April 23, 1963 G. AZZOLARI 3,086,378

CONTROL AND BRAKING DEVICE FOR PIN-CARRYING DRUMS OF CIRCULAR KNITTING MACHINES AND THE LIKE

Filed April 21, 1960 4 Sheets-Sheet 1

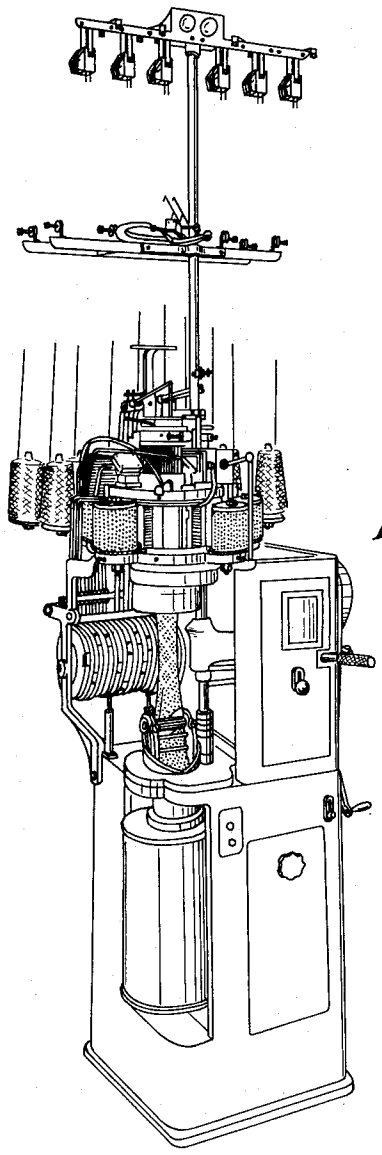

Fig. 1

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Fig. 2

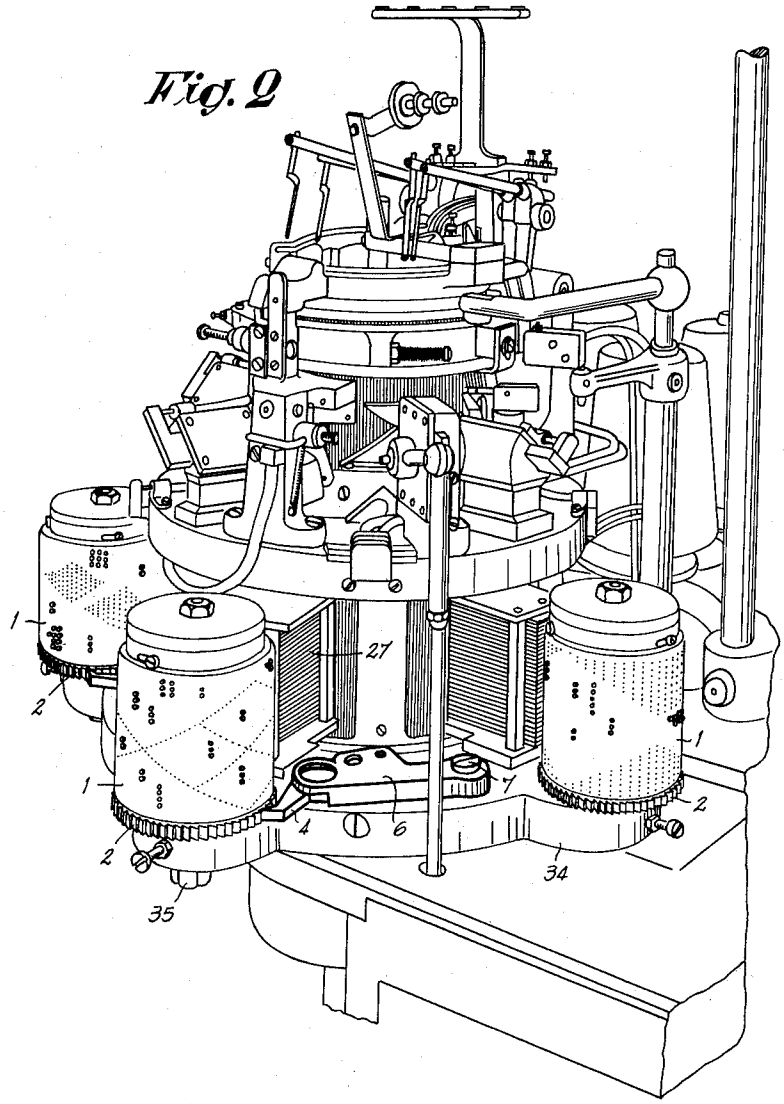

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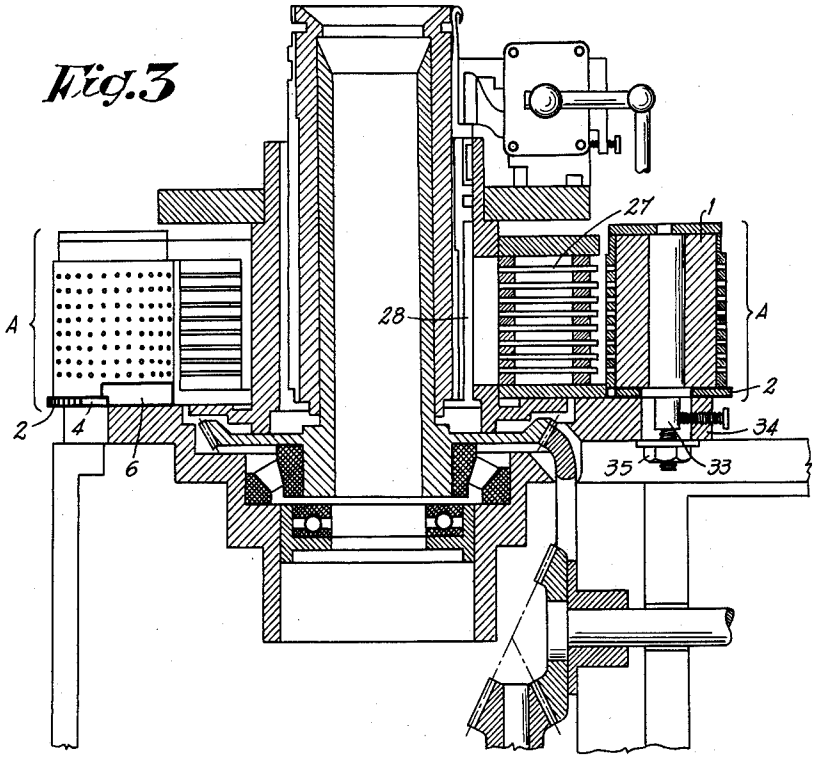
Fig.3



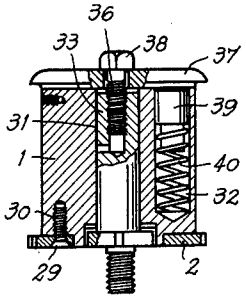


Fig.12

Fig.8

Fig.9

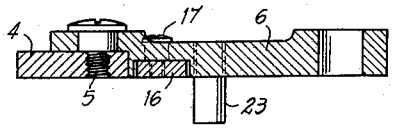


Fig.11

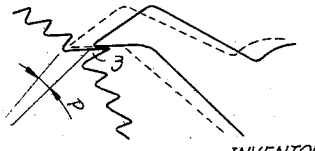


Fig.10

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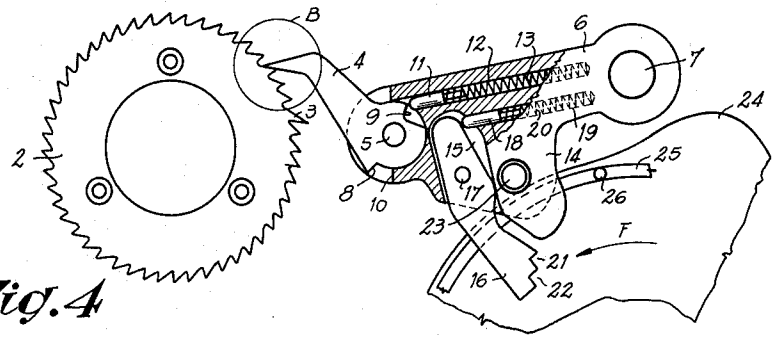

Fig. 4

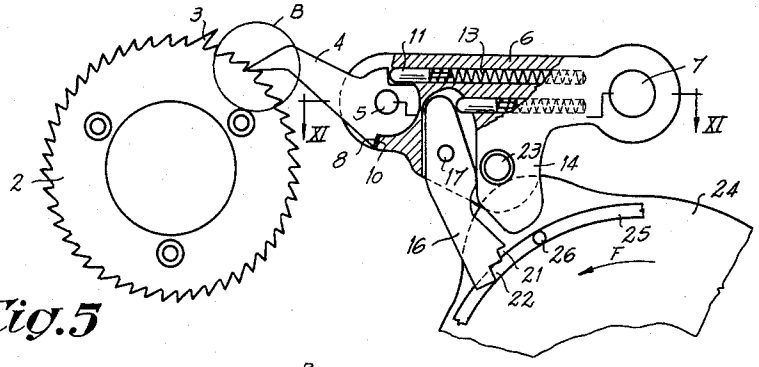

Fig. 5

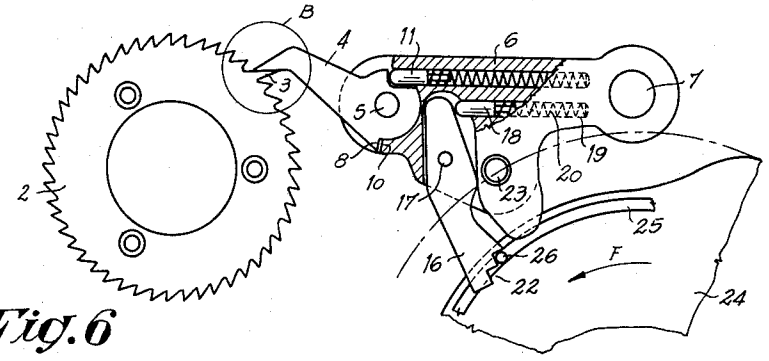

Fig. 6

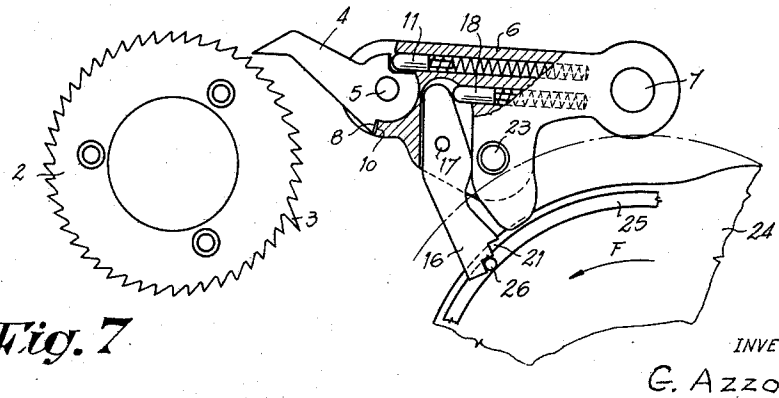

Fig. 7

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United States Patent Office 3,086,378
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3,086,378

CONTROL AND BRAKING DEVICE FOR PIN-CARRYING DRUMS OF CIRCULAR KNITTING MACHINES AND THE LIKE

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Claims priority, application Italy Apr. 24, 1959
9 Claims. (Cl. 66—50)

In circular machines for knitted goods, manufacturing hose and the like, use is normally made of a certain number of pin-carrying drums, adapted to rotate, "step by step" about their longitudinal axis so as to urge, at the proper time and in essentially variable combinations, selector plungers which are disposed horizontally in a rack and which are adapted, in turn, to urge at the proper time the selector jacks guided positively in the longitudinal grooves or tricks of the needle cylinder.

The invention has essentially for its object combined means adapted to ensure the duly controlled "step by step" driving and the permanent braking of said pin-carrying drums in order to absorb systematically all effects of inertia.

The control or driving device forming the subject of the invention enables said pin-carrying drums to be indexed at will, according to the characteristics of the knitting work to be carried out.

In these duly programmed angular positions, the pin-carrying drums are adapted to cause selective operation of the needles, which is essential, for example in work carried out with yarns of different colors. To this end, each pin-carrying drum is fast with a ratchet wheel which must be able to carry out predetermined angular movements followed by temporary stops, for the purpose, for example, of permitting the needles to knit a plurality of yarns of different colors or to carry out special work when use is made of yarns of a single color.

A first object of the invention is to provide a mechanism adapted to control, rigorously and quasi-mathematically, the movements and the stoppages, respectively, of the ratchet wheel and thus also of the pin-carrying drum with which it is fast. It is important to secure the pin-carrying drum against the harmful inertia effects resulting from the periodic setting in motion of the mass which the movable assembly represents.

To this end, a second object of the invention is to provide a rational braking device working in correlation with the control or driving mechanism.

Inasmuch as the invention is based essentially on very special mechanical combinations, its characteristics will become more apparent from the detailed description given hereinafter and with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a circular knitting machine provided with a control and braking device of the present invention.

FIGURE 2 is an enlarged perspective view of a portion of the knitting machine shown in FIG.1.

FIGURE 3 shows diagrammatically and partly in section the head of said circular knitting machine;

FIGURES 4, 5, 6 and 7 show the control or advance mechanism of the pin-carrying drum in four characteristic positions;

FIGURES 8 and 9 show two characteristic positions of the part inscribed in the circle B shown in FIGURES 4 and 5;

FIGURE 10 represents a characteristic position of the part inscribed in the circle B shown in FIGURE 6;

FIGURE 11 is asection on the line XI—XI of FIGURE 5;

FIGURE 12 shows, in radial section, the essential elements of the braking device of the pin-carrying drum.

The circular knitting machine as a whole is described and illustrated merely diagrammatically, since the construction of its needle cylinder with its needles and selector jacks and their cooperation with the selector plungers and the pin-carrying drum, are known in the art and are described, for example, in U.S. Patents Nos. 2,217,022 and 2,756,575.

The control and braking device according to the invention occupies, in the head of the circular knitting machine, the positions indicated at A in FIGURE 3. The location of this device is clearly indicated in FIGS. 1 and 2.

This device, associated with each pin-carrying drum **1**, is formed substantially by the following mechanical combination: a ratchet wheel **2**, one tooth **3** of which has a length greater than that of the other teeth, is fixed to the bottom face of the drum **1**; opposite the ratchet wheel there is disposed horizontally on the machine the driving mechanism proper; the latter is formed by a pawl **4** the axis of oscillation **5** of which is supported at the end of a lever **6** able to oscillate about a fixed axis **7** disposed towards its other end. The pawl **4** has two shoulders **8, 9** serving to limit its angular movements, the first by coming into contact with the fixed stop **10** formed by the corresponding part of the oscillating lever **6** and the other by coming into contact with a movable stop formed by a finger **11** fitted with slight friction in a blind passage **12** provided in the thickness and longitudinally of the oscillating lever, and in which there is also housed a return spring **13** acting, on the one hand, on the bottom of the blind passage and, on the other hand, on the rear face of said finger **11**. Towards the bottom, the oscillating lever **6** has a wide protuberance **14** in which there is formed a recess **15**. In the latter there is engaged one of the ends of a rocking lever **16** which is able to oscillate about the pin **17**. The upper end of the rocking lever **16** is permanently urged by a finger **18** likewise fitted with slight friction in a longitudinal blind passage **19** hollowed out of the thickness of the oscillating lever **6** and in which there is also housed a return spring **20** bearing, on the one hand, against the bottom of the blind passage and, on the other hand, against the rear face of the finger **18**. The lower arm of the rocking lever **16** has two shoulders or steps **21, 22**. On the lower face of the protuberance **14** there is fixed a stud **23**, which is normally in contact with a cam **24** of suitable profile. Concentrically with the latter there is disposed a movable annular element **25** carrying a pin **26** in the path of which the rocking lever **16** is located.

By means of this mechanism, it is possible to cause the ratchet wheel **2** to be able to move angularly "step by step"; either in order to drive the pin-carrying drum **1** continuously "step by step" according to a given program, or in order to bring it automatically to a stop at a duly predetermined instant, or again in order to bring it to a stop almost instantaneously at any moment desired.

The cam **24** is, therefore, continuously turning in the direction of the arrow F under the action of a suitable mechanism (not shown), while the annular member **25** is moved in the direction of the arrow F in a sequence or program related to the operation of the knitting machine. Normally, as shown in FIGURE 4, the tip of the pawl **4** is engaged between two teeth of the ratchet wheel **2**. When the hump or lobe of the cam **24** comes into contact with the stud **23** (FIGURES 5, 8 and 9), the latter is pushed away upwardly, forcing the lever **6** to rotate about its axis **7**. During this movement of the lever **6**, the pawl **4** rotates about its axis **5** while remaining engaged by its tip in a gap in the teeth of the ratchet wheel. The pawl **4** shifts the ratchet wheel **2** by one step and, consequently,

also the pin-carrying drum 1 with which the ratchet wheel is fast.

The arrangement is such that, in this position, the amplitude of the return movement of the tip of the pawl 4 is equal to one and a half steps or spaces of the toothing of the ratchet wheel 2. The result is that, without any other intervention, the ratchet wheel can be shifted indefinitely step by step, that is to say, tooth by tooth.

It will be observed that the tooth 3 of greater length has no influence in interfering with this movement, since, by construction, an amplitude of one and a half steps for the movement of the tip of the pawl 4 is sufficient to surmount this special tooth 3. However, if it is desired to prepare the machine so as to cause the stopping of the pin-carrying drum 1 automatically at a predetermined instant by the intervention of the special tooth 3, it is sufficient to provide for the annular element 25 to be set in motion at that instant in such a manner that the pin 26 is engaged in the first shoulder 21 of the corresponding end of the rocking lever 16 (FIGURES 6 and 10). For this reason, the pin 26 pushes the rocking lever 16 back upwardly and the latter, in turn, shifts the oscillating lever 6 in the same direction. The result of this is that the stud 23 first with the lever is normally disposed at a distance from the cam 24. As a result, when the lobe of the latter encounters stud 23, the latter will be shifted by an amount less than in the previous case. The pawl 4 will thus consequently also be shifted through a reduced amplitude. The arrangement is such that this reduced amplitude is equal to one step. Therefore, as long as the tip of the pawl 4 is engaged in the normal teeth of the ratchet wheel 2, the latter will be shifted "step by step" in the prescribed manner. Nevertheless, when the special tooth 3 comes into contact with the tip of the pawl 4, the latter, as long as the pin 26 remains engaged in the shoulder 21 of the rocking lever 16, will be unable to surmount the special tooth and the oscillating system will continue to move without influencing the rotation of the ratchet wheel 2 and of the pin-carrying drum with which the latter is fast. In this way, the predetermined stopping of the drum is caused by reason of the special tooth 3. Finally, in order to stop the pin-carrying drum at any moment and independently of the special tooth 3, it is sufficient to impart to the annular element 25 a supplementary rotary movement, so that the pin 26 is engaged in the second shoulder 22 of the rocking lever 16 (FIGURE 7). A supplementary thrust is thus obtained on rocking lever 16, this thrust being transmitted to the oscillating lever 6, which locates itself in a position such that the tip of the pawl 4 is completely disengaged from the ratchet wheel 2. The latter, like the pin-carrying drum with which it is fast, is therefore also brought to a stop.

By judiciously combining the movements of the cam 24 and the annular element 25, it is possible to obtain a true programming having a direct influence on the selector jacks through the intermediary of the pin-carrying drum and the sliding plates 27 forming the mechanical connection between the pins and the selector jacks shown diagrammatically at 28.

In order to secure the pin-carrying drum against the effects of inertia, use is made of a braking device, the essential elements of which are shown diagrammatically in FIGURE 12.

In this form of construction, the ratchet wheel 2 is fixed to the bottom face of the drum 1 by means of a screw passing through the hole 29 in the ratchet wheel and engaging in the threaded blind hole 30 in drum 1. The latter has a cylindrical axial bore 31 and comprises around the latter a series of blind holes 32 opening out on the top face of the drum. The latter is fitted with slight friction by means of its axial bore 31 on a spindle 33 rendered fast with the corresponding part of the plate 34 of the head of the machine, for example by means of a clamping nut 35. The spindle 33 is provided axially with a threaded blind hole 36. On top of the drum 1 there is placed a cover 37 through which extends the cylindrical upper portion of a screw 38 engaged in threaded blind hole 36 in the spindle 33. The bottom face of the cover is provided with a number of studs 39 equal to the number of blind holes 32 in the drum 1 each stud engaging in a blind hole and compressing a coil spring 40.

The result of this arrangement is that the pin-carrying drum 1 and its ratchet wheel are permanently pressed resiliently against the corresponding part of the table 34 of the head of the machine. In this way there exists a resistant force which will absorb any inertia effect, thus ensuring that the pins will have an absolutely correct position opposite the sliding plates 27 which they must operate.

It is obvious that, both as regards the control or driving mechanism of the pin-carrying drum and as regards the braking device of the latter, the invention covers all mechanical combinations which are equivalent or calculated to give equivalent technical results, whatever the modifications of form, dimensions and relative position of the various elements of the combination.

What I claim is:

1. In a circular knitting machine, in combination with a fixed support and a pin-carrying drum mounted on said support, a control and braking device for said pin-carrying drum comprising in combination, at least one ratchet wheel fixed coaxially in the pin-carrying drum and having a plurality of ratchet teeth one of said teeth being of greater length than any other tooth on said ratchet wheel, an oscillating lever mounted on said support adjacent said pin-carrying drum, a pawl supported on said oscillating lever and having a tip portion adapted to selectively engage said ratchet wheel, a cam adapted to shift said oscillating lever periodically, means for modifying the stopping position of said oscillating lever in order to reduce the amplitude of its movements caused by said cam, and elastic means urging said pin-carrying drum and its coaxial ratchet wheel against said fixed support.

2. A device according to claim 1 wherein said oscillating lever has a profiled part at one end and a fixed stop at one side of said profiled part, a longitudinal blind passage formed in the thickness of said lever, a finger slidably mounted in said blind passage and constituting a movable stop, said pawl further having two shoulders, one of said shoulders cooperating with the fixed stop on said lever and the other one of said shoulders cooperating with said movable stop, and a return spring located in said blind passage for permanently urging said finger towards said other shoulder of said pawl.

3. A device according to claim 1 wherein said lever has a wide transverse protuberance, and a stud carried on said protuberance, said cam contacting said stud for oscillating said lever.

4. A device according to claim 3 further comprising a recess in the protuberant portion of said oscillating lever, a rocking lever carried by said oscillating lever and having an end portion extending into said recess, said rocking lever having another end portion extending beyond the protuberant portion of said oscillating lever, said rocking lever further having a pair of stepped shoulders on the last-mentioned end portion, an annular element concentric with said cam, a pin carried by said annular element, said annular element being movable to an operative position wherein said pin engages the shoulders on said rocking lever when said cam engages said stud, another longitudinal blind passage formed in the thickness of said oscillating lever adjacent the first-mentioned blind passage, another finger slidably mounted in said other blind passage and extending into said recess, and elastic means urging said other finger towards the first-mentioned end portion of said rocking lever.

5. A device according to claim 4 wherein said ratchet wheel, said pawl, said oscillating lever and said pin, and

said cam are such that movement of said cam moves said oscillating lever to cause the tip of said pawl to shift through an amplitude equal to one and one-half teeth of lesser length of said ratchet wheel.

6. A device according to claim 4 wherein said ratchet wheel, said pawl, said oscillating lever, said rocking lever, the shoulders on said rocking lever, the annular element, and the pin carried thereby are such that when said pin engages one of the shoulders on said rocking lever and said cam is moved, said oscillating lever is moved to cause the tip of said pawl to shift through an amplitude equal to one tooth of lesser length of said ratchet wheel, and when said pin engages the other of said shoulders on said rocking lever, said oscillating lever is moved to cause the tip of said pawl to shift through an amplitude such that is disengaged from said ratchet wheel.

7. A device according to claim 4 wherein the length of the tooth of greater length on said ratchet wheel is such the tip of said pawl will engage thereon when moved through an amplitude equal to one and one-half teeth of lesser length on said ratchet wheel, and will not engage said tooth of longer length when the movement of

the tip of said pawl is equal to an amplitude of one tooth of lesser length on said ratchet wheel.

8. A device in accordance with claim 1 wherein the braking portion of said device comprises a spindle carried by said fixed support, said pin-carrying drum being supported on said spindle, a cover carried by said spindle and enclosing the top of said drum, and elastic means carried by said cover and engaging said pin-carrying drum for urging said drum in contact with said fixed support.

9. A device in accordance with claim 8 wherein said drum has circumferentially spaced blind bore holes extending longitudinally therein, and said elastic means comprises coil springs extending in said bore holes.

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