

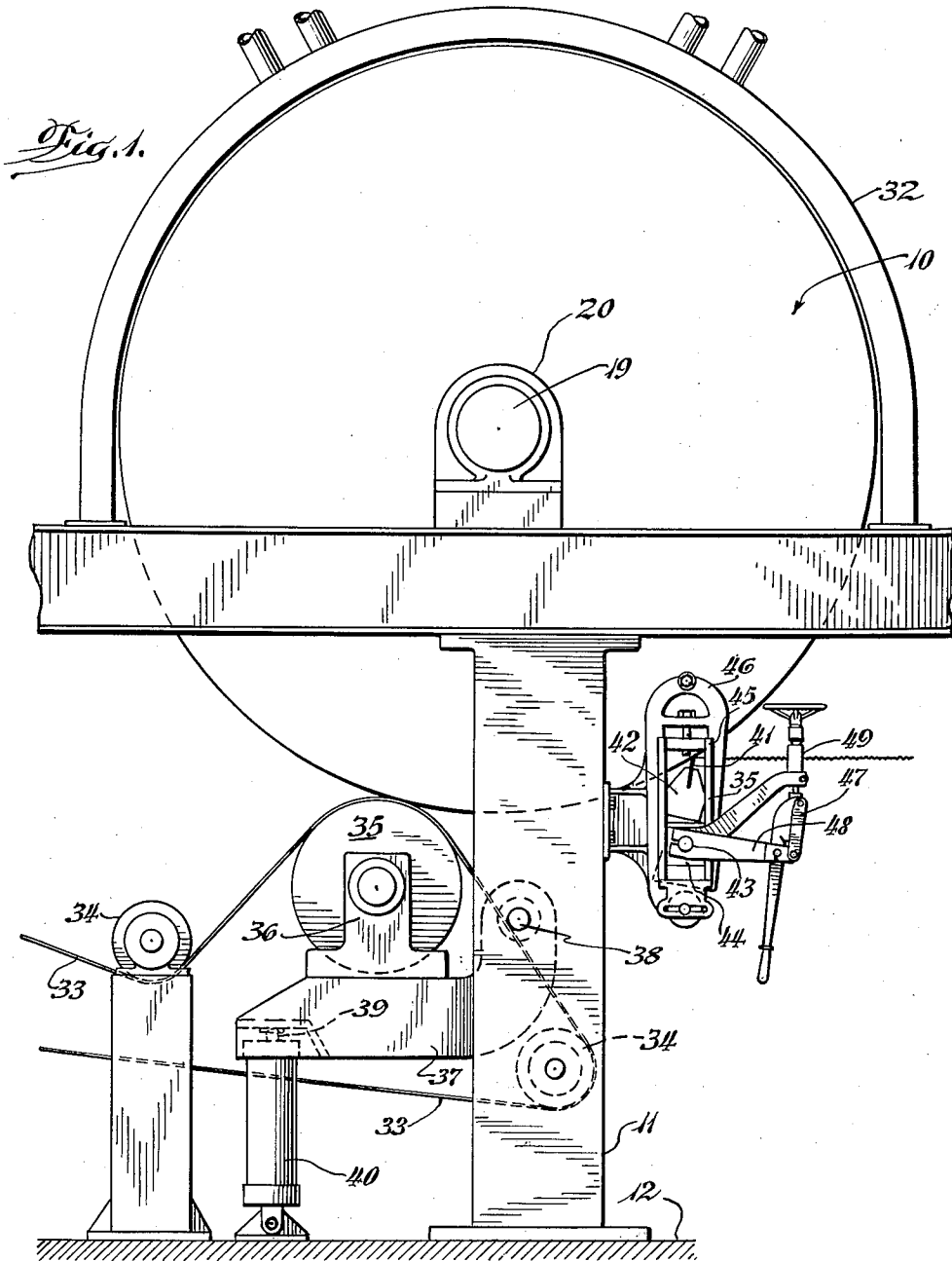
Nov. 6, 1962

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PAPERMAKING MACHINE

3,061,944

Filed April 15, 1959

5 Sheets-Sheet 1



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3,061,944

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Fig. 3.

