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E. B. HELM

2,246,465

THREAD TRAVERSE MECHANISM

Filed March 18, 1938

2 Sheets-Sheet 1

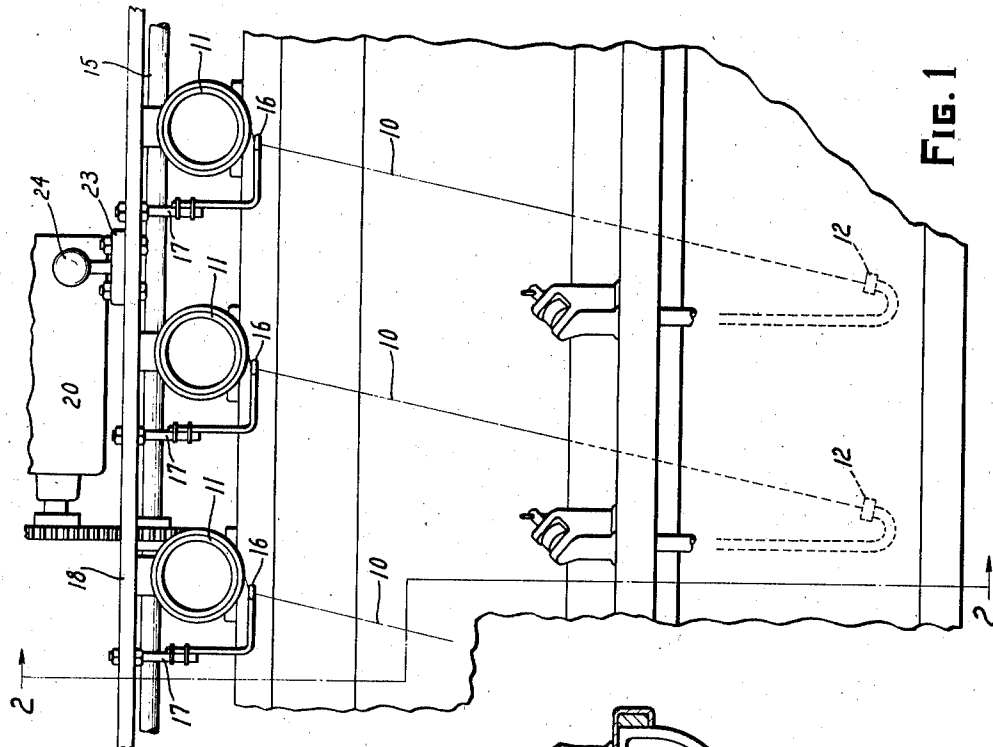


FIG. 1

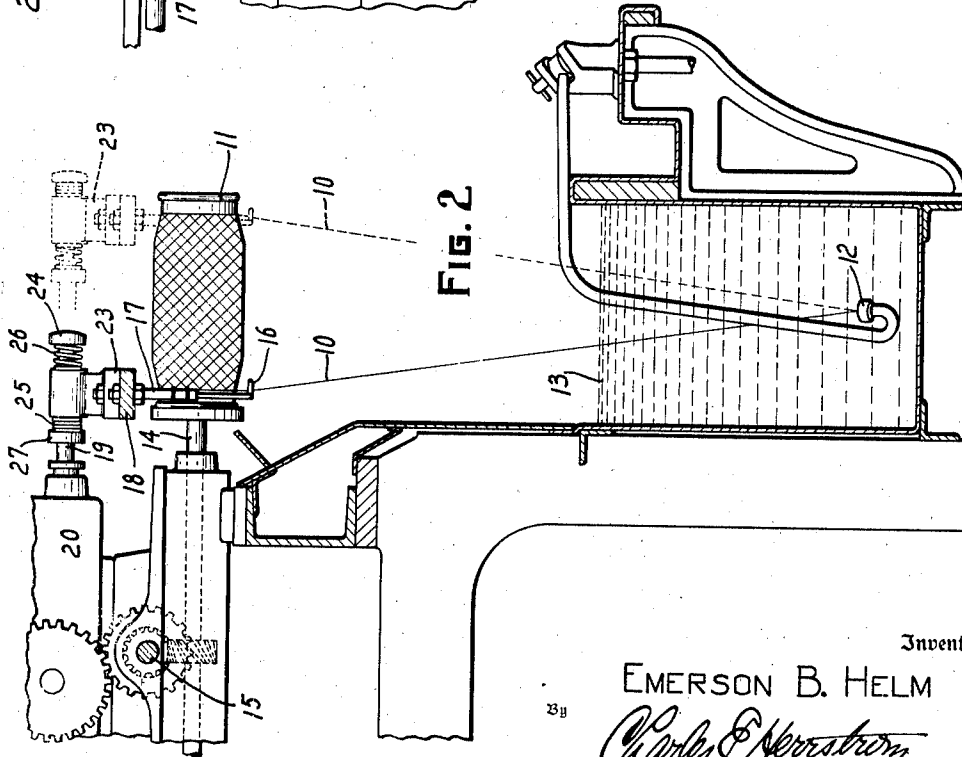


FIG. 2

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2 Sheets-Sheet 2

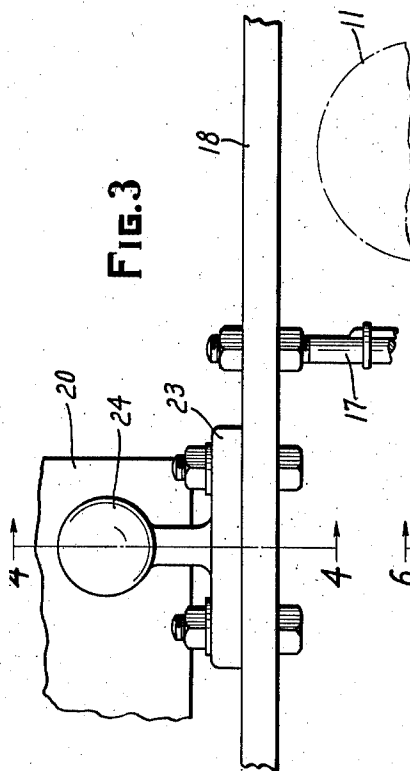


FIG. 3

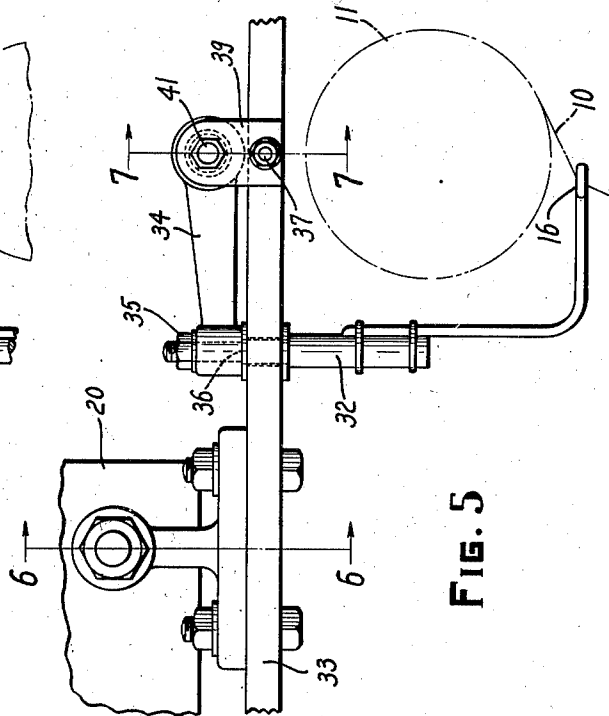


FIG. 5

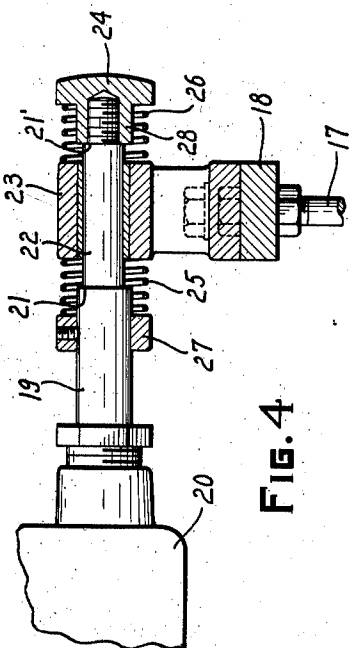


FIG. 4

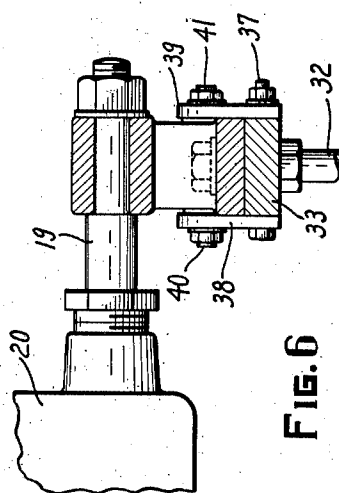


FIG. 6

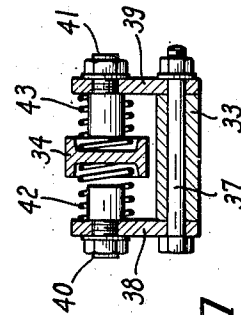


FIG. 7

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THREAD TRAVERSE MECHANISM

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12 Claims. (Cl. 242—43)

This invention relates to thread winding apparatus and, more particularly, to improvements in the traverse mechanism employed in such thread winding apparatus.

In winding thread in package form upon a collecting spool, difficulty is experienced in so laying the thread upon the package that likelihood of entanglement between the thread turns is minimized. Such entanglement is especially likely to occur in spool packages formed in the manufacture of artificial silk thread inasmuch as in the usual operation of subjecting the wound packages to the action of processing liquids, the thread of a given turn tends to wash under or over the thread of another turn. Such an underwind or overwind makes it difficult, if not impossible, to unwind the thread from the package. Even though an underwind or overwind may not occur as a result of a liquid processing step upon the thread, it is quite possible in the course of unwinding the thread from the package that the thread will be pulled from underneath another turn and in this manner will prevent the package from being freely unwound.

