

May 16, 1933.

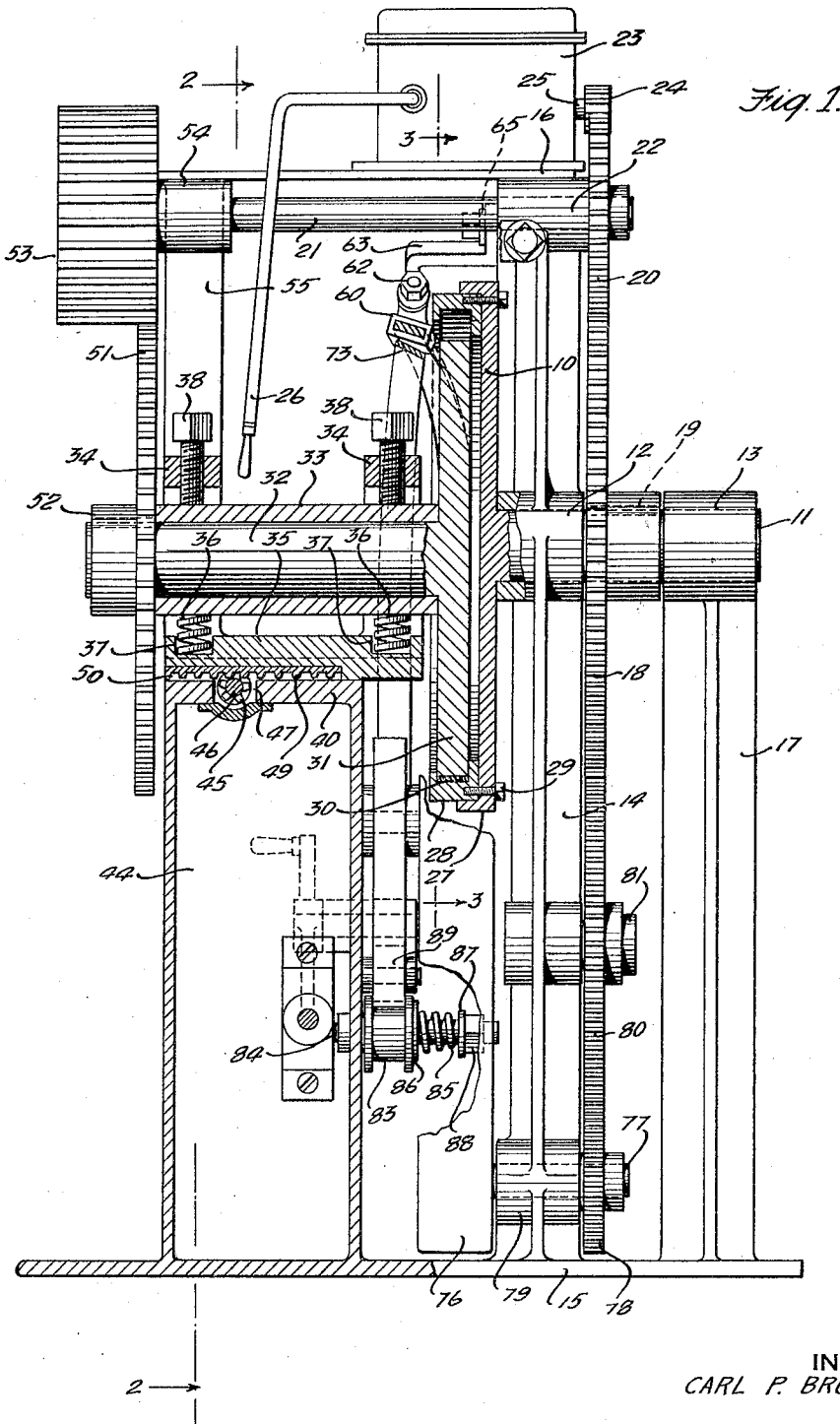
C. P. BROCKWAY

1,909,653

APPARATUS FOR FORMING BRAKE LINING

Filed May 6, 1931

3 Sheets-Sheet 1



INVENTOR
CARL P. BROCKWAY

BY ATTORNEY

Chester H. Braceton

May 16, 1933.