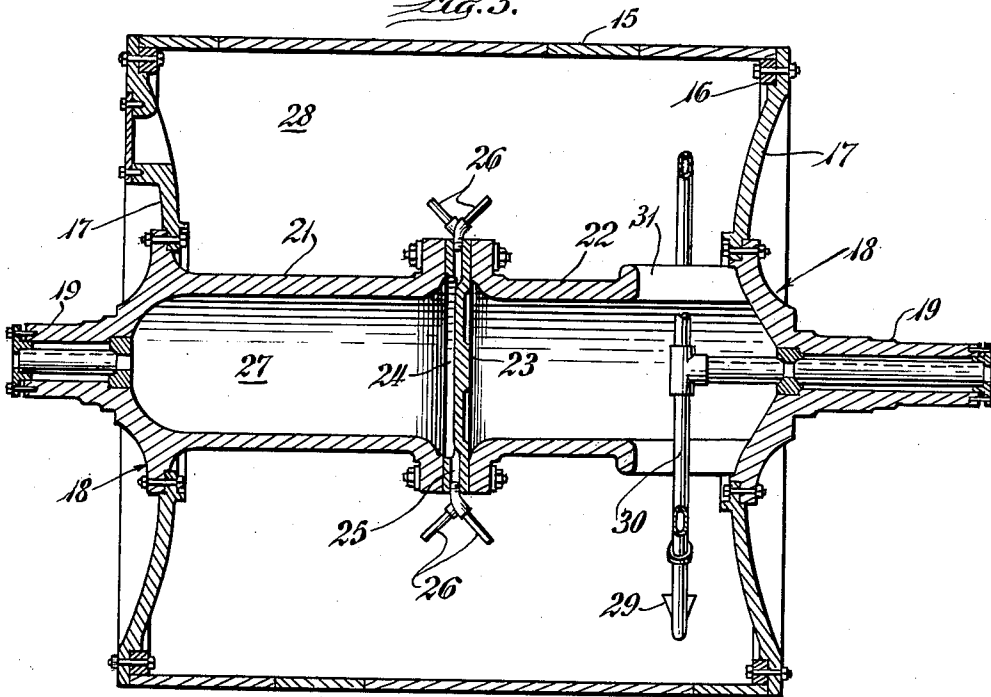


Fig. 4.

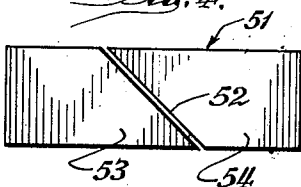


Fig. 5.

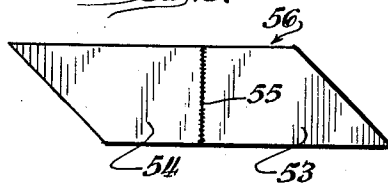
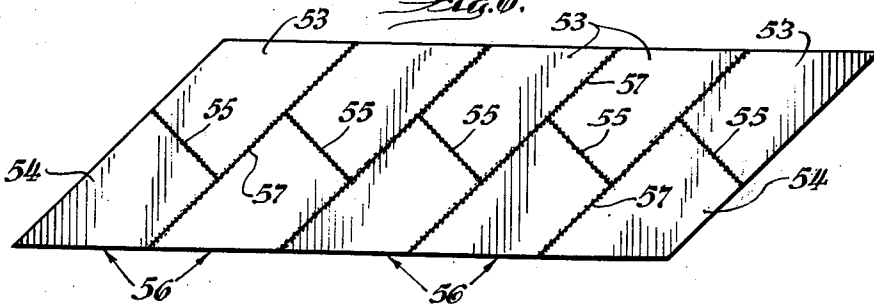


Fig. 6.



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Fig. 7.

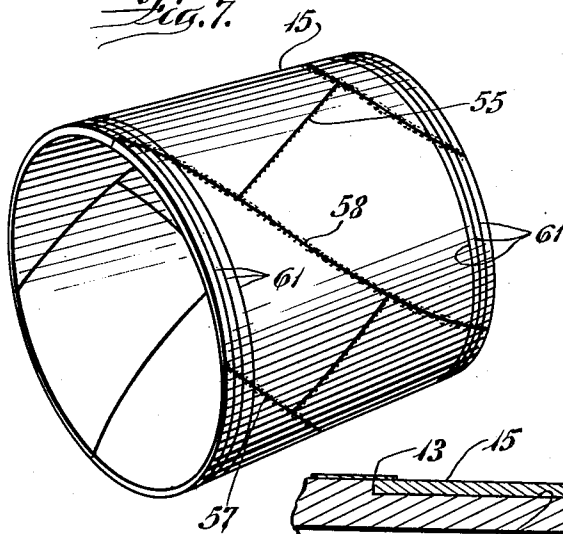


Fig. 10.

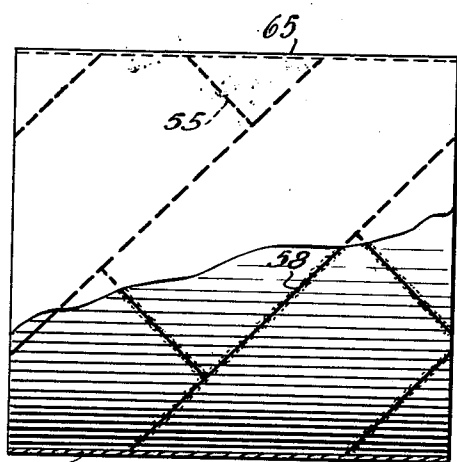
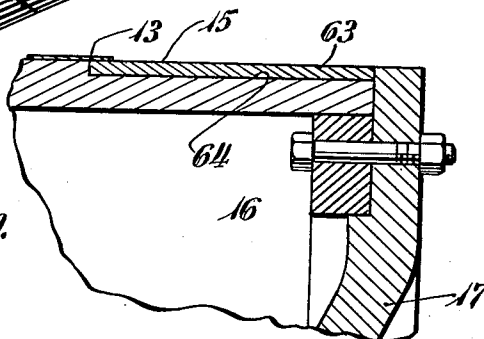


Fig. 11.

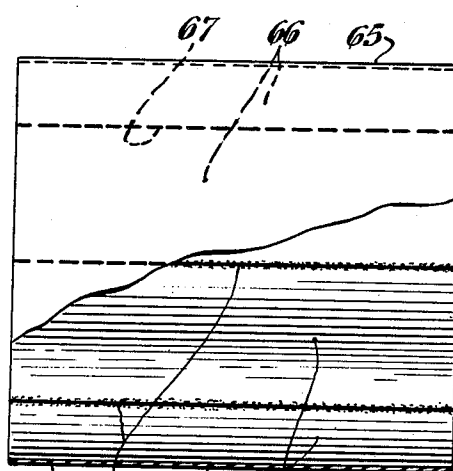


Fig. 12.

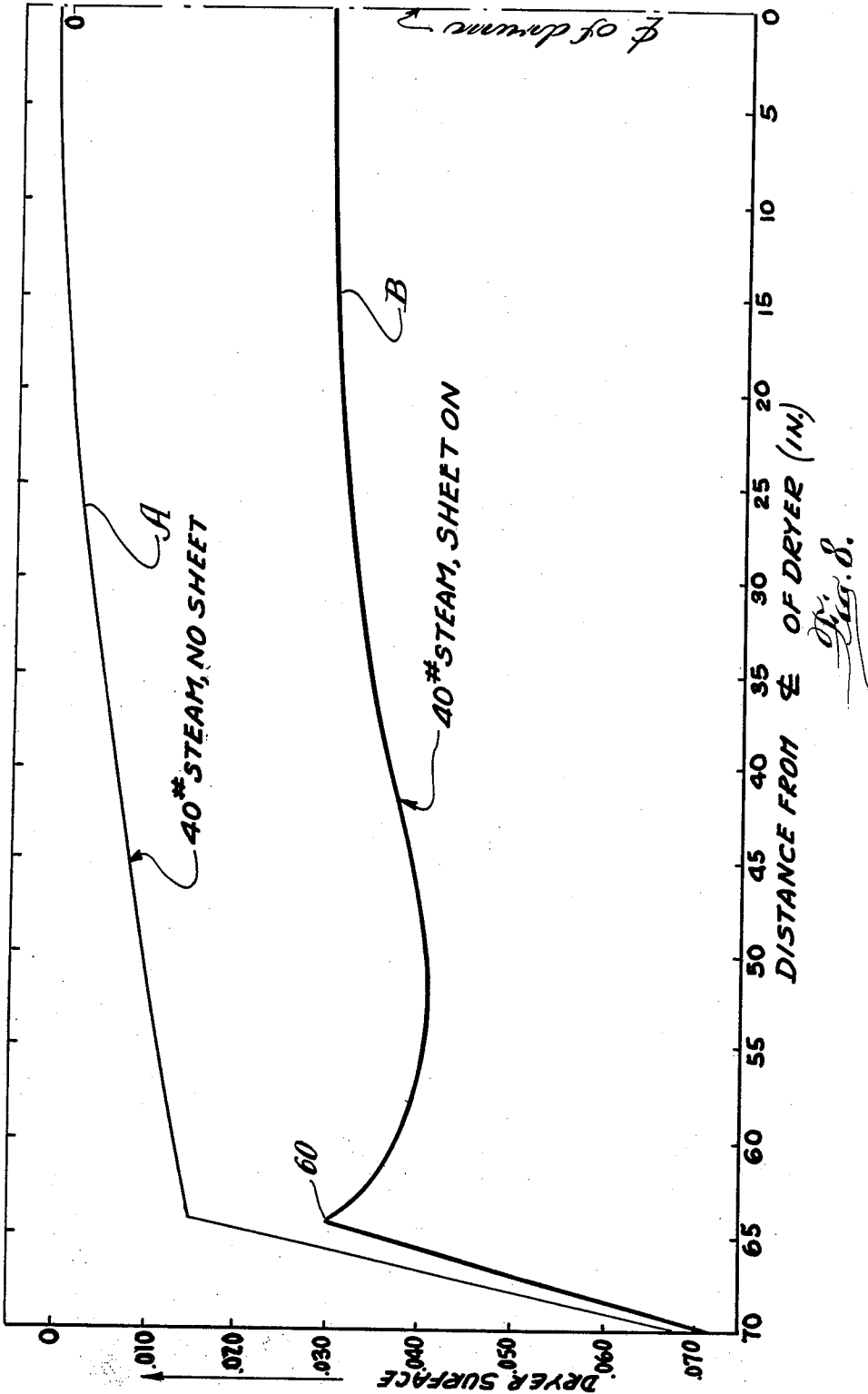
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PAPERMAKING MACHINE

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Filed Apr. 15, 1959, Ser. No. 806,653

12 Claims. (Cl. 34—110)

The invention relates to pressure vessels and more particularly to welded wrought drier drums for use in the manufacture of paper.

A paper or tissue forming machine generally comprises a forming wire carrying the wet paper web which is couched from the wire and is partially dewatered between felts and which is subsequently pressed onto the surface of at least one drier drum. These drums may be heated by means of steam applied internally of them. In the case of a so called "Yankee" type paper machine, only a single drum is used, and the wet paper web is pressed onto the surface of the drum and is dried to the desired final moisture content within a single revolution of the drum. The Yankee machine differs from the conventional Fourdrinier paper machine in that the latter has a number of small drier drums, and the paper is transferred from one drier drum subsequently to the others. The paper may be removed or creped from the large Yankee drier drum by means of a doctor blade which rides on the surface of the drum.

