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Piola et al.

[11] **3,753,481**

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[54] **DEVICE FOR CONTROLLING THE STANDSTILL PERIOD OF INTERMITTENTLY MOVING ELEMENTS AS A FUNCTION OF THE CONTINUOUS MOVEMENT OF MECHANICAL MEMBERS**

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[52] **U.S. Cl.** ..... **192/142 R,** 74/37, 74/125.5, 242/158 B

[51] **Int. Cl.** **F61d 71/00,** B65h 57/28

[58] **Field of Search** ..... 192/33 R, 142 R; 74/37, 125.5; 242/158 B

[56] **References Cited**

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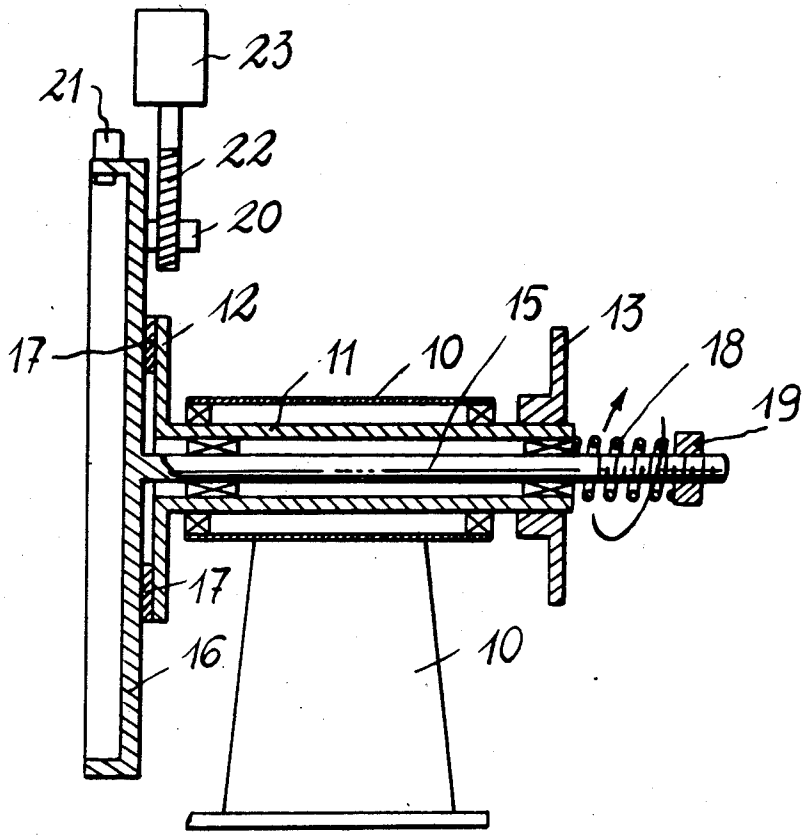
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[57] **ABSTRACT**

A device for controlling the standstill period of intermittently moving elements as a function of the speed of continuously moving mechanical members. These members operate a first disc of a clutch slipping on a second disc, which is normally kept stationary by a latch and carrying in turn a ratchet which, when said latch is released, concurrently with the stop of said elements, and the second disc rotates along with the first disc, acts upon a switch controlling the movement resumption for said moving elements.

4 Claims, 4 Drawing Figures



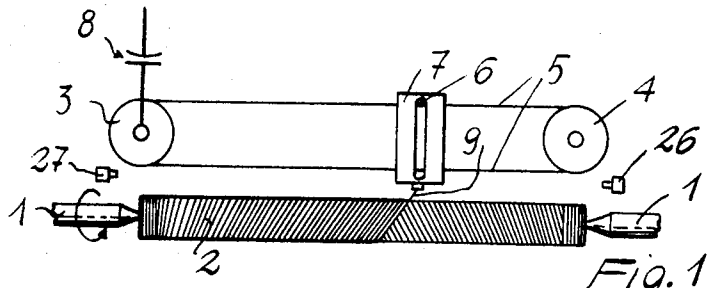


Fig. 1

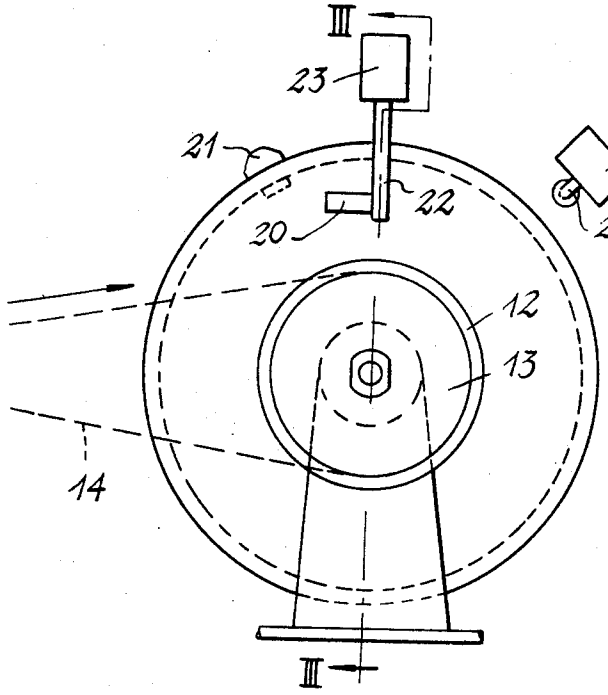


Fig. 2

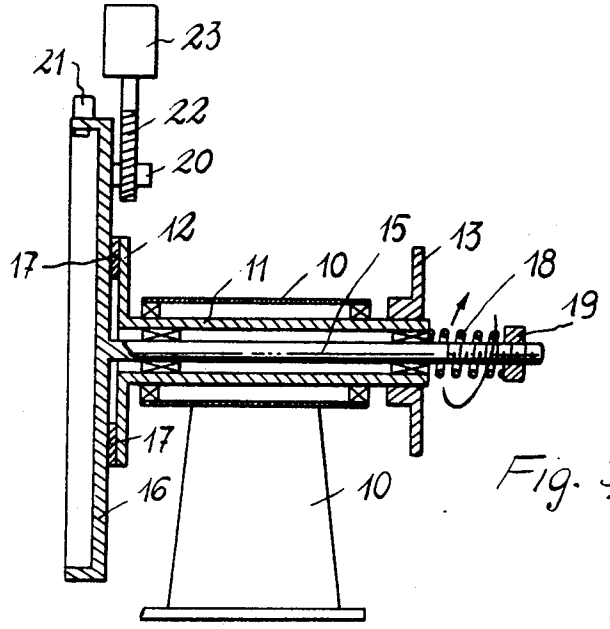

23
21
22
20
12
17
11
10
15
13
18
19
17
16
10

Fig. 3

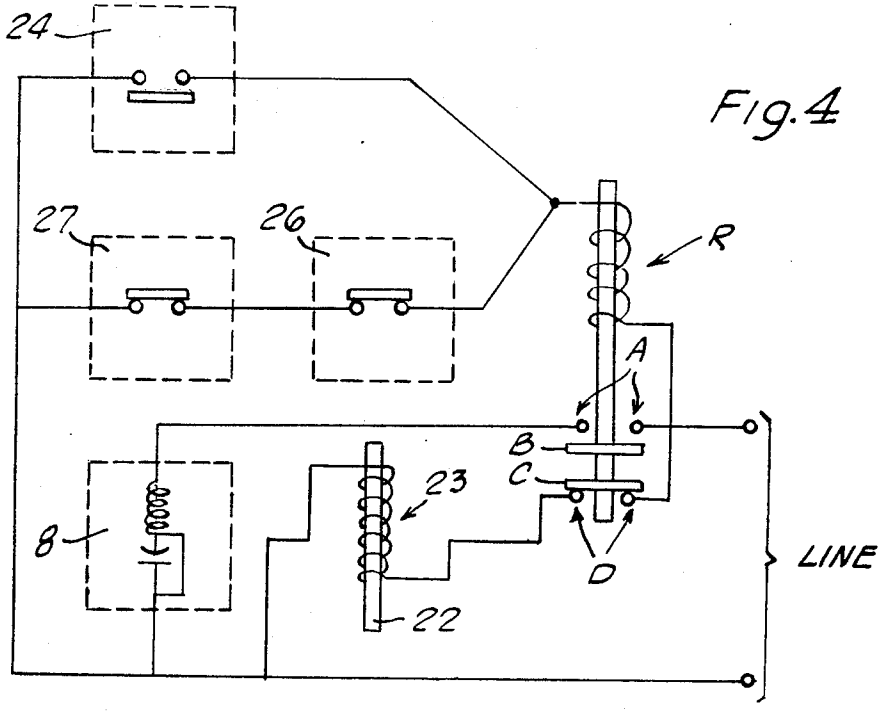

24
27
26
R
A
B
C
23
8
22
D
LINE

Fig. 4

DEVICE FOR CONTROLLING THE STANDSTILL PERIOD OF INTERMITTENTLY MOVING ELEMENTS AS A FUNCTION OF THE CONTINUOUS MOVEMENT OF MECHANICAL MEMBERS

This invention relates to a device for controlling the standstill period of intermittently moving elements as a function of the continuous movement of mechanical members.

Equipments have been developed in which mechanical members are continuously moving and in which elements are provided as intermittently moving, generally reciprocating between one stroke and the next successive one.

It is often required in such equipments that the intermittently moving element remains at each of its ends of stroke at a standstill condition for a time interval which is not constant, but depends on the speed of the continuous movement for the mechanical members, which speed may be variable.

An example of such equipments is where a cylindrical body, whether internally hollow or not, is continuously rotated about its own axis, while its external surface is being covered with a tape, strip or the like, which is distributed as spirals overlying one another and in opposite directions by a carriage rectilinearly moving parallel to the axis of the cylindrical body. For reasons unnecessarily probed herein, the tape distributing carriage should be halted whenever arriving at the ends of the cylindrical body being covered with the tape. The carriage standstill period cannot be only bond to a constant time because, where the rotational speed of the cylindrical body should decrease or increase, there would be time by time an irregular accumulation of tape at the ends of the cylindrical body rotating about its own axis.

Quite similarly, reference can be had to such known equipments as comprising a carriage continuously rotating about a large-sized, vertical axis cylindrical body, this rotating carriage having thereon a rigid vertical structure, on which a tape distributing carriage is upward and downward reciprocated covering the large-sized cylindrical body with the tape. Also in this case, the tape distributing carriage should stop its vertical motion at the top and bottom ends of said large cylindrical body prior to reversal of its motion, while the carriage rotating about the cylindrical body continues its unintermittent motion.

The known devices for halting the intermittently moving element relative to the continuously moving mechanical members are grounded on timers or the like suffering from the above mentioned disadvantages.

Therefore, it is the main object of the present invention to provide a device allowing to control the standstill of an intermittently moving element, by regulating the standstill period as a function of the speed of continuously moving mechanical members.

Another object of the invention is to provide a device of the above character, in which the standstill period of the intermittently moving element can be simply and readily changed.

A still further object of the present invention is to provide a device of a rather simple structure and high reliability.

These and still further objects are accomplished by a device comprising a first rotating body firmly rotably

driven with continuously moving mechanical members, a second body freely rotable about an axis coincident with the axis of rotation for said first body, frictional seals interposed between said first and second bodies and fast with one of said bodies, yielding elements urging one of said two bodies against the other, at least one detent fast with said second body, at least one locking member acting under inoperative or rest conditions on said detent to prevent said second body from rotating, a device for moving said locking member relative to the detent, at least one limit switch acted upon by the intermittently moving element at each end of stroke thereof, generating a pulse operating the control device of said locking member by causing it to temporarily move away from said detent and causing said intermittently moving elements to stop, at least one ratchet carried by said second body, and at least one rod operable by said ratchet and connected to members controlling under the conditions said rod is operated by the ratchet the movement resumption for said intermittently moving elements.

For a better understanding of the device features and operation, a preferred embodiment of the device will now be described by mere way of not limiting example, reference being had to the accompanying drawing, in which:

FIG. 1 is a diagrammatic view for an equipment in which the device according to the invention can be used;

FIG. 2 is a diagrammatic side elevational view of the device;

FIG. 3 is a cross-section taken along line III—III of FIG. 2; and

FIG. 4 is a wiring schematic showing a preferred embodiment of the electrical circuit controlling the working of the device.

Reference is first made to FIG. 1, diagrammactically showing an equipment to which the device according to the present invention can be applied. This equipment includes mechanical members which move continuously comprising two spindles 1 coaxial with each other and provided with a continuous rotary motion, a cylindrical body 2 being clamped between said spindles and therefore also rotating about its own axis. Laterally of the spindles, two pinions 3 and 4, respectively, are located and between which a looped chain 5 is stretched. Intermittently moving elements including a carriage 7 are mounted on stationary guides (not shown in the drawings) on which it is rectilinearly reciprocable. A peg 6 is fast with the chain and inserted and vertically moveable within an elongated groove in the carriage 7. Pinion 3 is part of a mechanical drive including a motor (not shown) driving the pinion through a clutch 8. Of course, should pinion 3 be continuously rotated, peg 6 would cause carriage 7 to forward move in one direction and then in the opposite direction, the motion reverse for the carriage occurring at pinions 3 and 4, respectively, where said peg 6 moves in the elongated groove of the carriage.

