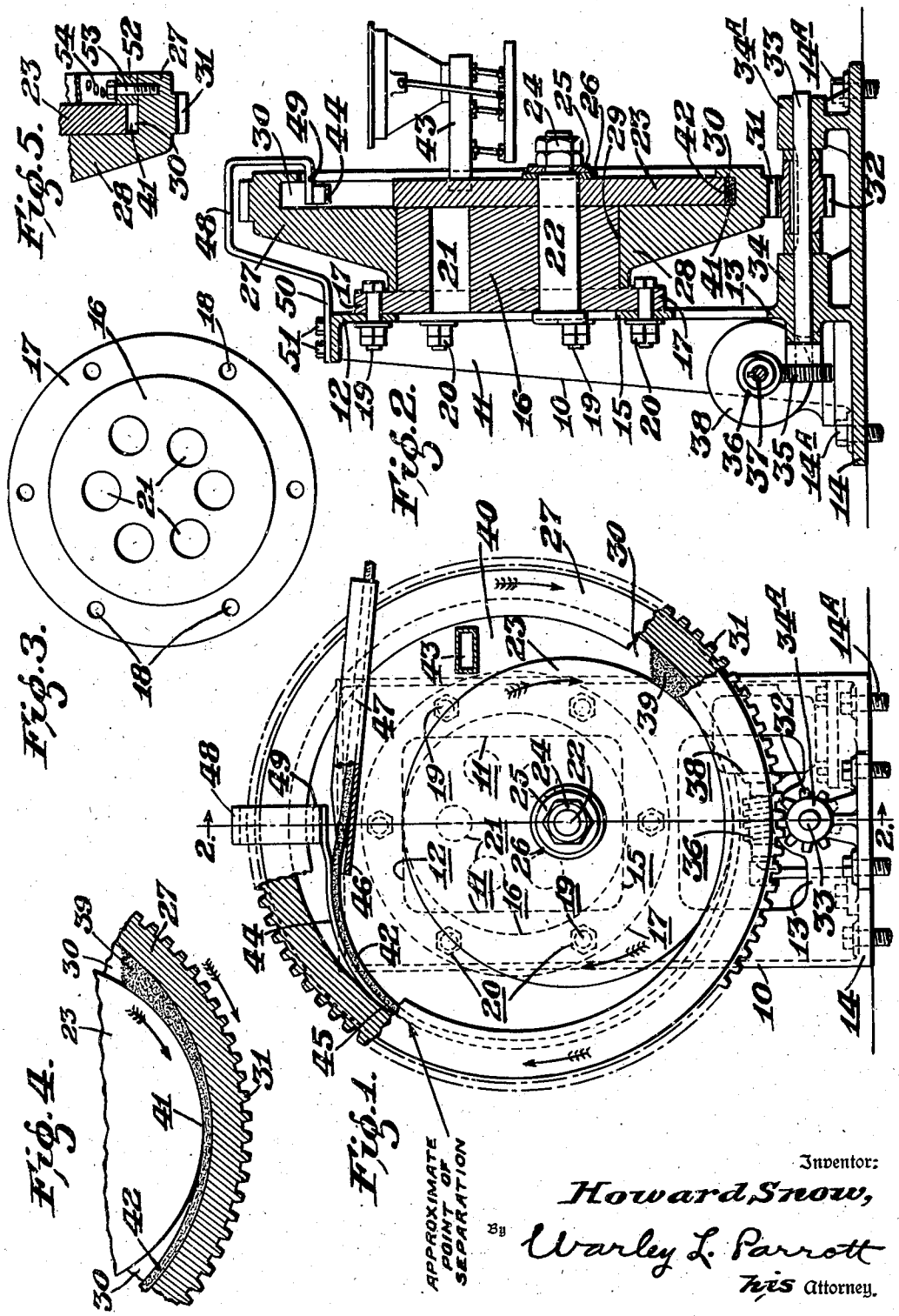
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MOLDING PRESS

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MOLDING PRESS

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This invention relates to the manufacture of fibrous composition products. It has to do more particularly with brake linings, but the manufactured material may be used for various other purposes, e. g., clutch facings, gasket sheeting, shim and washer stock, etc. Such products are usually made from a mixture of a fibrous filler or base constituent, such as asbestos and the like, with an organic binder, and the fibrous material being interfelted with the binding ingredient distributed therethrough and compressed therewith in the course of manufacture.

