(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 227 302**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **86309081.7**

(22) Date of filing: **20.11.86**

(51) Int. Cl.4: **D21G 1/02** , D21F 3/06 , D21G 1/00

(30) Priority: **21.11.85 GB 8528658**

(43) Date of publication of application:
01.07.87 Bulletin 87/27

(84) Designated Contracting States:
CH DE ES FR GB IT LI NL

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(54) **Roll deflection control means.**

(57) A calender or mangle has means for controlling and/or preventing deflection of at least one roll of the calender or mangle. The or each roll comprises a centre or beam, preferably stationary and a rotatable tubular shell, and the deflecting control means is constituted by four bearings whereof two are mounted, axially-spaced, on the stationary centre or beam between the latter and the rotating tubular shell within the working width of the latter, while the other two are located between the ends of the rotating shell and the calender or mangle supporting frame.

With such a deflection control and/or prevention means the pressure between rolls of the calender or mangle is applied partly by forces acting on the end bearings and partly by forces acting on the ends of the centres or beams of the rolls.

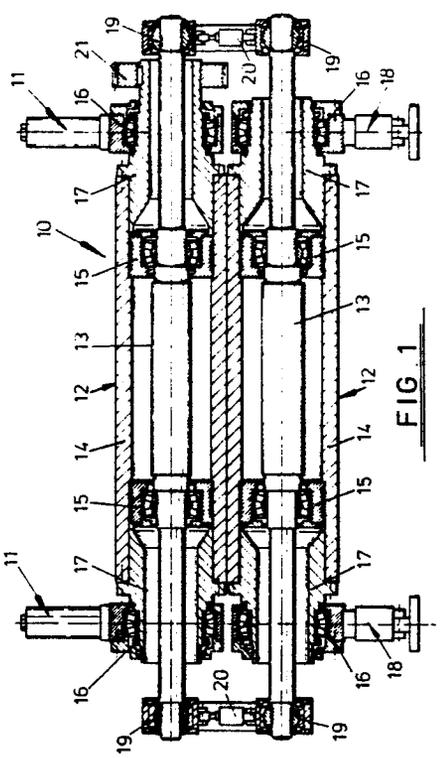

FIG 1

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ROLL DEFLECTION CONTROL MEANS

This invention relates to a means for controlling and/or preventing the deflection of a roll or series of rolls as used, for example, in calenders or mangles in the processing of textiles or paper.

Many systems are known for controlling and/or preventing the deflection of such rolls.

It is known, for example, to apply pressure to the outside of a roll at a location opposite to the face of the roll which is pressing on to the material being processed. The application of pressure in this way to the outside of the working face of the roll, however, requires lubrication to prevent damage to the roll surface and this lubrication is then transferred to the material being passed through the calender or mangle which is undesirable. Because of the disadvantage of this system, various other systems have been developed which apply pressure to the roll internally so that the pressure applied to the roll uniformly balances the pressure applied to that roll by the opposing roll.

In most of such internal systems, the rolls are constructed of a tubular shell rotating around a non-rotating fixed centre or beam which runs through the centre of the rotating shell and in such systems the pressure is applied to the internal surface of the tubular shell by a particular means using the stationary centre or beam as a support for the pressure applying means. The pressure is applied to the outer shell in the direction in which the roll is required to press on to the fabric or paper. In one such system, the pressure is applied by hydraulic fluid under pressure with the fluid being restrained from passing to the unloaded side of the stationary centre or beam by longitudinal seals.

In another such internal system, a series of hydraulically loaded pistons are fitted in the stationary centre or beam to apply pressure through bearing shoes in contact with the internal circumference of the rotating shell.

The above two known methods require complicated hydraulic controlling means and sealing systems, both of which are expensive to make and to maintain.

One simpler system which has been used to control and/or prevent roll deflection is to apply the required pressure to the tubular shell by two bearings mounted on the stationary centre or beam and positioned inside the working width of the externally rotating shell. With such a system, however, the deflection of the roll cannot be entirely prevented as both the ends and the central region of the tubular shell have no support. Furthermore, to drive such a roll requires either contact with another driven roll, which may not always be convenient, or the provision of drive gears or chains inside the supporting framework of the calender or mangle which is also inconvenient from a process point of view.

It is also known to construct rolls with an outer tubular shell fixed onto a rotating centre or beam with the contact between the centre and shell only extending to a portion in the middle of the working width of the roll. In such a case, the centre or beam deflects but, as in the case above, there is no support for the ends of the tubular shell and therefore perfect control of deflection is not obtained.

It is an object of the present invention to provide a simple and effective means for controlling and/or preventing the deflection of such rolls which is less expensive to manufacture and to maintain than the aforesaid known systems.

