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 [32] Priority **Oct. 28, 1967**
 [33] **Germany**
 [31] **P 15 74 356.3**

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[54] **TRAVERSING MECHANISM FOR SPOOL WINDING**
 5 Claims, 7 Drawing Figs.

[52] U.S. Cl..... **242/43**
 [51] Int. Cl..... **B65h 54/28**
 [50] Field of Search..... **242/43,**
43.1, 158, 158.1, 158.2, 158.3, 158.4, 158.5, 157;
74/55, 56, 57, 470

[56] **References Cited**
UNITED STATES PATENTS
 2,301,699 11/1942 Helland..... **242/43X**

ABSTRACT: Traversing mechanism for rapidly winding a thread onto a rotating spool in which a traversing rod carrying one or more thread guides is reciprocally driven in a linear axial path by cam means constructed to abruptly brake and reaccelerate the rod at the points of reversal of its reciprocation, the rod and cam means being coupled or interconnected by resilient coupling means in the nature of an elastomeric vibration damping connector.

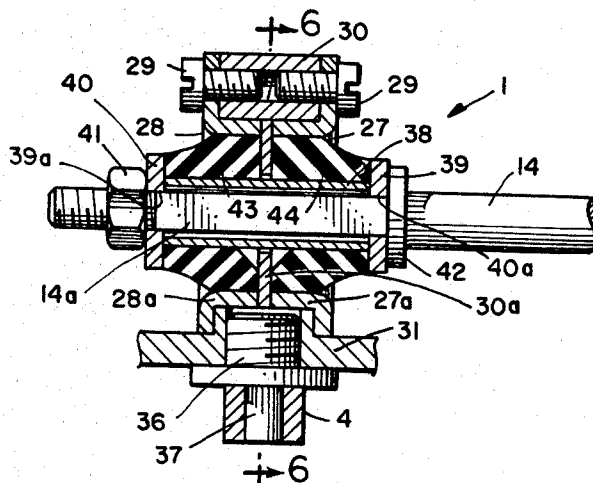


FIG. 1

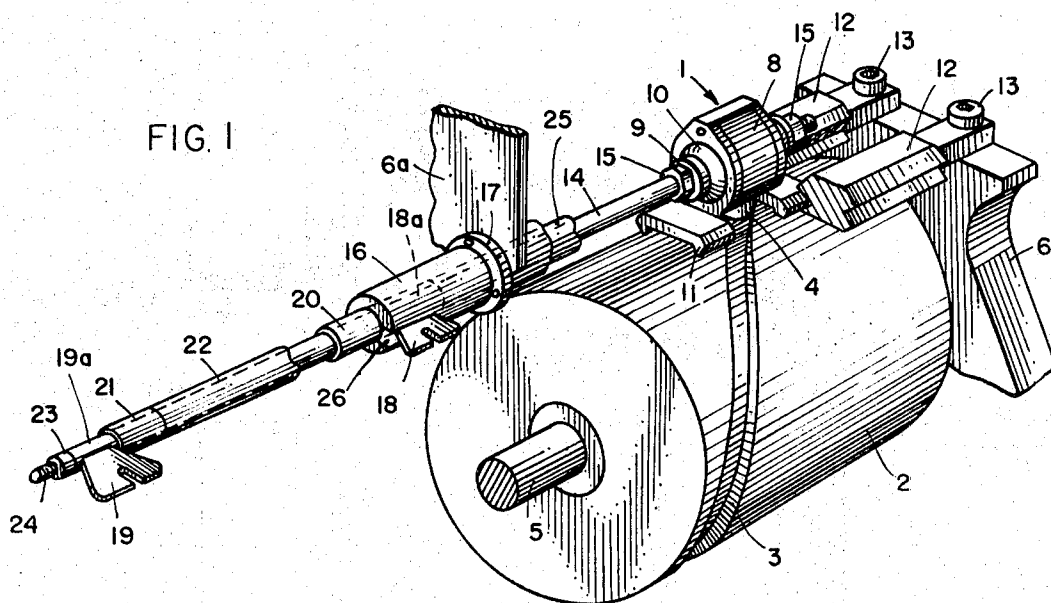


FIG. 2

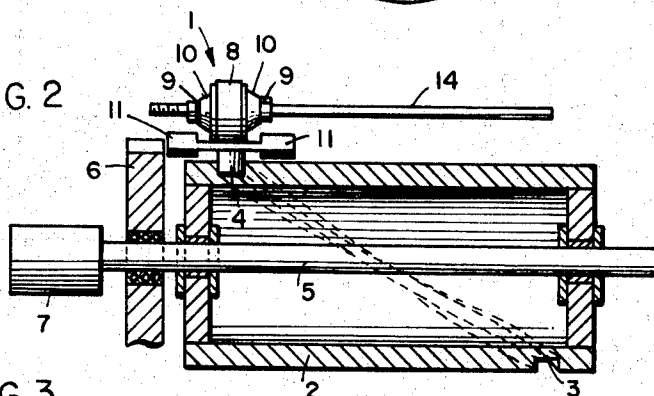
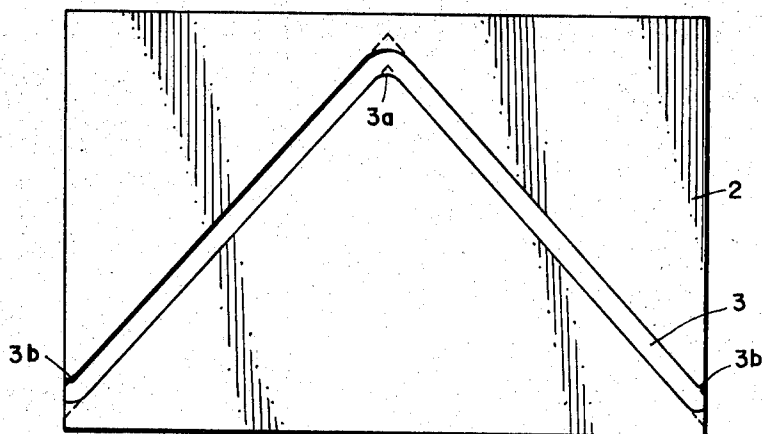


FIG. 3



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FIG. 4

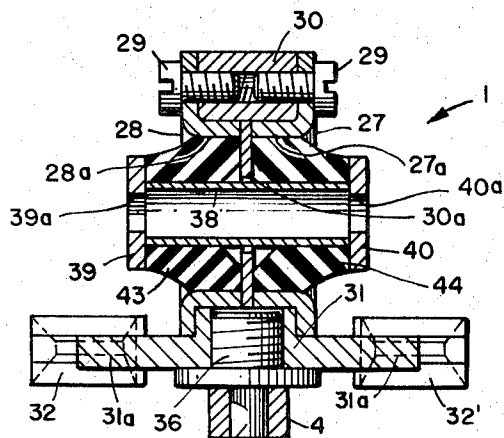


FIG. 5

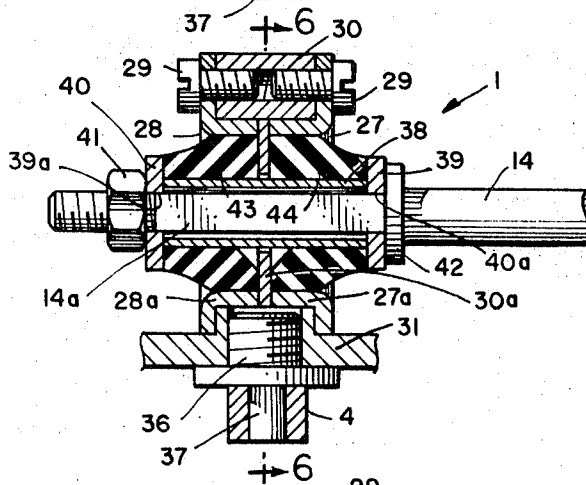
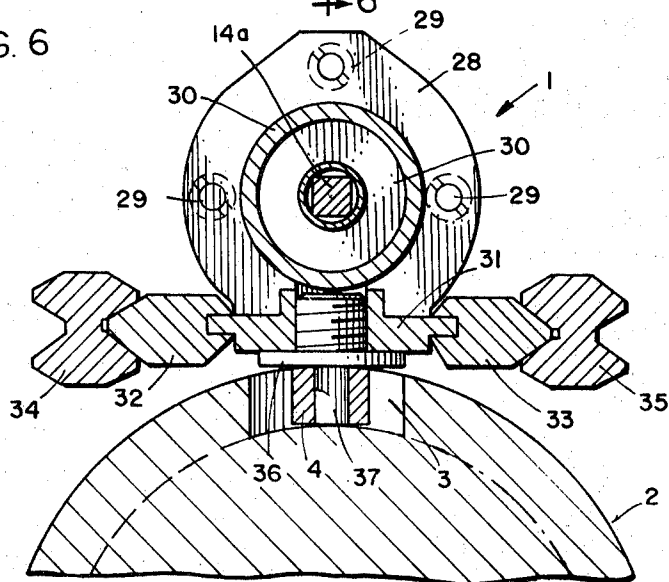