The present invention is concerned particularly with drier drums on which the doctor blade is applied and which distort substantially when in use due to the steam pressure applied within them and due to the material of which the drum is constructed. Such distortion may be expected to occur particularly when the drums are of a large size, being of the Yankee type specifically, and particularly when the drums are of welded construction of high heat conducting material. Drier drums in the past usually have been constructed of cast iron, and the doctor blades in contact with them have been steel. With such drums of the Yankee type, which may be of a diameter of 8 to 15 feet and a length of 10 to 15 feet, there is some distortion due to the fact that the wet paper web is not applied for the complete width of the drum but only within a few inches of each drum edge, and the wet paper web maintains the part of the drum with which it contacts at a lower temperature than the temperature of the outer edges of the drum surface and the internal surfaces of the drum. Cast iron and steel are somewhat compatible when there is rubbing action between the two materials, there being a slight lubricating action between them, and furthermore the cast iron does not have a high coefficient of thermo-expansion as does other materials which are now proposed for use in drier drums; and consequently the wearing of cast iron drums by steel doctor blades has been uniform enough over the complete drum length as to be no major source of trouble.

It has now been proposed to make the cylindrical drum surface of welded sheets, preferably with the welds extending diagonally with respect to the axis of the drum, such as proposed in the application of C. G. R. Johnson, for Paper Making Machine, Serial No. 699,704, filed November 29, 1957. In general, the welds are more brittle than are the sheets, and hence the welds have been placed diagonally, so that the doctor blade is continuously in contact with at least one of the welds, for minimizing wear. It has been proposed to manufacture the drum of an aluminum bronze, with both the metal sheets and also the welds being of this material. Aluminum bronze is softer than cast iron but transmits more heat than does cast iron, rendering it particularly suitable from the latter standpoint for drier drum usage. As with other

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metals, however, the aluminum bronze sheets are less brittle than the welds, and it has been found in actual usage of a drum of this construction that, even though the welds are diagonally disposed, nevertheless there has been substantially and non-uniform wear of the drum due to the action of the doctor blade riding in contact with the drum. This wear has occurred particularly at the outer edges of the drum behind the welds in the areas which do not carry the paper web. Such undue wear does not occur on the drum surface carrying the paper sheets due apparently to the paper debris that is carried by the drum in these areas over which the paper web extends and due apparently also to the fact that the paper web in being creped from the drum has the action of tending to separate the doctor blade from its contact with the drum.

It is therefore an object of the present invention to provide an improved drier drum construction minimizing such wear occurring on the outer edges of the drum.

Concisely, the invention comprises in providing areas of material harder than the sheets, of which the drum surface is composed, on the outer edges of the drum surface; so that the doctor blade does not dig into the drum to such an extent as to cause uneven wear of the drum on its outer edges, outside of the drum areas on which the paper web is disposed.

The invention consists of the novel constructions, arrangements and devices to be hereinafter described and claimed for carrying out the above stated objects and such other objects as will be apparent from the following description of preferred forms of the invention, illustrated with reference to the accompanying drawings, wherein:

FIG. 1 is a fragmentary side elevational view of a paper machine incorporating a drier drum embodying the principles of the present invention;

FIG. 2 is a fragmentary end view on an enlarged scale of the drier drum as shown in FIG. 1;

FIG. 3 is a longitudinal sectional view on a reduced scale of the drier drum;

FIG. 4 is a top plan view of a plate from which the drier drum is fabricated showing the cutting of the plate into two segments;

FIG. 5 is a view similar to FIG. 4 showing two plate segments welded together to form a parallelogram shaped section;

FIG. 6 is a view similar to FIG. 4 showing the sections welded together to form the plate pattern;

FIG. 7 is a perspective view of the completed welded shell;

FIG. 8 is a diagram showing the crowning of the drier drum under two different conditions;

FIG. 9 is a sectional view taken on line 9—9 of FIG. 2;

FIG. 10 is a sectional view similar to FIG. 9 of a modified form of drum structure;

FIG. 11 is a side view of another modified form of drum structure; and

FIG. 12 is a side view of still another modified form of drum structure.

Like characters of reference designate like parts in the several views.

Referring now to the drawings and in particular to FIGS. 1 and 2, there is illustrated fragmentarily a typical Yankee type paper machine, particularly the dry end of the machine, which includes a drier drum 10. The drum is supported by a supporting frame 11 resting on a suitable foundation 12. The wet paper web 13 is adapted to be applied to the outer surface of the drum having its edges 14 spaced a few inches from the edges of the drum and being dried by the drum during a single revolution thereof.

The drum 10 includes a generally cylindrical, welded shell 15 having end flanges 16 which are bolted to heads

17. The heads 17 enclose the ends of the shell and are provided with aligned axial openings which receive a hollow shaft 18.

