July 29, 1947. C. F. SCHNUCK 2,424,856

CALENDER

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Fig. 1.

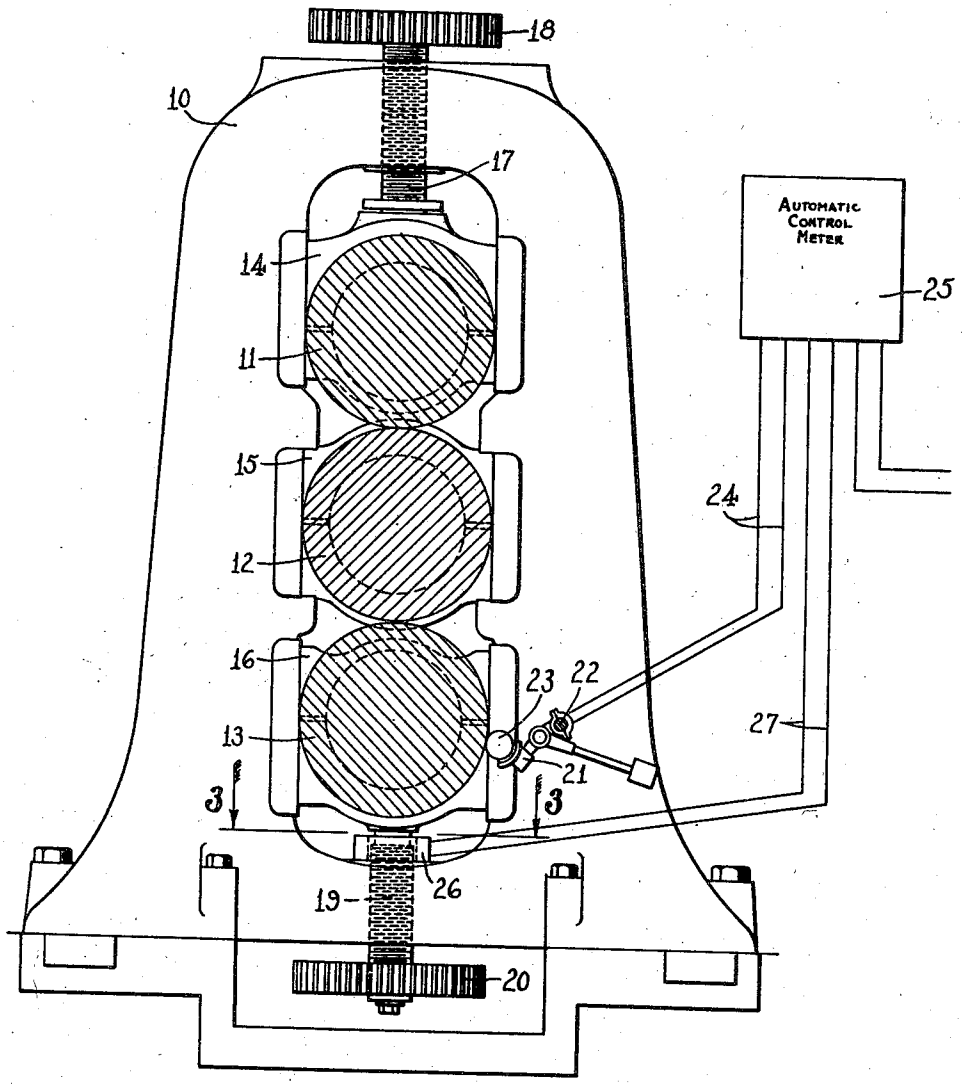
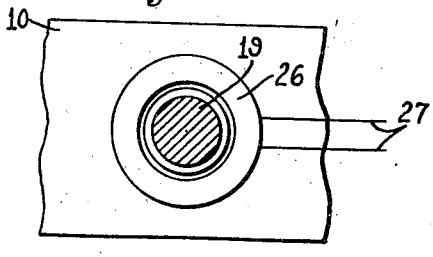