C. P. BROCKWAY

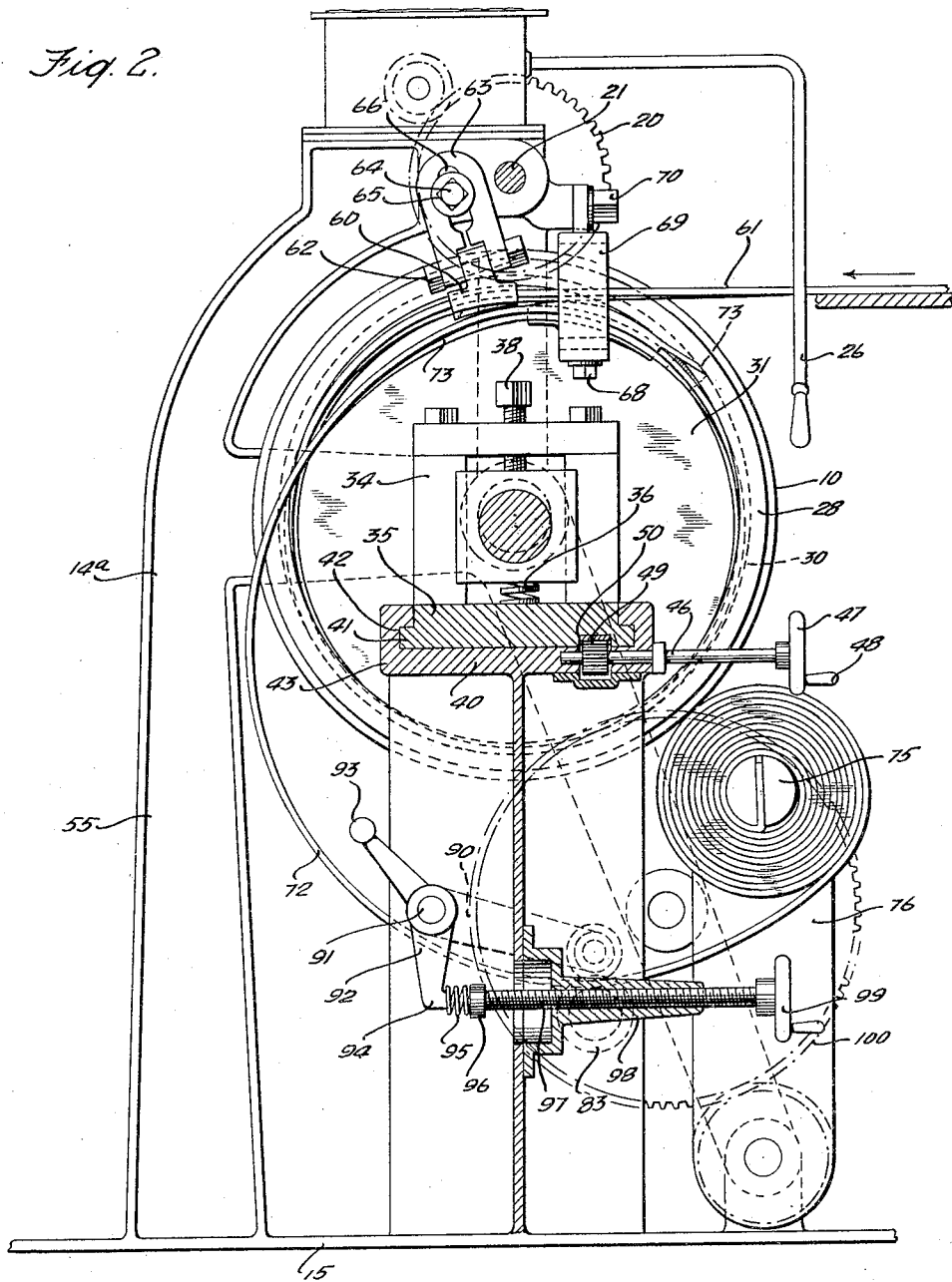
1,909,653

APPARATUS FOR FORMING BRAKE LINING

Filed May 6, 1931

3 Sheets-Sheet 2

Fig. 2.



INVENTOR
CARL P. BROCKWAY

BY ATTORNEY
Charles H. Brantley

May 16, 1933.