In either event, whether the underwind or overwind occurs during a liquid processing step or during unwinding of the thread, it is very likely that the thread will be broken.

The occurrence of such underwinds or overwinds has been found to be largely due to the substantial parallelism which exists between the thread turns at the ends of the package. This parallelism between the thread turns arises from the necessity of reversing the thread traverse mechanism at the end of each traverse stroke. During the time the traverse mechanism is decelerating at the end of the stroke, remaining momentarily at rest, and accelerating, the spool is continuing to rotate at a substantially constant angular speed, with the result that the guide eye in effect remains at rest while the spool is rotating. Because of this relationship, the thread will not be laid upon the spool so as to form a sharply reversed bend, but instead will be laid upon the spool in an approximately circular path.

Another factor responsible for the parallelism which exists between the thread turns at the ends of the spool package is the thread lag between the guide eye and the spool. In passing from the guide eye to the spool, the thread necessarily assumes a path tangential to the spool, so that even though the guide eye is placed as close as practicable to the surface of the spool, there will still be present a substantial length of thread between them. This length of thread makes it impossible

to deposit the thread upon the spool in a locus exactly the same as that characterizing the guide eye itself. Consequently, at the end of each traverse stroke the length of thread between the guide eye and the spool introduces a thread lag.

The combined effect of the necessity of permitting the guide eye to decelerate, remain at rest, and accelerate and the impossibility of avoiding a thread lag between the guide eye and the collecting spool is to lay a considerable length of thread in a plane nearly perpendicular to the axis of the spool. It has been found that nearly three-fourths of a complete turn around the spool is utilized merely to obtain a return in the thread stroke. The presence of these thread turns at the end of the spool about approximately three-fourths of the circumference of the spool results in parallelism between the turns and causes the underwinds and overwinds which the present invention overcomes by effecting an abrupt reversal of the movement of the guide eye at the end of each stroke.

For convenience in illustrating the invention, it is shown as applied to a spool-spinning machine for spinning viscose artificial silk thread. In the manufacture of viscose artificial silk thread by the spool-spinning system, the thread immediately after its extrusion from the spinneret is collected upon a rotating spool along which it is laid by traverse mechanism. The thread on the collecting spool is subsequently subjected to the action of processing liquids to remove various undesirable reaction products from the thread. It will be understood, however, that although the invention is shown in connection with such a machine, it may be utilized in connection with the winding of thread or thread-like material of practically any character.