FIG. 6



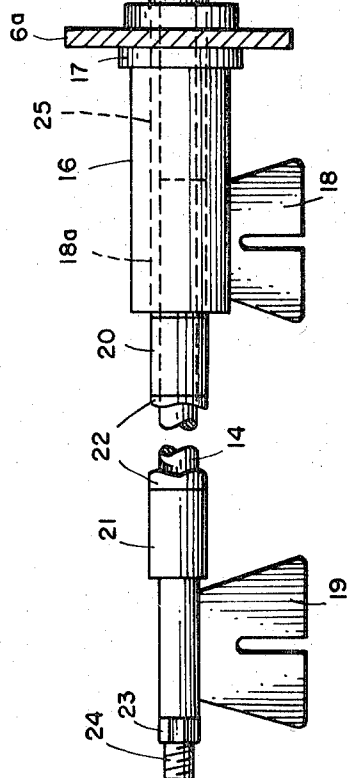
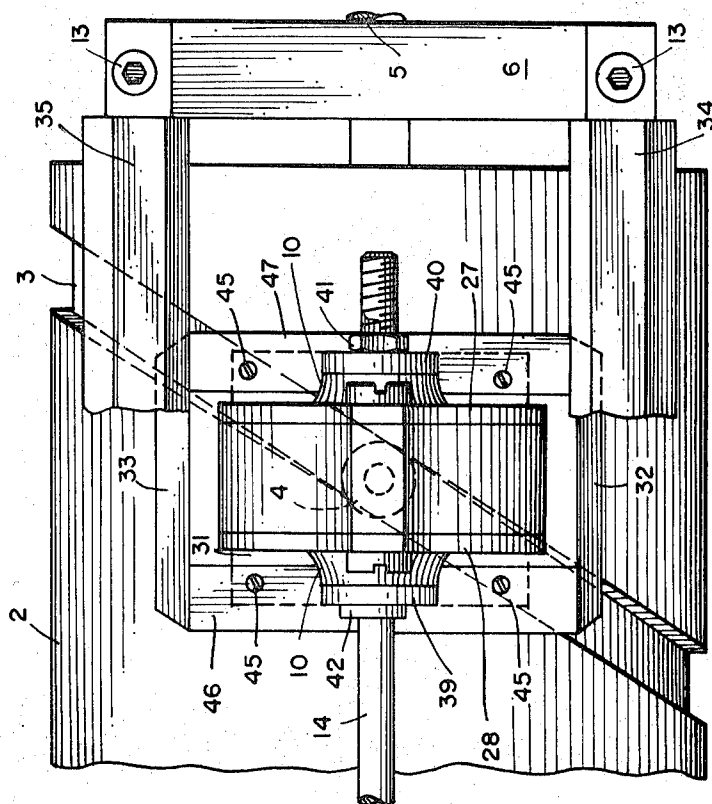
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TRAVERSING MECHANISM FOR SPOOL WINDING

The present invention is concerned with a traversing mechanism for rapidly operating winding devices, especially as used in machines for the spinning of synthetic or artificial filaments, threads or yarns, wherein it is necessary to provide a traversing rod bearing at least on one thread guide with means to rapidly reciprocate the rod in the direction of its longitudinal axis such that the reciprocal movement of the rod is suddenly braked or brought to a stop and then rapidly accelerated or started again in the opposite direction at the so-called reversal points of the reciprocal movement. This movement of the traversing rod is best accomplished by means of a sliding member or cam follower coupled to the traversing rod and engaged in the continuous groove of a rotatably driven grooved drum.

In order to produce a uniform winding over the entire breadth or winding surface of the collecting spool, the traversing movement must also be uniform at a constant winding velocity. It is for this reason that the moving parts of the traversing mechanism, i.e. both the thread guide or guides and the traversing rod, must be abruptly braked and then reaccelerated at the reversal points of the traversing movement. If the traversing rod is driven in coupled engagement over the peripheral surface of a grooved drum, then the curved groove on the shell of the drum must theoretically form a sharp angled peak or apex while proceeding with a relatively constant slope or pitch to the left and to the right of this apex. The braking and accelerating forces which occur under these circumstances at the turning or reversal points are infinitely large. The sliding member or cam follower engaged in the groove as well as the sides or flanks of the groove are stressed in an arrangement such as this above and beyond their limits of strength and elasticity so as to be almost immediately destroyed.

