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Rosen

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[54] **THREAD SUPPLY DEVICE FOR TEXTILE MACHINES**

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[52] **U.S. Cl.** **242/47.12,** 242/47.01

[51] **Int. Cl.** **B65h 51/20**

[58] **Field of Search** 242/47.01–47.12

[56] **References Cited**

UNITED STATES PATENTS

3,709,444	1/1973	Tannert	242/47.12 X
3,713,307	1/1973	Muhlaushler	242/47.12 X

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[57] **ABSTRACT**

A thread supply device for a textile machine, said device including a rotatable drum upon which a thread issuing from a storage coil is tangentially wound to form on the drum an intermediate thread storage. A thread guide element is positioned adjacent the drum for guiding the thread as unwound from the intermediate storage. The thread guide element is movably mounted transversely relative to the direction of the thread passing therethrough and is resiliently biased in said transverse direction such that the thread is resiliently deflected in the lateral direction to form a compensation loop.

13 Claims, 5 Drawing Figures

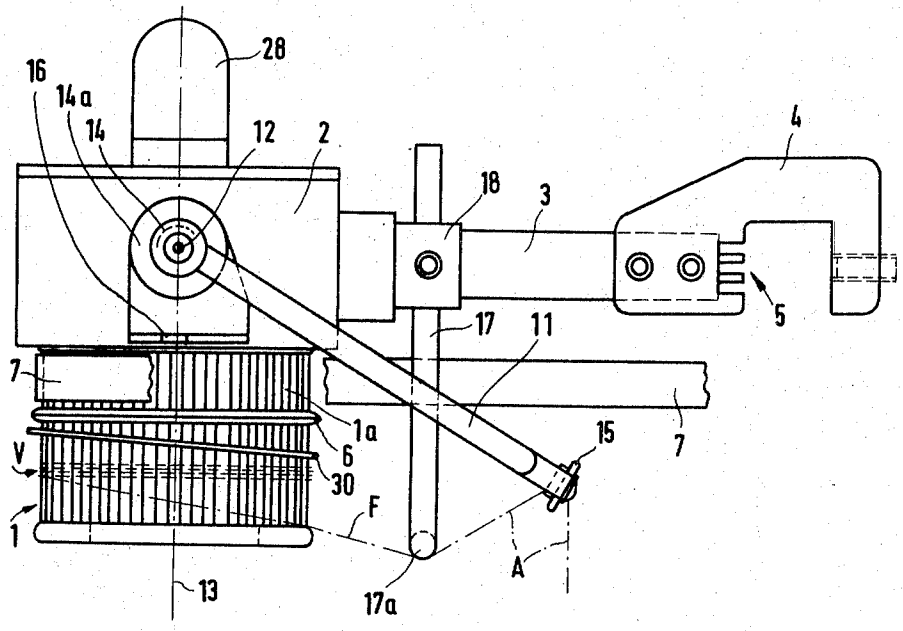
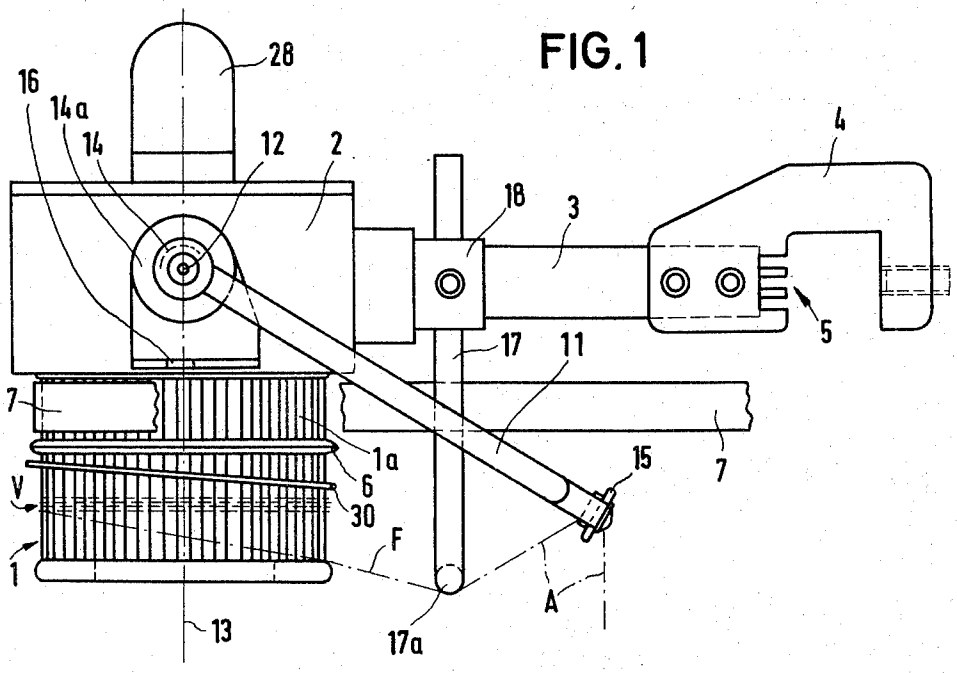