According to the present invention there is provided in or for a calender or mangle means for controlling and/or preventing deflection of at least one roll of the calender or mangle, which roll comprises a centre or beam, preferably stationary, and a rotatable tubular shell, the means being characterised by comprising four bearings whereof two are mounted, axially-spaced, on the stationary centre or beam between the latter and the rotating tubular shell within the working width of the latter, while the other two are located between the ends of the rotating shell and the calender or mangle supporting frame.

With such a deflection control and/or prevention means the pressure between rolls of the calender or mangle is applied partly by forces acting on the end bearings and partly by forces acting on the ends of the stationary centres or beams of the rolls.

Preferably the two inner bearings are each disposed at a location which is one third of the total shell width in from the respective shell end.

This ensures almost perfect pressure distribution across the width of the shell and minimum deflection is achieved by applying half the total desired pressure through the end bearings and half through the stationary centre or beam.

The end bearings are preferably mounted on hollow journals bolted to, or forming part of, the shell ends.

If it is desired, for example, to deliberately bend the roll shells so that only the central portion of the shell is in contact with the adjacent roll shell, it is only necessary to decrease the proportion of the total load which is applied through the end bearings. This feature is of advantage when, as is often the case, the roll shells of the calender are

constructed alternately of steel and polyamide or other thermoplastics material, and when the steel shells are heated. Deliberately cambering the roll in this way is useful when a narrow fabric is to be processed on a wide calender and damage to the polyamide roll due to the temperature of the steel roll outside the working width of the cloth is to be avoided.

With the present invention, as a substantial proportion of the pressure is applied through the roll centres or beams, it is convenient to apply the load by pulling the ends of adjacent stationary centres or beams together by hydraulic or other means and, if the pressure is applied in this manner, the total load on the support framework of the calender or mangle is substantially reduced.

A modification of the present invention, which is convenient on calenders which have to rotate at a slow speed and which also require the rolls heating to such a temperature that the internal bearings cannot easily be lubricated, is to arrange for the centre or beam, which passes through the tubular shell, to be mounted on spherical seatings inside the shell, which seatings are fitted with locating means which cause the centre to rotate with the shell. At slow speeds, the flexure of the centre is permissible without excessive fatigue loading.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a transverse sectional view through a pair of rolls of a calender or mangle fitted with roll deflection control and/or prevention means according to this invention; and

Fig. 2 is a similar view with a modified roll deflection control and/or prevention means.

Referring to Fig. 1, a calender or mangle 10 comprises a framework generally indicated at 11 supporting two rolls 12 forming a nip therebetween.

Each roll 12 comprises a stationary centre or beam 13 extending through a rotatable tubular steel shell 14.

The shell 14 is supported by four bearings, two indicated at 15 within the working width of the shell 14 and two indicated at 16 at the ends of the shell 14.

Each bearing 15, which is a spherical roller bearing, is mounted on the centre or beam 13 while each bearing 16, which is also a spherical roller bearing, is mounted on a hollow journal 17 and is secured to the framework 11.

Each bearing 15 is positioned in from its respective end of the shell 14, a distance which is ideally but not essentially, one third of the total width of the shell 14 with the advantages obtained as hereinbefore mentioned.

The end bearings 16 of the lower roll 12 are loaded by hydraulic cylinders 18.

Each stationary centre or beam 13 is supported at each of its ends outboard of the framework 11 in a spherical plain bearing 19, and these bearings 19 of the adjacent rolls 12 are interconnected at each end by a hydraulic camber control cylinder 20 which applies load by pulling the ends of the centres or beams 13 together with the consequent advantage mentioned above.

It is to be understood that the hydraulic camber control means, i.e. cylinder 20, may, on occasion, be applied to the ends of a centre 13 of only one roll 12.

The calender or mangle driving gear is indicated at 21 and is keyed onto one of the hollow journals 17.

Referring now to Fig. 2, parts corresponding to those of Fig. 1 are indicated by the same references with the suffix 'A'.

However, in this embodiment, the centres or beams 13A are rotatable, the inner bearings 22 are spherical plain bearings, the bearings 23 for the ends of the rotatable centres or beams 13A are spherical roller bearings, and a flexible coupling 24 is provided between the hollow journal 17A mounting the driving gear 21A and the associated rotatable centre or beam 13A.

The means for controlling and/or preventing deflection of a calender roll according to this invention is applicable both to rolls manufactured with a parallel face and to rolls which have been preformed. In the latter case, negative loading of the inner bearings 15 or 22 is applied to correct the roll shape at low total loads while positive loading of the inner bearings 15 or 22 is applied for high total loads. As a result, the range of loads permissible is a given calender design is extended, and greater flexibility in deflection control and/or prevention is achieved.