In order to achieve a workable traversing mechanism of this type, it is necessary as a practical matter for the continuous groove on the drum surface to be inclined or smoothed out in the area of the reversal points so that the transition from the left side to the side of the continuous curved segment (or vice versa) no longer extends into a peak or apex but instead forms or lies on a turning radius. In other words, the peak or apex of the groove at the points has at least a small radius of curvature sufficient to avoid damage to the slider or cam follower as well as the groove itself. Thereby, the linear traversing movement is correspondingly slower in this region of reversal, i.e. the braking and reacceleration of the traversing rod occurs at a slower speed as compared to a traversing movement passing through a sharp apex at the reversal points. As a result, more thread or filamentary material is wound at the edge or rim of the spool than in the center. Thus, bulges or beads arise at both ends of the cylindrical spool winding, these bulges being quite disadvantageous in later working operations requiring a thread supply from the wound spool, as is well known in actual practice.

In order to prevent this bulge formation, it has already been suggested that the reversal of the traversing movement be accomplished as suddenly as possible. For example, in British Pat. No. 714,032, a traversing device is disclosed in which the moving elements strike against a spring cushion at the reversal points, thereby placing this under compression, and are then accelerated in the opposite direction of movement supplemented by the spring force. A similar device is also described in German Pat. No. 1,144,631. The springs or cushion of this device must be carefully adjusted for each individual winding process such that the traversing thread guide rod is braked as suddenly as possible. In spite of the energy storage capacity of the spring elements, however, a large part of the kinetic energy inherent in the moving traversing elements is transposed between the slider or cam follower and the sides of the curved groove on the drum, and this kinetic energy manifests itself in a very strong and damaging wear of both of these parts.

This damaging wear likewise occurs in the traversing device disclosed in British Pat. No. 954,664. In this case, an attempt

was made to prevent the bulge formation during the development of the winding by means of a lengthening of the traversing width, i.e. longitudinally of the winding spool axis. This lengthening is achieved by a very expensive movable arrangement of the thread guide on the traversing rod. British Patent No. 611,586 also illustrates this principle. These two patents differ from each other only in construction of individual elements. By means of this proposed enlargement of the traversing width, the end bulges are only flattened out and therefore do not fall within a specified range or receiving area on the winding spool. This same result can feasibly be accomplished with much simpler means provided that the turning radius of the curved groove is substantially enlarged.

One cam groove extending at the reversal points into a peak or apex is suggested in German Pat. No. 1,169,818. In this case, the upper part of the slider or cam follower strikes against a stop on the machine frame. Apart from the fact that the resulting continuous hammering or pounding produces strong vibrations in the machine with a very undesirable influence on the reciprocating winding method and wound product, the stops on the machine frame must be very accurately adjusted. This adjustment of the stops must be repeated at very short intervals due to an unavoidable shifting or displacement of the stops caused by the constant hammering.

All of the disadvantages of previously known devices occur to even a greater extent with higher winding velocities and correspondingly more rapid traversing speeds. It can especially be observed that the kinetic energy inherent in the moving elements and therewith the wear or damage of the slider and the curved sides of the groove increases with the square of the velocity.

One object of the present invention is to provide an improved traversing mechanism capable of providing a smooth cylindrical winding free of end bulges while essentially avoiding or substantially reducing the wear of moving parts, especially the cam elements which consist essentially of the sliding member and the sides or flanks of the cam groove on the rotating drum. Another object of the invention is to provide an improved traversing mechanism which is especially adapted to handle high winding velocities with a correspondingly rapid thread transport and storage onto a winding spool. Still another object of the invention is to provide a cam operated traversing mechanism for the rapid winding of spools which is relatively inexpensive and simple in construction but which requires very little or no adjustment or replacement even after long periods of operation. Other objects and advantages of the device according to the invention will become more apparent upon consideration of the following detailed specification.

It has now been found, in accordance with the invention, that the foregoing and other objects and advantages can be achieved by providing an resilient coupling means interconnecting the traversing rod and the sliding member in the otherwise generally known combination of a traversing rod bearing at least one thread guide and mounted for reciprocation along its longitudinal axis by means of the sliding member or cam follower coupled thereto and engaged in a continuous groove or cam slot on a driven rotating drum. This groove or cam slot is arranged on the periphery of the drum to provide an abrupt braking and reacceleration of the coupled sliding element and traversing rod, but due to the resilient coupling means of the invention, it is possible to achieve this desirable operation at the reversal points with a groove or cam slot having a smooth radius of curvature rather than a sharp apex or peak at the reversal points. The resilient coupling means is preferably an elastomeric material such as rubber or the like in the form of a vibration damping connector mounted in a traversing rod holder as a resilient link or coupling element between the rod and the slider attached to the holder. In particular, the resilient coupling means consists essentially at an least one annular elastomeric block or disc-shaped member firmly adhered or bonded between two radially spaced concentric rigid elements, preferably flanged metal rings or sleeves, one of which and preferably the outer concentric element being

fastened or connected to the sliding member or cam follower and the other of which, preferably the inner concentric element, being advantageously demountably fastened to the traversing rod.

An especially favorable embodiment of the invention is disclosed by way of illustration in the accompanying drawings in which:

FIG. 1 is a perspective view, with certain elements shown only partially, of the essential traversing mechanism bearing two thread guides;

FIG. 2 is a side elevational view reduced in size from FIG. 1 and having the grooved drum shown in cross section with the device facing in the opposite direction;

FIG. 3 is an enlarged peripheral layout of the grooved drum shown in FIG. 2;

FIG. 4 is an enlarged vertical cross-sectional view of the traversing rod holder, the resilient coupling element and the attached cam follower, or slider together with associated guiding or tracking elements, the cross section passing through the axes of both the rod holder and the slider, the traversing rod being omitted;

FIG. 5 is the same vertical cross-sectional view as FIG. 4 but with the traversing rod fastened in place and the tracking elements omitted;

FIG. 6 is another vertical cross-sectional view taken on lines 6-6 of FIG. 5, including the tracking elements; and

FIG. 7 is an enlarged top plan view of the traversing rod holder and assembled elements of the traversing mechanism, longitudinal portions being broken away or omitted.

Referring first to FIGS. 1 and 2 of the drawings, the traversing rod holder or coupling assembly 1 according to the invention is generally mounted above and in close proximity to the grooved drum 2 which has a continuous curved groove or cam slot 3 on its peripheral surface adapted to receive a slider or cam follower 4 in sliding or preferably rolling contact therewith. The drum 2 is mounted on a rotatably driven shaft 5 journaled in the machine frame 6 and operated by any suitable drive means 7.

The traversing rod holder 1 has an outer rigid housing 8 connected to the slider 4 and an inner rod supporting means including a flanged sleeve 9 interconnected by means of one or more disc-shaped resilient elastomeric blocks or coupling elements 10. The housing 8 also includes prismatic supporting elements 11 guided in correspondingly grooved tracking members or guide rails 12 connected rigidly to the machine frame 6 by suitable bolts 13 or the like. These guide rails 12 are arranged substantially parallel to the longitudinal axis on which the traversing rod reciprocates as well as being parallel to the rotating axis of the drum and further provide an extended support for the holder 1 as it travels back and forth. The guide rails or tracks 12 also accurately position or locate the slider 4 in the cam groove 3 so that no pressure is exerted radially inwardly against the bottom surface of the groove.

The traversing rod 14 fastened to the holder 1 by means of nuts 15 is held in position for movement only in the direction of its longitudinal axis by means of a flanged guide tube 16 with its flange 17 firmly attached by means of screws or bolts to a faceplate 6a of the machine frame (illustrated only as a small portion of the whole frame). Two thread guides 18 and 19 are fixed at a spaced interval at the outer free end of the traversing rod 14 by means of spacer sleeves or collars 20, 21 and 22 which may also function as bearing sleeves if desired. The thread guide assembly can be firmly tightened in place longitudinally of the traversing rod 14 by means of a nut 23 at the threaded end 24 of the rod. The thread guides are also mounted on collars 18a and 19a which may have the same outer diameter as the spacers 20, 21 and 22 as with 18a which abuts a stop or bearing sleeve 25 on the traversing rod or may have a smaller diameter fitting over the rod 14 where it has a correspondingly smaller circular cross section. These spacers or collars may be keyed to the main reciprocating shaft of the rod 14 and/or can be fixed in place by suitable set screws. Any number of suitable arrangements can be used in this thread

guide assembly, preferably so that the thread guides are easily removed or positioned along the traversing rod.

The guide tube 16 is slotted along one side 26 so that thread guide 18 can be retracted within this tube or preferably so that this tube can be extended further toward the free end of the traversing rod 14 to provide greater support. The spool or spools being wound (not shown) are located in a conventional manner to receive the travelling thread from the individual thread guides. These winding spools are positively driven at relatively high velocities, preferably so as to be synchronized with the traversing mechanism through conventional controls. This general operation of rapid winding bobbins or spools is well known and does not require further explanation here since the fixed arrangement of the thread guides on the traversing rod causes the thread to be transported in any desired traversing path depending on the length of the traversing movement and the spacing of one or more thread guides.

With reference to FIG. 3, the continuous groove 3 worked into the surface of the drum 2 has a constant slope in both directions, terminating at the reversal points 3a and 3b which have a small radius of curvature. However, because of the resilient coupling element 10 in the traversing rod holder 1, the traversing rod 14 follows substantially the same linear path or end points of reciprocal movement as though the cam groove 3 terminated in a sharp apex or peak as indicated by the dotted lines. This effect is explained in greater detail below.

The particular or preferred construction of the rod holder 1 can be best viewed in FIGS. 4-7, it being understood that the illustrated device can be modified without departing from the spirit or scope of the invention.

As shown in FIGS. 4 and 5, the holder 1 include two rigid and preferably metallic annular flanged rings 27 and 28 which together provide the rigid housing 8 of FIG. 1 and are bolted together by several bolts 29 spaced on either side around its circumference and connected to an annular wedge or filler member 30. A spacer disc 30a is preferably inserted between the two oppositely disposed concentric flanges 27a and 28a of the ring-shaped holding members 27 and 28.

The rigid housing 8 also includes a base plate 31 connected to the ring holders 27 and 28, this base plate extending laterally to provide arms 31a and 31b on which there are mounted prismatic supporting elements 32 and 33, which preferably run completely along the side of the holder 8 as elements 11 shown in FIG. 1 or which may be separately mounted at the corners of the base plate 32 and 32' as indicated in FIG. 4. In either case, these prismatic supports fit into correspondingly grooved tracks or rails 34 and 35 (FIG. 6) mounted to the frame 6 as shown by the same tracks 12 in FIG. 1. These prismatic supporting elements engaged in the guide tracks or rails act to protect the traversing elements against the forces exerted by the driven drum on these parts, since the holder 1 is thus supported independently of the drum. Also, these guide tracks 34 and 35 require the holder 1 to be restricted to a linear path of movement together with the reciprocating traversing rod 14.

In the base plate 6, a threaded cavity is provided to receive the bolt 36 having a projecting pin or stud 37 on which the slider or cam follower 4 is mounted, preferably in the form of a roller which rotates on the pin 37. This roller or slider 4 is thus in sliding and preferably rolling contact with one side of the cam groove 3 with only a slight tolerance between the sides of the groove and the slider, as indicated in FIG. 7.

In order to hold the traversing rod 14 in the holder 1 with a resilient coupling or interconnection with the slider or cam follower 4, a rigid sleeve or tubular member 38 is concentrically within and at a spaced interval from the two connected flanged rings 27 and 28 as shown in FIGS. 4 and 5. This rigid sleeve 38 may be integral with the two end flanges 39 and 40 as suggested by the flanged sleeve 9 in FIG. 1 or else the circular flanges 39 and 40 may simply be carried without being connected to the ends of the sleeve 38 as indicated in FIGS. 4

and 5. The traversing rod 14 is inserted within the sleeve 38, preferably by providing square openings 39a and 40a in the flanges and a corresponding square cross section on that portion 14a of the traversing rod which fits inside the holder 1 (see FIGS. 5 and 6). The remaining portions of the rod 14 are circular in cross section and the rear protruding end of the rod is threaded to receive nut 41 which cooperates with collar 42 to tighten the rod 14 in place against flanges 39 and 40.

The vibration damping connector or resilient coupling means is essentially represented by the two ring-shaped elastomeric discs 43 and 44 which are firmly adhered or bonded, preferably by vulcanization, to the flanged portions 39 and 40 of the sleeve 38 and the flanged supporting rings 27 and 28. These resilient discs 43 and 44 may simply bear along their inner diameter or circumference directly on the sleeve 38, but are likewise preferably adhered thereto to provide somewhat greater rigidity to the otherwise flexible or elastic structure. Alternatively, the discs 41 and 42 can be adhered to sleeve 38 while simply being tightened against flanges 39 and 40. Likewise, the discs 43 and 44 may be optionally adhered to the spacer disc 30 by vulcanization or by any suitable rubber-to-metal cement. A strong bond is especially desirable between these resilient discs and the supporting rings 27 and 28 on the one hand and the sleeve 38 and/or its associated flanges 39 and 40 on the other hand. In this manner, the discs 43 and 44 act as highly resilient and flexible connecting elements which preferentially flex in the longitudinal direction of the axis of the reciprocating traversing rod 14. The slightly irregular concave shape of the two resilient discs also contributes to this preferential flexing along the same direction as the reciprocating movement of the traversing rod.

