

[54] **ROTARY ACCUMULATION DEVICE**

[57]

ABSTRACT

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[52] U.S. Cl. **242/154, 226/90, 226/114**

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

[58] Field of Search 226/113, 114, 118, 195,
226/90; 242/154, 47.09, 47.1, 47.11, 47.13

[56] **References Cited**

UNITED STATES PATENTS

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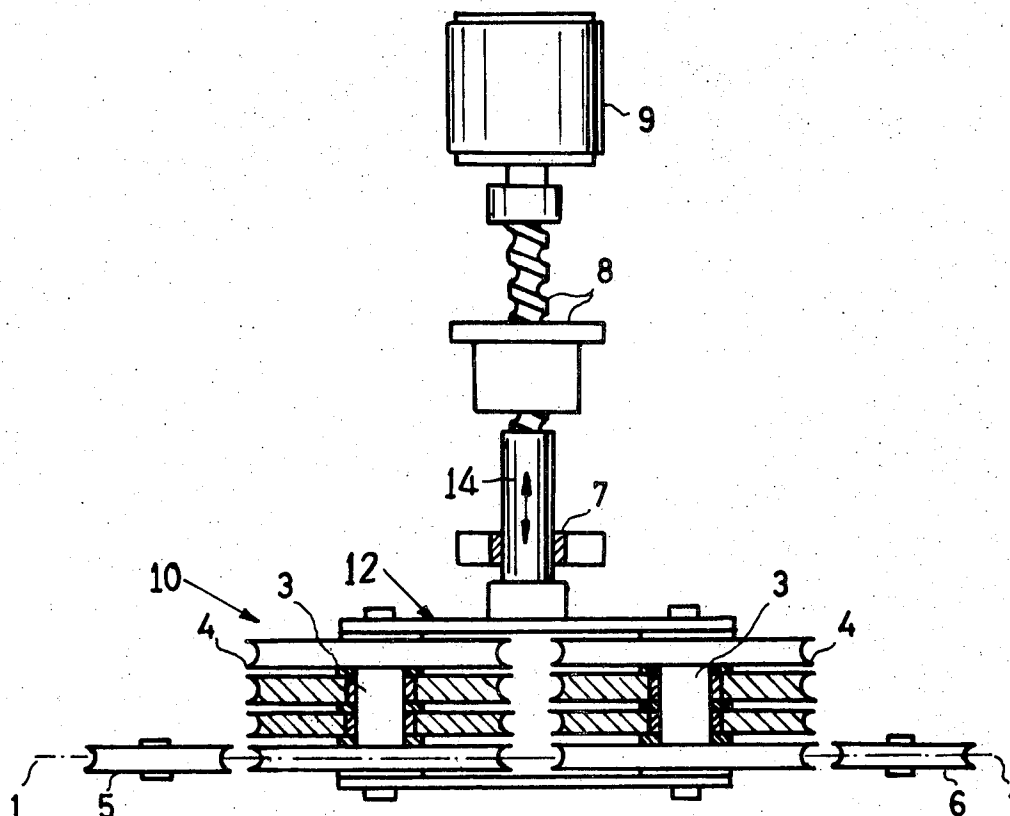
A line of material accumulating device comprising a rotary accumulator with two diametrically spaced axially extending stacks of individual planetary reels adapted for receiving a line of material therebetween, helical feed screw means for selectively feeding the rotary accumulator in opposite axial directions in conjunction with rotation of the accumulator in opposite angular directions for selectively accumulating the line of material onto successive reels and discharging the accumulated material therefrom, and a motor for applying a torque for rotating the rotary accumulator in one angular direction for accumulating the line of material and permitting rotation of the accumulator in the opposite direction for discharging the accumulated material in accordance with the line tension.