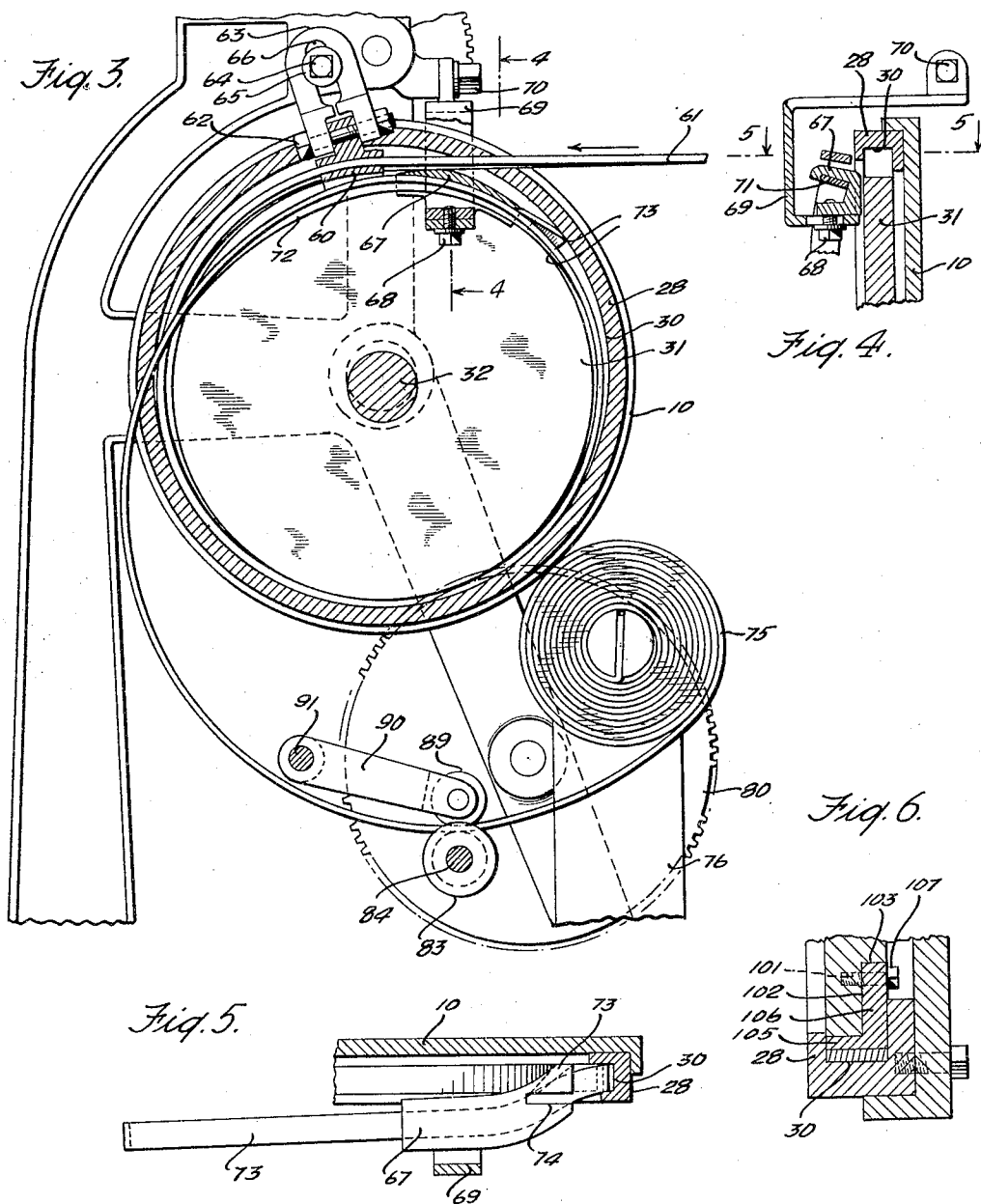
C. P. BROCKWAY

1,909,653

APPARATUS FOR FORMING BRAKE LINING

Filed May 6, 1931

3 Sheets-Sheet 3



INVENTOR
CARL P. BROCKWAY

BY ATTORNEY
Chester W. Branson

UNITED STATES PATENT OFFICE

CARL P. BROCKWAY, OF RIDGEWOOD, NEW JERSEY, ASSIGNOR TO WORLD BESTOS CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF DELAWARE

APPARATUS FOR FORMING BRAKE LINING

Application filed May 6, 1931 Serial No. 535,398.