The present invention resides in a rotary press designed to improve the quality and at the same time increase the speed yet minimize the cost of manufacture of the above mentioned products.

A feature of this invention is an arrangement of small internal rolls that provide a markedly low angle of compression and apply a continuous, gradually increasing, pressure of great magnitude on the material, without disturbing the lay of the fibers whereby to attain an ideal interfelting of the same in the product.

Another feature is a means for varying the thickness of the compressed product. Provision is also made for varying the width of the product.

Still another feature is the adaptability of the press in a control of feed of the constituent material thereto in a way to vary the density of the product.

Without limitation thereto, the press of the present invention is primarily intended and adapted for the following particular uses:

1. Compressing fibrous masses into a strip or sheet.

2. Preforming, either cold or hot, fibrous masses into strips or sheets for subsequent calendering or pressing.

3. Calendering previously formed masses.

A practical adaptation of the invention is set forth in the following detailed description in connection with the construction and arrangement of a rotary press as illustrated in the accompanying drawing, in which:

Fig. 1 is a view in front elevation with portions broken away and in section to show certain interior features;

Fig. 2 is a section taken on or about the line 2—2 of Fig. 1;

Fig. 3 is a front face view of the hub member detached from the press;

Fig. 4 is a fragmentary view of cooperating portions of the outer ring member and the rotor in the region where the initial and final compression takes place on the material of which the product is made; and,

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Fig. 5 is a fragmentary sectional view illustrating a provision for varying the width of the product strip.

Referring now to the drawing in detail, the numeral 10 designates an upright supporting frame, comprising the vertical side members 11, top cross member 12, bottom cross member 13, with integral base footing 14, and an intermediate cross member 15. This frame may be either an integral casting or a built-up structure, as preferred.

The base footing 14 may be made heavy enough to keep the frame 10 from toppling over under the weight of the laterally offset parts of the press carried thereon as presently described, or said footing 14 may be fastened to a floor or other solid base by bolts or lag screws 14A as indicated in Figs. 1 and 2. So, too, the press structure now to be described may be mounted on any other stable support in lieu of the said frame 10.

The illustrated press structure comprises a hub member 16, the main body portion of which is cylindrical. The hub member 16 is provided at the rear thereof with an annular flange or collar 17. The part 17 is apertured in annular series as at 18 (see Fig. 3). These apertures are for the reception of bolts 19 that are inserted in registered apertures provided in the opposed portions of the frame 10. The bolts 19 thus located are fastened by jam nuts 20 (see Figs. 1 and 2).

The cylindrical body portion of the hub member 16 is provided with a plurality of bores 21, of the same number and angular position as the holes 18 in the portion 17 (see Fig. 3). In one of these bores a stub shaft 22, in the form of a headed axle pin, is inserted from the rear of the hub member (see Fig. 2). Mounted freely rotatable on this stub shaft 22 is a rotor 23 in the form of a flat, circular, disk having a plain, cylindrical, circumferential face.

As shown in Fig. 2, the rotor 23 directly abuts the flat outer face of the hub member 16 and it is held in place on the stub shaft 22 by jam nuts 24 applied on the reduced, screw-threaded, protruding end portion of the shaft, with washers 25, 26, interposed between the nuts and the adjacent outer face portion of the rotor.

In the illustrative structure, the bore of the rotor 23 is fitted rather tightly but freely rotatable on the stub shaft 22, but, advantageously,

a suitable anti-friction bearing (not shown) may be provided.

Inasmuch as the axis of the thus mounted rotor **23** is located radially away from the center of the hub member **16**, it rotates eccentrically with respect to the hub member and also to an outer ring member **27** rotatable concentrically on the same hub member, as will now be described.

The ring member **27** has a hub portion **28** provided with a smooth cylindrical bore that is fitted rotatably on the cylindrical body portion of the hub member **16** as at **29** (see Fig. 2). As with the stub shaft **22** and the rotor **23**, the fitting of the ring member hub portion **28** to rotate on the hub member **16** may be either solely by accurate surfacing of the fitted parts or by the obvious provision of an antifriction bearing between the parts (not shown).

An internal, annular channel **30**, of rectangular cross section, is formed in the ring member **27**. The lower peripheral portion of the rotor **23** travels within the adjacent lower portion of this channel but spaced from the bottom thereof. The minimum space between the opposed peripheral faces of the rotor and the channel governs the ultimate compression and thickness of the product. The width of the channel is but slightly greater than the thickness of the rotor so that the opposed cooperative face portions of the rotor and side wall faces of the channel are close to each other and they function as a continuous positive mold. The width of the channel determines the width of the product.

