United States Patent

Hoever et al.

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[54] CALENDER ROLL ADJUSTMENT APPARATUS

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **100/168**, 72/240, 72/248, 100/46, 100/47

[51] **Int. Cl.** **B30b 3/04**

[58] **Field of Search** ..... 100/46, 47, 168, 258 A; 192/140, 141; 72/240, 248; 74/3; 241/37

[56] **References Cited**

UNITED STATES PATENTS

2,859,591	11/1958	Zimmerman	100/46 X
2,328,258	8/1943	Cannon	100/46
2,603,145	7/1952	Dreis	100/46
2,100,653	11/1937	Umansky	100/47 UX

FOREIGN PATENTS OR APPLICATIONS

548,715	4/1932	Germany

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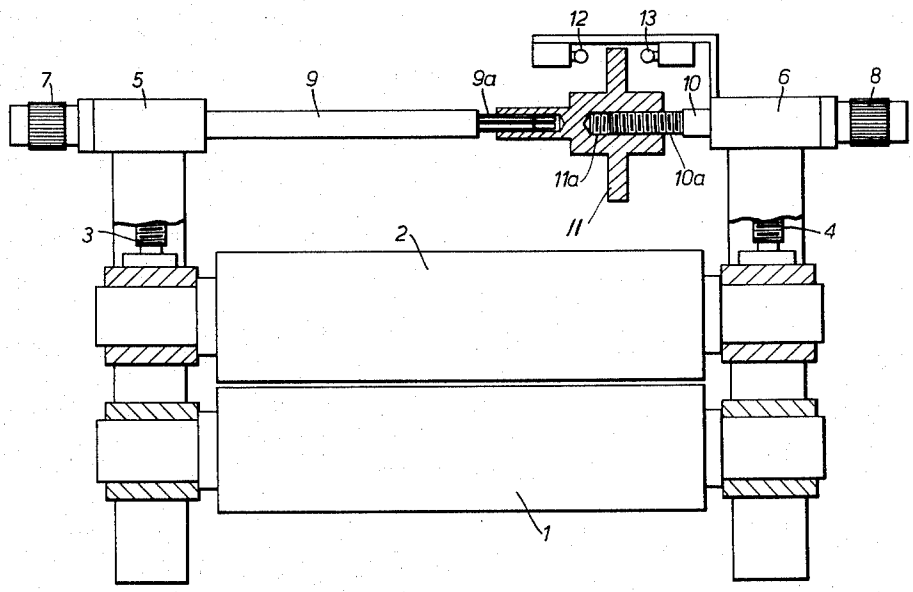
[57] **ABSTRACT**

Apparatus for adjusting the spacing between parallel calender rolls comprises a respective motor for moving each end portion of one of the rolls. Differences in the speeds of the motors causes movement of a member to switch off the motors.

4 Claims, 2 Drawing Figures



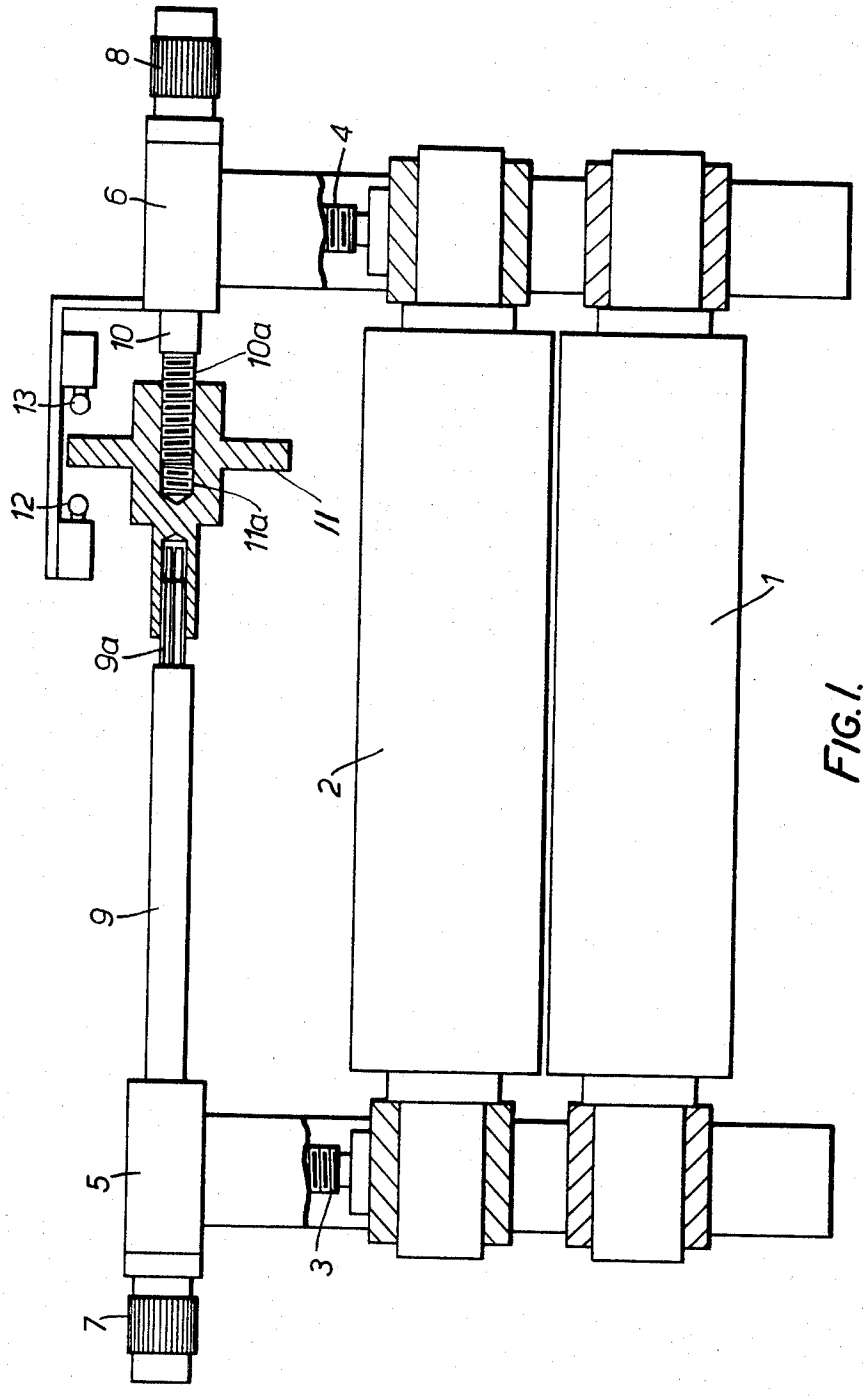


FIG. 1.

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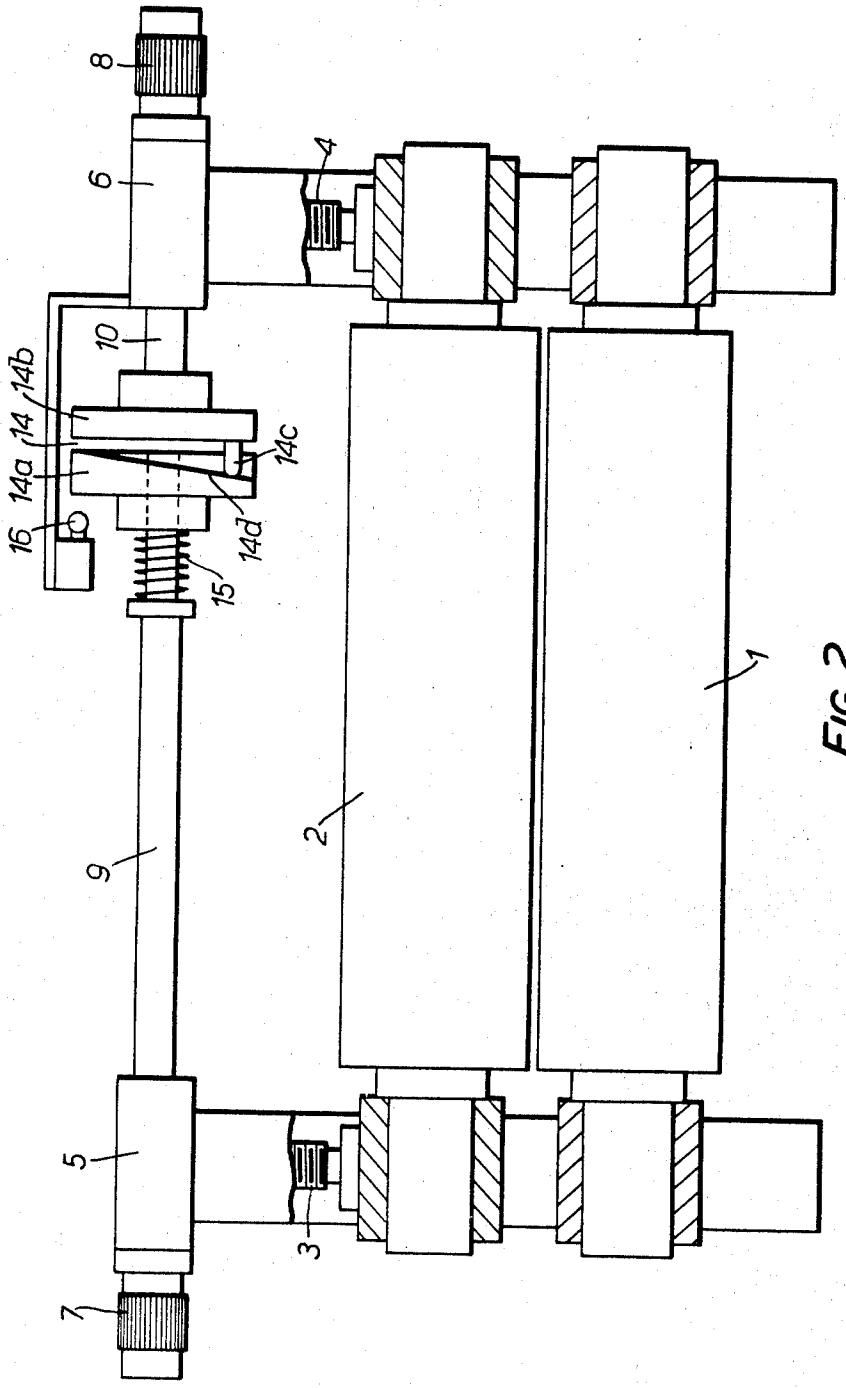

