United States Patent [19]

Duplessy

[11] **3,810,494**

[45] **May 14, 1974**

[54] **DEVICE TO SUPPLY A THREAD**

[76] Inventor: **Jean Duplessy**, "Le Sommet" 5 bis, rue J. B. Simon, Sainte Foy-Les-Lyon, France

[22] Filed: **Dec. 1, 1972**

[21] Appl. No.: **311,393**

[30] **Foreign Application Priority Data**

Dec. 10, 1971 France 71.45355

[52] **U.S. Cl.** ..... **139/122 R**, 66/132

[51] **Int. Cl.** **D03d 47/34**

[58] **Field of Search** 66/132; 226/42, 44, 116; 139/122–127

[56] **References Cited**

UNITED STATES PATENTS

3,330,304	7/1967	Hall	139/122
3,734,368	5/1973	Kadelski	226/44

FOREIGN PATENTS OR APPLICATIONS

1,510,153	12/1967	France	139/122
675,185	7/1952	Great Britain	139/122

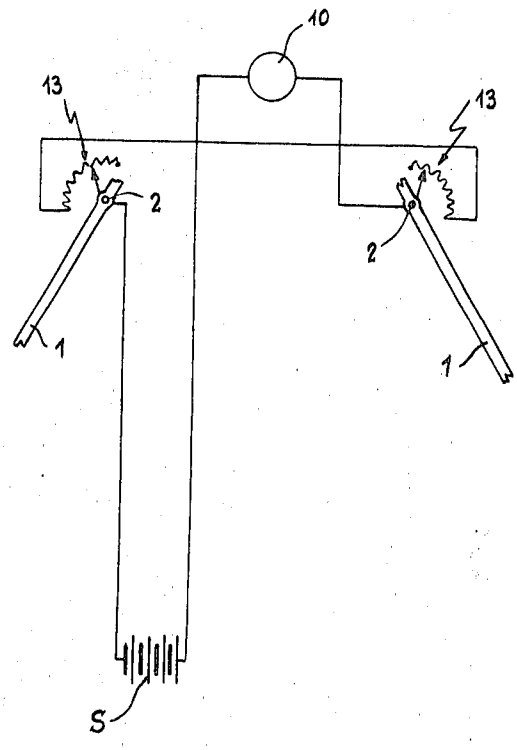
Primary Examiner—Henry S. Jaudon

Attorney, Agent, or Firm—Alexander & Dowell

[57] **ABSTRACT**

The invention relates to devices adapted to positively supply a thread or like elongated article under an approximately constant tension to a processing machine as it is pulled by the latter, of the kind comprising a thread advancing mechanism driven by a variable-speed electric motor, and two supports, such as pivoted levers, movable with respect to each other and urged apart by appropriate means such as springs, each carrying a number of guiding means between which the thread passes in zig-zag fashion, while means are provided to control the angular speed of the motor in such manner that it increases as the supports come nearer to each other and that it decreases when they move apart. In order to absorb the sudden variations of the linear speed at which the thread is pulled by the processing machine, as for instance a loom with stationary weft supply, in accordance with the invention the thread guiding means are carried by the movable supports through the medium of spring loaded pivoted arms of quite negligible inertia which follow closely the variations of the pulling speed of the thread without causing appreciable additional tensions. With such an arrangement the supports are practically only responsive to the variations in the average pulling speed of the thread.