FIG. 1


28
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14a
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FIG. 2

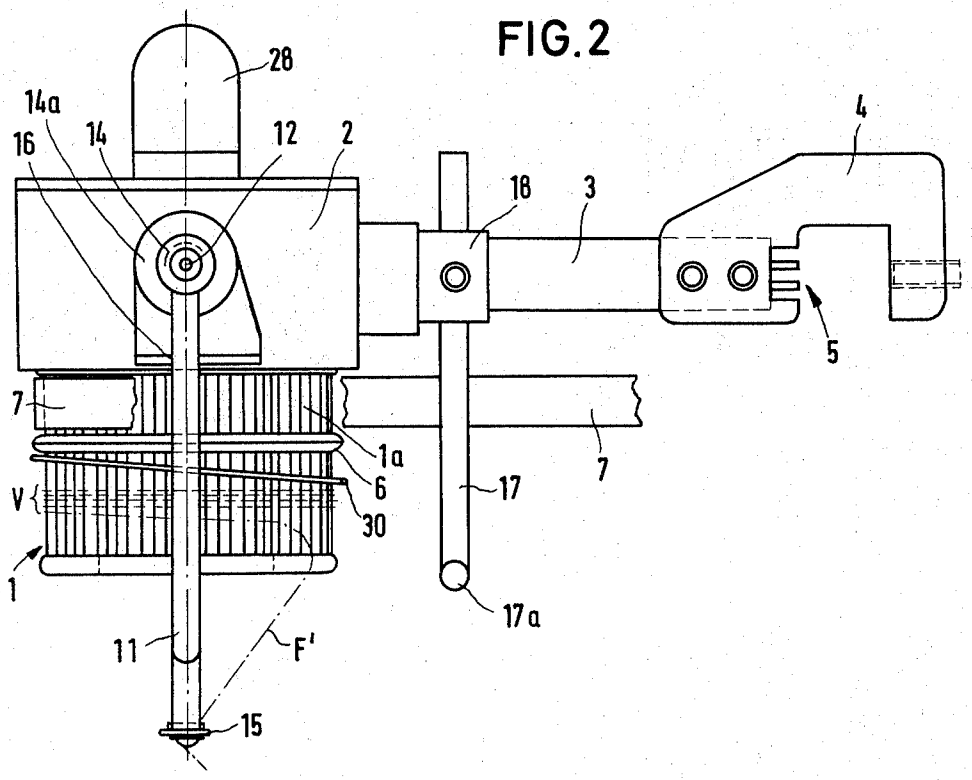
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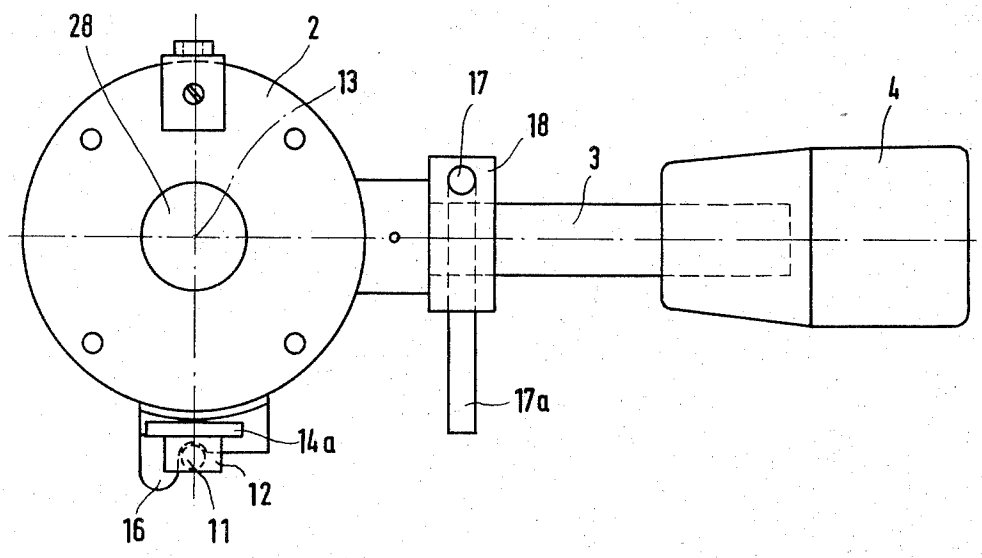
FIG. 3