Claims

1. A calender or mangle comprising a roll constituted by a centre and a rotatable tubular shell, and roll deflection and/or prevention means constituted by four bearings whereof two are mounted, axially-spaced, on the centre between the latter and the rotatable tubular shell within the working width of the latter, while the other two are located between the ends of the rotatable shell and a supporting frame of the calender or mangle.

2. A calender or mangle as claimed in claim 1 in which the centre is stationary.

3. A calender or mangle as claimed in claim 1 or 2, in which the two inner bearings are each disposed at a location which is one third of the total shell width in from the respective shell end, or substantially so.

4. A calender or mangle as claimed in any one of claims I to 3, in which the end bearings are mounted on hollow journals connected to, or forming part of the shell ends.

5. A calender or mangle as claimed in any one of claims I to 4, comprising a pair of rolls defining a nip, and hydraulic loading means adapted to act on the end bearings of one of the rolls.

6. A calender or mangle as claimed in claim 5, in which the ends of the centres of the rolls are supported in bearings and are interconnected by hydraulic camber control means.

7. A calender or mangle as claimed in claim 5 or 6, in which the ends of the centres of the rolls extend freely through the hollow journals at the ends of the shells, a driving gear being coupled to one of the hollow journals.

8. A calender as claimed in any one of claims 5 to 7, in which the roll centres are rotatable, flexible coupling means being provided between the hollow journals and the roll centres.

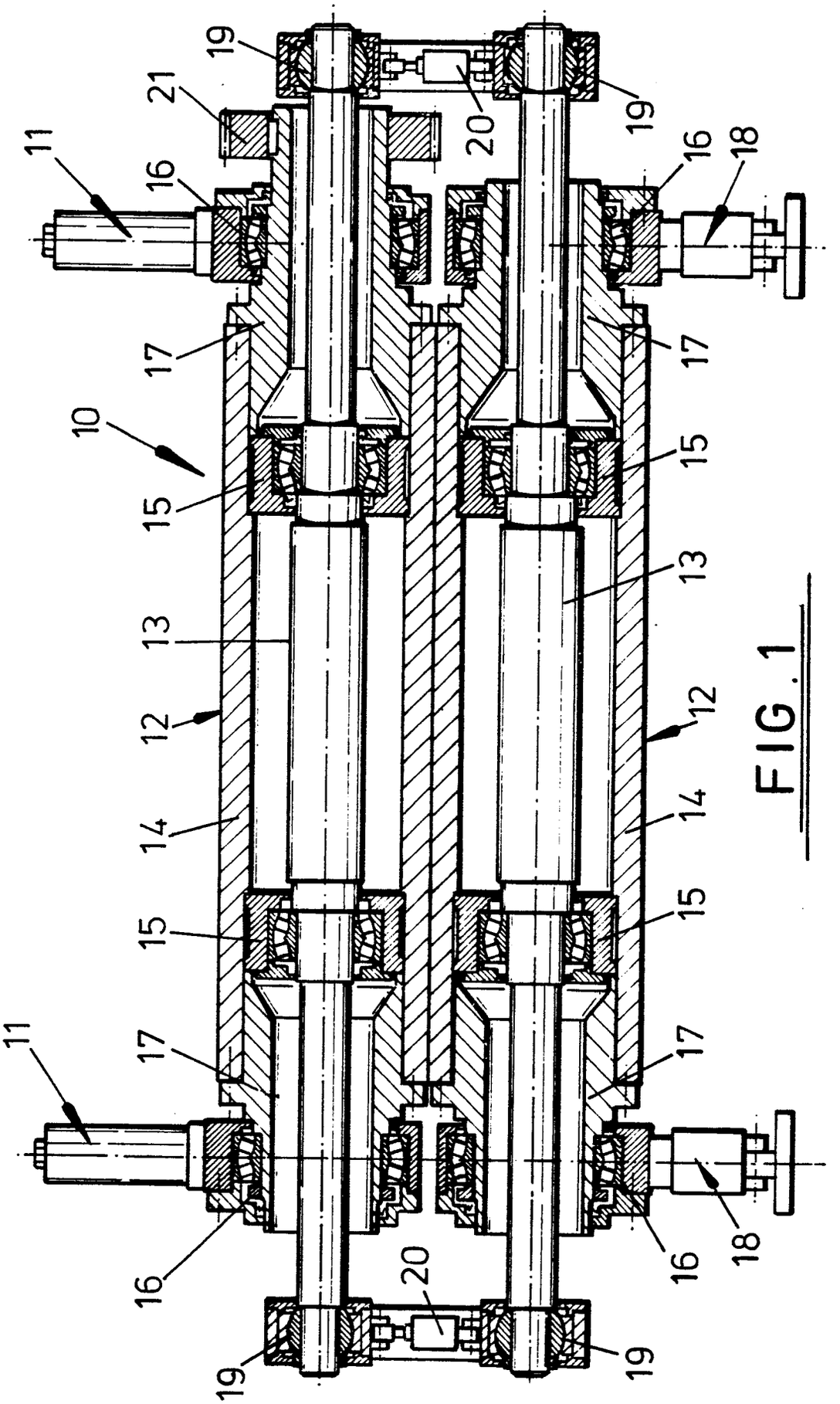
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FIG. 1