Although the discs or ring-shaped blocks 43 and 44 are preferably made of synthetic or natural rubber, other equivalent elastomeric materials are also suitable, and the size or shape of these discs can also be varied in order to adapt them to specific conditions of winding.

As shown in FIG. 7, the prismatic supporting elements 32 and 33 can be screwed or bolted to the base plate 31 by means of the screws 45 threaded through cross members or struts 46 and 47 and into the base plate 31. Other means of attaching these prismatic supports are equally suitable, since they essentially support only the weight of the holder or housing 1 carrying the slider or cam roller 4 at its lower end and the traversing rod 14 in its central axis mounted or held resiliently by the resilient coupling discs 10 (FIGS. 1 and 7). These resilient discs are of course shown in greater detail in FIGS. 4 and 5 as elements 43 and 44.

When operating the traversing mechanism according to the invention, the groove of the driven rotating drum acts through its sides or flanks on the slider or cam roller 4 to impart a reciprocal movement to the traversing rod 14 coupled to the slider through the resilient coupling discs 43 and 44. This cammed movement is generally known, but it is especially desirable to arrange the cam groove so that a uniform traversing speed is achieved as indicated by the straight slope of this groove between reversal points as shown in the peripheral layout of FIG. 3. Then, at the reversal points or area of the groove 3a and 3b, there is a rather small radius of curvature sufficient to avoid a sudden or extremely damaging impact of the slider or cam roller 4 against one side or flank of the groove.

The special advantage of the device according to the invention resides in the fact that as the slider or roller 4 enters the curved reversal point of the groove, the rubber disc or discs 10 in the holder 8 undergo deformation arising from the braking force being applied by the side or flank of the groove. This, in turn, causes the traversing rod with its thread guide or guides to be moved further in the original direction of travel, i.e. corresponding to the original slope of the curved groove. In other words, the traversing rod tends to overshoot or carry itself beyond the normal stopping and reversal point due to the elasticity or resilience of the coupling means. As the linearly moving traversing rod is rapidly braked, the greatest portion

of its kinetic energy is transformed into the work of deformation of the rubber or other elastomeric element by which it is resiliently coupled. This deformation is purely elastic so that the energy stored in the coupling means is again converted into kinetic energy after the traversing rod has passed through the reversal point. This release of kinetic energy rapidly accelerates the rod in its return direction of travel by providing an additional sudden thrust to the rod beyond that normally imparted by the drum groove.

Only very slight amounts of energy losses occur in this movement at the reversal points as evidenced by a much lower heating of the interacting parts, a much lower noise level and a considerable reduction of wear on the cam roller or slider and the sides of the groove. This reduction in wear has been observed to amount to 50 —per cent or more as compared to known devices. The inherent overrun or resilient thrust of the traversing rod in the direction of the normal peak or apex of the curve of the groove (as indicated in dotted lines in FIG. 3) causes the thread guide or guides to move in a corresponding pattern which very closely approximates the desired sharp peak or apex of the traversing curve. Furthermore, there is very little or no vibration of the traversing rod beyond the resilient braking movement to the outermost point of travel and the immediate reacceleration back into its normal traversing movement. In this manner, the traversing velocity is maintained at a uniform rate practically up to the very edges of the winding on the spool, and one can avoid the formation of bulges and achieve a very good development of the winding.

It will be recognized, of course, that some preliminary design of the resilient holding and coupling assembly is desirable in order to achieve optimum performance under specific conditions. However, it is a further advantage of the invention that a single resilient coupling means such as the two rubber discs disclosed in the particular embodiment of the invention are capable of handling a relatively wide range of thread winding conditions, the resiliency or flexibility of the discs resulting in a shorter movement or deformation thereof at lower winding and traversing speeds and a correspondingly greater movement at higher winding and speeds.

It is further desirable to lock the traversing rod against rotational movement about its axis in order to properly transmit a certain amount of energy exerted by the running thread on the thread guide which is then transformed into a twisting or turning movement of the traversing rod which must be capable of being taken up by the rod holder. Accordingly, the traversing rod is most conveniently constructed with a rectangular or square cross section over that portion received in the rod holder while providing square openings in the two mounting flanges, substantially as shown in FIGS. 5 and 6. Both ends of the traversing rod are provided with external screw threads. The thread guides, rod holder, spacer elements and the like are then easily slipped over the rod and connected longitudinally on the rod axis by means of suitable nuts tightened at the ends of the traversing rod. This serves to lock the entire assembly in place and to guarantee any change in the position of the individual elements during the winding process. On the other hand, the nuts can be quickly and easily loosened in order to detach the traversing rod and/or to remove and replace individual thread guides on the traversing rod.

Since the turning movement of the groove drum is into a reciprocal movement of the traversing rod and thread guide means, it will be apparent that a proportionately large force acts upon the grooved drum in a direction perpendicular to the movement of the traversing rod, thread guides and rod holder. These components are most easily taken care of by conducting them over from the rod holder onto the fixed or rigid tracks or guide rails which are mounted on the stationary machine frame. Straight prismatic tracks have proven to be especially advantageous for an exact guiding of the rod holder as it is conducted in reciprocal movement.

While the traversing rod has an actual movement at both of the turning or reversal points as indicated by the dotted lines

for the groove in FIG. 3, resulting from the elastic deformation of the resilient coupling means, it will be apparent that the slider or cam roller 4 must conform to the radius of curvature of the actual cam groove at the reversal points. However, by using a roller turnably mounted on a pin or bolt attached to the rod holder, frictional losses and wear on the cam surfaces is minimized. A certain amount of sliding engagement is achieved in any case, so that it is particularly helpful to use a cam roller made of a substance having somewhat less hardness and durability than the grooved drum since this roller is very easily replaced. These and other variations in the cam mechanism itself will be readily apparent to a skilled mechanic and are only indirectly related to the present invention.

The traversing mechanism of the invention is especially characterized by its relatively simple construction and arrangement of basic or essential parts. The expense of construction in making and installing the device is very small in comparison to many prior devices. Moreover, one can rapidly change the dimensions of the device with reference to its use with winding spools requiring different widths of the thread winding, and this changeover can be accomplished without time consuming adjustments or fittings of individual elements.

I claim:

1. In a transversing mechanism for rapidly winding a thread onto a rotating spool wherein a traversing rod bearing at least one thread guide is mounted for reciprocation along its lon-

gitudinal axis by means of sliding member coupled to said rod and slidably engaged in the continuous groove of a driven rotating drum, said groove being arranged on the periphery of said drum to provide an abrupt braking and reacceleration of the coupled sliding element and traversing rod at the reversal points of the reciprocating rod movement, the improvement in combination therewith of resilient coupling means interconnecting said traversing rod and said sliding member, said resilient

2. A traversing mechanism as claimed in claim 1 wherein said traversing rod is demountably fastened to said resilient coupling means and to said at least one thread guide.

3. A traversing mechanism as claimed in claim 1 wherein each of two said resilient elastomeric ring-shaped discs is individually adhered to an axially extended flange of one said annular ring and to one radially extended flange of said sleeve, the innermost circumference of each disc bearing on said sleeve.

4. A traversing mechanism as claimed in claim 3 wherein the innermost circumference of each disc is adhered to said sleeve.

5. A traversing mechanism as claimed in claim 1 wherein said at least one resilient elastomeric ring-shaped disc is composed of rubber and is bonded securely to said flanged portions by vulcanization.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,568,941

Dated March 9, 1971

Inventor(s) Peter Uelpenich

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 6, "to two" should read -- two --.

Column 4, line 69, "38 is" should read -- 38 is arranged --
line 74, "may 1" should read -- may --.

Column 6, line 4, "in he" should read -- in the --; line 15
"50 -" should read -- 50 --; line 41, "and speeds" should read
-- and traversing speeds --; line 65, "large of" should read
-- large component of --.

Column 8, line 9, Claim 1, insert -- coupling means comprising
at least one rigid annular flanged ring arranged concentrically
around the axis of said traversing rod, means to connect said
sliding member to said annular flanged ring, a rigid elongated
sleeve carrying a flange at either end thereof and being spaced
concentrically within said at least one annular flanged ring
means to rigidly fasten said traversing rod longitudinally
within said sleeve, and at least one resilient elastomeric
ring-shaped disc adhered to the flanged portions associated
with each of said annular ring and sleeve members. --.

Signed and sealed this 17th day of August 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents