

Sept. 4, 1956

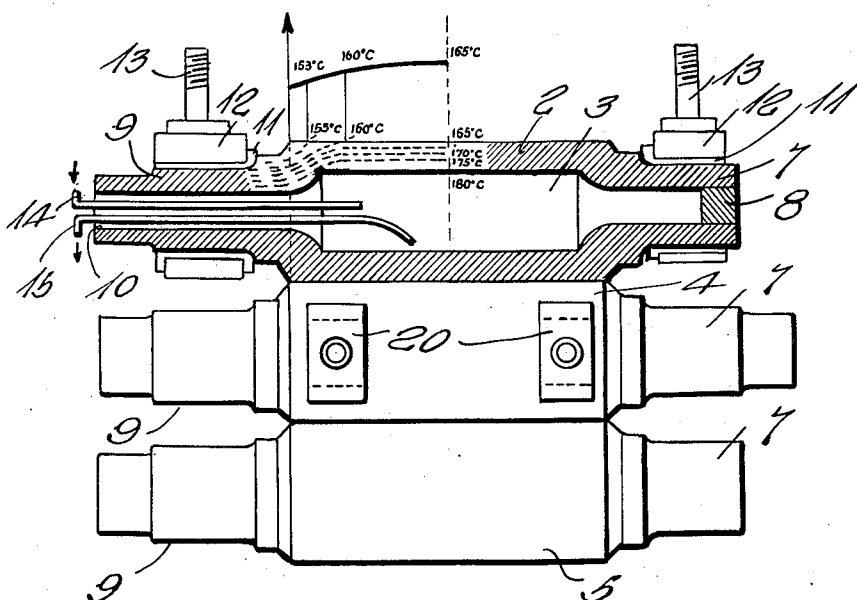
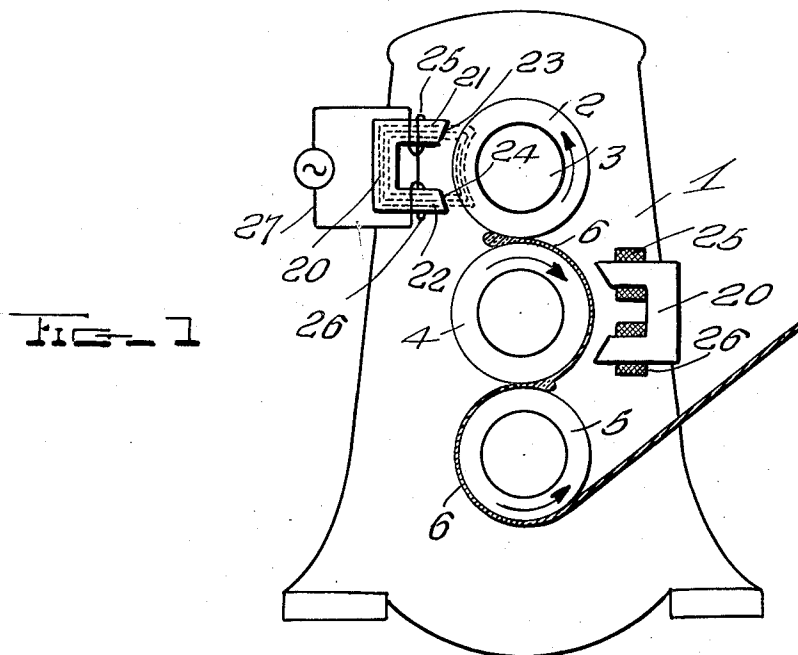
G. ARDICHVILI