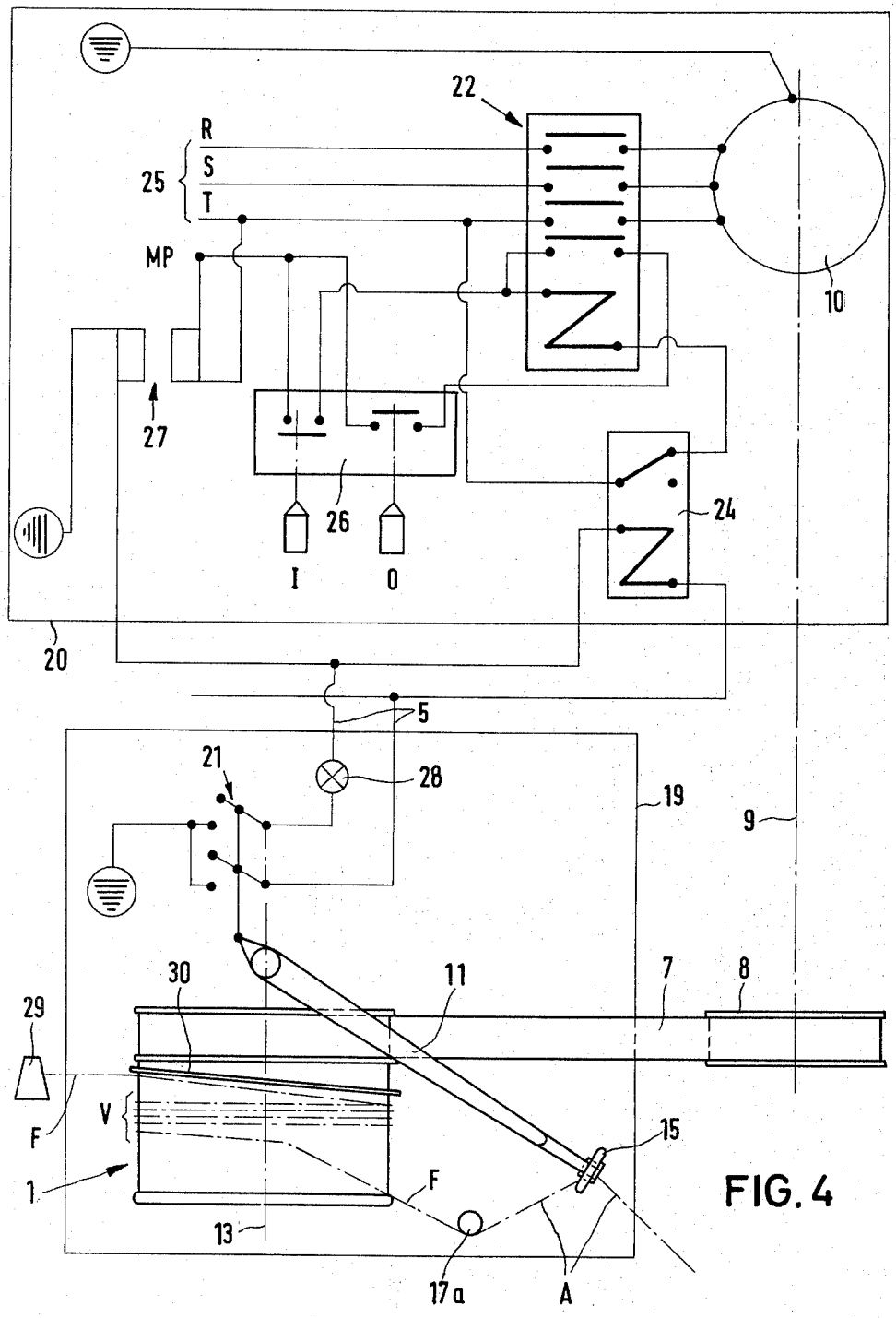
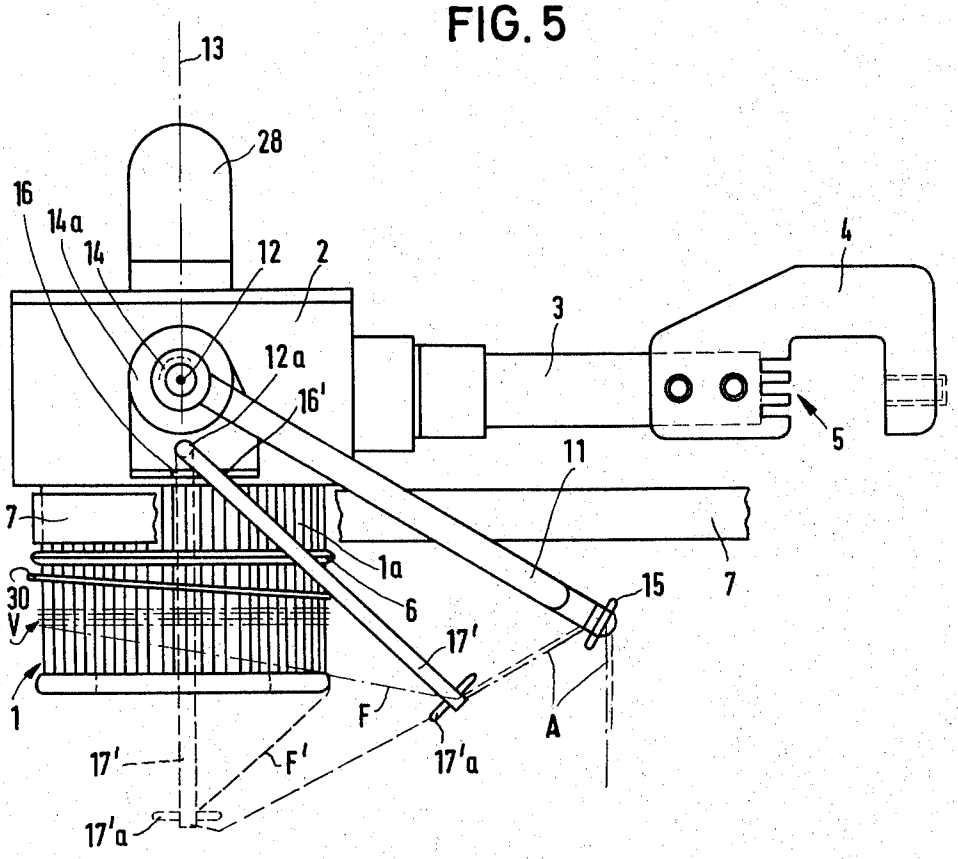


