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2,676,387

MOUNTING FOR SMOOTHING PRESS ROLLS

Filed July 11, 1951

2 Sheets-Sheet 1

FIG. 1.

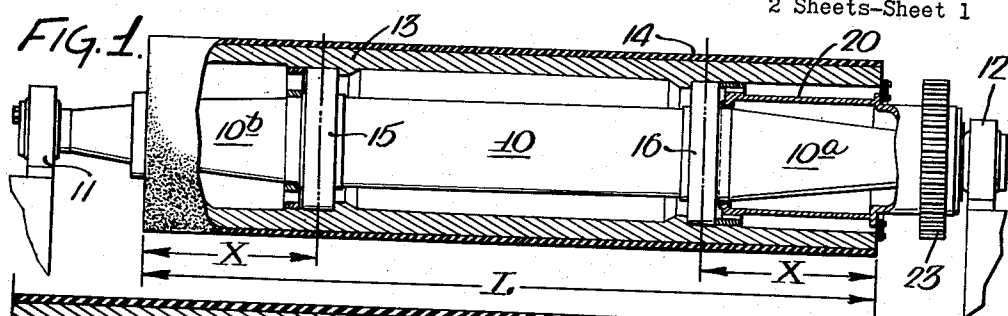


FIG. 2.

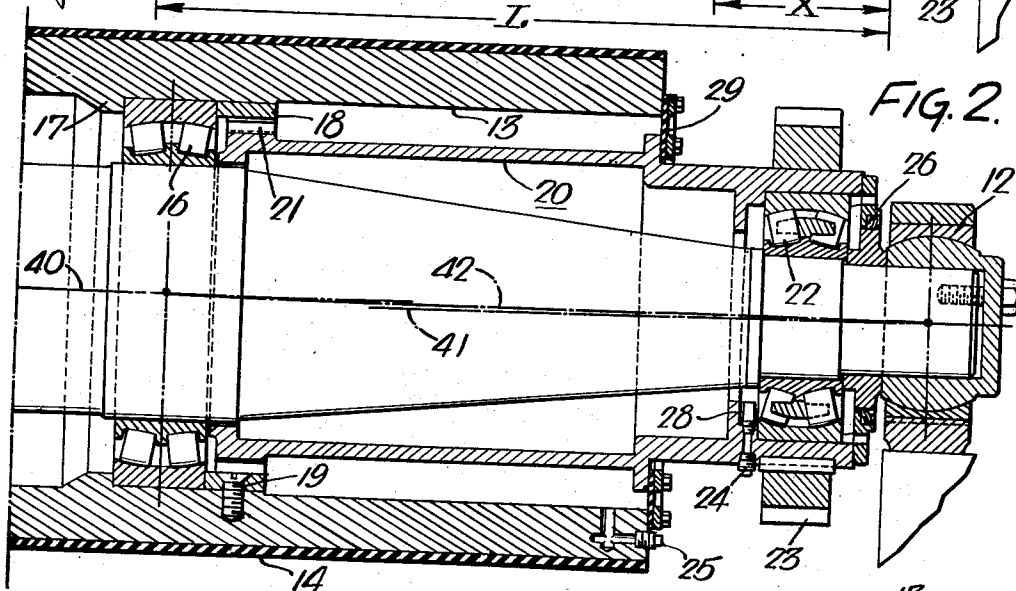
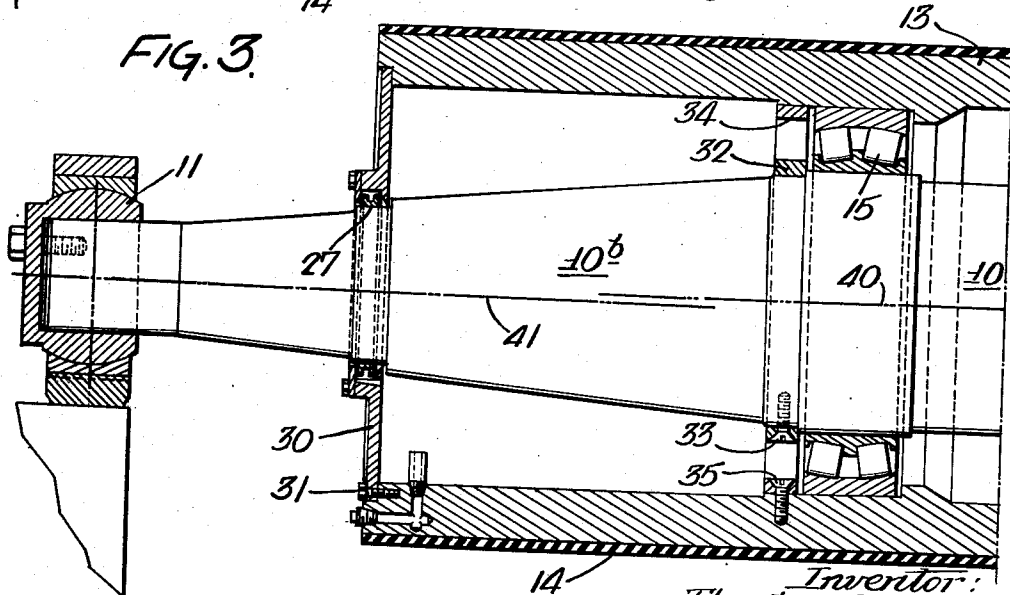