5 Claims, 4 Drawing Figures



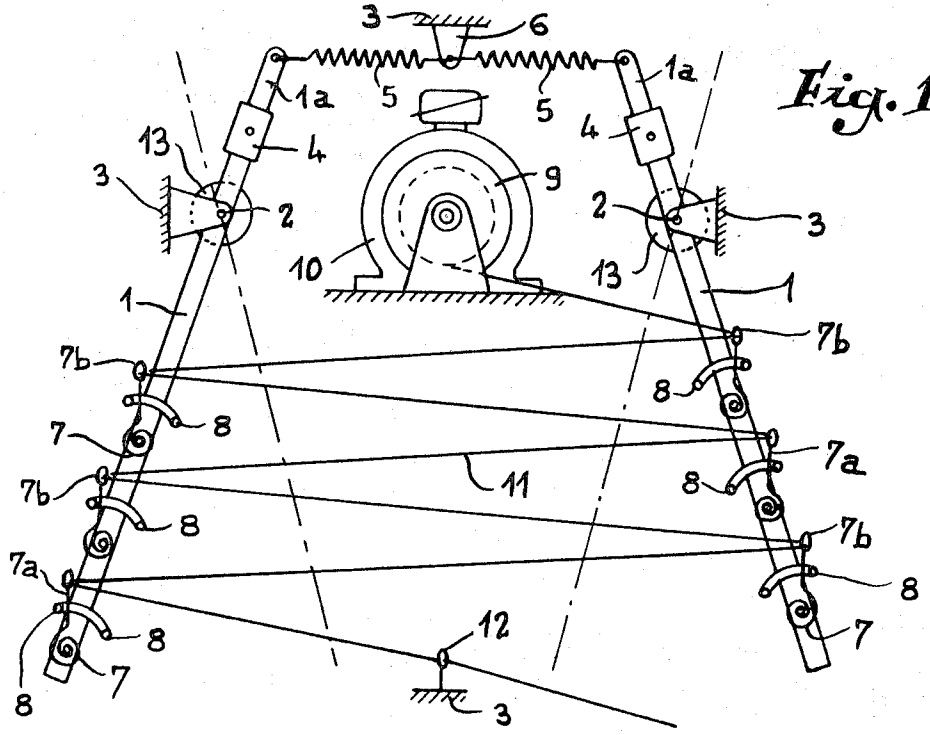


Fig. 1

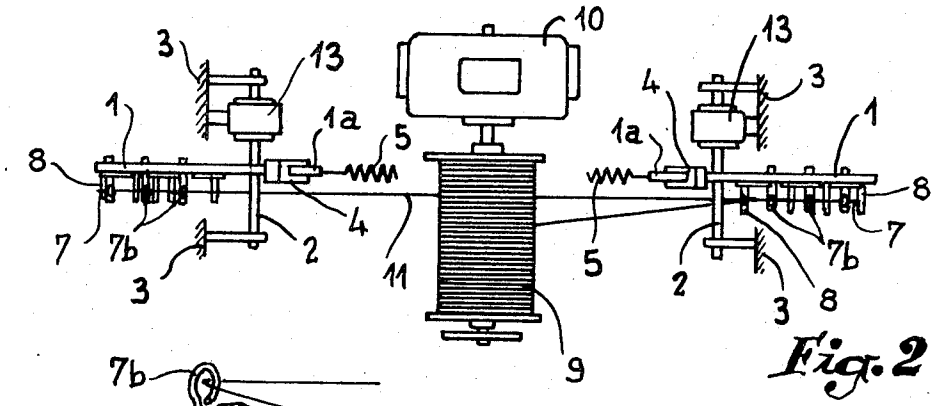


Fig. 2

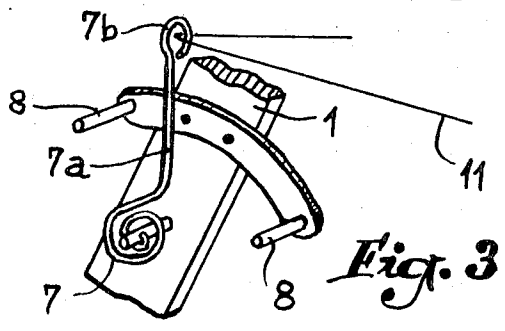


Fig. 3

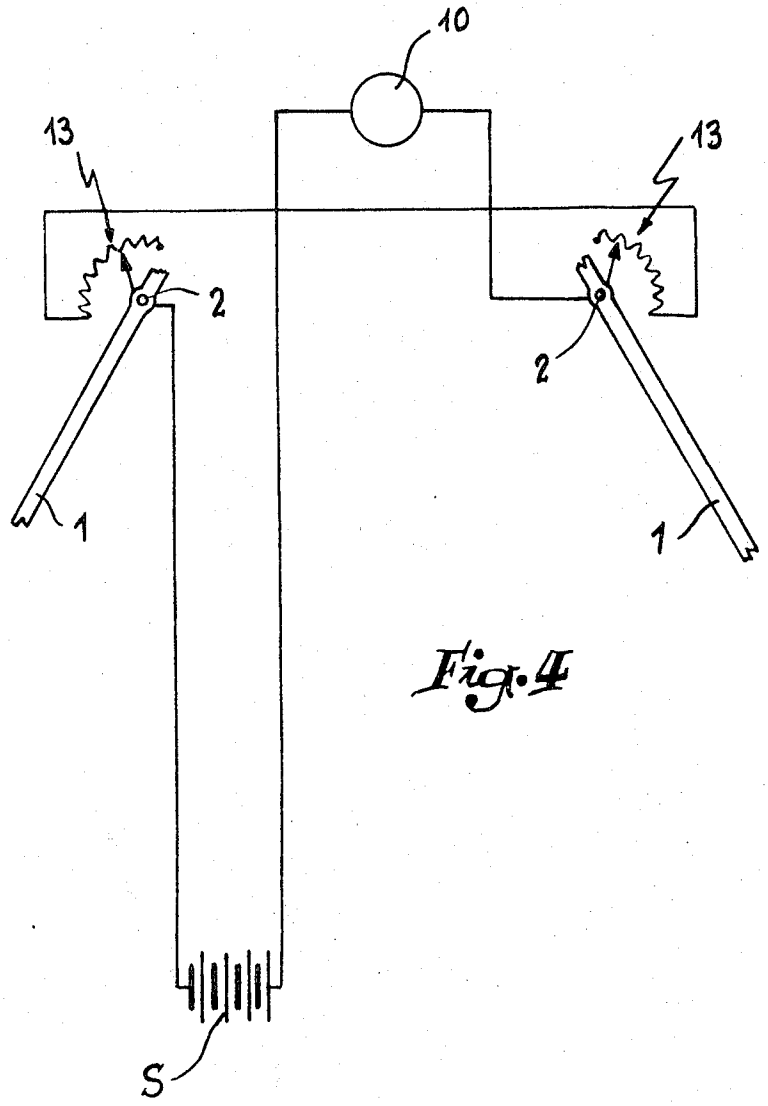


Fig. 4

DEVICE TO SUPPLY A THREAD

The present invention relates to devices adapted to supply a thread, ribbon or other flexible elongated article under an approximately constant tension to a processing machine of any kind, as for instance to a loom with stationary weft supply or to a knitting machine.

Devices are known which deliver positively a thread from a bobbin or the like under the effect of the variations of its tension downstream of the device. Such devices comprise a thread advancing mechanism actuated by a variable speed electric motor and a thread tensioning system formed of pulleys, eyelets or like thread guiding means carried by two supports movable with respect to each other and which are urged apart by spring means or equivalents, the thread following a zig-zag path between the thread guiding means of one and the other supports, while means are provided for controlling the motor speed in proportion to the relative position of the supports, in such manner that this speed decreases when the distance between the said supports increases and, conversely, that the said speed increases when this distance decreases. The known devices of the kind in question however afford the drawback that the inertia of the supports is in fact considerable and that therefore if the speed at which the thread is pulled by the machine to which it is supplied is subject to rapid variations, as this is the case for instance with looms having a stationary weft supply, the tension to which the said thread is submitted increases considerably due to the fact that it has to ensure the acceleration of the relatively heavy movable supports.

It is an object of the present invention to avoid such an inconvenience.

According to the invention the guiding means are carried by the movable supports through the medium of individual pivoted arms which are biassed by spring means in the direction corresponding to the tension of the thread or like article. When the pulling speed of the thread or like article varies suddenly, these variations are absorbed by the pivoted arms, the supports being practically only responsive to the average pulling speed.

In the annexed drawings:

FIG. 1 is a view in elevation illustrating an embodiment of a device according to the invention.

FIG. 2 is the corresponding plan view.