2,761,941

ROLLER TEMPERATURE MODIFYING APPARATUS

Filed June 1, 1953

2 Sheets-Sheet 1



INVENTOR

GEORGES ARDICHVILI,

BY

Linton and Linton
ATTORNEYS

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G. ARDICHVILI

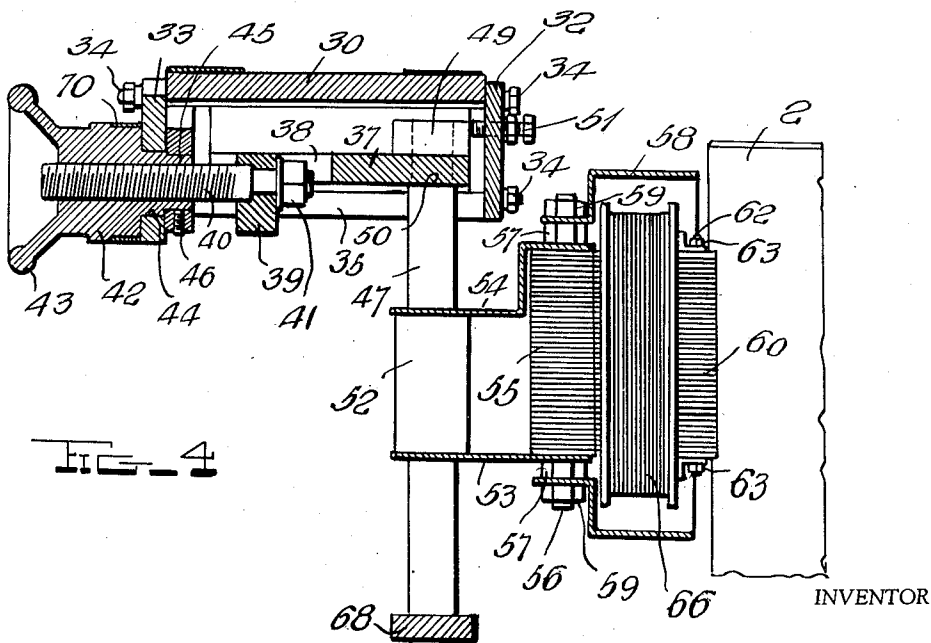
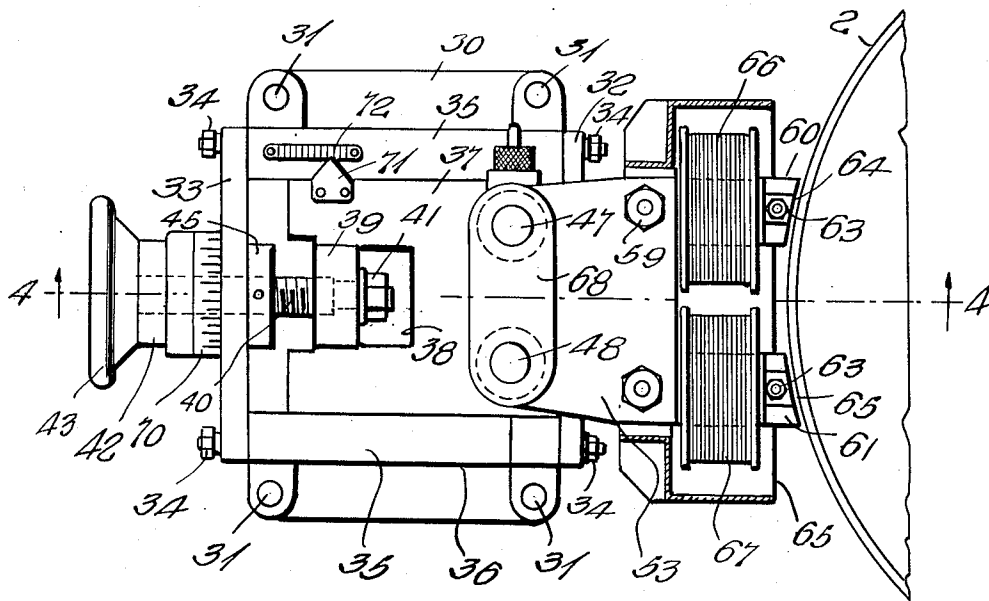
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FIG. 3



INVENTOR

GEORGES ARDICHVILI,

BY

Linton and Linton

ATTORNEYS

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ROLLER TEMPERATURE MODIFYING APPARATUS

Georges Ardichvili, La Hulpe, Belgium

Application June 1, 1953, Serial No. 358,720

3 Claims. (Cl. 219—10.49)

The present invention relates to apparatus employing rollers particularly for pressing purposes, and is more specifically concerned with apparatus for heating portions of rollers.