In the accompanying drawings, in which are illustrated several modifications of the invention, Figure 1 is an elevation of a portion of a conventional spool-spinning machine to which the invention is applied. Figure 2 is a sectional elevation on line 2—2 of Figure 1. Figure 3 is an elevation on an enlarged scale of a portion of the upper part of the apparatus of Figure 1. Figure 4 is a section on line 4—4 of Figure 3. Figure 5 is an elevation corresponding to Figure 3 of a modification. Figure 6 is a section on line 6—6 of Figure 5. Figure 7 is a section on the line 7—7 of Figure 5.

Referring first to the embodiment of the invention illustrated in Figures 1 to 4, inclusive, the thread 10 which is to be collected upon rotating spool 11 is formed by extrusion of viscose

through spinneret 12 submerged in coagulating bath 13. In a complete spinning machine, a number of spools 11 are arranged in parallel relation at intervals along the axis of the machine. For each of the collecting spools, a separate spinneret 12 is provided in the coagulating bath 13. The spools 11 are mounted upon and are rotated by shafts 14, all of which are driven from a common longitudinally extending shaft 15. As the packages of wound threads increase in thickness, change speed mechanism progressively decreases the speed of shafts 14, so that peripheral speed of the outermost layer of thread on the spools 11 remains constant.

In order to pass the threads back and forth along the collecting spools 11, each thread passes through a reciprocating guide eye 16. Guide eye 16 is secured by means of bolt 17 to a carrier bar 18 which extends longitudinally of the machine and which supports the several guide eyes necessary for the several collecting spools 11. To reciprocate the bar 18 back and forth so that the guide eye 16 will be caused to traverse the length of the collecting spool, it is driven by supporting shaft 19. The shaft 19 passes through a cam box 20 which contains mechanism driven from shaft 15 by which the shaft 19 is caused to reciprocate in the direction of its axis.

In accordance with the invention, a resilient coupling is provided at some suitable point in such apparatus, preferably between reciprocating shaft 19 and longitudinally extending bar 18.

In the embodiment of the invention illustrated in Figures 1 to 4, inclusive, this resilient coupling is effected by providing the end of shaft 19 with a projecting pin portion 22. Slidably mounted upon the pin portion 22 is an attaching block 23 to which the longitudinal bar 18 is secured. To retain block 23 upon the pin portion 22 a nut 24 may be screw-threaded upon the end of the pin portion. In order that the block 23 may have a limited sliding movement axially of the pin portion 22, it is of less breadth than the space between the shoulders 21 and 21' provided at opposite ends of pin portion 22 by the enlarged portion of shaft 19 and by nut 24, respectively.

To urge the block 23 to a neutral position on the pin 22 it is acted upon from opposite sides by springs 25 and 26. Spring 25 extends from the block 23 to a collar 27 secured upon shaft 19. By locating the collar 27 a slight distance back from shoulder 21, the spring 25 may have a large number of turns so as to increase its resiliency. Spring 26 extends between the bearing block and the head of nut 24. An elongated hub portion 28 extending from shoulder 21' to the head of nut 24 permits spring 26 to have a large number of turns.

Spring 25 should be of the same length and resiliency as spring 26, so that block 23 when in its neutral position will be acted upon equally from both sides. However, the distance from the collar 27 to shoulder 21 should be less than the distance from the head of nut 24 to shoulder 21', so that block 23 when in neutral position will be closer to shoulder 21' than to shoulder 21. For example, it has been found that the space between the one side of block 23 and shoulder 21 may be 50% greater than the distance between the opposite side of the block and shoulder 21'. When the block is at rest, the springs may be under a slight compression; however, if desired, the springs 25 and 26 may be of such

length that they will not be under compression when the block is in normal position.

In the operation of the apparatus, the block 23 remains during the intermediate portion of the traverse stroke in a neutral position between springs 25 and 26. As the shaft 19 comes to rest at one extremity of the traverse stroke; namely, in its most projected position with respect to cam box 20, the attaching blocks 23 tend to slide along pins 22 against the action of spring 26 due to the mass of bar 18, guide eyes 16, bolts 17 and the several attaching blocks 23. Such movement of the attaching blocks carries the guide eyes 16 with a relatively rapid motion beyond the point they would reach if the axial movement of block 23 was prohibited, so that instead of a rounded bend in the portion of thread laid down at the end of the traverse stroke, the spiral formation of the thread is continued.