FIG. 2.

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CALENDER ROLL ADJUSTMENT APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to apparatus for adjusting the spacing between two generally parallel elements. More particularly but not exclusively, the invention relates to apparatus for adjusting the spacing between two rolls of a calender.

2. **Summary of the Prior Art**

For the production of rolled sheet materials, e.g. textiles, paper, plastics, rubber, it is necessary to adjust the nip between the rolls of the calender according to the desired thickness of the sheet. The rolls must be parallel, otherwise the sheet will not be of uniform thickness. Moreover, when the rolls are not set parallel, they are subjected to pressures that can damage their bearings and finally cause fracture of the end portions of the roll. The renewal of rolls and bearings entails considerable cost, both in capital outlay and in lost production.

In one method of adjusting the spacing between the rolls, proposed hitherto, two motors are provided which move the rolls together or apart and which are actuated by a common switch. It has been found, however, that differences in the efficiency of the transmission systems of the respective motors, and variations in lubrication, affect the speed of the motors and prevent them from running precisely in synchronism. This becomes noticeable in the form of speed differences, especially when the motors are frequently used, the result being that the rolls are not parallel. Even with the aid of revolution counters coupled to each of the motors, differences in speed can only be revealed, not prevented, unless relatively complex electronic means is utilized to keep the motors in step.

SUMMARY OF THE INVENTION

According to the invention there is provided apparatus for adjusting the spacing between two nominally parallel elements, one of said elements having first and second opposed end portions, said apparatus comprising, a first motor operable to move the first said end portion of the said one of said elements relative to the other of said elements, a second motor operable to move the second said end portion of the said one of said elements relative to the said other of said elements, a respective shaft operatively connected to each of said motors, switch means for controlling said motors, and switch-actuating means associated with each of said shafts and operable to actuate said switch means to switch off said motors when the speed of said shafts differs.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

FIG. **1** is a front elevation, partially in section, of one embodiment of the invention, and

FIG. **2** is a front elevation of a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

There is shown in the Figures, the rolls **1** and **2** of a two-roll calender, the upper roll **2** being movable vertically relative to the lower roll **1**.

The upper roll **2** can be raised and lowered by means of threaded spindles **3** and **4**, which are respectively driven by motors **7** and **8** through worm gears **5** and **6**. The spindles **3** and **4** act directly on the respective bearings at each end portion of the roll **2**. The roll **2** is moved relative to the roll **1** by raising and lowering the said bearings. Accordingly, adjustment is provided of the roll nip and hence also of the thickness of the foil or sheet formed therein.

To move the roll **2** so that it remains parallel to the roll **1**, the two adjusting motors **7** and **8** must run in synchronism. For this purpose, there is provided a shaft **9**, **10** driven by the motors **7**, **8** respectively. When the speed of the shafts **9** and **10** differ to a predetermined extent, the motors **7** and **8** are switched off to enable corrections to be made, for example by reversing the direction of rotation of one of the motors by parallel or individual switching. In the embodiment shown in FIG. **1**, there is provided a switch actuating member in the form of a flanged bush **11**, which is mounted on a splined end portion **9***a* of the shaft **9**, with freedom to slide axially. The bush **11** also has a threaded bore **11***a* which is engaged with a threaded end portion **10***a*, of the shaft **10**.

Control of the motors **7**, **8** is effected through switches **12** and **13** actuated by movement of the bush **11**, each switch being operable to switch off both the motors.

In operation, if the speed of rotation of the shaft **10** becomes higher than that of the shaft **9**, i.e. the motor **8** is running faster than the motor **7** so that the angular displacement exceeds that of the shaft **9**) the threaded end portion **10***a* of the shaft **10** is screwed along the threaded bore **11***a*, thus drawing the bush **11** to the right, as viewed in FIG. **1** until it contacts the switch **13** so that both the motors are switched off to enable correction to be made.

If, however, the motor **7** is running faster than the motor **8**, the bush **11** will be unscrewed along the threaded end portion **10***a* and will thus move to the left as viewed in FIG. **1** until it contacts the switch **12** so that the motors **7** and **8** are switched off.

In the embodiment illustrated in FIG. **2**, a switch-actuating member **14** is formed in two parts **14***a* and **14***b*. The part **14***a* is axially slidable along the shaft **9** and is biassed by a spring **15** towards the part **14***b* which is fast with the shaft **10**.

The part **14***a* has a peripheral face **14***d* inclined to the axis of the shaft **9** and biassed by the spring **15** into engagement with a pin **14***c* or other abutment means carried by the part **14***b*.

Control of the motors is effected through a switch **16** actuated by the part **14***a*.

In operation, if the speed of the shaft **10** exceeds that of the shaft **9**, the pin **14***c* will ride up one half of the inclined face **14***d* and will move the part **14***a* to the left, as viewed in FIG. **2** until it contacts the switch **16**, whereupon the motors **7**, **8** will be switched off.

If the speed of rotation of the shaft **9** exceeds that of the shaft **10** (i.e. the angular displacement of the shaft **9** exceeds that of the shaft **10**), the pin **14***c* will ride up the other half of the inclined face **14***d* and will again move the part **14**a to the left until it contacts the switch **16**.

As particularly described, any departure from the original parallel setting of the roll nip can be kept within pre-determined limits without the need for complicated adjusting arrangements which are liable to develop faults. In addition to this, damage to the roll bearings as a result of non-parallel adjustment is prevented.

The invention is naturally not limited to a two-roll calender; on the contrary, it can be applied with advantage to multi-roll calenders and to other equipment or machinery where parallel adjustment of machine elements is required.

What is claimed is:

1. Apparatus for adjusting the spacing between two nominally parallel elements, one of said elements having first and second opposed end portions, said apparatus comprising

a first motor,

a first mechanical drive, said first motor being coupled by said first mechanical drive to the first said end portion of the said one of said elements and rotatable to move said end portion transversely relative to the other of said elements,

a second motor,

a second mechanical drive, said second motor being coupled by said second mechanical drive to the second said end portion of the said one of said elements and rotatable to move said end portion transversely relative to the other of said elements,

a first shaft driven by said first mechanical drive,

a second shaft driven by said second mechanical drive and lying adjacent said first shaft,

switch means controlling said first and second motors, and

a switch-actuating device having

a switch-actuating portion, said switch-actuating

device being interposed between said first and second shafts and rotating jointly with said first and second shafts, and said switch-actuating portion of said switch-actuating device being movable relative to said shafts to actuate said switch means to switch off said first and second motors when the angular displacement of said first and second shafts differs by a predetermined extent.

2. Apparatus according to claim 1, wherein the said switch-actuating device is mounted with freedom to slide axially relative to one of said shafts.

3. Apparatus according to claim 2, wherein the said switch-actuating device includes means defining a threaded bore, and wherein the other of said shafts is provided with a threaded portion engaged in said threaded bore.

4. Apparatus according to claim 1, wherein the two said elements comprise the respective rolls of a calender.

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