This carriage 7 is for distributing on the surface of cylindrical body 2 a continuous tape 9 from a roll or spool, not shown in the drawing, helically winding up around said body 2 in either direction, as shown in FIG. 1.

In order to ensure stability to the tape winding on body 2, it is essential that at the ends of said body 2 a plurality of tape turns should be superimposed not ac-

cording to a helical pattern, but in which said turns are lying in a plane at right angles to the axis of the cylindrical body, still as outlined in FIG. 1. Particularly, said carriage 7 should stop at a stroke or travel end to cause the overlap of the turns or coils perpendicular to the axis of body 2 and restart with a motion in opposite direction to that of the previous travel only after the desired amount of turns or coils has been achieved on the ends of the cylindrical body. It is just to this purpose that the device hereinafter described and claimed was carried out.

Of course, instead of being carried out as disclosed in connection with FIG. 1, the tape winding could be effected about the surface of a stationary cylindrical body, a main carriage continuously rotating thereabout and having thereon a movable tape distributing carriage reciprocating between the two ends of the cylindrical body.

Referring now to FIGS. 2 and 3, there is shown the preferred embodiment of the device comprising a support 10 on which a hollow shaft 11 is freely rotably mounted, integrally having at one end thereof a first rotating body formed of a disc 12, and integrally having at its other end a sprocket wheel 13 on which a chain 14, shown in broken lines in FIG. 2, is wound and rigidly connected to a movable element of the above mentioned continuously moving mechanical members of the equipment. In other terms, referring to FIG. 1, this chain 14 could be driven by spindles 1 and hence said disc 12 would rotate along with these spindles and change its speed as the speed of the spindles changes.

A rotating shaft 15 extends within the hollow shaft 11 and a disc 16 is fast with one end thereof, this disc 16 forming a second body freely rotable about an axis coincident with that of disc 12.

A frictional seal or gasket 17 is fast with said disc 12 and contacts the flat surface of disc 16, which surface is kept pressed on said seal by a controlled force which may be graduated through a spring 18 retained at a compressive condition between the adjoining end of the hollow shaft 11 and a nut 19 which is screwed down on a threaded length of shaft 15. As apparent, by tightening more or less this nut 19 on the threaded length of shaft 15, the compression of spring 18 can be varied and, as a result, the force by which said disc 16 is kept pressed on the seals or gaskets 17.

A detent 20 and a ratchet 21 project from disc 16. During the movement of both the continuously moving equipment members and the intermittently moving elements, the device has and maintains the position or attitude as shown in FIGS. 2 and 3, in which a locking member acts upon detent 20, this locking member comprising a movable stem 22 restrained to a control device 23. Under these conditions, as disc 12 is continuously rotating, disc 16 is stationary and said frictional seal 17 slips thereon.

The device also comprises a control member 24 carrying a rod 25, said ratchet 21 interferring therewith when disc 16 is allowed to freely rotate about its own axis.

For a more clear understanding of the operation of the disclosed device, reference should be had again to FIG. 1. Assume that carriage 7 is moving in a rightward direction and upon arriving at the end of the cylindrical body 2 this carriage impinges against a limit switch comprising a microswitch 26. The operation of this microswitch causes said clutch 8 to be disconnected (and therefore the immediate stop of the movement for chain 5 and carriage 7 therewith) and operates the control device 23 raising stem 22 away from detent 20. Under these conditions, disc 16 can freely rotate and thus is rotably driven by disc 12 under the action of the frictional seal 17.

The rotation of disc 16 continues at the same speed as that of disc 12 and slows down or accelerates depending on possible changes in speed of disc 12, that is of spindles 1, and continues until said ratchet 21 acts upon said rod 25 of the control member 24, causing the immediate re-engagement of clutch 8, that is causing the immediate start of carriage 7 in opposite direction to that of the previous travel. The carriage movement continues in a leftward direction (as seen in FIG. 1) until it acts upon a limit switch comprising a further microswitch 27, also causing the disengagement of clutch 8 and the operation of the raising device 23 for stem 22.