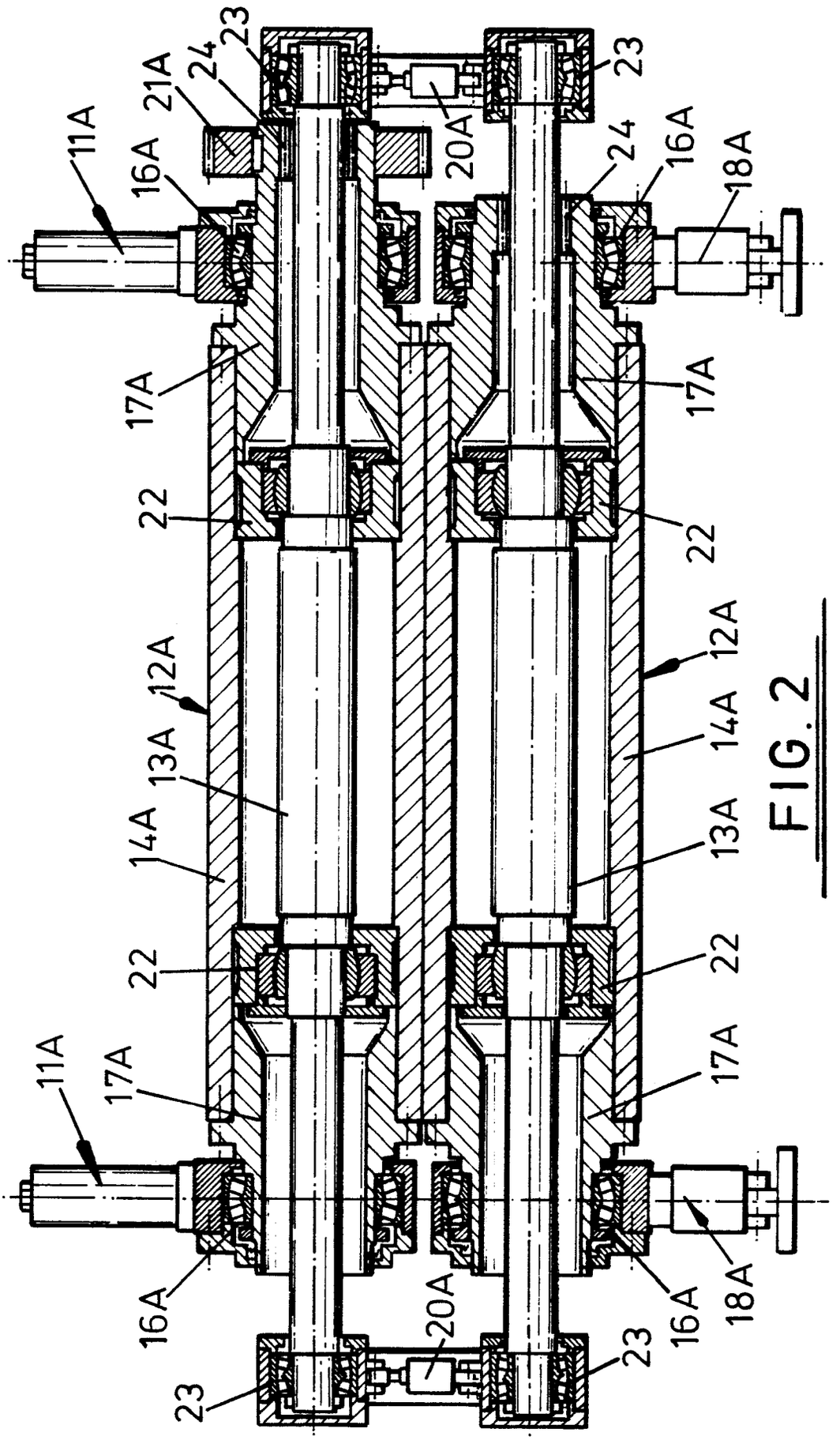
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FIG. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 86 30 9081

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-3 161 125 (HORNBOSTEL) * Whole document *	1,3-6,8	D 21 G 1/02 D 21 F 3/06 D 21 G 1/00
A	FR-A-2 367 851 (ARTOS) * Whole document *	1,4-6	
A	DE-A-2 832 457 (KOLLER) * Whole document *	1,4,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

D 21 G
D 21 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11-03-1987	DE RIJCK F.

CATEGORY OF CITED DOCUMENTS

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