

April 6, 1965

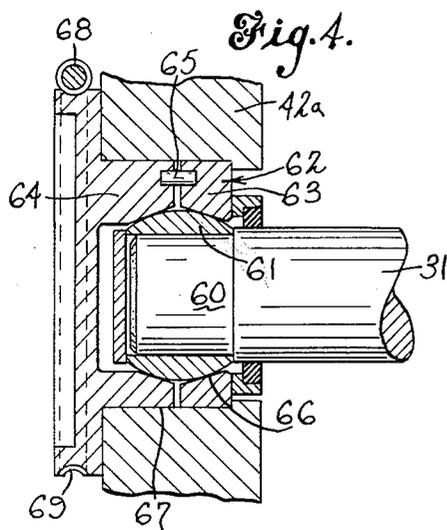
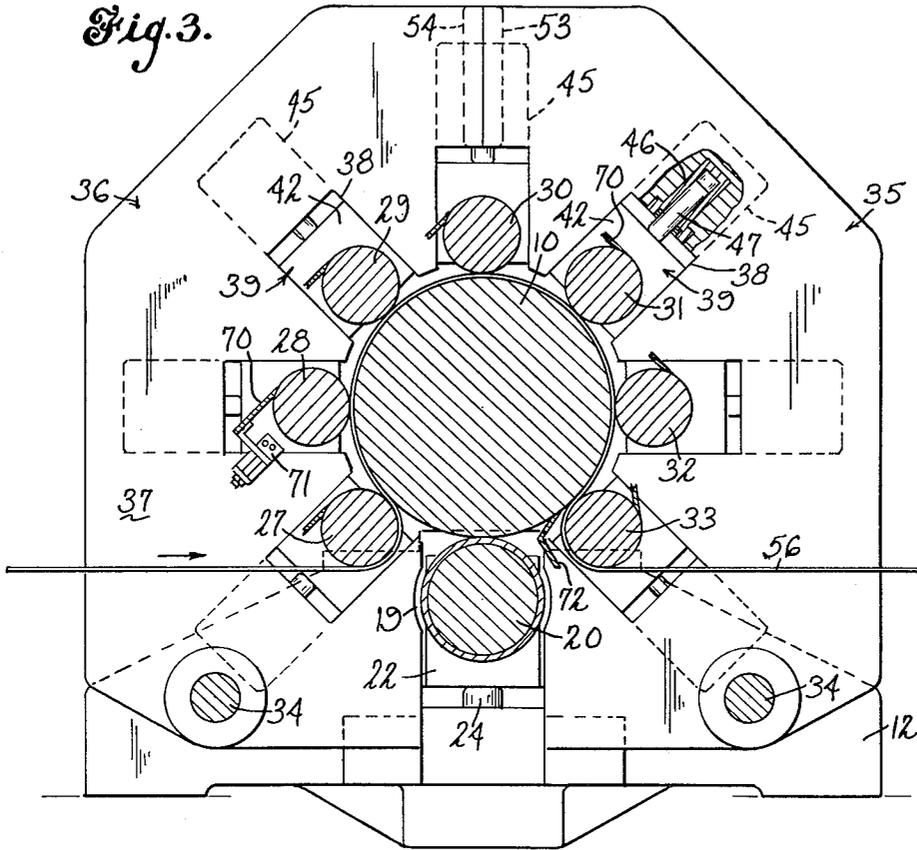
C. J. KLARA ETAL

3,176,608

CALENDER

Filed July 24, 1963

2 Sheets-Sheet 2



INVENTORS

Charles J. Klara
Warren C. Whittum

BY

Rockwell and De Leo
ATTORNEYS

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3,176,608
CALENDER

Charles J. Klara, Seymour, and Warren C. Whittum,
Orange, Conn., assignors to Farrel Corporation,
Ansonia, Conn.

Filed July 24, 1963, Ser. No. 297,274
14 Claims. (Cl. 100-163)

This invention relates to calendering apparatus and more particularly relates to calendering apparatus adapted to process paper.