FIG. 3 is a fragmental perspective view showing a pivoted arm and the parts associated therewith.

FIG. 4 is a diagram illustrating the electric circuitry of the device.

Referring to the drawing reference numeral 1 designates two supporting levers carried by two parallel shafts 2 which are rotatably supported in the same horizontal plane by an appropriate frame diagrammatically indicated by reference numeral 3. Levers 1 extend above their pivoting shafts 2 as indicated at 1*a* and each extension 1*a* carries a counterweight 4 due to which the lever is balanced about its pivot. Springs such as 5 are interposed between these extensions 1*a* and the frame 3 in such manner as to urge apart the supporting levers 1.

Each lever 1 supports a number of flat spiral springs 7 made for instance of steel wire, the geometrical axes of these springs being substantially parallel to the pivoting axes of the levers. The last convolution of each spring 7 extends radially in the form of a small arm 7*a*

which may be considered as being resiliently pivoted to the corresponding lever through the medium of the spiral spring itself. The end of the steel wire which forms each spring 7 and the radial arm 7*a* associated therewith is coiled in the form of a threadguiding eyelet 7*b*. Springs 7 are identical with each other and they are so mounted on each lever 1 that their associated arms 7*a* are parallel to each other and that they remain parallel when they are submitted to the tension of the thread, as more fully explained below.

Two abutments 8 are associated with each arm 7*a* in order to limit its angle of oscillation on the corresponding lever 1.

The device further comprises a bobbin 9, mounted on the shaft of a variable speed electric motor 10 carried by the frame 3. The thread 11 issuing from this bobbin 9 passes alternately in zig-zag fashion through the eyelets 7*b* carried by one and the other lever 1, and then through a stationary thread guide 12 from which it is directed towards the loom or other processing machine (not illustrated) to which it is to be supplied.

The speed of the electric motor 10 is positively controlled by the respective position of the supporting levers 1 in such manner that this speed decreases down to zero when the levers are far apart, and on the contrary that it increases progressively when their distance decreases. In the example illustrated it has been supposed that the electric motor 10 is of the direct current type having a flat armature or rotor void of any iron and consequently of quite small inertia, the speed of such a motor following quite closely the voltage applied thereto.

In the embodiment illustrated the motor speed is controlled by means of two circular rheostats 13 respectively mounted on the pivoting shafts 2 of the supporting levers 1, these rheostats being connected in series in order to obtain an additive effect on the motor.

FIG. 4 shows how the speed of motor 10 may be controlled by rheostats 13 in the conventional manner. As indicated, motor 10 is preferably of the direct current type and therefore the source S of electrical energy has been diagrammatically illustrated in the form of an electric battery. Rheostats 13 are connected in series with each other and with motor 10. Each comprises in the conventional manner an arcuate resistor and a pivoted slider cooperating therewith, the said sliders being driven by the shafts 2 of levers 1. The arrangement is such that the resistance of rheostats 13 increases when levers 1 move apart, in order to decrease the speed of motor 10, as above noted.

The operation is as follows:

Assuming the supporting levers 1 are at the spaced position of FIG. 1, if the pulling speed, i.e., the linear speed at which the thread 11 is pulled by the loom or like machine, increases suddenly, as for instance when the weft inserting member begins its stroke across the shed, the pivoted arms 7*a*, the inertia of which is quite negligible, flex immediately inwardly with respect to the device and they thus supply a sufficient length of thread before the supporting levers begin moving in a appreciable manner. When thereafter the pulling speed decreases or even becomes zero, arms 7*a* return to their former position. It will therefore be understood that with a loom or like machine operating in accordance with a regular cycle, the supporting levers oscillate in an imperceptible manner on each side of an average position for which the angular speed of motor 9

corresponds to the average linear pulling speed of the thread. The device is preferably so adjusted that this average position of the supporting levers is substantially vertical, the position illustrated in full lines corresponding for instance to the standstill of motor **9** and the position diagrammatically indicated in dash and dot lines to its maximum angular speed for which the thread is supplied at a linear speed well above the aforesaid average linear pulling speed. The irregularities of the pulling speed are thus absorbed by the pivoted arms *7a* which, owing to their quite reduced inertia, do not cause a noticeable increase in the tension of the thread, as would be the case if the guiding eyelets *7 b* were directly carried by the relatively heavy supporting levers **1.** The thread is therefore supplied to the loom or like machine under an approximately constant tension during the whole operation cycle.