FIG. 3.



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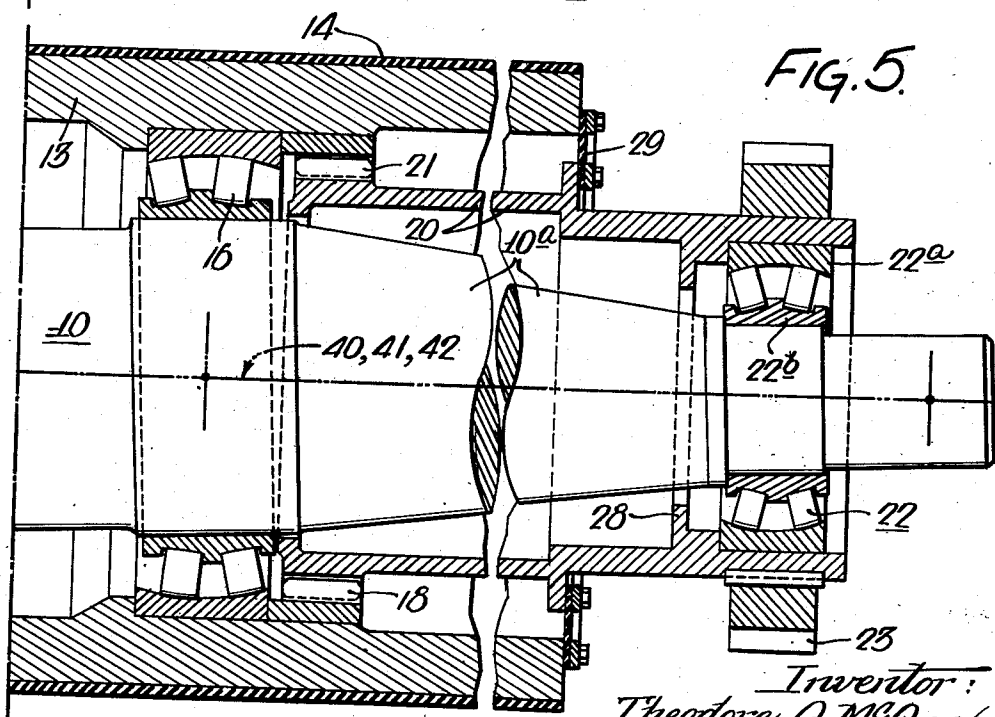
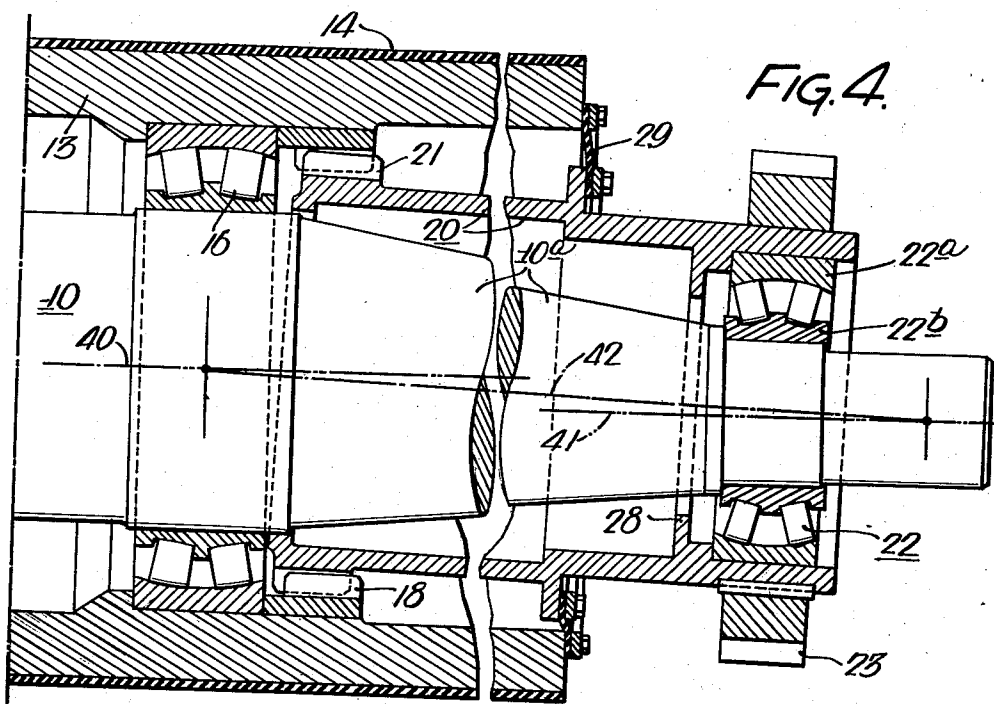
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UNITED STATES PATENT OFFICE