FIG. 4

FIG. 5



THREAD SUPPLY DEVICE FOR TEXTILE MACHINES

This invention relates to a thread supply device for textile machines comprising a drum which can be set in rotation, upon which a thread issuing from a storage coil can be tangentially wound up to form an intermediate thread storage and further comprising a thread guide element for the thread unwinding from the drum.

If a thread supply device of this type is employed for so-called positive thread supply in which the thread supply device only releases a limited amount of thread per work cycle of the textile machine, the movable operating parts of the textile machine and the drum of the thread supply device must always move synchronously. If deviations in the synchronized movement develop due to mass inertia, clearance or slippage in the drive system, braking delays or other reasons, there is a danger that the textile machine will remove more or less thread from the drum than corresponds to the rotation of the same. This could cause breaks in the thread of reduction of the thread tension to zero, both of which could result in flaws or irregularities in the goods.

The invention is based on the task of developing a thread supply device of the class defined at the outset such that deviations in synchronization between the textile machine and the thread supply device do not lead to breakdowns or interruptions in the thread supply. This task is accomplished in accordance with the invention in that the thread guide element is movably mounted transversely to the direction of the thread passing through said thread guide element and in that a force storage means is biased such that the thread is resiliently deflected in a lateral direction to form a compensation loop.

In the thread supply device in accordance with the invention the thread forms a compensation loop between the drum and the textile machine which can be increased or decreased in size. Changes in the length of the thread between the drum and the operating elements of the textile machines which are caused by deviations in the synchronization between the textile machine and the drum of the thread supply device are compensated for by changes in the size of the loop without resulting in a break in the thread or in a reduction in the thread tension. This advantage is achieved without any substantially additional structural parts because this additional function of providing a compensation loop by resiliently deflecting the thread in a lateral direction during positive thread supply is assumed by the thread guide element of the thread supply device in accordance with the invention in addition to its main task of dictating the suitable thread path for positive or intermittent thread supply.

In a known thread supply device of the type recited at the outset (German published application 1,760,600), the thread guide element designed as a thread eye is mounted at the free end of a pivotal arm. This can assume two positions. In the first position, the thread eye is radially readially in spaced relation to the drum axis and thereby dictates a positive thread supply. In the second position, the thread eye is aligned with the drum axis so that intermittent thread supply is also possible with the same thread supply device by drawing off the thread over the lower edge of the drum. The pivot arm supporting the thread eye is stationary in both work positions so that no precautions have to be taken in the known thread supply device against the possibility of interruptions or breakdowns occurring as discussed above with regard to positive thread supply. Furthermore, the invention provides a further development of the thread supply device according to German published application 1,760,600 such that the thread guide element can be brought in a manner known per se from a first position for positive thread supply in which it is movably arranged radially at a distance from the drum axis as well as transversely to the thread path to form the compensation loop to a second position for intermittent thread supply in which it is aligned with the drum axis. The pivot arm which serves in the known thread supply device to convert from positive to intermittent thread supply and vice-versa forms with its thread eye in the further development of the invention the thread guide element which produces a compensation loop in the thread path after the drum when in position for positive thread supply.