This invention relates to apparatus for compressing strip material. More particularly the invention relates to a calender for brake lining involving certain improvements over apparatus heretofore in use.

A common form of calendering apparatus for compressing and forming sheet or strip material such as paper, moldable products, woven and moldable brake lining and the like, consists in two rotating drums between which the material is passed and compressed, the distance between the drums being so adjusted as to secure the desired dimensions of the material.

An undesirable characteristic of calender machines of this type has been that the compression on the material, as on a strip, for example, is located at a definite point of limited area which causes the material of the strip to flow lengthwise thereof. This causes a lengthening of the strip which is undesirable as tending among other things to prevent proper control of the dimensions of the product. Moreover, a sidewise flow of the material occurs which brings about a further distortion of the strip and makes it difficult to properly control the contour or dimensions of the finished product.

It is an object of the present invention to provide a type of calender machine in which the tendency of the material to flow either lengthwise or sidewise is greatly diminished.

Another object is to provide a set of calender elements or rolls which will prolong the pressure effect over an extended section of the material without in any way interfering with the movement of the material through the machine.

Various other objects of the invention involving features of the construction and economies of handling and the like, will become apparent on consideration of the following specification and of the accompanying drawings, in which:

Fig. 1 is a sectional elevation of the machine taken substantially through the center thereof;

Fig. 2 is a sectional side elevation of the machine taken on the line 2—2 of Fig. 1;

Fig. 3 is another sectional side elevation

showing the upper portion of the machine and taken on the line 3—3 of Fig. 1;

Fig. 4 is a front sectional view of the means for guiding the strip of material out of the machine, taken on the line 4—4 of Fig. 3;

Fig. 5 is a plan view of the guiding means shown in Fig. 4, taken on the line 5—5 of that figure; and

Fig. 6 is a sectional view of a modified form of the calender rollers taken at a point of compression showing means whereby adjustment of the rollers may be provided for brake bands of different widths.

In Fig. 1 the general construction of the machine is illustrated. A roller provided with a rim having an internal contact surface is adapted to cooperate with a second inner roller having an external contact surface, a continuous strip of brake band material being fed into the space between the two rollers and out again after completing one revolution.

The outer roller comprises a disc 10 mounted upon the end of a shaft 11 which is rotatably mounted in bearings 12 and 13. The bearing 12 is formed integral with a sturdy upright frame member 14. This member comprises a member 14a having an H cross-section supported on a suitable base plate 15 and extending upwardly at one side of the bearing 12 and curving above the bearing 12 to form a motor platform support 16 which is integral therewith and a transverse member 14b of the same cross-section connecting the member 14a and the bearing 12. Suitable webs are provided connecting the bearing 12 with the base plate 15 and members 14a and 14b as indicated in Figs. 1 and 2. The bearing 13 is formed integral with a second frame member 17 provided with suitable strengthening webs which in turn is also formed integral with the base plate 15.

The frame member 17 is separated from the member 14 so as to permit the rotation of gear wheels therebetween for driving the shaft 11. A gear wheel 18 is mounted on the shaft 11 between the two bearings 12 and 13 being keyed to the shaft by the key 19 and meshes with another gear 20 mounted on a

shaft 21 which is supported in a bearing 22 formed integral with the upper end of the frame member 14 and directly beneath the motor support platform 16. A suitable motor (not shown) is connected to a system of reduction gears mounted in a casing 23 on the motor supporting platform 16 to drive the gear 20 by means of a small pinion 24 mounted on a driving shaft 25 protruding from the casing 23. The ratio of the gear mechanism in the casing 23 may be arranged to be controlled by means of the lever 26 which may extend outwardly and downwardly from the casing to be within reach of the operator of the machine.

The disc 10 may be provided at its periphery with a flange 27 extending at right angles to the disc on the opposite side of the shaft 11 and a ring 28 may be provided to fit within the flange 27 and against the disc 10 where it may be securely held in position by bolts 29 as indicated. The ring 28 may be provided on its inner surface with a groove 30 which may be made to conform in width to the desired width of the brake band material after it has passed through the machine.

A second disc 31 may be mounted upon a shaft 32 which is rotatably mounted in a relatively long bearing 33. The periphery of the disc 31 may be just wide enough to fit into the groove 30 of the ring member 28, and the diameter of the disc 31 may be slightly less than the inner diameter of the ring 28 so that when the disc 31 is mounted in close contact with one side of the ring 28 there will be a sufficient space at the opposite side between the edge of the disc 31 and the ring 28 to permit the entrance and exit of a strip of brake lining material.

The bearing member 33 is preferably rectangular in cross-section and is mounted in a pair of brackets 34 positioned one at each end of the bearing and formed integral with a base plate 35. The bearing member 33 is mounted in the brackets 34 so as to have vertical sliding movement therein, and the lower surface of the bearing may rest upon two heavy springs 36 the lower ends of which are seated in suitable sockets 37 provided in the base plate 35. The brackets 34 are each provided above the bearing 33 with a heavy screw 38 which is threaded into a tapped hole in the bracket and bears against the top of the bearing. Rotation of the screws 38 will cause the bearing to move either down against the tension of the springs 37 or upwardly, forced by the springs, depending on whether the screws 38 are screwed into or out of the brackets 34.

The base plate 35 rests upon a platform 40 upon which it is adapted to have a sliding motion axially of the shaft 32 of from left to right as viewed in Fig. 1. Such motion on the plate 40 is restricted to one plane by means of a base flange 41 on each side of the

plate 35 which engages a groove 42 in on the inner side of a flange 43 formed integral on each side of the plate 40. This construction, while it permits movement from left to right as viewed in Fig. 1, holds the bracket member 34 and bearing 33 in axial alignment upon the plate 40 against any vertical or side-wise movement.

The plate 40 is preferably formed integral with a sturdy frame member 44 shown in the drawings as comprising an H section and preferably formed integral with the base plate 15.

Movement of the bearing supporting plate 35 may be affected by a pinion 45 rotatably mounted upon a shaft 46 in an opening 47 provided for that purpose in the plate 40 which is fitted with suitable bearings for the shaft. The other end of the shaft protrudes from the side of the plate 40 and is provided with a wheel 47 having a hand grip 48 whereby the wheel and shaft and attached pinion may be rotated manually. A rack 49 is secured by any desirable means in a groove 50 in the bottom of the base plate 35 immediately above the pinion 45 and has teeth adapted to mesh with the teeth on the pinion as is clearly indicated in Fig. 1. Rotation of the shaft 46 by means of the hand wheel 47 and handle 48 causes rotation of the pinion 45 and movement of the rack and attached parts thus moving the bearing toward or away from the disc 10 as desired.

The disc 31 and the shaft 32 are also adapted to be driven by the motor and this may be accomplished by a gear wheel 51 which is keyed at the end of the shaft 32 by means of the key 52. This wheel is adapted to mesh with a relatively wide gear wheel 53 which is keyed at the opposite end of the shaft 21 which, as already described, is driven by the motor. The end of the shaft 21 adjacent the gear wheel 53 is supported in a bearing 54 which is mounted at the upper end of a frame member 55 extending upwardly from the plate 15 and similar in outer contour to the upright portion 14a of the frame member 14 being curved out around the plate 40 and associated bearing 33 and brackets 34 to permit the movement of these members without interfering therewith. The width of the gear wheel 53 permits considerable adjustment of the gear wheel 51 with respect thereto so that the two will keep in mesh even though the shaft 32 is drawn to its outermost position.

Inasmuch as the disc 31 fits into the groove 30 provided in the ring 28 there can be no axial movement of the shaft 32 unless the disc is raised sufficiently so that it will clear the sides of the groove 30. Thus if it is desired to move the disc 31 away from the disc 10 it will first be necessary to loosen screws 38 whereupon the springs 36 will force the bearing member 33 upwardly until the disc 31 is clear of the sides of the groove 30 where-

upon the hand wheel 47 may be rotated to draw the whole bearing structure including the disc 31 away from the disc 10.

Note is made of the fact that the two discs 31 and 10 being of different diameters will travel at different shaft speeds in order to have the same peripheral speed and the proper adjustment is obtained by varying the sizes of the gears 20 and 18 and 53 and 51. Ordinarily the same peripheral speed is satisfactory although in some uses a slight difference of speed may be of value as imparting a desired finish or other characteristic to the surface of the compressed material.

The clearance space between the top of the disc 31 and the inner side of the top of the ring 28 is relatively small as indicated in Fig. 1 and hence it is necessary to provide means to guide a strip of the brake lining material into this space between the rollers and out again after it has made one revolution with the rollers without making any reverse or edgewise bends, and this may be done in the following manner:

The guiding means for directing the brake band material into the machine is relatively simple and may comprise a guide member 60 which has an opening therethrough corresponding to the cross-sectional size of the strip 61 of uncompressed brake band material. This guide member is mounted at an angle as clearly indicated in Fig. 1 and may be secured by means of a bolt 62 to a bracket 63 which is in turn held upon the frame member 14 at the top thereof by means of a bolt 64 which bears against a washer 65. A suitable slot 66 (Fig. 2) is provided in the bracket 63 so that the bracket may be adjusted to the proper position by loosening the bolt 64. Also the angle of the guide member 60 may be changed by loosening the bolt 62, and its position at an angle twists the entering strip 61 of brake band lining material so that it enters the space between the two calender rolls without any undue bends or distortions. In fact it is only necessary to push the strip through the guide member 60 to have it run into the groove 30 between the two rollers. When it is desired to move the disc 31 to the left as shown in Fig. 1 it is necessary to loosen the bolt 62 and rotate the guide member 60 in a clockwise direction to move it out of the way of the disc.

In order to guide the compressed strip of brake band lining material out of the machine a slightly different type of guide is necessary. This guide consists of a stripper arm 67 mounted by means of a bolt 68 on a bracket 69 which extends outwardly, (see Fig. 4), and upwardly, and then over the top of the calender roll where it is pivoted by means of a bolt 70 to the top of the frame member 14. The arm 67 is provided with a groove 71 in the underside thereof which is spirally curved to fit the natural configura-

tion or twist of the compressed strip 72 of the brake band lining as it leaves the space between the calender rolls and moves slightly sidewise to clear the top of the roll and the incoming strip of material. The arm is also extended inwardly toward the disc 10 and terminates in a finger 73 which is adapted to bear against the inner side of the groove 30 and the bottom of the groove and is tapered down to a point so that it will catch the strip of material as it comes around and guide it outwardly toward the left as indicated in Fig. 1. The end of the arm 67 adjacent the finger 73 is provided with a slot 74 to receive the outer edge of the ring member 28 thus permitting the ring to rotate without interference from the arm 67. When it is desired to move the disc 31 to the left as seen in Fig. 1 the bracket member 69 is rotated in a clockwise direction by loosening the bolt 70 similarly to the guide member 60.

As is clearly indicated in both Figs. 2 and 3 the brake band material 61 enters the space between the rolls at the top and is compressed between the rolls as they make one revolution when it emerges again as a compressed strip 72 at the top just below the entering strip 61 and moving in the same direction.

It is important that the strip 72 of treated material does not make any sudden or reverse bends as it is passed through the machine and hence the emerging strip of material is preferably allowed to take a natural curve after it leaves the stripper arm 67. Accordingly means is provided to wind the treated brake band lining in a roll after it leaves the machine and in the same direction as it is curved by the machine. To this end a roller 75 is rotatably mounted upon a gear box 76 which is secured to the frame of the machine adjacent the bottom plate 15. The gear box 76 is provided with a train of gears (not shown) and a friction drive mechanism which permits the spool 75 to slip. The gears are arranged so that they tend to drive the spool 75 at a speed faster than the brake lining material is fed out of the machine so that the material may be placed under tension to insure the tight winding of the material around the spool. The gear train in the gear box 76 is driven by a shaft 77 which has a gear 78 keyed thereto. The shaft 77 passes through a bearing member 79 in the lower portion of the frame member 14 so as to rotatably support the shaft. The gear wheel 78 is arranged to mesh with a gear wheel 80 mounted on a stub shaft 81 which rotates in a bearing 82 formed on the frame member 14. The gear wheel 80 also meshes with the gear wheel 18 on the shaft 11 and as this gear is driven by the motor as already described the gear wheels 80 and 78 are also driven.

The tension on the brake band material 73 as it comes out of the machine may be applied by means of a friction roller 83 which

is rotatably mounted on a shaft 84 secured rigidly to the frame 44. A spring 85 may be placed on the end of the shaft 84 to bear against the roller 83, the other end of the spring bearing against a washer 86 held by an adjustable nut 87 whereby the rotation of the roller 83 is slowed up by the frictional engagement of the roller between the frame and the washer 86. A second roller 89 may be mounted upon an arm 90 which is pivotally mounted on a shaft 91 secured in the frame member 44 in a suitable bearing therefor. The end of the shaft 91 may be provided with a bell crank arm 92 having a handle 93 at one end and at the other a spring socket 94 for receiving the end of the spring 95 the other end of which bears against a member 96 at the end of a shaft 97. The shaft 97 is threaded into a bracket 98 which is mounted on the web of the frame 44 and the outer end of this shaft is provided with a band wheel 99 and a handle 100 so that the shaft 97 may be moved axially with respect to the bracket 98. Such movement of the shaft tends to rotate the bell crank arm 92 and, therefore, the shaft 91 which has the arm 90 attached to it so that the arm 90 may be raised and lowered and the roller 89 moved toward or away from the roller 83. By means of this system the tension of the roller 89 against the roller 83 may be adjusted, the spring 95 providing a slight resiliency between the rollers and permitting the rollers to be separated in order to introduce a strip of brake lining by pulling downwardly on the handle 93 without turning the shaft 97.

This tension device tends to frictionally hold the brake lining material and permits a tight winding on the spool 75 without shortening the loop of the material between the stripper arm 67 and the rollers 83 and 89 so that the natural curve of the material may be maintained between these two points.

In the operation of the machine the disc 31 is adjusted with respect to the ring 28 on the disc 10 so that the clearance between the lower edge of the disc and the bottom of the groove 30 is equal to the desired thickness of the brake band material after the calendering process and the entrance guide 60 and the stripper guide 67 are adjusted in their proper positions. Then the machine is started and a strip of the brake band lining material is fed through the guide member 60 whereupon it enters the space between the disc 31 and the ring 28 and follows around with the two discs falling into the groove 30. As the material moves downwardly in a counter clockwise direction the disc 31 comes closer and closer to the bottom of the groove 30 in the ring and hence the brake band material is gradually compressed between these two members. It reaches a maximum point of compression at the lowermost portion of the disc and then gradually releases as it moves

upwardly at the right hand side as viewed in Figs. 2 and 3. When it reaches the finger 73 of the stripper arm 67 it is scraped away from the groove 30 and is twisted slightly as it moves along the slot 71 toward the left, as indicated in Fig. 1, and downwardly, still in a counter-clockwise direction, as indicated in Figs. 2 and 3, passing in a long curve to the tension rollers 83 and 89 near the bottom of the machine and then to the spool or winding wheel 75.

The fact that the pressure is gradually brought against the brake band lining material and that the material lies in the groove 30 for a large portion of the circumference thereof tends to prevent a lengthening out of the material as it is compressed. As the disc 31 and the inner sides and bottom of the groove 30 are in contact with the strip for a considerable length thereof and during the time of compression there is a frictional resistance against elongation of the material as well as the direct pressure between the rolls which also helps to prevent it so that the dimensions of the compressed strip are much more accurately controlled with the calendering machine of the invention than with machines heretofore used for that purpose.

It may be preferable to provide the inner disc 31 with an adjustable ring so that brake lining strips of different widths may be compressed in the same machine. Such a construction is shown in Fig. 6 where the disc 101 is similar to the disc 31 but is provided at its periphery with an annular cut out portion 102 forming a shoulder 103. A ring 105 having a surface adapted to fit into the groove 30 of the ring member 28 has a flange 106 which is adapted to fit into the cut out portion 102 and against the shoulder 103. Suitable bolts 107 may be provided to hold the ring in position upon the disc 101. With this construction the ring 105 may be removed from the disc 101 and other rings of different sizes may be attached thereto, it being necessary, of course, to remove the ring member 28 from the disc 10 and attach thereto another having a groove corresponding in size to the width of the ring attached to the inner disc.

Obviously the machine may be employed for a wide variety of materials but for purposes of illustration I have shown and described it as applied to the calendering of brake lining for motor vehicles. It will be seen from the above description that I have provided a calendering machine which will compress a continuous strip of material over a relatively long surface thereof whereby the material may be compressed to the desired cross-section without the usual lengthening which has been characteristic of machines heretofore used. The machine is also capable of exerting great pressure upon the ma-

terial but the material may be fed through the machine without any sudden or transverse or reverse bends with the result that no damage is done to the mechanical structure of the material so as to weaken it or otherwise interfere with its use for the purpose intended.

