to go back if the same is left free) when the nippers or the equivalent moving elements are opened.

The possible presence of knots or of a irregularities of count in the yarn do not cause any inconvenience in that the braking action is regularly effected in each case (in the known types in such a case a brakage of the yarn very often occurs).

The action of the compressed air provides a constant cleaning of the device and also of the yarn, while no tensions differences occur passing from rough yarn to slippery yarns and vice versa.

The constant tension provided by the device on the yarn, makes it possible to form a more regular fabric with respect to those obtainable with known systems.

The constant tension of the yarn eliminates stops of the textile machines which usually take place with known devices, due to the yarn loosing and consequent operation of the sensor located close to the same devices.

As stated above, the less tension given to the yarn permits the use of yarns of low tenacity while the braking action is such as to permit a weaving with a larger space for the combs i.e. with possibility of obtaining fabrics of remarkable width.

The invention thus conceived is susceptible to numerous modifications and changes all of which are to be considered as included in the inventive scope.

In practice the used materials as well as dimensions could be any according to the requirements and furthermore all the elements could be substitued with other technically equivalent means.

I claim:

1. A device for controllably conveying yarns in textiles machines, spinning frames and the like, comprising a body having a yarn inlet and a yarn outlet spaced therefrom, means defining a cavity inside said fixed body for providing communication between said yarn inlet and the said yarn outlet for the passage of the yarn therethrough, nozzle means arranged to supply a pressure fluid into said cavity and to provide a stream of said fluid substantially parallel to said yarn all around the periphery thereof, said nozzle means being arranged opposite to each other adjacent to said yarn inlet and to said yarn outlet, respectively, for blowing the pressure fluid against said yarn in opposite senses, said cavity including in an intermediate part thereof a collection chamber for the yarn between said inlet and said outlet and having venting apertures for the pressure fluid.

2. A device as claimed in claim 1, wherein said body is a tubular member and the said intermediate chamber has an inner diameter greater than the inner diameter of the remaining portions of said cavity.

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