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MOUNTING FOR SMOOTHING PRESS ROLLS

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2 Claims. (Cl. 29—115)

1

This invention relates to an improved paper machine roll and has to do more particularly with a non-deflecting smoothing press roll.

Heretofore, considerable difficulty has been encountered in providing a satisfactory journal for a smoothing press roll. Due to the size and weight of these rolls, it has been found that a roll mounted on a rotating shaft had so much deflection at the center of the roll that undesirable results followed. In an effort to reduce the deflection and bending of such a roll, it has been proposed to support the roll shell on the rotating shaft at two points well within the length of the shell. This expedient however, did not provide a satisfactory solution to the problem.

Rolls of this sort are customarily about 32" in diameter and 128" long and are loaded at 1,000 lbs. per inch face, making a total load of 128,000 lbs. The shaft is customarily a steel forging weighing about 7 tons and the outer shell of cast iron is 3-4" thick and covered with hard rubber, stainless steel or similar non-corrodible material. It will be understood that the static deflection in a roll of this size and weight is sufficiently great to prohibit assembling the roll in a horizontal manner. Heretofore, it has been necessary to construct special equipment to press or shrink the shaft into the roll in a vertical position.

Therefore, in order to overcome some of the above difficulties and to provide a suitable roll having uniform deflection and minimum bending moment, I propose to utilize a fixed shaft on which the shell is journaled through self-aligning bearings. This construction not only permits horizontal assembly of the roll but also eliminates the necessity for the extremely heavy and rugged shaft previously required. This is due to the fact that there is no reversal of bending stress in the shaft because it does not rotate. My construction permits the shaft to be designed as a simple beam subject to bending in only one plane.

A primary object of the invention therefore, is to provide an improved mounting for a smoothing press roll.

A further object of the invention is to provide in a press roll assembly a stationary shaft on which the press roll shell is journaled internally by means of self-aligning bearings.

A further object of the invention is to provide an improved drive device for an internally journaled smoothing press roll.

Further objects will be apparent from the specification and drawings in which:

2

Fig. 1 is a side view partly sectioned, of a smoothing press roll constructed in accordance with the present invention;

Fig. 2 is an enlarged sectional detail of the drive end of the structure of Fig. 1;

Fig. 3 is an enlarged sectional detail of the left end of the structure of Fig. 1;

Fig. 4 is a view similar to Fig. 2 showing the relationship of the parts when the roll is in an unloaded condition and in which the deflection is greatly exaggerated; and

Fig. 5 shows the structure of Fig. 4 when the roll is loaded.

The invention comprises essentially the provision of a stationary shaft for a smoothing press roll which is mounted at each end beyond the shell of the roll on a pair of swivel blocks. The roll shell is journaled at two points on the shaft in such a way that the distance from the journal points to the ends of the shell provides minimum bending moment. A flexible drive is utilized for the shell and this drive is so constructed to accommodate the change in deflection which occurs when the roll is loaded.