While I have illustrated a specific embodiment of the invention as applied to strip material such as brake lining, it is, of course, obvious that changes may be made in the various machine parts, and I, therefore, do not desire to be limited other than is required by the claims hereto appended.

Having thus described my invention what I claim is:

1. In calender apparatus, the combination of a wheel having a rim provided with an inner contact surface, a second wheel having a rim provided with an external contact surface, said first mentioned rim having inner extending edges adapted to overlies the external edge of said second wheel, an inlet guide for material entry into the space between said wheel rims and an outlet guide for the material, said guides being angularly disposed in relation to said contact surfaces.

2. In calendar apparatus, the combination of a wheel having a rim provided with an inner contact surface and a second wheel having a rim provided with an external contact surface, said first mentioned rim having inner extending edges adapted to overlies the external edge of said second wheel, the rim of said first wheel being removably attached thereto, and said second mentioned wheel having a diameter less than that of the first mentioned wheel and shafts provided for each of said wheels, the axis of the shaft of one of said wheels being displaced from the axis of the other.

3. In calender apparatus, the combination of a wheel having a rim provided with an inner contact surface and a second wheel having a rim provided with an external contact surface, said first mentioned rim having inner extending edges adapted to overlies the external edge of said second wheel, said second wheel having a lesser diameter than the first wheel, shafts for supporting said wheels, the shaft of said second wheel being normally displaced laterally away from the axis of the shaft of the first wheel.

4. In calender apparatus, the combination of an internal contacting calender wheel provided with a rim having inner extending walls whereby a groove of U-shaped cross-section is formed thereby, an external contacting wheel, the rim of which is adapted to seat in said groove of the internal contacting wheel and to compress therein strip material, means for guiding the strip material between said external and internal contacting wheels, shafts supporting each of said

wheels the axes of said shafts being offset one relative to the other and the diameter of one of said wheels being less than that of the other.

5. In calender apparatus, the combination of a wheel having a rim provided with an inner contact surface, a second wheel having a rim provided with an external contact surface, said second wheel having a diameter smaller than said first wheel and being positioned within the contacting surface of the rim of said first wheel, means to rotatably mount said wheels eccentrically of each other, an inlet guide for material passing into the area between said wheel rims, and an outlet guide for said material, said inlet and outlet guides lying in a plane angularly disposed to said contact surfaces.

6. In calender apparatus, the combination of a wheel having a rim provided with an inner contact surface, a second wheel having a rim provided with an external contact surface and rotatably positioned within the contact surface of said first wheel and closer to said surface at one side than at the other, means to rotate said wheels in fixed speed relation to each other, an inlet guide for material entry into the area between said wheel rims, and an outlet guide, said inlet and outlet guides lying in a plane angularly disposed to the plane including said contact surfaces.

7. In calender apparatus, the combination of a wheel having a rim provided with an inner contact surface, a second wheel provided with a rim having an external contact surface and rotatably mounted within the inner contact surface of said first wheel and closer to one side than to the other, means to rotate said wheels in fixed speed relation to each other, means to feed a continuous strip of material into the space between said surfaces, and means to remove said continuous strip from the space between said surfaces after said strip has been carried around between said surfaces.

8. In calender apparatus, the combination of a wheel having a rim provided with an inner contact surface, a second wheel having a rim provided with an external contact surface and rotatably mounted within the inner contact surface of said first wheel and closer to one side thereof than to the other, side flanges on one of said contact surfaces adapted to overlap the side edges of the other contact surface, means to feed a strip of continuous material into the space between said surfaces after said wheels have made substantially one revolution.

9. In calender apparatus, the combination of a wheel having a rim provided with an internal contact surface, a second wheel positioned adjacent said first wheel and provided with a rim adapted to contact with the rim of said first wheel, the rim of said second

mentioned wheel adapted to approach approximately in contact with the inner rim surface of said first mentioned wheel, guide means for guiding the coherent strip material intermediate said rims to be compressed thereby, and an outlet guide angularly disposed with reference to said inlet guide.

In testimony whereof, I affix my signature.

CARL P. BROCKWAY.

10

15

20

25

30

35

40

45

50

55

60

65