Fig. 3



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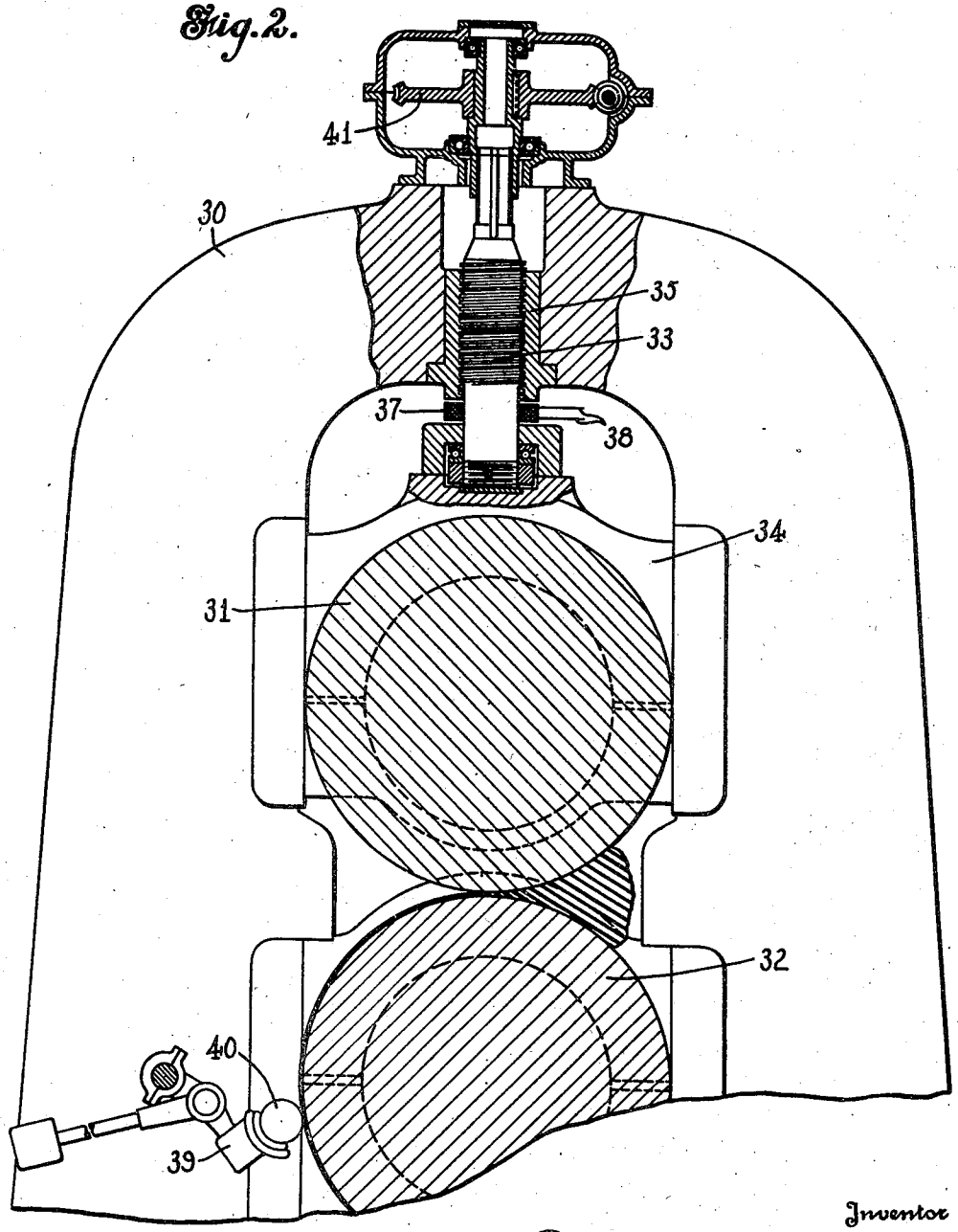
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CALENDER

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Fig. 2.



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2,424,856

CALENDER

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10 Claims. (Cl. 18—2)

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This invention relates to calenders, and more particularly to a device for controlling the adjustment between cooperating rolls of calenders and the like, so that the rolls may be maintained at the proper distance apart to insure that the sheet of material issuing therefrom will be of constant gauge or thickness within very fine limits.

In sheeting rubber and other materials at the present time, it is important to produce a sheet of material which shall be of uniform thickness within very fine tolerances, it being required to maintain the sheet within a few $^{10}/_{1000}$ of an inch of the desired gauge.

In order to effect this result, automatic controls have been provided which employ a carriage resting upon the sheet to be controlled, so that this sheet lies between the carriage and one of the rolls, and, therefore, the distance of the carriage from the roll will measure the thickness or gauge of the sheet. Any variation in the thickness of the sheet will effect a variation in the distance of the carriage from the roll, and the change in this distance is made to cause more or less current to flow to a controlling meter which operates a roll-adjusting motor in the proper direction to adjust one of the rolls to or from the other to bring the sheet back to the required gauge.

As the gauge must be constant within very fine limits, this requires very fine adjustment of the rolls and very accurate roll-adjusting mechanism and usually one which operates at a very slow speed so that sudden variations in thickness of the material will not occur.

I contemplate by the present invention to provide roll-adjusting mechanism which will be employed for what may be termed a near setting or adjustment of the rolls, and also to provide auxiliary adjusting mechanism for the fine setting, which latter adjusting mechanism will be automatically actuated by the gauge device but which will be much simpler in construction and more accurate in operation than the usual means employed for this purpose.

As herein illustrated, I prefer to effect the fine adjustment by the provision of a pressure element located between a fixed part of the housing or frame of the machine and the journal box of the adjustable roll, so that any change in the length of this element will effect an adjustment of the roll with which it is associated and to bring about changes in the length of this element by thermal means such, for example, as by heating it electrically.

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One object of my invention is to provide a new and improved means for controlling the gauge of a sheet of material delivered by a calender or like machine.

A further object of the invention is to provide a new and improved means for adjusting one of two cooperating rolls, so that the space between such rolls may be maintained at a constant figure within very close limits.

A still further object of the invention is to provide means for adjusting one of a cooperating pair of rolls by bringing about the expansion through the application of heat to a member disposed between this roll and a fixed part of the machine.

A still further object of the invention is to provide in a calender or like machine having a plurality of cooperating rolls, at least one of which is adjustable, new and improved means for adjusting such roll, such means comprising devices for bringing about a near adjustment of the roll and an auxiliary device for bringing about a fine adjustment of the roll in order that the sheet of material issuing from the rolls may be maintained at a predetermined gauge within very close limits.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a sectional view of a three-roll calender embodying my invention and showing my improved roll-adjusting mechanism applied to the lower roll thereof;

Fig. 2 is a similar fragmentary enlarged view of a calender showing my adjusting mechanism applied to the upper roll; and

Fig. 3 is a sectional view on line 3—3 of Fig. 1.

As illustrated in Fig. 1 of the drawings, I have shown a calender comprising end frames 10 having mounted therein calendering rolls 11, 12 and 13, the ends or necks of these rolls being mounted in journal boxes 14, 15 and 16. As shown, it may be assumed that the journal box of the roll 12 is fixed, while the journal boxes of the rolls 11 and 13 are adjustable vertically in order to vary the distances between the surfaces of the middle roll 12 on the one hand and those of the upper and lower rolls 11 and 13 on the other. It will be understood, however, that my invention is not to be limited to a roll arrangement of the type shown, but may be employed in connection with any pair of cooperating rolls where it is desired to maintain a constant gauge for the sheet of material issuing therefrom.

As illustrated, the upper roll 11 may be adjusted by the usual adjusting screw 17 driven by the gear 18, and likewise the lower roll may be adjusted by the adjusting screw 19 driven by the gear 20. The gears 18 and 20 may in turn be driven by any suitable mechanism well known in the art.

Mounted adjacent the lower roll 13 is a carriage 21 pivoted at 22 and carrying a roller or other contact element 23 designed to bear against the sheet of material on the roll 13, so that the thickness of this sheet will be a measure of the distance between the surface of the roller 23 and that of the roll 13. As is well known in the art, a change in the air gap between the roller 23 and the roll 13 will cause more or less current to flow through the wires 24 to the automatic control meter 25 which, in the usual arrangement, brings about operation of the adjusting devices 17 and 19, but which, in the present invention, is used to effect adjustment of the rolls in a different manner.

Surrounding the adjusting screw 19 is a heating element such as a heating coil 26 which may be energized by wires 27 leading from the control meter 25. It will, of course, be understood that any form of heating element may be employed instead of the coil 26 so that the adjusting screw 19 will be heated and caused to expand or elongate under the effect of an increase in temperature. This elongation will cause the journal box 16 and the roll 13 to be moved upwardly toward the roll 12, and thus effect a reduction in the gauge of the sheet of material issuing from the bites between the rolls 12 and 13. If the current to the coil 26 is broken, the adjusting screw will, of course, cool and permit the roll 13 to move away from its mate 12.

In the operation of my device, the adjusting screw 19 will be actuated through the gear 20 by any suitable means to effect an initial adjustment of the roll 13 in order to produce a film or sheet of material of slightly greater thickness than that desired. This would be the near adjustment of the device, and the roll 13 would never be set up against the roll 12 to the final limit desired in order that the fine adjustment in the proper direction would be automatically effected through the heating element 26. After this near adjustment has been accomplished, the automatic control meter would be set, so that when the meter reads zero and the sheet of the desired predetermined gauge is obtained, no current would flow through the wires 27 to the heat element 26. If, however, the gauge of the sheet of material is shown to "run heavy," the circuit would be closed through the wires 27 and the heating element 26 would be energized. This would cause the adjusting screw 19 to expand and adjust the roll 13 toward the roll 12.

When this adjustment becomes sufficient to produce a film or sheet of the required gauge, the current would be cut off and the circuit to the heat element 26 would be open. The residual temperature in the screw would, however, cause the device to "coast" for some time, thus keeping the gauge at the proper figure, but as soon as there was a deviation from the predetermined gauge, current would again be supplied to the heating element 26 and a correction would be made.

The amount of adjustment thus made through the agency of the heating coil would be relatively small and require a relatively small amount of current, so that there would be no danger of hardening or annealing the surface of the adjusting screw or of expanding the screw to such an extent that it would bind. The adjustment would be made without any moving parts so that it could be extremely accurate.

It will, of course, be understood that if desired, a separate block may be placed between the screw or some other part of the frame and the journal box 16 to which heat is applied by the heating element 26, but it is convenient to employ the adjusting screw itself for this purpose.

In Fig. 2 of the drawings, I have illustrated my invention applied to the upper roll of a calender. In this instance, there is mounted in the frame or standard 30 an upper roll 31 and a lower roll 32, it being understood that more than two rolls may be employed if desired. In this instance, an adjusting screw 33 is secured to the journal box 34 of the upper roll 31, so that adjustment of the screw 33 in the nut 35 secured in the standard 30 will move the journal box 34 and the roll 31 upwardly as well as downwardly, the journal box being supported by the screw. Surrounding the screw 33 is a heating element 37 energized by conductors 38 which will be controlled as explained above from the adjusting carriage 39 carrying the roller 40 resting upon the sheet or a film of material carried by the roll 32.

The operation of this form of my device is like that described in connection with the form of my invention shown in Fig. 1. As before, the screw 33 is given an initial setting through the gear 41 so that the film or sheet of material would be slightly heavier than that described. However, when the machine is put into operation and the current closed to energize the heating element 37 by variations in the position of the roll 40 of the gauge 39, the consequent heating and lengthening of the screw 33 will force the roll 31 toward the roll 32 and effect a thinning of the film to the desired gauge. When this point is reached, the current will be cut off as before and a film of the proper gauge will be delivered.

It will be understood that the particular form of gauge-measuring device is shown for illustrative purposes only, and that the invention of the present application is not limited to any particular form of device for measuring or indicating the gauge of the sheet of material delivered by the rolls, and that any form of such device may be used for this purpose and for energizing the heating element to effect the fine adjustment of the adjustable roll or rolls and thus maintain the gauge of the delivered sheet of material within very close limits. It will also be understood that while the invention is illustrated as applied to a calender, it may also be employed in other relations where it is desired to maintain a fine adjustment of the cooperating rolls, particularly where such rolls are delivering a sheet of material. It may, for example, be employed in connection with the close, final positioning of the adjustable roll of a metal rolling mill, and the language of the claims is not to be so construed as to limit the invention to a calender for plastic material.

While I have shown and described some preferred embodiments of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. Roll-adjusting means for calenders or like machines having a frame and a pair of cooper-

ating rolls, bearings carried by the frame in which said rolls are mounted, the bearings of one roll being adjustable relatively to those of the other, said means comprising a member bearing at one end against a part of the adjustable roll bearing and restrained against movement at the opposite end, and means for heating said member to effect elongation thereof and thereby effect relative adjustment of the rolls.

2. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls, bearings carried by the frame in which said rolls are mounted, the bearings of one roll being adjustable relatively to those of the other, said means comprising a member bearing at one end against a part of the adjustable roll bearing and restrained against movement at the opposite end, and means for electrically heating said member to effect elongation thereof and thereby effect adjustment of the adjustable roll.

3. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, said means comprising a member disposed between a part of said adjustable roll and a fixed portion of the frame, means to apply heat to said member to effect elongation thereof and thereby effect movement of said adjustable roll relatively to its mate, and means controlled by the gauge of the material issuing from the rolls to effect application of heat to said member by said heat-applying means.

4. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, said means comprising a member disposed between a part of said adjustable roll and a fixed portion of the frame, means to apply heat to said member to effect elongation thereof and thereby effect movement of said adjustable roll relatively to its mate, and means actuated by the separation of the surfaces of the rolls to control said heat-applying means to apply heat to said member.

5. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, comprising means to effect an initial adjustment of said adjustable roll, additional means to effect a further adjustment of the roll according to the gauge of the sheet of material issuing from the roll bite, said last-named means including a member exerting pressure on the roll and variable in length according to changes in the temperature thereof, means to heat said member, and means to energize said heating means by variation in the gauge of material issuing from the rolls.

6. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, comprising an adjusting screw, means to rotate said screw to effect adjustment of the separation between said rolls, and electrically operated means to heat said screw and elongate the same and thereby effect a fine adjustment of the bite between the rolls.

7. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, comprising an adjusting screw, means to rotate said screw to effect adjustment of the separation between said rolls, electrically operated means to heat said screw and elongate the same and thereby effect a fine adjustment of the bite between the rolls, and means actuated by the gauge of material issuing from the roll to energize said heating means and apply heat to said screw.

8. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, comprising an adjusting screw, means to rotate said screw to effect an adjustment of the adjusting roll to approximately the desired position to produce a sheet of the proper gauge, and additional means to effect elongation of said screw to bring about the final roll adjustment for the exact gauge desired.

9. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, comprising an adjusting screw, means to rotate said screw to effect an adjustment of the adjusting roll to approximately the desired position to produce a sheet of the proper gauge, additional means to effect elongation of said screw to bring about the final roll adjustment for the exact gauge desired, said additional means comprising a heating element associated with said screw, and means to energize said heating element.

10. Roll-adjusting means for calenders or like machines having a frame and a pair of cooperating rolls supported by the frame, one of which is adjustable relatively to the other, comprising an adjusting screw, means to rotate said screw to effect an adjustment of the adjusting roll to approximately the desired position to produce a sheet of the proper gauge, additional means to effect elongation of said screw to bring about the final roll adjustment for the exact gauge desired, said additional means comprising a heating element associated with said screw, and means controlled by variations in the gauge of the sheet to energize said heating element.

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