In conventional paper calenders the rolls thereof are vertically arranged one above the other, and the paper is introduced through rolls at the top of the calender, guided downward between successive rolls and finally issues from the calender at the bottom thereof. Dependent on the grade of paper and calender action desired, the paper may be passed through a selected number of rolls, bypassing such other rolls as may be in the calender at the time. This vertical arrangement of rolls produces an inherent increase of pressure between successive roll nips as the paper approaches the bottom of the calender. There are practical limits to the unit linear pressure which a particular grade of paper can withstand in calendering without injurious effects, or without changing the desired calendering effect for the particular type of paper.

This arrangement of rolls wherein most of the weight of the upper rolls is supported by a large bottom roll is susceptible to vibrations, particularly at higher speeds. These vibrations may often be encountered in operation and will produce markings in the paper being calendered which may be objectionable in subsequent printing operations utilizing the paper. In avoiding this tendency towards vibration found in calenders having vertically arranged rolls, the present invention provides a calender comprising a plurality of presser rolls surrounding a larger central roll, each of the presser rolls being urged against the central roll at a suitable pressure for a desired calendering operation. With this arrangement the presser rolls are not subjected to the weight of each other and more control of the pressure exerted on the paper during rolling thereof is achieved. While this type of calendering machine has been broadly disclosed in the prior art as exemplified by U.S. Patent No. 639,974 dated December 26, 1899, and U.S. Patent No. 222,081 dated November 25, 1879, such calenders have heretofore not been known to achieve commercial acceptance.

The present invention provides a new and improved calender of the type described having means for varying not only the pressure exerted by each of the smaller rolls on the central roll but also varying the effective crown therebetween. The present invention further provides means for preventing deflection of the central roller due to its own weight or the pressure exerted thereon by the smaller rollers, and further provides a calender of the type described of simplified construction which facilitates initial threading of material therethrough, removal, and change of the smaller rollers.

Accordingly, an object of this invention is to provide a new and improved calender of the type described.

Another object of this invention is to provide a new and improved calender of the type described having facility for adjustment of the pressure between each of the presser rolls and the central roll and also means for varying the effective crown on the presser rolls.

A further object of this invention is to provide a new and improved calender of the type described of simplified and economical construction which facilitates initial threading of material through the calender, and replacement of the presser rolls.

The novel features of the invention are pointed out with particularity and distinctly claimed in the concluding

portion of this specification. The invention, however, both as to its organization and operation, together with further objects and advantages thereof may best be appreciated through reference to the following description taken in conjunction with the drawings wherein;

FIG. 1 is a side elevation of a calender embodying the invention and further illustrates in dashed line the manner in which the frame may be opened to facilitate access to the interior thereof;

FIG. 2 is a sectional view taken along line 2-2 of FIG. 1;

FIG. 3 is a sectional view seen along line 3-3 of FIG. 2; and

FIG. 4 is a detail in section of a means for supporting a presser roller and further shows means for crossing the axis of the presser roller with respect to the central roll.

The invention in a preferred form comprises a calender having a main or central roll 10 rotatably supported at opposite ends thereof by first frame members 11 and 12. Frame members 11 and 12 act as pedestals and carry on bridging portions 13 thereof journal boxes 14 which through bearing means 15 therein rotatably support neck portions 16 of roll 10 at either end thereof. Coupling means 17 are provided to connect roll 10 to a drive shaft 18 and suitable roll drive means, not shown. Each of frame members 11 and 12 further define openings 19 therein. As more clearly shown in FIG. 3 openings 19 receive therethrough means for supporting backup roll 20 at the journals or necks thereof. The journals 21 of roll 20 are received in journal boxes 22 at either end thereof and rotatably mounted therein by means of bearing means 23. Journal boxes 22 are supported on the pistons 24 of hydraulic cylinders 25 which by exerting pressure on journal boxes 22 control the pressure exerted on roll 10 by back-up roll 20. Hydraulic conduit and control means, not shown, are provided to control the force exerted by pistons 24 on the journal boxes 22. The purpose of roll 20 is to back-up roll 10 and prevent deflection thereof, either due to the weight of roll 10 or pressure exerted thereon by the presser rolls, hereinafter described. For these purposes the axis of roll 20 is arranged to be in a common vertical plane with the axis of roll 10.

A plurality of smaller presser rollers 27-33 are arranged about the periphery of central roll 10 with their axes normally parallel to the axis of roll 10 and on a radius therefrom. The presser rolls 27-33 are arranged to selectively cooperate with roll 10 in calendering operations.

Pivotaly mounted to frame members 11 and 12 by means of shafts 34 carried between frame members 11 and 12 at either end thereof are housing members or second frame members 35 and 36. In accordance with one aspect of the invention the presser rolls are carried in housing members 35 and 36 and the housing members 35 and 36 are made pivotal on the frame members to facilitate placement of the presser rolls therein so that when the housing members are closed, as shown in full line in FIG. 1, the presser rolls are in the proper relationship to central roll 10 and may be further adjusted in relation thereto. Each of the housing members 35 and 36 comprise spaced apart wall members 37, FIG. 2, which support the presser rolls 27-33 therebetween. The wall members 37 define pedestal openings 38 therein radially disposed about the axis of roll 10. Each of pedestal openings 38 receive therein a journal box 39 which rotatably supports one end of one of the presser rolls. A neck or journal 40 of the presser rolls is received in bearing means 41 which is in turn received in journal box 39 which comprises a bearing support member 42 and a cover member 43 having flanges 44 thereon which overlap the outside surfaces of wall members 37 and thus

laterally position the presser rolls. Disposed behind each of the pedestal openings 38 in the wall members 37 is a pocket 45 which receives therein a hydraulically operated cylinder 46 having a piston 47 therein (FIG. 3), arranged to exert a force on a journal box 39 and through the bearing means 41 urge the presser rolls toward the central roll.

Each of the presser rolls is provided with means to lift that presser roll and hold it out of operative relationship with the central roll 10. As illustrated on each of the cover members 43 is a ledge 43 which receives a bolt 49 therethrough. Bolt 49 extends through a further ledge 50 on the frame member and receives a nut 52 thereon. Thus by adjusting nut 52 on bolt 49 the ends, or rather the journal boxes of the presser rolls may be moved radially from the axis of roll 10 and thus hold the presser rolls therewith away from the central roll. While this lifting arrangement is shown as associated with only three of the presser rolls (FIG. 1) it will be understood that suitable lifting means are provided for all of the presser rolls.

Frame members or housing members 35 and 36 are provided with flanges 53 and 54 at the upper portions thereof which provides means for retaining the housing members 35 and 36 in a predetermined relationship for operation of the calendering device. When the flanges 53 and 54 are joined and secured to each other the presser rolls 27-33 are positioned in operative relationship to central roll 10.

By pivotally mounting the housing members 35 and 36 carrying presser rolls 27-33 it is possible to open the housing to facilitate threading of material 56 to be calendered about central roll 10 and then close frame members 36 and 37 and secure them together to position presser rolls 27-33 in operative relationship to central roll 10.

As shown in FIG. 3 the pass-line in for material 56 to be calendered extends to and about presser roll 27 adjacent support roll 20 on one side thereof and continues about central roll 10 continuously on the periphery thereof, substantially more than 180°. The material 56 is taken from the periphery of central roll 10 at presser roll 33 adjacent support roll 20 on the opposite side thereof with respect to presser roll 27.

With the construction disclosed it may be seen that various ones of the presser rolls 27-33 may be utilized in conjunction with central roll 10 and the pressure between any one of the presser rolls and the central roll may be varied by provision of the hydraulic cylinders 45. Also various ones of the presser rolls may be removed from operative relationship with central roll 10. With this arrangement, it will now be apparent that the weight of and pressure exerted by one of the presser rolls has no effect on the other presser rolls.