The drum is mounted for rotation by providing the ends of the shafts 18 with journals 19 which are rotatably disposed in bearings 20 secured to the frame 11. The shaft 18 is formed of two hollow axially aligned sections 21 and 22 which are separated by a separator plate 23. The separator plate 23 is provided with a thickened rim 24, and a series of openings 25 extend through the rim and communicate with the interior of the shell 15. Steam nozzles 26 are threaded into the openings 25 and serve to distribute steam from the interior cavity 27 of the shaft section 21 of the interior cavity 28 of the drum 10.

For removing steam condensate from the drum 10, a pair of scoops 29 are secured to the ends of pipes 30 which extend radially through openings 31 in the shaft section 22.

The drum 10 is rotated by a conventional driving mechanism (not shown) which is attached to the end of the shaft 18 by a suitable gear or pulley arrangement.

For providing additional heat to dry the paper web on the surface of the drum 10, a heated hood 32 is secured to the frame 11 and extends around the upper portion of the drum 10. Suitable hot air inlets and outlets are provided in the hood for the entry and discharge of the air or other heating medium.

The wet paper web to be dried is carried by a felt web 33 which travels around rolls 34. The paper web is forced against the surface of the drum 10 by a pressure roller 35 which is rotatably mounted in brackets 36 attached to an arm 37. The arm 37 is pivoted at 38 to the frame 11, and the pressure roller 35 is forced against the surface of the drum 10 by a ram 39 of a hydraulic cylinder 40 which bears against the arm 37. The dried paper web is removed from the surface of the drier shell by a creping doctor which includes a doctor blade 41 which is removably secured from within a doctor blade holder 42. The ends of the holder 42 are provided with shafts 43 which are rotatably mounted from within guide blocks 44. The blocks 44 in turn are each mounted within a slide assembly 45 attached to a pivot frame 46 pivotally carried by frame 11. The doctor blade holder 42 and the blade 41 are pivoted by a toggle mechanism 47 which is attached through a lever arm 48 to one of the shafts 43. In addition, a spring loading mechanism 49 of any suitable detailed construction is connected through the toggle mechanism 47 to provide a resilient contact for the doctor blade 41 against the surface of the drier drum 10.

In addition to the vertical and pivotal adjustment for the doctor blade 41, the doctor blade is adapted to oscillate in a direction parallel to the axis of the drum 10. The oscillating motion is provided by an eccentric drive which is shown generally at 50 connected to one of the shafts 43. The oscillating motion is permitted by a loose fit between the pivot frame 46 and the frame 11 and permits the doctor blade to move back and forth across the surface of the drum 10 as the drum 10 rotates to prevent uneven wear of the blade 41.

The drum shell 15 is fabricated from a series of generally rectangular rolled plates 51. As shown in FIG. 4, the rectangular plates 51 are initially cut diagonally at 52 to provide two halves or segments 53 and 54. The cut at 52 is made so as to divide the rectangular plate 51 into two generally equal parts of similar shape and surface area. After severing the rectangular plates into the parts 53 and 54, the edges of the segments are scarfed for welding, and the segments are reversed in position so that the square ends are in abutting relation. The aligned ends of the segments are welded together at 55 to provide a generally parallelogram shaped section 56 as seen in FIG. 5.

A series of the parallelogram shaped sections 56 are then arranged with the diagonal edges in alignment and

the longitudinal side edges in opposed relation as shown in FIG. 6 to form a larger plate section. The abutting side edges of the sections 56 are then welded together as at 57, and the large parallelogram shaped pattern as seen in FIG. 6 is then rolled into cylinder form, and the free ends are welded along line 58 to provide the generally cylindrical welded structure shown in FIG. 7 constituting the drum shell 15.

The plates 51 and also the other parts of the drum including the shaft 18 and the heads 17 are preferably formed of an aluminum bronze alloy which may have the specific compositions and which may be made in accordance with the metallurgical processes described in the co-pending application of John F. Klement, for "A Welded Wrought Aluminum Bronze Article and a Method of Heat Treating the Same," Serial No. 682,577, filed September 9, 1957. In brief, the alloy may contain 5 to 8 percent of aluminum, .05 to 4 percent of iron, .01 to 5 percent of nickel, .01 to 5 percent of manganese, .01 to 2 percent of tin, .01 to 5 percent of zinc and the balance of copper. The composition of the welding material is substantially the same as the plates 51, having, however, a slightly greater amount of aluminum, such as 8 percent to 11 percent, in view of the fact that a small amount of aluminum is lost during the welding procedure. The plates 51 are wrought, that is, rolled; while the other parts of the drum 10 are cast.

The angle of the cuts 52 with respect to the longitudinal side edges of the plates 51 is greater than 5 degrees and preferably within the range of 30 degrees to 60 degrees, so that the welds 57, 55 and 58 extend at substantial angles with respect to the axis of the shell 15.