An annular series of gear teeth **31** are either formed directly or otherwise provided on the circumference of the ring member **27**. These teeth mesh with the teeth of a driving pinion **32** which is secured on a power shaft **33**. This shaft, as shown, is journalled in a bearing portion **34** of the bottom cross member **13** of the frame **10** and an outer bearing **34A** on an extension of the footing **14**. The shaft is provided at its inner end with a worm wheel **35**. The worm wheel **35** is driven by a worm-screw **36** fixed on the armature shaft **37** of an electric motor **38** that is mounted on the footing **14**. Other conventional means for rotating the ring member **27** at a comparatively slow speed may be substituted for that shown. An ideal speed of ring rotation for the purposes of the present invention is 3 R. P. M., with a rotor diameter of approximately three feet.

In the operation of the press the outer ring member **27** is rotated under power as above described. The rotor **23** is rotated in the same direction and at the same peripheral speed by the interposition of the constituent material of which the product is made. If the rotation of the ring member **27** and rotor **23** is clockwise, when viewing the press from the front as in Fig. 1, the constituent material, designated by the numeral **39**, is fed into the upper space **40** at the right, between the rotor and ring member, whence it falls into the downwardly tapering space below.

The extent of compression and resultant density of the product is governed by the proportionate quantity of the constituent material fed into the space between the rotor **23** and outer ring member **27**. Under usual operating conditions, the loose material will be supplied in an amount just sufficient to fill the lower tapered space up to a level that is approximately at an angle of 45° from the axis of the rotor **23**. Variations

from this angle, up and down, vary the density of the product, as described.

The minimum compression space, yet maximum pressure attained, is directly vertical below the axis of the rotor **23**, as designated at **41** (see Fig. 4). This governs the thickness of the product, designated at **42**. The space **41** may be varied as will be later described.

The ring member **27** being in motion and rotating clockwise as above stated, and also by the wedging effect of the interposed material **39** in the tapered space between the rotor **23** and ring member **27**, the rotor is thereby caused to rotate also in the clockwise direction. As the ring member and rotor thus rotate, the interposed material is carried with said elements, so that a comparatively slow yet continuous flow of the material is caused, with a correspondingly slow and gradually increasing pressure without eddy currents or back flow. This is advantageously effective in gradually compacting the material from its original loose bulk, as fed into the press, to its ultimately compressed product thickness, without lamination but with an ideal interfelting of the material.

By the relative diameters of the ring channel bottom and the perimeter of the rotor the speed of travel of said portions is substantially the same. Hence, the material is carried therebetween with varying radial pressure but uniform longitudinal travel of the mass. This continues from the time of its loose bulk condition as the material initially enters the upper compression space between the rotor and outer ring member until it emerges from between the narrowest space of final compression **41** as a finished product. Thus, there is no excess lengthwise displacement by pull or push of the material adjacent either the rotor or outer ring channel. Hence, the original fiber distribution in the mass remains undisturbed except as to compression radially with respect to the axis of the rotor **23**, and this is gradual. The result of this so controlled action is that lamination or separate layer formation in the finished product is avoided. Therefore, in the resultant product there is an ideal interlocking and felting of the fibers in the product as well as a thorough compacting of the commingled binding ingredient therewith.

The loose bulk material **39** may be fed continuously into the press through a suitable standard vibrating hopper feeder of the choke feeder type, as indicated conventionally at **43** (see Figs. 1 and 2), capable of maintaining a definite level of the loose material in the receiving space. By adjustment of such a device the level of the material fed into the press may be raised to increase or lowered to decrease density of the product. So, too, the flow into the press may be further regulated by any conventional means (not shown) but preferably a suitable mixing device that makes the mass of mixed constituent ingredients loose and fluffy, from which device the fluffed material is supplied to the aforesaid feeder **43**. The proportionate supply of the material will be governed according to the speed of rotation of the outer ring member **27** and the rotor **23**.