According to an advantageous further development of the invention, the thread guide element is concurrently a part of a disconnecting or cut-off device which monitors the thread for breaks. The thread guide element thus assumes still another function, namely monitoring the thread unwinding from the drum for breaks. Since the thread guide element is affected by the action of a force storage means in its position for positive thread supply, the movement of the thread guide element which is produced by the force storage means when the thread breaks can be employed to disconnect the textile machine and the supply device.

Between the drum circumference and the thread guide element located radially in space relation to the drum there is expediently arranged a thread support element such that it supports the thread passing by the thread support element contrary to the thread deflection caused by the thread guide element. The compensation loop is thus formed in back of the thread support element in the course of the thread path. The lateral deflection of the thread which is required to form the compensation loop thus does not extend to the surface of the drum. The thread can run radially in the most favorable direction for uninterrupted progress of the thread from the drum to the thread support element and is not laterally deflected until it has passed said support element.

The thread support element can expediently be adjusted parallel to the drum axis. This adjustment enables that course of the thread to be set which is most favorable for uninterrupted running of the thread from the drum and for the formation of the compensation loop.

If the thread guide element which is movably disposed transversely to the direction of the thread unwinding from the drum is, at the same time, a part of a cut-off device monitoring the thread for breaks, it is particularly favorable if the thread support element has a thread eye which can be moved from a first position for positive thread supply in which it is radially arranged in space relation to the drum axis in a stationary manner into a second position for intermittent thread supply in which it is aligned with the drum axis. The function of the converter from positive to intermittent thread supply and vice-versa is assumed by the thread support element in this embodiment of the invention. This causes the thread guide element forming a shut-off

device to remain effective even when the device is set for intermittent thread supply. The thread issuing from the drum is thus monitored for breaks even in the case of intermittent thread supply.

Embodiments of the invention will be explained hereinafter in conjunction with the drawing in which:

FIG. 1 is a side elevation of a thread supply device in accordance with the invention in the position for positive thread supply,

FIG. 2 is an illustration corresponding to FIG. 1 in the position for intermittent thread supply,

FIG. 3 is a plan elevation of the thread supply device in accordance with FIG. 2,

FIG. 4 is an electrical circuit diagram, and

FIG. 5 is a side elevation of another embodiment of the invention.

The thread supply device has a drum **1** which is rotatably journaled in a housing **2.** The housing **2** is arranged at the outer end of a support arm **3** which is provided at its inner end with a clamping member **4** by means of which the thread supply device can be clamped to a support of the textile machine. Electrical contacts for supplying the electrical part of the supply device are shown at **5.**

The drum **1** which is designed in the illustration embodiment as a rod cage forms in its upper section **1a** a pulley which is bordered at the bottom by a flange **6** and which is encompassed by a belt **7.** The belt **7** runs over a drive disc **8** (cf. FIG. **4**) which in turn is driven via a shaft (shown by the dot-and-dash line at **9**) from the main drive motor **10** of the textile machine which cooperates with the supply device. In this way, the drum **1** can be rotated by the main drive motor **10** substantially synchronously with the moved operating elements of the textile machine.

A pivot arm **11** is rotatably journaled in the housing **2** about an axis **12.** This axis **12** extends perpendicularly to the imaginary axis of rotation **13** and lies in a common plane therewith. A coil spring **14** indicated by the dotted line in FIGS. **1** and **2** and engaging the axis **12** tends to pivot the arm **11** in counterclockwise direction in FIGS. **1** and **2.** The axis **12** is also journaled in a knurled wheel **14***a* which is rotatably journaled on the housing **12** and by means of which the position of the pivot arm **11** can be varied.

The pivot arm **11** has at its free end a thread guide element **15** in the form of a thread eye. A stop **16** is positioned laterally on the housing **2** beneath the axis **12** and is releasably engaged by the pivot arm **11** in the position in accordance with FIGS. **2** and **3.**

A bracket-like thread support element **17** is journaled on the support arm **3** adjacent the housing **2** in a clamping head **18** so as to be adjustable in height. The thread support element **17** has at the lower end a horizontal arm **17***a* which is located relative to the position of the pivot arm **11** according to FIG. **1** somewhat beneath the thread guide element **15.**

The circuit elements belonging to the supply device are contained within the frame **19** in the schematic drawing of FIG. **4** while the frame **20** includes the circuit and drive elements of the associated textile machine, for example, a knitting machine.