Due to compression of spring 26, when the block 23 strikes shoulder 21' it rebounds therefrom and under the influence of spring 26 is immediately thrust away from nut 24. This rapid return of the attaching blocks causes an equally rapid return of the guide eyes 16, so that an abrupt angular turn is formed in the thread. Upon reaching the other limit of the traverse stroke defined by the most retracted position of the shaft 19 with respect to cam box 20, the same rapid return action of guide eye 16 occurs under the influence of spring 25.

The desirability for the increased space between the block 23 and shoulder 21 as compared with the space between the block and shoulder 21' is apparent from the fact that when shaft 19 is in its most projected position or when block 23 is farthest from cam box 20, advantage is had of the flexibility of the projecting portion of shaft 19 in supplementing the impositive motion of guide eyes 16 provided by spring 26. However, when the shaft 19 is retracted and block 23 is close to cam box 20, the projecting portion of shaft 19, being very slight, offers no flexibility the effect of which might be additive to that offered by spring 25. With the differential spacing thus provided it has been found that substantially the same abrupt formation of thread occurs at both ends of the spool.

In the modification of the invention illustrated in Figures 5, 6 and 7, each of the guide eyes 16 is independently resiliently mounted. In this modification, the bolt 32, which corresponds to bolt 17 in Figures 1, 2 and 3, is pivotally mounted in the longitudinally extending carrier bar 33. This pivotal mounting may be accomplished by providing a loose fit between bolt 32 and the receiving hole in bar 33. Secured to the portion of bolt 32 which projects above the bar 33 is an arm 34. A nut 35 clamps arm 34 against a shoulder 36 of bolt 32 and in this manner the bolt 32 remains free to turn within bar 33. If desired, the arm 34 may fit on a squared portion of bolt 32 so that relative rotation will be prevented.

Clamped rigidly in place, as by means of bolt 37, on opposite sides of bar 33 in proximity to the free end of arm 34 are stop pieces 38 and 39. From the inner faces of stop pieces 38 and 39 project hub portions 40 and 41, respectively. These hubs 40 and 41 serve to mount springs 42 and 43 and also serve to limit the angular movement of arm 34. To receive the inner ends of springs 42 and 43 the opposite sides of arm 34 between stop 40 and 41 are enlarged and recessed to form spring seats as shown in Figure 7.

It is desirable that spring 42 and spring 43

be of the same length and resiliency so that when in normal position the arm 34 will be equally acted upon from both sides. Hub 41 should be slightly longer than hub 40 so as to obtain the same effect of differential spacing as that provided between block 23 and shoulders 21 and 21' of the arrangement of Figures 1 to 4. That is, when the bar 33 is farthest from the cam box 20 and is about to begin its return stroke, the arm 34 will be capable of a relatively small movement toward stop 41. In contrast to this, when the bar 33 is in its position nearest to the cam box 20 and is about to make a return stroke, the arm 34 may have a relatively larger motion toward stop 40 in order to offset the greater rigidity of the parts when in this retracted position.

With the arrangement of Figures 5, 6 and 7, the same abrupt bends at the ends of the traverse strokes are formed as result with the arrangement of Figures 1 to 4. Such abrupt turns do not result in parallelism between the turns at the end of the spool; so that the possibility of an underwind or overwind is minimized. In withdrawing the thread from such a spool little or no difficulty is experienced, the thread being withdrawn without interference. Substantially the same advantages characterize both embodiments of the invention in these important respects.

The illustrated embodiments of the invention serve to indicate its generic character. It will be understood that the invention is readily susceptible of further modifications; indeed, that numerous changes may be made by those skilled in the art without departing from the inventive concept. It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What is claimed is:

1. Thread traverse mechanism comprising a guide eye; actuating means for moving said guide eye in opposite directions in a predetermined normal path; and, disposed between said guide eye and said actuating means, a resilient coupling permitting an impositive movement of said guide eye beyond the limits of its predetermined normal path, said impositive movement resulting from the inertia of said guide eye.