The respective elasticities of springs **5** and **7** are preferably such that the pivoted arms *7a* oscillate on each side of a substantially vertical average position whatever may be the angular position of the supporting levers **1.** When this is obtained the pivoted arms are substantially perpendicular to the successive lengths of thread and therefore, for a given position of levers **1,** the variations of the quantity of thread stored in the device are substantially proportional to the angles of oscillation of the said arms, which would not be the case if the average position of the latter were at a marked angle to the vertical. It is to be noted that when the position of the supporting levers varies, this corresponds to a proportional variation of the average tension of the thread, which in turn causes a variation in the average angular position of the pivoted arms *7a* with respect to the levers themselves and it is easily conceived that if these angular variations are of equal amplitude, the pivoted arms *7a* always remain at an average vertical position, as above noted.

It will be understood that the controlling rheostats **13** could be replaced by any other transducer adapted to control the speed of motor **10** under the action of the relative angular position of the supporting levers **1,** as for instance by a variable capacitor or a variable inductance associated with an appropriate electronic circuit. If the said motor **10** is of the conventional type having a substantial inertia, the device could include a braking system actuated by the supporting levers themselves when they approach their spaced position of FIG. **1,** or by an electric signal derived from rheostats **13** or like transducers. Although it is of advantage to provide the supporting levers in such manner that they are substantially vertical at their average position in order to reduce to a minimum the unavoidable lack of balance about a horizontal axis, they could be disposed in any other manner. It could also be possible to mount the said levers on a common pivoting axis. The threaded bobbin **9** could be driven frictionally as this is conventional in the textile industry. The thread to be supplied could be drawn axially from a non-rotating bobbin, the motor then driving appropriate thread-advancing rollers. The arms *7a* could be formed as separate members mounted on pivots and receiving the action of springs such as **7.** The thread guiding eyelets *7b* could be replaced by small pulleys.

It is besides understood that the device according to the invention could also be used with ribbons or more generally with any kind of flexible elongated articles, the guiding members carried by arms *7a* being of course provided in accordance.

What I claim is:

1. In a device to positively supply a thread or like flexible elongated article under an approximately constant tension to a processing machine such as a loom with stationary weft supply or a knitting machine, including an advancing mechanism for said article, a variable speed electric motor to drive said advancing mechanism, guiding members through which the article issuing from said advancing mechanism passes before reaching said processing machine, two supports movable with respect to each other, said supports supporting said guiding means with said article following a zigzag path between the guidjng means carried by one and the other of said supports, means to urge apart said supports, and means to control the angular speed of said motor in correspondence with the relative position of said supports in such manner that this speed increases when said supports come nearer to each other and decreases when said supports move apart;

the improvement according to which said device further comprises arms pivoted to each of said supports with each of said arms carrying one of said guiding means, and spring means interposed between said supports and each of said arms to urge said arms together with said guiding means in a direction corresponding to the tensioning of said flexible article between said guiding means.

2. In a device as claimed in claim **1,** each of said spring means being in the form of a spiral spring having successive convolutions of increasing diameter with the corresponding one of said arms being formed of a radial extension of the last convolution of said spiral spring.

3. In a device as claimed in claim **2,** each of said guiding means being formed of the outer end of the corresponding one of said arms, said outer end being coiled on itself in the form of an eyelet.

4. In a device as claimed in claim **1,** each of said supports being formed of a lever pivoted about an axis, the axes of said levers being substantially situated in a common horizontal plane, and said levers oscillating about a substantially vertical position.

5. In a device as claimed in claim **1,** said supports being in the form of pivoted levers, and said means to urge apart said supports and said spring means acting on said arms being such that said arms oscillate about an average position substantially perpendicular to the successive zig-zags of said flexible article between said guiding means.

* * * * *