Referring now more particularly to the drawings, my improved smoothing press roll assembly comprises a central stationary shaft 10 having tapered ends 10a and 10b which are mounted in swivel blocks 11 and 12. The shell 13 is provided with a non-corrodible covering 14 such as rubber or stainless steel and the shell is journaled on shaft 10 by means of self-aligning bearings 15 and 16. Since the present construction does not use a rotating shaft subject to rapid reversals of bending stress, I have found that the location of bearings 15 and 16 are desirably spaced inwardly from the ends of shell 13 a distance of 20.7% of the length of the shell. In Fig. 1, the dimension of X therefore is equal to 20.7% of L. In the conventional smoothing press roll described above, this location for the bearings is at the points which provide minimum bending moment. Without the use of a stationary shaft and self-aligning bearings, it was not heretofore possible to take advantage of the optimum construction that would produce uniformity in the paper from edge to edge.

Referring now to Fig. 2, it will be noted that bearing 16 is pressed in the bore of shell 13 against a shoulder 17 and is retained thereon by an internal annular splined ring member 18 secured to the shell by one or more screws 19. A driving sleeve 20 is provided with an externally splined portion 21 which meshes with the internal splines on the ring 18 to provide a loose driving connec-

3

tion therebetween, and sleeve 20 is journaled at its outer end on a self-aligning roller bearing 22 mounted on the shaft 10. Spur gear 23 rigidly connected to sleeve 20 is driven by any suitable gear train from a source of power (not shown).

Lubricant for bearings 15, 16, 22 and splines 18 and 21 may be introduced within the bore of the sleeve and/or shell by removing plugs 24 and 25. Suitable oil seals 26 and 27 prevent the loss of lubricant, and the lubricant level is desirably carried sufficiently high to adequately lubricate all the bearings. A dam 28 retains sufficient lubricant for bearing 22 and a flexible annular collar 29 provides a suitable seal for lubricant between the sleeve 20 and shell 13.

At the opposite end of the shell I provide an end plate 30 secured to the shell by means of cap screws 31 and it will be noted in Fig. 3 that bearing 15 is secured in place by means of an inner annular retainer 32 secured to the shaft by screw 33 and an outer retainer 34 secured to the shell by screws 35.

Referring now to Figs. 4 and 5, it will be noted that the tapered end 10a of shaft 10 is of asymmetrical form. Also bearing 16 is substantially centered when the roll is unloaded. In this event, the centerline 40 of the shell is substantially above the centerline 41 of bearing 22 so that the centerline 42 of sleeve 20 is tilted as shown in Fig. 4. In actual practice, the maximum deflection for each bearing should not exceed 4° (2° on either side of the vertical centerline of the bearing). It will thus be appreciated that the showing of the relative positions of the parts in Figs. 4 and 5 has been greatly exaggerated in order to more clearly illustrate this feature of the construction. In the unloaded position therefore, the inner and outer races of bearing 22 are not in alignment but the axis of the outer race diverges upwardly with respect to the axis of the inner race. When the roll is loaded however, the deflection is so calculated that the centerline 40 of the shell coincides with the centerline 41 of the outer race 22a of bearing 22 (as shown in Fig. 5). This of course, imparts a bend to shaft 10 that throws the inner and outer races of bearing 16 out of alignment in a manner similar to the misalignment of the bearing 22. The splines 18 and 21 however, will now mesh evenly since the centerline of sleeve 20 likewise coincides with the centerlines 41 and 42. In this event, the outer and inner races 22a and 22b of bearing

4

22 will still be somewhat misaligned by an amount equal to the bend in shaft 10. However, this is of no consequence because there is a straight drive between gear 23 and the shell 13.

It will thus be understood that the present invention enables the assembly of the press roll to be greatly facilitated, it prolongs the life of such rolls by eliminating stress reversals in the roll shaft, and permits the roll to be designed for minimum bending moment.

Having thus described my invention, I claim:

1. In a press roll assembly comprising a stationary shaft having a central portion and normally misaligned end portions, said end portions actuatable into alignment with said central portion upon loading of said shaft, a shell mounted coaxially of said shaft central portion, a pair of self-aligning bearings spaced inwardly from the ends of said shell rotatably mounting the same on said shaft central portion, a hollow driving sleeve for said shell mounted about one end of said shaft, a self-aligning bearing at one end of said sleeve journaling the sleeve on the shaft, and a flexible driving connection between the other end of said sleeve and the interior of said shell.

2. In a press roll assembly comprising a stationary shaft having a central portion and normally misaligned end portions, a shell mounted coaxially of said shaft central portion, a pair of self-aligning bearings spaced inwardly from the ends of said shell rotatably mounting the same on said shaft central portion, drive means in engagement with said shell and normally misaligned with respect to the shaft central portion, and means including a hollow driving sleeve mounted in engagement with said shell responsive to loading of the shaft to align the drive means with the shaft central portion.

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