Pressing rollers in particular utilize for pressing material such as laminated products, plastic materials, sheet rubber as well as machines having drying cylinders in the manufacture of paper, textile and the like, employ metallic cylinders generally one above another or with a series of super imposed rollers around and between which the material to be treated is passed. These rollers are generally supported at their end portions by bearings and are sometimes of a cylindrical nature for receiving a heating fluid or containing apparatus therein when the purpose of which employed requires rollers heated above room temperature. However, such rollers during their use tend to conduct the heat off of the end portions thereof as well as passing the heat to the mounting means supporting the roller. As a result the temperature along the periphery of the rollers are not uniform being generally cooler in the end portions thereof than in the intermediate portion. As a result generally only the central portion of the roller can be used or where the material is in contact with the cooler portions they sometimes stick to the roller or the material treated is not uniform throughout its width due to the variance in the peripheral temperature of the rollers.

The principal object of the present invention is to provide means for modifying the temperature of the roller at such portions thereof as are cooler than the remainder for either equalizing the temperature along the roller or increasing the temperature at portions thereof as may be required.

A further and important object of the invention is to provide means for heating rollers at portions thereof which means are adjustable longitudinally of the roller as well as laterally of the axis thereof for varying the intensity of the heat in the roller as well as the portion of the roller being heated.

A still further and equally important object of the invention is to provide means for heating rollers which means is mounted exteriorly of the roller and is spaced therefrom and yet capable of creating heat energy in the wall of the roller without injury or interference to the material passing around the roller.

Further objects of the invention will be in part pointed out and in part obvious from the following description of the accompanying drawings, wherein,

Fig. 1 is a schematic view of a roller press with one standard removed and including induction heating apparatus for the present purpose.

Fig. 2 is an enlarged side elevation of three superimposed rollers with the top roller in cross section and including a chart showing an example of the varying temperatures of such a roller.

Fig. 3 is an enlarged side elevation of an adjustably mounted magnetic flux producing device in its position adjacent a roller; and

Fig. 4 is a horizontal cross sectional view of Fig. 3 taken on line 4—4 thereof.

Referring now more particularly to the accompanying drawings, wherein like and corresponding parts are designated by similar reference characters, numeral 1 refers

2

to a standard of a roller press having a cylindrical roller 2 formed with a longitudinal bore 3 and a similar roller 4 positioned therebeneath with a further similar roller 5 therebelow. Material 6 to be treated is, as shown, passed between rollers 2 and 4 for being compressed and between rollers 4 and 5 for further compression and from roller 5 to the apparatus for treatment or storage as required. As best shown in Fig. 2 of the drawings, rollers 2, 4 and 5 form a series with the rollers super imposed one upon the other and all of these rollers can be internally heated when necessary and roller 2 is shown in Fig. 2 in cross section as an example of a roller for this purpose. That is, such rollers have reduced end portion forming a stub axle 7 with the bore 3 closed at that end by a plug 8. The opposite end portion of the roller also has a reduced cylindrical configuration forming a second stub axle 9 with the bore 10 thereof open and communicating with bore 3. Axles 7 and 9 have a bearing sleeve 11 surrounding each of them which in turn is supported by a collar 11 and a supporting rod 13 connected thereto permitting the rotation of the roller. Heated fluid is introduced through pipe 14 through bore 10 into bore 3 and exhausted through pipe 15 whereby the roller is heated. The foregoing is an example of a conventional arrangement of a roller, support and heating means therefor, shown by way of example only.

Such rollers when rotating have for example an internal temperature of 180° C. with the wall of the roller being gradually cooler towards its periphery where the temperature is approximately 165° C. as shown in Fig. 2. The peripheral temperature of the roller also becomes gradually cooler as it approaches the stub axles 7 and 9 with the temperature dropping to 160° C. and then to 153° C. as it approaches the end portions due to the end portions rapidly giving off heat to the atmosphere and connected elements such as supports 12 and 13. Accordingly, the temperature of the roller varies throughout its length and does not uniformly heat material 6 as it passes therearound.

To modify the temperature of the cooler portions of the roller U-shaped laminated cores 20 having laminations of high magnetic permeability are positioned with their spaced parallel arms 21 and 22 extending towards the portion of the rollers 2, 4 or 5 when it is desired to increase the temperature thereof. The ends 23 and 24 of said legs are shaped so that they extend on an arc concentric with the axis of said roller. Induction coil 25 is wound around leg 21 with a similar coil 26 surrounding leg 22 and said coils are connected to a source of alternating current 27 utilizing normal industrial frequencies.

Similar induction cores 20 are positioned along the remaining rollers such as 4 and 5 with the cores of adjacent rollers being positioned on opposite sides of said rollers as indicated in Fig. 1. Such cores 20 are spaced for heating the end portions of the rollers as indicated in Fig. 2 for roller 4.

A modified arrangement is shown in Figs. 3 and 4 wherein the roller 2 has a magnetic flux producing apparatus positioned adjacent a portion of the periphery thereof and which apparatus includes a plate support 30 having a series of openings 31 at each corner thereof for attachment to the standard or other members of the roller press by bolts or the like. Side plates 32 and 33 are connected to and extend laterally of support 30 and are attached thereto by bolts 34. A pair of spaced apart bars 35 are connected to the front portions of said side plates 32 and 33 by means of additional bolts 34. A base plate 36 extends between the bottom bar 35 and support 30 and is connected thereto by welding or the like. A slide 37 having a U-shaped cross sectional configuration is mounted for sliding upon said base plate 36 and retained between bars 35 and support 30. Said slide 37 has a central opening 38 and a laterally extending arm

39 with a threaded rod 40 extending through arm 39 and fastened by a nut 41 positioned in said opening 38. A shaft 42 having a hand wheel 43 formed at one end thereof is rotatably seated through an opening 44 in side plate 33. Said shaft 42 has a longitudinally extending threaded bore 45 with rod 49 extending therethrough in threaded engagement therewith. A ring 46 is fixedly connected on the end of shaft 42 within plate 33 for permitting the rotation of said shaft, but preventing longitudinal movement thereof.

A pair of parallel rods 47 and 48 extend through an end portion of slide 37 being retained thereto by a nut 49 and a shoulder 50, each on an opposite side of slide 37. A stop screw 51 extends through side plate 32 for contacting slide 37 and limiting its movement towards said plate 32. A pair of sleeves 52 are each slidably mounted on one of said rods 47 and 48 with plates 53 and 54 extending from opposite sides of said sleeve and having a core 55 consisting of a U-shaped stack of laminated sheets of high magnetic permeability positioned between the free ends of said plates 53 and 54. Threaded end rods 56 extend through openings in said plates 53 and 54 and core 55 and are retained thereon by nuts 57. A shield 58 is also mounted on said rod 56 and retained by nut 59. Within shield 58 there extends parallel spaced legs 60 and 61 of said core 55 with the end portions thereof retained together by a bolt 62 and nut 63. The ends 64 and 65 of said legs 60 and 61 extend on an arc concentric with the axis of roller 2. An induction coil 66 surrounds leg 60 while a similar coil 67 surrounds leg 61 and both coils are connected to a source of alternating current when in operation. Rods 47 and 48 are joined together at their outer end by a link 68 which maintains the same apart.

In the operation of machines employing rollers for pressing, drying or other purposes, it is necessary that the material to be treated be passed around the rollers without interference or without injury from the roller heating apparatus and for this reason the rollers are generally heated from within. By employing cores such as core 20 which is formed with laminations of sheets having a high magnetic permeability, between which sheets are positioned thin insulating sheets, magnetic losses in the core are greatly reduced and the passing of the alternating current through the induction coils 25 and 26 produces a magnetic flux surface which extends from the ends 23 and 24 of said core to the immediate portion of the roller in front thereof. The portion of the roller in the path of this flux is heated by the absorbed energy which is transformed into heat in the wall of the cylinder by the Joule and the hysteresis effect of the magnetic flux circuit. Thus the material 6 is permitted to pass around the rollers 2, 4 and 5 without interference or being affected by the magnetic flux since the cores 20 are spaced from the rollers. The rollers whether internally heated or not can be heated by the present means uniformly, enabling the entire width of the roller to be utilized and assuring that the material is uniformly treated.

In the modification shown in Figs. 3 and 4 rotation of hand wheel 43 causes rod 40 to move within bore 45 for in turn moving slide 37 therewith. The amount of rotation of hand wheel 43 can be determined by comparing scale 70 mounted on shaft 42 with a pointer or mark on side plate 33. The corresponding amount of movement of slide 37 is indicated by pointer 71 moving along scale 72.

As slide 37 is thereby moved, rods 47 and 48 move therewith and through their connection by means of plates 53 and 54 with core 55, said core is moved to and from roller 2 for varying the air gap between the ends 64, 65 of said core with said roller. In this manner the degree of coupling between the induced circuit represented by core 55 and the secondary circuit consisting of the wall of cylinder 2 can be varied and as a result the

heating power of the flux circuit can be varied in a continuous manner without losses due to the use of resistances or other regulating devices.

Further, by movement of the sleeves 52 on rods 47 and 48 the position of the cores 55 can be varied longitudinally of the roller 2 for varying the location of the heating zone.

The magnetic flux is generated in core 55 by the alternating current passing through the induction coils 66 and 67 surrounding legs 60 and 61 of said core while the metallic wall of the roller 2 being formed of a magnetic material closes the magnetic flux circuit for being heated by the induced current.

The amount of heat generated in the wall of roller 2 can be such as to create a thermal dilation of the roller increasing the diameter of the roller in the heating zone for modifying the profile of the roller when such is required.

The present device is capable of considerable modification and such changes thereto as come within the scope of the appended claims, are deemed to be a part of the invention.

I claim:

1. Roller temperature modifying apparatus comprising in combination a rotatably mounted roller formed of a magnetic material, means for heating said roller, and auxiliary heating means mounted exteriorly of and spaced from said roller at an end thereof, said auxiliary heating means comprising means for producing an alternating current magnetic flux of which the path extends into the periphery of said roller at said end thereof to compensate for the temperature drop due to the cooling at the end of said roller for assisting in maintaining the temperature of said roller uniform throughout its length.

2. Roller temperature modifying apparatus comprising in combination a rotatably mounted roller formed of a magnetic material, means for heating said roller, two laminated cores, having parallel spaced legs positioned outside of said roller with said legs having their end positioned adjacent to, but spaced from the periphery of said roller, a source of alternating electrical current, induction coils each surrounding one of said core legs and connected to said source of electrical current for completing the magnetic circuit with the air gap between said legs and said roller and with the wall of said roller, means for supporting each core and means for moving each core independently towards and away from said roller for varying the intensity of the heating of said roller.

3. Roller temperature modifying apparatus comprising in combination a rotatably mounted roller formed of a magnetic material, a support fixedly mounted adjacent to, but exteriorly of said roller at an end thereof, a slide movably connected to said support for movement in a line extending radially of said roller, means for adjusting the position of said slide along said radial line relative to said roller, laterally extending rods connected to said slide, a frame slidably mounted on said rods for movement longitudinally of said roller and magnetic flux producing means positioned on said frame to direct the flux path into said roller at an end thereof.

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