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7 Claims, 2 Drawing Figures



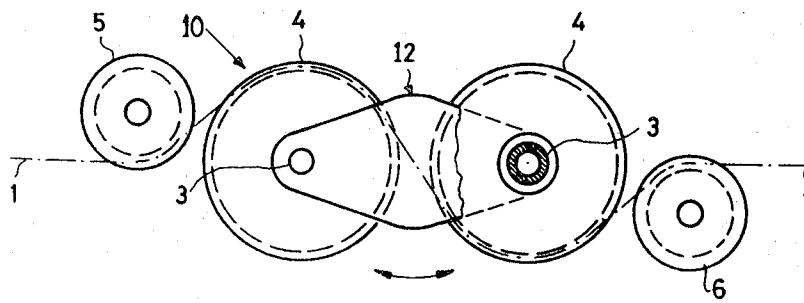


FIG. 1

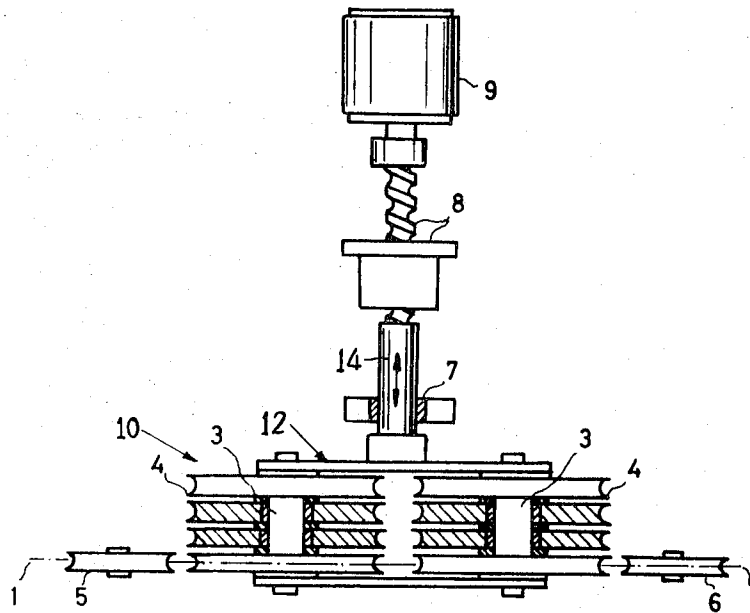


FIG. 2

ROTARY ACCUMULATION DEVICE

BRIEF SUMMARY OF THE INVENTION

The intermittent or continuous processing of lines of materials having a relatively large ratio of length to cross-sectional area has brought about the development of numerous accumulators or loopers to either accommodate velocity differentials between the initiating and the concluding points of the process, or to permit stoppage of either or both extremities of such process lines without interrupting the process itself. Such accumulators or loopers range in complexity from simple pits for depositing and retrieving a line of material in process, to a single track or multiple tracks in planes ranging from horizontal to vertical, having multiple rotary devices traveling the plane or planes for selectively accumulating and discharging a line of material in process. Since the length of material to be accommodated by such accumulators or loopers is a direct function of their length and the number of tracks, their size and complexity grow with the length required, and the threading of such devices is often elaborate and time consuming. Rotary motion by some members of such devices serves primarily or entirely the purpose of conveying the line of material in process and providing angular compensation for length variations.

It is a primary object of the present invention to provide a new and improved accumulating device employing primarily rotary motion and related axial motor for accumulating a relatively long length of a line of material in process and discharging any accumulated material.

In accordance with the present invention, the rotary accumulating device is particularly suitable for, but not limited to, lines used in the process of cable, wire, rope, string, tape or strip.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

A better understanding of the invention will be obtained from the following detailed description and accompanying drawing of an illustrative application of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a somewhat diagrammatic front elevation view, partly broken away and partly in section and showing a line of material in process in phantom, of an embodiment of a rotary accumulating device incorporating the present invention; and

FIG. 2 is a top plan view, partly broken away and partly in section and showing the line of material in process in phantom, of the rotary accumulating device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing in detail wherein like numerals represent like parts, a preferred embodiment of a rotary accumulating device incorporating the present invention is shown comprising a rotary accumulator 10 having a support rotor 12 and two axially extending parallel stacks of coaxial circular reel members 4 mounted thereon. The reel members 4 of the parallel stacks are shown mounted in lateral alignment to provide a plurality of parallel reel systems, and the reel members are individually shaped for guiding and supporting the line of material 1 in process and for permit-

ting the line of material to pass from the reel member 4 of one reel stack to the reel member of the adjacent reel system of the other reel stack. The reel members 4 are mounted for independent rotary motion on parallel shaft members 3 which are preferably but not necessarily diametrically spaced and radially equidistant and parallel to the principal axis of the rotary accumulator 10 whereby the reel members 4 are capable of planetary motion about the main axis of the rotary accumulator 10. Although only two axially extending stacks of the reel members are shown, it is to be recognized that in some applications, three or more axially extending stacks, which are preferably both parallel and equian-
gularly spaced, may be preferred.

The line of material 1 in process passes partly around a rotary entry guide 5 and between leading or outermost reel members 4 and partly around a rotary exit guide 6. The ease by which the line of material 1 in process can be threaded through the apparatus is readily recognizable.

FIG. 2 is a plan view, partly in section, of the rotary accumulating device showing the circular reel members 4, the reel supporting shafts 3, the support rotor 12 having an integral combination drive and support shaft 14 mounted within a suitable journal 7, a rotary-to-linear axial indexing mechanism 8 and a drive motor 9. The drive motor 9 may be a suitable hydraulic motor for applying a substantially constant torque for rotating the rotary accumulator 10 in one angular direction, in the clockwise direction as viewed in FIG. 1. The shown indexing mechanism 8 is of the helical feed screw type and comprises a male helical feed screw or cam forming a part of and rotatable with the rotor shaft and a suitable conforming female helical threaded member or follower which is fixed. It is to be recognized that another type of indexing mechanism (e.g., a separate hydraulic or electrically powered indexing mechanism) may be preferred in some applications, depending in part on the size of the rotary accumulating device.