Any suitable means for stripping and removing the product may be provided for the purpose. As shown (see Figs. 1 and 2) the stripper comprises a blade **44**, which may be more or less resilient and curved so that its sharpened end **45** engages the bottom of the ring channel **30** and thereby shaves the adhering product from the

channel bottom. The curvature of the blade 44 is also such that it cooperates with the inner end portion 46 of a downwardly inclined discharge chute 47 so as to bend and deliver the product without creating undue stresses thereon or otherwise detracting from its tensile strength.

As shown, the stripper blade 44 is mounted on a rebent bracket 48, one end portion 49 of which is projected into the larger open space between the outer ring member 27 and the rotor 23 and thus carries said blade. The opposite angular end portion 50 of the bracket 48 is bolted or otherwise suitably secured to the top cross member 12 of the supporting frame 10, as at 51.

The inner end of the discharge chute 47, of course, is located within the said upper space of the press to cooperate with the stripper blade 44 so as to receive the product as it is shaved and lifted from the channel 30. The chute 47 is turned out of the space in the press so as to deliver the detached product into some suitable receiving receptacle, reel or utility (not shown).

As before stated, the minimum compression space and maximum pressure is attained directly in a vertical line intersecting and below the axis of the rotor 23, as at 41. To adjust the rotor vertically so as to vary the space 41, the rotor 23 and the outer ring member 27 are removed from the hub member 16. The axle pin or stub shaft 22 is then removed from the bore 21 of the hub member and inserted in one of the other bores 21 that is either closer to or farther from the center of the hub, as the case may be, depending upon the desired thickness in which the strip of product 42 is to be made.

After the change in location of the axle pin or stub shaft 22, the jam nuts 20 are removed from the bolts 19, and the hub member 16 then detached from the supporting frame 10 and rotated to bring the replaced axle pin or stub shaft 22 vertically below the axis of the hub member. Thus set, the hub member is again attached to the frame 10.

In the manufacture of plastic molded lining stock and the like, six adjustments for thickness will usually suffice. Hence, such provision is made in the press illustrated, i. e., six of the bores 21 are provided in the hub member 16 at different distances radially from the center of the hub and in a hexagonal arrangement. Accordingly, a hexagonal arrangement of holes 18 is provided in the annular flange or collar portion 17 of the hub member 16 and a like arrangement of holes in the supporting frame 10 for the reception of the securing bolts 19. By the foregoing provision, the adjustment of the hub member 16, conformably to the desired adjustment of the axle pin or stub shaft 22, is easily and accurately effected. If a greater range of adjustments is desirable for further variation in thickness of product, a corresponding increase in the number of bores 21 may be provided in the hub member 16 and a proportionate balanced number and arrangement of the bolt holes 18 in the hub flange or collar 17 and also as to the holes in the supporting frame 10.

Any suitable provision may be made for producing product strips 42 of different widths. As an example thereof (see Fig. 5) the outer wall of the channel 30 may comprise a laterally adjustable ring 52 inserted in the outer ring member 27 and fastened in place by bolts 53. The bolts are secured in alternate ones of an annular series of staggered holes 54 in the ring 52 that are registrable with a straight annular series of

holes in the outer ring member 27. In this way the ring 52 may be unfastened and rotated within the outer ring member 27 and moved laterally inward or outward until the proper bolt holes are brought into registration for the reception of the bolts 53, so as to again fasten the ring 52 in place for a different width of the channel 30. With this provision for adjustment of the ring 52 to vary the width of the channel 30 a number of interchangeable rotors 23 of correspondingly different thicknesses are, of course, provided.

Instead of using the ring 52 and bolts 53, any other conventional provision suitable for adjusting the outer side wall of the ring channel inward and outward may be incorporated in the ring structure.

If a wire mesh or other fabric backing is desired for a brake lining or other product of the press, a strip of the backing material may be fed into the press with the hereinbefore described constituent material, either between the said material and the peripheral face of the rotor or between the material and the bottom of outer ring channel. This may be accomplished by hand of an operator or by some suitable mechanical means, not shown.

While the location of the eccentric axis of the rotor 23 directly vertical below the axis of the hub member 16 in the construction and arrangement of press illustrated is practical for most purposes of the present inventive idea, the angularity may be changed to either side of the vertical plane. So, too, other changes and modifications in the general structure are contemplated within the scope of the appended claims. The invention, therefore, is not limited to the construction and arrangement shown.

The press of the present invention is not only adapted for the compressing and preforming of strips or sheets from the constituent loose bulk material, as hereinbefore described, but it is just as advantageously usable for re-pressing and calendering preformed strips or sheets.