2. Thread traverse mechanism comprising a plurality of guide eyes; a carrier bar to which said guide eyes are rigidly affixed; means for reciprocating said carrier bar; and, disposed between said carrier bar and said reciprocating means, resilient coupling means permitting an impositive movement of said carrier bar additive to the movement of said reciprocating means toward the end of each traverse stroke, said impositive movement resulting from the inertia of said guide eyes and carrier bar.

3. Thread traverse mechanism comprising a plurality of guide eyes; a carrier bar supporting said guide eyes in spaced relation; reciprocating means for moving said carrier bar in opposite directions in strokes of fixed length; and, disposed between each of said guide eyes and said carrier bar, an independent resilient coupling permitting an impositive movement of said guide eye additive to the movement of said reciprocating means toward the end of each traverse stroke, said impositive movement resulting from the inertia of said guide eye, coupling and carrier bar.

4. Thread traverse mechanism comprising a guide eye; a support for said guide eye; means

for reciprocating said support, said reciprocating means imparting to said support a traverse stroke of predetermined characteristics; a pivotal connection between said support and said reciprocating means, said pivotal connection permitting said guide eye to be at least partially rotated about the axis of said support so as to enable it to move in the general direction of said traverse stroke; and, for biasing said guide eye to a neutral position, resilient means cooperating with said pivotal connection in permitting an impositive movement of said guide eye additive to the movement imposed thereon by said reciprocating means toward the end of each traverse stroke, said impositive movement resulting from the inertia of said guide eye.

5. Thread traverse mechanism comprising a guide eye; a support for said guide eye; means for reciprocating said support, said reciprocating means imparting to said support a traverse stroke of predetermined characteristics; a pivotal connection between said support and said reciprocating means, said pivotal connection permitting said guide eye to be at least partially rotated about the axis of said support so as to enable it to move in the general direction of said traverse stroke; and stop means for limiting the extent of the movement of said guide eye about the axis of said support.

6. Thread traverse mechanism comprising a guide eye; means for reciprocating said guide eye; a resilient coupling including a support for said guide eye disposed between said guide eye and said reciprocating means in a manner permitting an impositive movement of said guide eye and support additive to the movement of said reciprocating means toward the end of each stroke, said impositive movement resulting from the inertia of said guide eye and support; and stop means limiting the extent of said impositive movement of the guide eye and support.

7. Apparatus as described in claim 6 in which said stop means permits an impositive movement of said guide eye and support of lesser extent on one side of the neutral position than on the other side thereof.

8. Apparatus as described in claim 6 in which said stop means permits an impositive movement of said guide eye and support of greater extent when said reciprocating means is in the most retracted position of its stroke than when in the most projected position thereof.

9. Thread traverse mechanism comprising a guide eye; means for reciprocating said guide eye; means supporting said guide eye from said reciprocating means; a coupling between said reciprocating means and said supporting means capable of relative sliding motion in the direction of reciprocation; and, cooperating with said coupling for biasing the same to a neutral position intermediate the limits of its sliding motion, coil springs which react to the sliding motion imparted to the coupling by the inertia of said guide eye and support so as to permit an impositive movement of said guide eye and support additive to the movement imparted thereto by said reciprocating means toward the end of each traverse stroke.

10. Apparatus as described in claim 9 having stop means for limiting the extent of the impositive movement of said guide eye and support to unequal spans on opposite sides of its neutral position.

11. Thread traverse mechanism comprising a guide eye; means for reciprocating said guide eye

from one extremity to the other of a predetermined traverse stroke; a support carrying said guide eye from said reciprocating means; a coupling between said reciprocating means and said support permitting relative sliding motion in the direction of reciprocation; coil springs disposed on either side of said coupling biasing the same to a neutral position intermediate the limits of its sliding motion permitting an impositive movement of said guide eye and support at either extremity of the traverse stroke supplementing the movement imparted by said reciprocating means; and stop means disposed on either side of said

coupling limiting the extent of the impositive movement of said guide eye and support and permitting movement of lesser extent on one side of the neutral position than on the other side thereof.

12. Apparatus as described in claim 11 in which said stop means permits an impositive movement of said guide eye and support of greater extent when said reciprocating means is in the most retracted position of its stroke than when in the most projected position thereof.

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