In accordance with the invention, means are also provided for controlling and varying an effective crown on the presser rolls. While various means may be provided to control the effective crown of the presser rolls, a technique of crossing the axes of the presser rolls is shown for purposes of disclosure. As shown in FIG. 4 a presser roll, indicated as presser roll 31, has a journal or neck 60 mounted in a bearing member 61 which is in turn received in a bearing support member 62 carried in a bearing mounting member 42a which in turn is supported in a housing member such as 35 or 36, but not shown in FIG. 4. Bearing support member 62 is made in two sections 63 and 64 for ease of assembly about bearing 61. When the members 63 and 64 are assembled about bearing 61 they may be aligned by means of pins 65 extending between aligned pin receiving apertures in the members 63 and 64. Bearing support member 62 defines a bearing seat 66 therethrough receiving the outer periphery of bearing 61. The annular bearing seat 66 is eccentric with respect to the cylindrical outer peripheral surface 67 of bearing support member 62. This construction is provided at each end of presser roll 31. Therefore

when the bearing support members 62 are rotated in box member 42a the ends of presser roll 31 will be displaced equal and opposite distances with respect to the center thereof and the axis of presser roll 31 will be "crossed" with respect to the axis of roll 10 to provide an effective crown on presser roll 31. Means are provided for rotating bearing support member 62 comprising a worm 68 mounted to a frame member 35 or 36 and supported thereon in driving engagement with a worm gear 69 defined about the periphery of bearing support member portion 64. In practice a cross axis adjusting means illustrated as 68 and worm gear 69 may be provided at each end of each presser roll or such means may be provided at one end of the roll with connecting means extending through the frame members to the outer end of the presser roll, so that upon adjustment of means such as worm 68 to move one end of presser roll the opposite end of the presser roll is moved an equal amount, but in an opposite direction.

Doctor blades 70 are provided adjacent each presser roll supported by brackets 71 on the housing members, and a doctor blade 72 is provided adjacent central roll 10 for cleaning the roll.

The disclosed calendering apparatus provides a calendering machine of simplified construction which allows adjustment of the pressure between each presser roll and the central roll without effecting the pressure between other presser rolls and the central roll. Moreover, the illustrated construction may easily be opened to allow and facilitate threading of material such as paper about central roll 10 and also facilitate removal and/or replacement of a presser roll. Additionally, the invention provides means for varying the effective crown on the presser rolls by allowing adjustment of the presser rolls to cross the axes thereof with respect to the central roll.

While the invention has been disclosed in a preferred embodiment thereof it will be understood that other embodiments thereof as well as modifications to the disclosed embodiment invention may occur to those skilled in the art. Accordingly it is intended to cover in the appended claims all embodiments of the invention as well as modifications to the disclosed embodiment of the invention which do not depart from the spirit and scope of the invention.

What is claimed is:

1. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll and means for urging said support roll against said main roll to prevent deflection of said main roll, housing means carried on said frame means, a plurality of presser rolls rotatably carried by said housing means and arranged therein about said main roll in operative relation thereto, means for urging each of said presser rolls radially toward the axis of said main roll and means for holding each of said presser rolls out of operative relation with said main roll, said rolls being arranged such that material to be calendered is introduced onto said main roll at a presser roll adjacent said support roll and taken from said main roll by a presser roll adjacent said support roll after traversing in continuous contact a major portion of the periphery of said main roll, said housing means being formed in two portions each pivotally mounted to said frame means on either side of said main roll so that said housing member portions with presser rolls therein may be moved from said main roll to allow access thereto and to said presser rolls, and means on said housing members for crossing the axis of each of said presser rolls with respect to said main roll to provide an effective crown on said presser rolls.

2. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll and means urging said support roll against said main roll to prevent deflection of said main roll, housing means carried on said frame

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means, a plurality of presser rolls rotatably carried by said housing means and arranged therein about said main roll in operative relation thereto, means for urging each of said presser rolls radially toward the axis of said main roll, and means for holding each of said presser rolls out of operative relation with said main roll, said rolls being arranged such that material to be calendered is introduced onto said main roll at a presser roll adjacent said support roll and taken from said main roll by a presser roll adjacent said support roll after traversing in continuous contact a major portion of the periphery of said main roll, said housing means being formed in two portions each pivotally mounted to said frame means so that said portions and said presser rolls therein may be moved from said main roll to allow access thereto and to said presser rolls.

3. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll and means for urging said support roll against said main roll to prevent deflection of said main roll, housing means carried on said frame means, a plurality of presser rolls rotatably carried by said housing means and arranged therein about said main roll in operative relation thereto, means for urging each of said presser rolls radially toward the axis of said main roll and means for holding each of said presser rolls out of operative relation with said main roll, said rolls being arranged such that material to be calendered is introduced onto said main roll at a presser roll adjacent said support roll and taken from said main roll by a presser roll adjacent said support roll after traversing in continuous contact a major portion of the periphery of said main roll, said housing means being formed in two portions each pivotally mounted to said frame means on either side of said main roll so that said housing member portions with presser rolls therein may be moved from said main roll to allow access thereto and to said presser rolls, and means varying the crown on said presser rolls.

4. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll and means urging said support roll against said main roll to prevent deflection of said main roll, housing means carried on said frame means, a plurality of presser rolls rotatably carried by said housing means and arranged therein about said main roll in operative relation thereto, and means for urging each of said presser rolls radially toward the axis of said main roll, said rolls being arranged such that material to be calendered is introduced onto said main roll at a presser roll adjacent said support roll and taken from said main roll by a presser roll adjacent said support roll after traversing in continuous contact a major portion of the periphery of said main roll, said housing means being formed in two portions each pivotally mounted to said frame means so that said portions and said presser rolls therein may be moved from said main roll to allow access thereto and to said presser rolls.

5. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll, means urging said support roll against said main roll to inhibit deflection of said main roll, a plurality of presser rolls spaced apart around said main roll and in operative relation thereto, housing means rotatably carrying said presser rolls, and means urging each of said presser rolls radially toward the axis of said main roll, said housing means being formed in two portions each pivotally mounted to swing away from one another and from the main roll to allow access to the rolls.

6. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll, means urging said support roll against said main roll to inhibit deflection of said main roll, a plurality of presser rolls spaced apart around

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said main roll and in operative relation thereto, housing means rotatably carrying said presser rolls, means urging each of said presser rolls radially toward the axis of said main roll, said housing means being formed in two portions each pivotally mounted to swing away from one another and from the main roll to allow access to the rolls, and means for removing at least certain of said presser rolls from operative relation with said main roll and holding the last-mentioned presser rolls in nonoperative position.

7. A paper calender comprising frame means rotatably supporting a main calender roll, a support roll rotatably mounted below said main roll, means urging said support roll against said main roll to inhibit deflection of said main roll, a plurality of presser rolls spaced apart around said main roll and in operative relation thereto, housing means rotatably carrying said presser rolls, means urging each of said presser rolls radially toward the axis of said main roll, said housing means being formed in two portions each pivotally mounted to swing away from one another and from the main roll to allow access to the rolls, means for removing at least certain of said presser rolls from operative relation with said main roll and holding the last-mentioned presser rolls in nonoperative position, and means for varying the effective crown on at least certain of said presser rolls.

8. A paper calender comprising frame means rotatably supporting a main calender roll, a plurality of presser rolls spaced apart around the circumference of the main roll on a plurality of angularly spaced radii from the axis of the last-mentioned roll, each of said presser rolls arranged to define a nip with said main roll, housing means formed in two portions each pivotally mounted on said frame to swing away from one another and each rotatably carrying a plurality of said presser rolls, means for urging each of said presser rolls radially toward the axis of said main roll, and means for varying the effective crown of at least certain of said presser rolls.

9. A paper calender comprising frame means rotatably supporting a main calender roll, a plurality of presser rolls spaced apart around the circumference of the main roll on a plurality of angularly spaced radii from the axis of the last-mentioned roll, each of said presser rolls arranged to define a nip with said main roll, housing means rotatably carrying said presser rolls, means for urging each of said presser rolls radially toward the axis of said main roll, and means for varying the effective crown of at least certain of said presser rolls, said housing means being formed in two portions each rotatably carrying a plurality of said presser rolls and each pivotally mounted to swing away from one another and from the main roll to allow access to the rolls.