As can be seen from FIG. **4,** the pivot arm **11** is coupled with a double switch **21** such that the double switch is open when the pivot arm **11** is in the operating positions shown in FIGS. **1** and **2,** but is closed when the pivot arm **11** is moved through the position according to FIGS. **1** and **4** in a counterclockwise direction by the coil spring **14.** This operation is described in greater detail hereinafter.

The drive motor **10** is supplied from a three-phase main supply **25** via a contactor **22.** Number **24** is a cut-off relay connected with the switch **21** via contact **5.** Number **26** designates a two-button switch by means of which the motor **10** can be switched on or off via contactor **22.** Number **27** is a transformer which can supply low-voltage current via switch **21.** Finally, a warning light is indicated by **28.**

The mode of operation is as follows:

When the main drive motor **10** of the textile machine is switched on, the drum **1** is driven via the drive connection **7, 8, 9** at a speed which is synchronous with the movement of the operating elements of the textile machine, for example, the needle cylinder of a round bed knitting machine. A thread F issuing from a thread storage coil **29** (FIG. **4**) is tangentially supplied to the drum **1** and is wound up thereupon to form a intermediate thread storage V. A thread transport element **30** is provided to distribute the thread storage V along the drum jacket formed from the rod cage. This thread transport element comprises a disc which is inclined relative to the axis of rotation **13** of the drum and projects with its radial arms through the rods of the rod cage forming the drum **1,** the outer ends of the arms being connected with one another by means of a closed ring. Thread transport elements of this type are already known, for example from German published application 1,760,600 and from U.S. Pat. No. 3,419,225. In the known cases, the inclined disc which forms the thread transport element is pivotally disposed about an axis perpendicular relative to the axis of rotation of the drum. In the present case, such a pivotably arrangement is not necessary. The disc **30** has a given inclined position relative to the axis of drum rotation **13** and is journaled to this end on a pivot bearing (not shown) which forms an angle somewhat under 90° with the axis **13** such that it retains the spacial inclined position evident from the drawing, but can nevertheless rotate with the drum **1.**

The thread F which is fed in a tangential direction is pressed downwardly by the inclined disc **30** in the axial direction of the drum **1** and thus forms the thread storage V mentioned above.

In the normal operating position of the thread supply device in accordance with the invention, the pivot arm **11** assumes the position according to FIGS. **1** and **4.** The thread F is unwound from the drum **1** substantially tangentially, passes under the horizontal arm **17***a* of the thread support element **17** and then passes through the eye-shaped thread guide element **15.** The thread F is deflected laterally by the thread guide element **15** by virtue of the spring load of the pivot arm **11** in the counterclockwise direction and thereby forms a compensation loop A. The exact path of the thread unwinding from the drum **1** and the size and shape of the compensation loop A can be influenced by the height at which the thread support element **17** is adjusted.

When the pivot arm **11** is positioned in accordance with FIGS. **1** and **4,** the thread F cannot be withdrawn from the rotating drum **1** more rapidly than corresponds to the speed of the drum **1.** Hence, the textile machine can only utilize a specific maximum amount of thread. This mode of operation is normally referred to as positive thread feeding.

If the operating elements of the textile machine temporarily consume for any reason whatsoever somewhat more thread than is released by the drum **1**, this does not result in a break in the thread in the case of the supply device in accordance with the invention. On the contrary, the compensation loop A is merely temporarily reduced in size by swinging the pivot arm **11** in the clockwise direction against the force of the spring **14.** On the contrary, lower thread consumption by the textile machine as compared to free release on the drum **1** does not allow the thread to become slack because the spring-loaded pivot arm **11** increases the size of the compensation loop A in such a case by moving in the counterclockwise direction.

If the thread F, however, does break for some reason between the drum **1** and the textile machine, the thread guide element **15** is released so that the spring **14** can swing the pivot arm **11** further in the counterclockwise direction, thereby closing the switch **21** and thereby actuating the cut-off relay **24** which brings the contactor **22** into switch-off position. The textile machine is then out of operation. At the same time, the warning lamp **28** is supplied with the current via switch **21** and lights up so that the operator is made aware of the break in the thread.