As apparent, the device 23 operating stem 22 may be of any configuration suitable to the intended purpose, and particularly said stem could be raised by an electrical, pneumatic, hydraulic or respectively mechanical control. Also said control member 24 may be of any kind suitable to the intended purpose, for example it may comprise a microswitch, the control stem of a hydraulic valve, etc.

From the foregoing, the period at which the movable element, or carriage 7 in the example shown, is held stationary at one of its ends of stroke will depend on the actual distance, under the conditions inhibiting the rotation of disc 16, between said ratchet 21 and rod 25 of the control member 24 and will also depend as well on the ratio by which the movement is transmitted from the continuously moving member to the sprocket wheel 13, depending for example on the diameter of said sprocket wheel. As a result, the stop period for the intermittently movable element can be readily changed by suitable selecting the position of ratchet 21 relative to rod 25 at the slippage conditions between discs 12 and 16, and by suitably selecting said velocity ratio. However, in any case it should be noted that the time interval for said ratchet to reach its stop position to contact said rod 25 is bond to the movement of the continuously moving member, for example being bond to the rotation of spindles 1.

Referring to the wiring diagram in FIG. 4, during normal working of the device, while it is in the position shown in FIG. 1, contacts 26 and 27 are closed, the electromagnet actuating the clutch 8 is deenergized and the clutch is engaged, the coil 23 is energized and the stem 22 is lowered to engage the detent 20 (FIG. 2), the contacts of the control device 24 are opened and the coil of the relay R is energized through contacts 26, 27, while plate C of the moveable core of the relay R closes the contacts D.

When the carriage 7 (FIG. 1) acts upon contact 26 (or the contact 27) opening it, the coil of the relay R is deenergized causing the moveable core to shift upward to open contacts D and to close contacts A by means of the plate B. In this way, the electrical current flows through the coil of the electromagnet controlling the clutch 8 which is so disconnected to stop the movement of carriage 7. Also, the coil 23 is deenergized and the stem 22 is raised away from detent 20 so that the disc 16 (FIG. 3) can freely rotate until the ratchet 21

(FIG. 2) acts upon the rod **25** (FIG. **25**) to close the contacts of the control member **24.**

As soon as the contacts of the control member **24** are closed, coil of the relay R is again energized, its moveable core is moved downwardly to close contacts D and to open contacts A, the coil of the electromagnet controlling the clutch **8** is deenergized, and the clutch **8** is immediately re-engaged to start the carriage **7** in opposite direction to that of the previous travel.

Obviously, two or more detents, such as that designated by reference numeral **20,** could be fast with said disc **16,** such detents being spaced apart from one another, and it is also apparent that two or more ratchets, such as that designated by reference numeral **21,** could be fast with the same disc **16.** Particularly, these ratchets can be positioned on different planes at right angles to the axis of rotation of said disc, and therefore can act upon different control members for operating different parts of a same machine.

What I claim is:

1. A device for controlling the standstill period of intermittently moving elements as a function of the continuous movement of mechanical members, comprising a first rotating body firmly rotably driven with said continuously moving mechanical members, a second body freely rotable about an axis coincident with the axis of rotation of said first body, frictional seals interposed between said first and second bodies and fast with one of said bodies, yielding elements urging one of said two bodies against the other, at least one detent fast with said second body, at least one locking member acting under inoperative or rest conditions on said detent to prevent said second body from rotating, a device for moving said locking member relative to the detent, at least one limit switch acted upon by the intermittently moving elements at each end of stroke thereof, generating a pulse operating the control device of said locking member by causing it to temporarily move away from said detent and causing said intermittently moving elements to stop, at least one ratchet carried by said second body, and at least one rod operable by said ratchet and connected to members controlling, under the conditions said rod is operated by the ratchet, the movement resumption for said intermittently moving elements.

2. A device as claimed in claim **1,** wherein said yielding elements urging said first and second bodies to each other comprise a spring, one end of which is acted upon by a nut mounted on a threaded shaft.

3. A device as claimed in claim **2,** wherein the continuous movement of said mechanical members is a rotary motion and the intermittent movement of said elements is a reciprocation motion.

4. A device as claimed in claim **3,** wherein said intermittently moving elements are driven by a mechanical drive, in which a clutch is connected as operated by a control member, and the disengagement of which causes said elements to come to a stop.

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