As viewed in FIG. 1, the line of material in process passes counterclockwise partly around the entry guide 5, clockwise partly around one of the outermost or lead reel members 4, between two outermost or lead reel members 4, counterclockwise partly around the other lead reel member 4, and then clockwise partly around the exit guide 6. When the tension imposed upon the line of material in process diminishes and the torque exerted by the drive motor 9 exceeds the resisting torque imposed by the line tension, the rotary accumulator 10 is rotated by the motor 9, in the clockwise direction as viewed in FIG. 2, and the indexing mechanism 8 provides for simultaneously axially indexing the rotor accumulator 10 outwardly relative to the entry and exit guides 5, 6 and such that the line of material is simultaneously wound from the entrance and exit of the rotary accumulator 10 onto the accumulator while at the same time the line of material is continuously longitudinally fed along its path of travel.

More particularly, as the rotary accumulator 10 is rotated and axially indexed to accumulate a line of material in process, the line of material is simultaneously wound from the two lead reels 4 of the two reel stacks onto the two reels of the adjacent reel system and is wound from each reel 4 onto a laterally and axially spaced reel of the other reel stack. The line accumulation process can continue until all of the reel members 4 have been used. The discharge of the accumulated

line of material in process occurs in the opposite manner when the line tension exerts sufficient torque to overcome the motor torque and rotate and axially shift the rotary accumulator in the opposite rotational and axial directions.

Alternatively, where desired and where the material process permits or suggests it, the entry guide 5 and exit guide 6 may be mounted and shifted in opposite axial directions in conjunction with the rotation of the rotary accumulator in opposite angular directions to provide the desired relative axial displacement of the rotary accumulator and entry and exit guides to properly wrap the line of material onto the reels 4.

Since the width of the reel members 4 may be approximately equal to and not substantially greater than the width of the line of material in process, it can be seen that the reel stacks may employ a large number of coaxial reels for accumulating a very substantial length of material in process in accordance with the present invention.

With the accumulation and discharge of an accumulated line of material in process taking place, for instance, in response to variations of line tension, the suitability of the rotary accumulating device as a means for the compensation of process tension fluctuations is evident.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

I claim:

1. An accumulating device for selectively accumulating and discharging a line of material being longitudinally fed along a path of travel comprising a rotary accumulator, entry and exit guide means for feeding the line of material to and from the rotary accumulator, the rotary accumulator being rotatable about a first axis of rotation and having a plurality of stacks of a plurality of independently rotatable coaxial reels mounted for rotation about axes generally parallel to and radially offset from said first axis such that the rotatable reels are mounted for planetary movement about said first axis, said stacks being spaced for initially threading the line of material between and passing the line of material partly around entry reels thereof, indexing means

for relatively axially indexing in opposite axial directions the reel stacks and the entry and exit guide means in conjunction with the rotation of the rotor assembly whereby the rotor assembly is rotatable in opposite angular directions for respectively accumulating a line of material and discharging it at both the entrance and exit of the rotary accumulator and respectively onto and off of successive reels of the reel stacks, and rotation control means providing for rotating the rotary accumulator in opposite angular directions for selectively accumulating and discharging a line of material.

2. An accumulating device according to claim 1 wherein the plurality of stacks of rotatable coaxial reels have axes of rotation generally equiangularly spaced about and generally equally radially offset from the first axis of rotation of the rotary accumulator.

3. An accumulating device according to claim 1 wherein the indexing means is operable for relatively axially indexing the rotary accumulator and entry and exit guide means in opposite axial directions for relatively axially indexing the reel stacks and the entry and exit guide means in opposite axial directions.

4. An accumulating device according to claim 3 wherein the indexing means is operable for axially indexing the rotary accumulator.

5. An accumulating device according to claim 4 wherein the indexing means comprises helical cam and follower means coaxial with the rotor assembly for axially indexing the rotary accumulator in opposite axial directions in conjunction with the rotation thereof in opposite angular directions.

6. An accumulating device according to claim 5 wherein the helical cam and follower means comprises a helical cam section mounted on the rotary accumulator coaxially therewith, and fixed follower means cooperating with the helical cam.

7. An accumulating device according to claim 1 wherein the rotation control means comprises motor means for applying a torque to rotate the rotary accumulator in one angular direction to accumulate a line of material onto the reel stacks and to permit the rotary accumulator to rotate in the opposite angular direction against the applied torque to discharge the accumulated line of material.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,854,675 Dated December 17, 1974

Inventor(s) Siegfried H. Hunke

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

The Title "Rotary Accumulation Device" should read
--Rotary Accumulating Device--.

In the Inventor's name, "Siefried" should read
--Siegfried--.

Column 4, line 23, "accumulaing" should read
--accumulating--.

Column 4, line 32, "accumulaing" should read
--accumulating--.

Signed and sealed this 18th day of February 1975.

(SEAL)

Attest:

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Attesting Officer

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