10. A calender comprising frame means rotatably supporting a central main roll, housing means carried on said frame means, said housing means being formed in two portions each pivotally mounted on said frame means so that said housing portions may each be swung away from said main roll in opposite directions therefrom, a plurality of presser rolls rotatably carried by each of said housing portions and arranged in spaced relation about the periphery of said main roll in operative relation thereto so that material to be calendered passes between said presser rolls and said main roll while traversing in continuous contact a major portion of the periphery of said main roll each of said presser rolls being arranged to form a nip with said main roll, and means for urging each of said presser rolls radially toward said main roll.

11. A calender comprising frame means rotatably supporting a central main roll, housing means carried on said frame means, said housing means being formed in two portions each pivotally mounted on said frame means so that said housing portions may each be swung away from said main roll in opposite directions therefrom, said frame means and said housing portions when closed surrounding said main roll at the ends thereof, a plurality of

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presser rolls rotatably carried by each of said housing portions and arranged in spaced relation about the periphery of said main roll in operative relation thereto so that material to be calendered passes between said presser rolls and said main roll while traversing in continuous contact a major portion of the periphery of said main roll, each of said presser rolls being arranged to form a nip with said main roll, and means for urging each of said presser rolls radially toward said main roll.

12. A calender comprising frame means rotatably supporting a main roll, housing means carried on said frame means, said housing means being formed in two portions each pivotally mounted on said frame means so that said housing portions may each be swung away from said main roll in opposite directions therefrom, a plurality of presser rolls rotatably carried by each of said housing portions and arranged in spaced relation about the periphery of said main roll in operative relation thereto so that material to be calendered passes between said presser rolls and said main roll while traversing in continuous contact a major portion of the periphery of said main roll, and means for urging each of said presser rolls radially toward the axis of said main roll.

13. A calender comprising frame means rotatably supporting a main roll, housing means carried on said frame means, said housing means being formed in two portions each pivotally mounted on said frame means so that said housing portions may each be swung away from said main roll in opposite directions therefrom, a plurality of presser rolls rotatably carried by each of said housing portions and arranged in spaced relation about the periphery of said main roll in operative relation thereto so that material to be calendered passes between said presser rolls and said main roll while traversing in continuous contact a major portion of the periphery of said main roll, and means carried by said housing portions for withdrawing each presser roll from operative relation with said main roll.

14. A calender comprising frame means rotatably sup-

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porting a main calender roll, housing means carried on said frame means, said housing means being formed in two portions each pivotally mounted to said frame means so that said portions may be swung away from said main roll to allow access thereto, a plurality of presser rolls rotatably carried by each of said housing portions and arranged therein in spaced relationship about the periphery of said main roll and in operative relation thereto, means for urging each of said presser rolls radially toward the axis of said main roll, and means for withdrawing each of said presser rolls from said main roll, said rolls being arranged such that the material to be calendered is introduced on to said main roll and traverses in continuous contact a major portion of the periphery of said main roll between said presser rolls and said main roll.

References Cited by the Examiner

UNITED STATES PATENTS

	86,058	1/69	Christy	100—162
	222,081	11/79	Schlatter et al.	100—162
	555,385	2/96	Linton	100—162
	639,974	12/99	Harley et al.	100—162
	699,753	5/02	Godfrey	100—162 X
	1,215,613	2/17	Brown	100—89
	1,405,211	1/22	Haug	100—162 X
	2,404,946	7/46	Clem	100—168 X
	2,825,217	3/58	Byrd	68—256
	2,850,952	9/58	Hornbostel	100—163
	2,970,339	2/61	Hausman	18—2
	2,985,100	5/61	Hornbostel	100—163
	3,044,440	7/62	Molsberry et al.	

FOREIGN PATENTS

	638,290	6/50	Great Britain.
	747,347	4/56	Great Britain.

WALTER A. SCHEEL, *Primary Examiner.*

LOUIS O. MAASSEL, *Examiner.*