This is conveniently accomplished by feeding the strips or sheets edgewise into the tapered space between the inner rotor 23 and outer ring member 27, either by hand of the operator or by some suitable mechanical feeder means. By the provision and arrangement of the internal rotor and outer ring element of relatively small diameter in the press of the present invention highly satisfactory calendering is attained equivalent to or better than that accomplished on machines having many times larger diameter, external rolls.

What is claimed is:

1. A press of the character described, comprising a hub member supportedly secured for rotative adjustment about a horizontal axis, said member having a plurality of parallel horizontal bores the axes of which are at different radial distances from the axis of said member, a stub shaft removably mountable in any one of said bores, a rotor detachably mountable rotatably on said stub shaft in abutting relation to the end face of said hub member, the circumferential face of said rotor being cylindrical, and an outer ring member revolvably mounted concentrically on said hub member and having an internal annular channel of rectangular cross section surrounding said rotor and in which the peripheral portion of the rotor travels in its rotation and is circumferentially spaced from the channel bottom.

2. In a press of the character described, a rigidly supported hub member, an outer ring member revolvably mounted concentrically on said

hub member, said ring member having an internal annular channel, a rotor adjustably mounted on said hub member to rotate eccentrically with respect to said ring member, said rotor being of lesser diameter than said ring member channel and with its peripheral portion traveling in its rotation within the channel but spaced circumferentially from the channel bottom, and means for adjusting the axial position of said rotor to vary said space between it and the channel bottom.

3. In a press of the character described, a rigidly supported hub member, an outer ring member revolvably mounted concentrically on said hub member, said ring member having an internal annular channel, a rotor mounted freely on said hub member for rotation eccentrically with respect to said ring member, said rotor being cylindrical and of lesser diameter than said ring member channel and with its peripheral portion traveling in its rotation within said channel but spaced circumferentially from the channel bottom, power means for revolving said outer ring member, and means for feeding a proportionately measured quantity of moldable material continuously into the press in an upper space between the rotor and ring member channel whereby to enter the convergent space below.

4. A press of the character described, comprising a revolvable outer ring member having an internal annular mold channel, a correlated rotor or lesser diameter rotatable within said ring member and eccentrically mounted with respect to the axis of the latter, and a rigidly supported hub member, the outer ring member and the correlated rotor each being separately mounted for rotation on said hub member, and the peripheral portion of said rotor traveling in its rotation within the ring member mold channel but spaced circumferentially from the channel bottom, and adjustable means for mounting the rotor so that the position of its axis of rotation may be varied and thereby vary the circumferential spacing of the rotor and the bottom of the ring member channel.

5. A press of the character described, comprising a power-driven revolvable outer ring member having an internal annular mold channel, a correlated rotor of lesser diameter freely rotatable within said ring member and eccentrically

mounted with respect to the axis of the latter, and a rigidly supported hub member, the outer ring member and the correlated rotor each being separately mounted for rotation on said hub member and the peripheral portion of said rotor traveling in its rotation within the ring member mold channel but spaced circumferentially from the channel bottom, and adjustable means for mounting the rotor so that the position of its axis of rotation may be varied and thereby vary the circumferential spacing of the rotor and the bottom of the ring member channel, the rotor being rotated by frictional engagement with interposed material under compression.

6. A press of the character described comprising a rigidly supported hub member, opposed spaced apart male and female internal roller surfaces rotatable in the same direction about mountings on said hub member, the axes of rotation of said surfaces being relatively eccentric whereby the restricted space between the surfaces is convergent to a desired minimum dimension, one of said roller surfaces being power-driven and the other driven by friction of material compressed between them, and means for radially adjusting one of said roller surfaces to vary said restricted space.

7. A press of the character described, comprising a revolvable outer ring member having an internal annular mold channel, a side wall of which is adjustable laterally for varying the working width of the channel, a correlated interchangeable rotor, of lesser diameter than the ring member channel, mounted rotatably within said ring member and eccentrically with respect to the axis of the latter, and a rigidly supported hub member, the outer ring member and the correlated rotor each being separately mounted for rotation on said hub member and the peripheral portion of said rotor traveling in its rotation within the ring member mold channel but spaced circumferentially from the channel bottom, and means for mounting the rotor so that the position of its axis of rotation may be fixed at various positions and thereby vary and positively set the circumferential spacing of the rotor from the bottom of the ring member channel.

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