If an intermittent thread supply is desired which is independent of the operating speed of the textile machine, for example because adjustment or repair work is supposed to be carried out on the shut-down textile machine which can only be operated manually, and for which the thread must be supplied manually, then the pivot arm **11** is brought into the position according to FIGS. **2** and **3** in which it is secured in the stop **16.** The thread can then be withdrawn from the drum **1** in an axial direction as is indicated at F'. The speed of withdrawal is independent of the speed of the drum. In particular, the thread can also be withdrawn when the drum **1** is stationary. The eye-like thread guide element **15** is located in this case in alignment with the imaginary axis of drum rotation **13.**

The invention is not restricted to the embodiment shown in the drawing. It is of course also possible to conduct the thread guide element **15** between the two positions by other means, for example, in a elongated slot. A spring load exerted transversely to the unwinding thread in the case of positive thread supply would of course have to be provided in this case as well. Furthermore, a weight for biassing the thread guide element in the corresponding sense could also be provided in place of the spring **14.**

Furthermore, another drive means for the drum **1** is also feasible, for example, by means of a motor which drives the drum **1** directly and which runs synchronously with the main drive motor of the textile machine.

Finally, the axial transport of the intermediate thread supply V on the drum **1** can also be accomplished by other means. For instance, conical transport surfaces, rod changes and belt drives which move axially between the rods of the drum are also known in the field of technology in this context.

In the case of the embodiment illustrated, the intermediate thread supply on the drum is not automatically maintained within specific limits in the case of intermittent thread supply. The thread storage must therefore be observed and, if necessary, must be refilled by rotating the drum manually or by means of an auxiliary device. This is completely adequate for intermittent operation during adjustment or repair work on the textile machine. If intermittent thread supply is desired during normal operation of the textile machine, the thread supply must be automatically maintained within specific limits by known means, for example, by designing the transport element **30** as a scanner for the amount of thread storage which automatically causes the thread storage to be refilled as described in German published application 1,760,600.

The invention can also be employed even if the thread guide element **15** cannot be brought into the position for intermittent thread supply. Even in the case of thread supply which is always positive, the compensation loops exclude and prevent any interruptions or breakdowns.

The embodiment according to FIG. **5** agrees in part with that according to FIGS. **1** to **4.** The same parts are provided with the same reference numerals and therefore do not need to be described again.

In the case of the embodiment according to FIGS. **1** to **4**, the pivot arm **11** serves to convert from positive to intermittent thread supply and vice-versa. It also forms in the position according to FIG. **1** an automatic disconnecting means which monitors the thread unwinding from the drum **1** in terms of pressure. If it is, however, pivoted in the position for intermittent thread supply according to FIG. **2,** the automatic disconnecting function is shut off. Hence, no monitoring of the thread unwinding from the drum **1** for thread break is provided in the embodiment according to FIGS. **1** to **4** in the position for intermittent thread supply.

In the embodiment according to FIG. **5,** this disadvantage is obviated. The function of converting from positive to intermittent thread supply and vice-versa is assumed in this embodiment by the thread support element **17***a'* which is designed here as a thread eye and which is mounted on a pivot arm **17'** which can be pivoted about a housing axis **12***a* extending transversely to the drum axis **13.** In the position indicated by the solid lines in FIG. **5,** the pivot arm **17'** is releasably locked by a stop **16'**. The thread issuing from the drum **1** runs along the path shown by the dot-and-dash line through the thread eye **17'***a* forming the thread support element and from here through the eye-shaped thread guide element **15.** By positioning the thread eye **17'***a* in radially spaced relation from the axis **13** of the drum, only that amount of thread can be unwound from the drum as is simultaneously wound up thereupon. Hence, positive thread supply is achieved. The unwinding thread F also forms a compensation loop A due to the movable and spring-loaded pivot arm **11** and is monitored for thread break in the manner recited in conjunction with FIG. **1.**

If the device according to FIG. **5** is supposed to be converted to intermittent thread supply, the pivot arm **17'** is swung into the position shown by the dotted line in which it is releasably held in the stop **16** and extends parallel to the axis **13** of the drum. The thread eye **17'***a* mounted laterally on the pivot arm **17'** is aligned in this case with the drum axis **13** so that the thread can be withdrawn from the drum **1** in a downward direction along the path F' of the dotted line. Hence, intermittent thread supply is possible independently of the thread winding speed. After passing through the thread eye **17'***a* the thread returns to the thread guide element **15** even in the case of intermittent thread supply and then

first arrives at the operating elements of the textile machine from the guide element. If the thread F' breaks between the thread drum 1 and the working elements of the textile machine in the case of intermittent thread supply, the thread guide element 15 in conjunction with the pivot arm 11 still fulfill the function of a cut-off or disconnecting device which stops the operation when the thread breaks.

What is claimed is:

1. In a thread supply device for a textile machine, said supply device including drum means upon which a thread can be tangentially wound to form an intermediate thread storage and thread guiding means for guiding the thread withdrawn from said drum means, the improvement comprising means mounting said thread guiding means for movement in a direction transverse to the direction of movement of the thread passing through said thread guiding means, and biasing means coacting with said thread guiding means for urging same in said transverse direction to form a compensating loop in the thread as it is withdrawn from said drum means.

2. A thread supply device according to claim 1, wherein said mounting means mounts said thread guiding means for movement relative to said drum means between a first position wherein said thread guiding means is spaced radially outwardly from the longitudinal axis of said drum means for permitting positive thread supply from said drum means and a second position wherein said thread guiding means is substantially aligned with the longitudinal axis of said drum means for permitting intermittent thread supply from said drum means.

3. A thread supply device according to claim 2, wherein said mounting means includes lever means mounted for pivotal movement about an axis which is substantially perpendicular to the longitudinal axis of said drum means, said lever means being pivotally movable between said first and second positions, and said thread guiding means being mounted on said lever means adjacent the free end thereof.

4. A thread supply device according to claim 2, further including monitoring means operative at least when said thread guiding means is in said first position for sensing when a breakage occurs in the thread as withdrawn from said drum means.

5. A thread supply device according to claim 4, wherein said monitoring means includes cut-off means for deactivating a textile machine associated with said thread supply device, said cut-off device being activated in response to movement of said thread guiding means by said biasing means into a third position which is spaced from said first position and is located on the side thereof opposite said second position, said thread guiding means being moved into said third position by said biasing means when said withdrawn thread experiences a breakage.

6. A thread supply device according to claim 1, wherein said thread guiding means is normally maintained in a first position by the thread withdrawn from said drum means, said biasing means normally urging said thread guiding means in said transverse direction toward a second position which is spaced from said first position, said biasing means causing said thread guiding means to be moved into said second position upon breakage of said withdrawn thread, and monitoring means for sensing the presence of a breakage in the thread withdrawn from said drum means, said monitoring means including a cut-off device associated with a textile machine used in conjunction with said thread supply device for deactivating said textile machine upon breakage of said withdrawn thread, said cut-off device being actuated for deactivating said textile machine upon movement of said thread guiding means into said second position.

7. A thread supply device according to claim 1, further including control means coacting with the thread as withdrawn from said drum means for permitting either a positive or an intermittent thread supply from said drum means to a textile machine, said control means including a thread guide element engaged with the thread as withdrawn from said drum means and movable relative to said drum means between a first location spaced radially outwardly from the longitudinal axis of said drum for permitting a positive thread supply and a second location located substantially coaxial with the longitudinal axis of said drum means for permitting an intermittent thread supply, said thread guide element when in said first location being disposed for engagement with the withdrawn thread at a point thereon which has already been removed from engagement with the drum means but has not yet passed through said thread guiding means.

8. A thread supply device according to claim 7, wherein the control means comprises an elongated lever mounted for pivotal movement about an axis extending substantially perpendicular to the longitudinal axis of said drum means, said thread guide element being mounted on said lever adjacent the free end thereof and being movable between said first and second locations in response to swinging movement of said lever relative to said drum means.

9. A thread supply device according to claim 8, wherein said mounting means includes a second elongated lever mounted for pivotal movement relative to said drum means about an axis extending substantially perpendicular to the longitudinal axis of said drum means, said thread guiding means being mounted on said second lever adjacent the free end thereof, and the thread guide element when in said first location being located radially between said thread guiding means and the external periphery of said drum means.

10. A thread supply device according to claim 9, wherein said thread guiding means is normally maintained in a first position by the thread withdrawn from said drum means, said biasing means normally urging said thread guiding means in said transverse direction toward a second position which is spaced from said first position, said biasing means causing said thread guiding means to be moved into said second position upon breakage of said withdrawn thread, and monitoring means for sensing the presence of a breakage in the thread withdrawn from said drum means, said monitoring means including a cut-off device associated with a textile machine used in conjunction with said thread supply device for deactivating said textile machine upon breakage of said withdrawn thread, said cutoff device being actuated for deactivating said textile machine upon movement of said thread guiding means into said second position.

11. A thread supply device according to claim 1, further including thread support means positioned externally of said drum means and disposed for engaging the thread withdrawn from said drum means, said support

means including a thread support element disposed radially outwardly from the circumference of said drum means and located between the circumference of the drum means and said thread guiding means for supportingly engaging the withdrawn thread.

12. A thread supply device according to claim **11,** further including means mounting said thread support means for permitting adjustment in the position of same relative to said drum means in a direction substantially parallel to the longitudinal axis of said drum means.

13. A thread supply device according to claim **11,** wherein said thread guiding means includes a thread engaging member movable relative to said drum means between a first position spaced radially outwardly from the longitudinal axis of said drum means for permitting positive thread supply from said drum means and a second position located substantially aligned with the longitudinal axis of said drum means for permitting intermittent thread supply from said drum means.

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