After the shell 15 has been rolled into its cylindrical form as shown in FIG. 7, it is heat treated to minimize the differences in mechanical properties between the plates and the weld seams; and the shell 15 is slightly crowned, preferably on the order of .03 inch diameter for a drum 12 feet in length and over all diameter, that is, the drum has a diameter at its center .03 inch greater than on its edges and has substantially the form as shown by curve A in FIG. 8. This curve shows the lengthwise contour of the shell surface 15 from the center of the drum to one end, and the ordinates in this figure show the crowning for a certain drum embodiment of .015 inch on a radius, with the operating steam pressure being supplied to the internal cavity 28 of the drum 10 and without a paper sheet on the drum to be dried thereby, so that the drum 10 is at a uniform temperature throughout.

In operation, the paper web is disposed on the lower surface of the lower pass of the felt 33 and travels with the web 13 around the lower felt roll 34 to the pressure roller 35. At the pressure roll 35, the paper web transfers from the felt web 33 onto the outer surface of the drum 10 and rotates with the drum 10 within the heating hood 32, so that the paper web is substantially completely dried by the time it reaches the doctor blade 41 from its damp condition at its point of application at the pressure roll 35 to the outer surface of the drum 10.

The doctor blade 41 scrapes or crepes the paper web from the exterior surface of the drum 10, and the paper web is then rolled on suitable rolls (not shown) for storage purposes. For securing the correct pressure of application of the doctor blade 41 on the drum surface 15, the spring loading mechanism 49 may be manually adjusted.

In view of the fact that the welds 55, 57 and 58 extend at angles to the longitudinal axis of the drum 10, the doctor blade 41 rides over at least one of the welds at all times and does not pass from any of the welds at a single instant so as to render uniform as possible any wear of the drum 10 caused by the doctor blade 41. Although the welds 57, 58 and 55 are made with substantially the same alloy as is used for the plates 51, nevertheless, since the sheets 51 are wrought or rolled while the welds are in the nature of castings, actually

the welds have longer wear characteristics than does the outer drum shell 15 under doctor blade scraping action, being in general slightly more brittle and hard. Therefore, if the outer shell 15 were made with welds extending longitudinally on the shell, it could be expected that the doctor blade 41 would wear longitudinal grooves in the shell 15 just in back of the welds. This action has in general been avoided due to the diagonally extending welds. However, in actual usage of the drum 10 as shown in FIG. 7, without the surface treatment of the shell 15 to be subsequently described, it has been found that slight depressions 59 (see FIG. 2) have been worn in the outer surface of the drum 10 between the edges 14 of the paper web and the outer edges of the drum, due to the action of the doctor blade 41, these depressions being immediately behind the welds 57 and 58. No such wear behind the welds 57 and 58 has been noticed in the portion of the shell covered by the paper web, due apparently to the paper debris that collects to a slight extent on this portion of the drum 10 and which apparently functions as a slight lubricant. Although this wearing could be expected to a slight extent if the shell 15 were made of plates of iron or any other relatively hard material welded together, nevertheless, the aluminum bronze alloy which is preferred for its heat conducting qualities is somewhat softer, and this wearing action therefore may be expected to be noticeable in this case. Such wear is objectionable for a number of reasons, including, weakening of the drum against the pressure of the steam used for heating it.

Referring to FIG. 8, the curve A, as previously mentioned, shows the crowning of a certain drier drum that exists when the drier drum is under operating steam pressure. Curve B in FIG. 8 shows the lengthwise contour of the drum when the drier drum is in use with a paper web being dried by the drum. Curve B shows that there are high points 60 in the drum existing nearly at the edges 14 of the paper web which would cause the doctor blade 41 to tend to dig into the exterior surface of the drum at these points. The change in diameter and change in shape of the shell 15 is caused by the reduction in temperature of the shell 15 between the edges 14 of the paper web due to the evaporation from the web. The surface of the shell 15 between its edges and the paper web edges 14, the other parts of the drum 10 including the heads 17 and shaft 18, as well as the internal surface of the shell 15, remain at the high temperature of the steam pressure. The reduction in average temperature of the shell 15 between the paper web edges 14 results in a reduction in diameter and a slight reduction in length of this portion of the shell 15, with the peripheral edges of the heads 17 drawn inwardly slightly, thus causing the inwardly bowed shape of the shell indicated by the curve B, with high points 60 adjacent the drum edges. When the drum is made out of aluminum bronze as previously described, the high points 60 are more pronounced than with a cast iron drum, for example, since the temperature coefficient of expansion is different for the aluminum bronze material as compared to cast iron, and for this reason there tends to be a greater abrasive effect of the doctor blade adjacent the edges of the drum. In addition, the aluminum bronze alloy is softer than cast iron, and although having the advantage of transmitting heat better than cast iron, nevertheless is more prone to be damaged by the scraping action of the doctor blade 41. The aluminum bronze alloy also does not provide the same high lubricating effect with respect to the steel doctor blade 41 that is provided by the cast iron. Thus, wear between the edges 14 of the paper web and the edges of the drum occurs with usage of the drum if the drum is made of the aluminum bronze alloy rather than of cast iron, the wear concentrating in regions 59 behind the welds 57 and 58 if the aluminum bronze drum 10 is of the welded construction, as illustrated.

In order to overcome the scraping action of the doctor blade 41 on the surface of the welded aluminum bronze drum 15, the present invention contemplates the provision of a plurality of circular bands 61 extending around the drum 10 and indented in the surface of the drum. These bands may be of any longer wearing or harder material than that of the drum surface under doctor blade scraping action, and may be simply bands of the welding material either sprayed or welded into circumferential grooves 62. Other harder metals such as chromium can also be used. These bands may be $\frac{1}{4}$ inch to $\frac{1}{2}$ inch in thickness but on the other hand can be made much thinner if desired, such as $\frac{1}{32}$ inch thick. The bands 61 prevent the doctor blade 41 from scraping off the surface of the aluminum bronze drum between the edges 14 of the paper web and the edges of the drum, effectively holding the doctor blade at the surface of the shell 15 and preventing the formation of the depressions 59.

The grooves 62 are preferably formed in the drum 15 after it has been rolled into cylindrical form but in certain instances it may be found desirable to form the grooves 62 in the assembled plate structure as illustrated in FIGURE 6 and to fill those grooves with the weld or other metal prior to the forming of the cylinder. The procedure will result in certain instances in the rings 61 having a physical structure which more closely approximates the main body of the cylinder or which may have desired differing characteristics.

As an alternative to providing the circumferential rings 61 on the ends of the drum 10, cylindrical rings 63 (see FIG. 10) may be provided on the ends of the drum. The rings 63 may be of the same longer wearing or harder material as the rings 61 and are provided in grooves 64 on the ends of the drum. The cylindrical rings 63 may be either sprayed or welded of the aluminum bronze weld material, for example, within the grooves 64 or may be slipped on to the drum from its ends.

As another alternative, the drum 10 may have a cylindrical shell 65 provided over its complete exterior as shown in FIG. 11. The shell 65 may be of the aluminum bronze weld material, or the shell 65 may simply comprise a plating, such as of chromium, for example. The weld material may be welded on the outer surface of the drum, if desired, and the plating may be applied by conventional plating methods or by metalizing processes in which the metal is sprayed on. When an outer cylindrical shell 65 is provided, the plates 51 may be of heat conducting materials other than the aluminum bronze alloy previously mentioned (such as iron); and the shell 65, if of the aluminum bronze weld material, provides the same good wearing qualities as previously mentioned uniformly over the complete outer surface of the drum. In the event the complete cylindrical shell 65 is used, the drum 10 in this case may be formed of sectors 66 of rolled strips of the aluminum bronze metal having welded joints 67 extending parallel to the axis of the drum (see FIG. 12).

The rings 61 advantageously prevent the undue wearing of the edges of the drum 10. Furthermore, the rings are relatively inexpensive to apply and are effectively held in position by the surrounding portions of the shell 15 forming the grooves 62. The cylindrical rings 63, although perhaps being more difficult to apply and fasten to the drum, assure that the complete edge surfaces of the shell 15 subject to the abrading effect of the doctor blade 41 are protected. The cylindrical shell 65, although perhaps distracting to some extent from the heat transmitting qualities of the drum as a whole, assuming that the shell 65 is of some baser material than the shell 15, nevertheless assures that the abrading effect of the doctor blade 41 is substantially the same over the complete surface of the drum 10.

It is to be understood that the invention is not to be limited to the specific constructions and arrangements shown and described, except only insofar as the claims

may be so limited, as it will be understood to those skilled in the art that changes may be made without departing from the principles of the invention.

What is claimed is:

1. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and to scrape paper web from the drum, a generally cylindrical rotatable drier shell adapted to receive a web of wet paper on the outer surface thereof and dry the web as the shell is rotated, said shell comprising a plurality of curved plates of heat conducting relatively soft metal welded together to form the shell, circumferential ring portions of the outer surface of said shell on opposite ends of the shell being covered by protective layers of a relatively hard metal, the outer surfaces of which are flush with the outer surface of said shell, for preventing a doctor blade in scraping relation with said shell from gouging out the surface of said shell adjacent its outer edges.

2. In a papermaking machine, a rotatable drier drum, a doctor blade bearing on the drum to scrape paper web from the drum, said drum comprising a generally cylindrical drier shell of a relatively soft material adapted to receive a web of wet paper on the outer surface thereof and to dry the web as the shell is rotated, and a ring portion of a material harder than said first named material and disposed on each end of said shell to be flush with the outer surface of the shell for preventing the doctor blade in scraping relation with said shell from gouging out the surface of said shell adjacent its outer edges.

3. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and scrape paper web from the drum, a generally cylindrical rotatable drier shell adapted to receive a web of wet paper on the outer surface thereof and dry the web as the shell is rotated, said shell comprising a plurality of curved plates of a heat conducting relatively soft metal welded together forming the shell, and a ring portion of a material harder than said metal and disposed on each end of said shell to be flush with the outer surface of the shell for preventing a doctor blade in scraping relation with said shell from gouging out the surface of said shell adjacent its outer edges.

4. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and scrape paper web from the drum, a generally cylindrical rotatable drier shell adapted to receive a web of wet paper on the outer surface thereof and dry the web as the shell is rotated, said shell comprising a plurality of curved plates of a bronze metal welded together forming the shell, and a ring portion of a metal harder than said bronze and disposed on each end of said shell to be flush with the outer surface of the shell for preventing a doctor blade in scraping relation with said shell from gouging out the surface of said shell adjacent its outer edges.

5. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and scrape paper web from the drum, a generally cylindrical rotatable drier shell adapted to receive a web of wet paper on the outer surface thereof and dry the web as the shell is rotated, said shell comprising a plurality of curved plates welded together at their edges to form the shell, said curved plates being of such shape that their welded edges extend diagonally with respect to the axis of the shell, and a plurality of rings of a material harder than the material of said plates and indented within said shell at each end of the shell to be flush with the outer surface of the shell for preventing a doctor blade in scraping relation with the shell from gouging out the surface of the shell adjacent its outer edges.

6. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and scrape paper web from the drum, a generally cylindrical rotatable drier shell adapted to receive a web of wet paper on the outer surface thereof and dry the web as the shell is rotated, said shell comprising a plurality of curved plates

welded together at their edges to form the shell, said curved plates being of such shape that their welded edges extend diagonally with respect to the axis of the shell, and a cylindrical band portion of a material harder than the material from which said plates are formed and disposed on each end of said shell to be flush with the outer surface of the shell for preventing a doctor blade in scraping relation with the shell from gouging out the surface of the shell adjacent its outer edges.

7. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and scrape paper web from the drum, a generally cylindrical rotatable drier shell adapted to receive a web of wet paper on the outer surface thereof and dry the web as the shell is rotated, said shell comprising a plurality of curved plates welded together at their edges to form the shell, said curved plates being of such shape that their welded edges extend diagonally with respect to the axis of the shell, and a cylindrical band of a material harder than the material of said plates and disposed on each end of said shell in indented relation with respect to the outer surface of the shell to be flush with the outer surface of the shell for preventing a doctor blade in scraping relation with the shell from gouging out the surface of the shell adjacent its outer edges.

8. In a paper machine drier drum for use with a doctor blade adapted to bear on the drum and scrape paper web from the drum including a generally cylindrical drier shell adapted to receive a web of wet paper on the outer surface thereof and to dry the web as the shell is rotated, said shell comprising a plurality of curved plates of a bronze alloy welded together to form the shell with the welded edges of the plates extending diagonally of the axis of the shell, the improvement which comprises a ring portion of a material harder than said bronze alloy and indented in the outer surface of the shell on each end of the shell to have its outer surface flush with the outer surface of the shell for preventing the doctor blade in scraping relation with the shell from gouging out the surface of the shell adjacent its outer edges.

9. A papermaking machine drier drum comprising a generally cylindrical drier shell which is made up of a plurality of curved plates of a bronze metal welded together forming the shell, and a ring portion of a metal harder than said bronze and indented in the shell on each end of the shell to be flush with the central portion of the shell.

10. In a papermaking machine drier drum for use with a doctor blade adapted to bear on the drum and to scrape paper web from the drum, a generally cylindrical rotatable drier shell of a relatively soft material adapted to receive a web of wet paper on the outer surface thereof and to dry the web as the shell is rotated, and a ring portion of a material harder than said first named material and indented in said shell on each end thereof within grooves provided in the shell so as to be flush with the outer surface of the shell for preventing a doctor blade in scraping relation with the shell from gouging out the surface of the shell adjacent its outer edges.

11. In a papermaking machine, a rotatable drier drum comprising a generally cylindrical drier shell of a relatively soft material adapted to receive a web of wet paper on the outer surface thereof and to dry the web as the shell is rotated, a doctor blade bearing on the drum for scraping paper web from the drum, means for admitting heating fluid into the drum for heating the drum, means for removing said heating fluid from the drum for providing circulation of heating fluid through the drum, and a ring portion of material harder than said first named material and indented within said shell on each end of the shell so as to be flush with the central portion of the shell for preventing the doctor blade in scraping relation with the shell from gouging out the surface of the shell adjacent the edges of the shell and the edges of the paper web.

12. In a papermaking machine, a rotatable drier drum comprising a generally cylindrical drier shell of a relatively soft material adapted to receive a web of wet paper on the outer surface thereof and to dry the web as the shell is rotated, a doctor blade bearing on the shell for scraping paper web from the shell, means for admitting heating fluid into the drum for heating the drum, means for removing said heating fluid from the drum for providing circulation of heating fluid through the drum, said shell comprising a plurality of curved plates of a heat conducting relatively soft metal welded together forming the shell, and a ring portion of a material harder than said metal and indented within said shell on each end of the shell to be flush with the central portion of the shell for preventing the doctor blade in scraping relation

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with the shell from gouging out the surface of the shell adjacent its outer edges and adjacent the edges of the paper web in the vicinity of the welds.

References Cited in the file of this patent

UNITED STATES PATENTS

1,763,629	Hopkins	June 10, 1930
2,047,372	Jalens	July 14, 1936
2,141,377	Chylinski	Dec. 27, 1938
2,151,048	Rowe	Mar. 21, 1939
2,653,061	Lewis et al.	Sept. 22, 1953

FOREIGN PATENTS

692,215	Great Britain	June 3, 1953
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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,061,944

November 6, 1962

James J. Kraus et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 14, for "of", first occurrence, read -- to --; line 70, for "abuttinig" read -- abutting --.

Signed and sealed this 28th day of May 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents