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(56) Documents cited
GB 1283636 A GB 1087226 A EP 0266845 A
US 3839908 A

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(54) Measurement of tension in moving fabrics

(57) A method of and apparatus for measuring the tension in a moving fabric is disclosed wherein a resiliently loaded member (24) at one face of the fabric displaces the fabric relative to the plane of a reaction member, typically in the form of a ring (14), at the other face of the fabric, the extent of displacement, as determined by an electronic depth gauge (29), being a measure of the tension in the fabric.

Providing the reaction member as a support surface and measuring the position of the resiliently loaded member relative to a datum position enables determination of the thickness of the fabric.

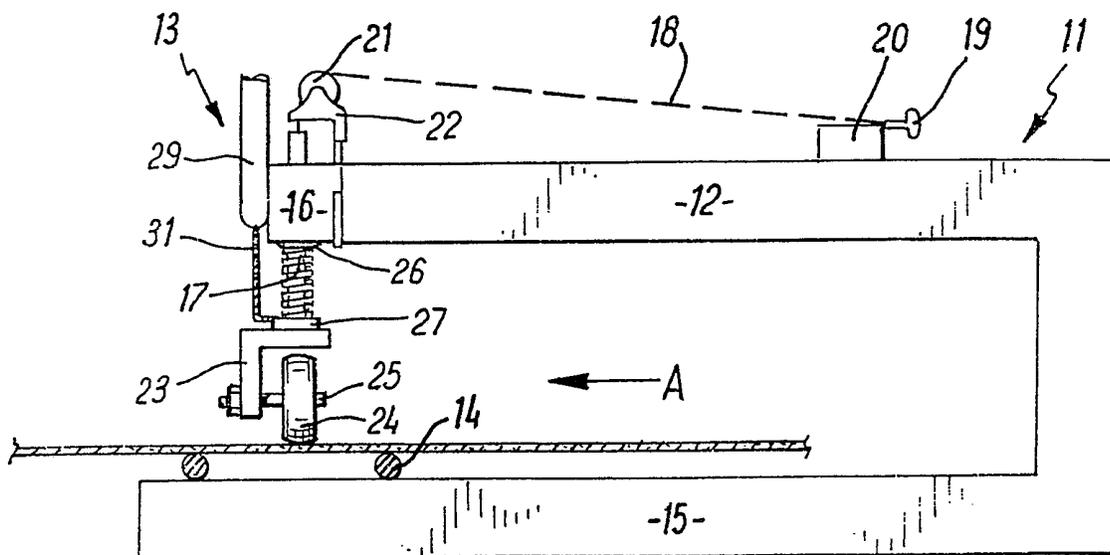


FIG. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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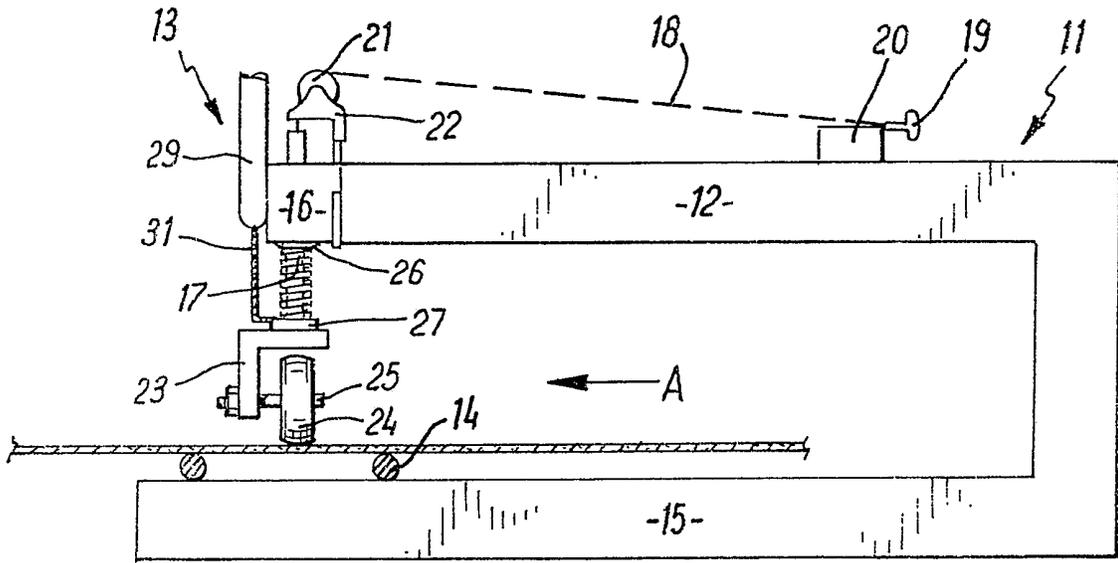


FIG. 1

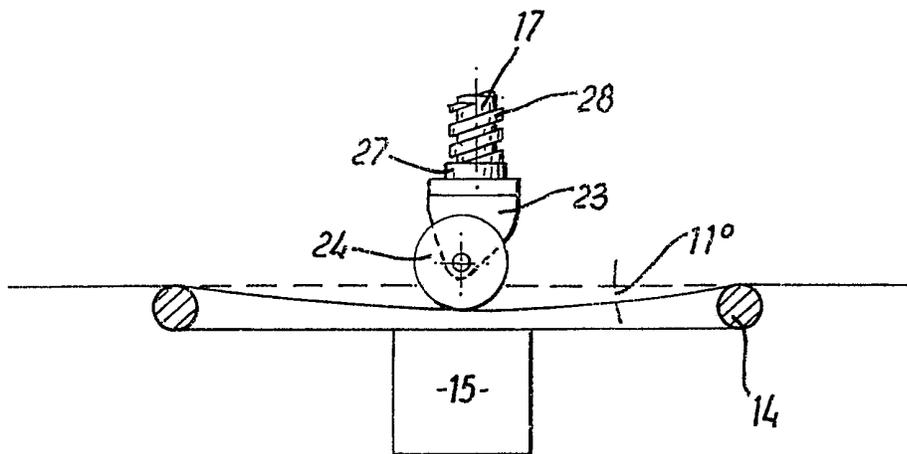


FIG. 2

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MEASUREMENT OF TENSION IN MOVING FABRICS

The invention concerns the measurement of the tension in or the thickness of a moving fabric, and has particular reference to an arrangement for measuring such parameters in relation to a moving papermaker's fabric and especially, though not exclusively, a papermaker's wet felt.

The need exists, in the field of papermaking, for measuring the running tension/thickness of a moving fabric.

It has hitherto been proposed to utilise a measuring device comprising a spring-loaded plunger slidably mounted in a cylinder supported on a base plate, the said plunger extending downwardly through an aperture in said base plate for movement relative thereto, and two fixed contact bars at the underside of the base plate and beyond the plane of which the head of the plunger ordinarily extends, under the influence of the spring-loading thereof, the head of the plunger being engageable with the surface of a fabric under test and, on manual loading of the device towards the fabric, being brought into coplanar relationship with the contact bars against the restraint of said spring-loading.

The fabric tension is determined by reference to the loading applied to the plunger, as indicated by a gauge operatively connected therewith, on attainment of such coplanar relationship.

Whilst the device as aforesaid does provide a rough and ready means of tension measurement, the accuracy of the

device falls far short of what is required, firstly on account of the difficulty in properly determining when the requisite coplanar relationship is attained, secondly having regard to the fact that readings depend upon the force applied, and thirdly because readings vary according to the proximity of the device to fabric support rolls.

The object of the invention is to provide an alternative to the device as aforesaid, which avoids the problems inherent therein in whole or in part.

According to the present invention there is proposed a method of measuring the tension in a moving fabric which includes the steps of supporting the fabric at two spaced locations at a first face thereof, applying a predetermined load to the opposite face of the fabric at a position intermediate said locations, and measuring the deflection of the fabric under said load.

According to a preferred feature the spacing of the locations whereat the fabric is supported and the applied load are constant.

The invention also includes apparatus for practising the method as aforesaid which comprises a reaction means for providing support to a fabric at two spaced locations and load applying means mounted with respect to the reaction means and engageable with a fabric at a position intermediate said spaced locations, the reaction means and load applying means being engageable with respective opposite faces of the

fabric, the load applying means including a resiliently loaded contact member and displacement means sensitive to movement and position of said contact member with respect to the reaction means.

According to a preferred feature, the load applying means includes a constant-load spring operable on said displacement means and loading said displacement means towards the reaction means.

According to a further preferred feature, the reaction means comprises a ring and the displacement means is operable along a line perpendicular to the plane of the ring and passing through the centre thereof.

The invention will now be described further, by way of example only, with reference to the accompanying diagrammatic drawings illustrating one embodiment thereof and in which ; _

Fig. 1 is an elevation of the apparatus of the invention as seen in the direction of fabric movement; and

Fig. 2 is a scrap view of the reaction means and contact member in the direction of arrow A of Fig. 1.

Referring now to the drawings, apparatus for use in measuring the running tension of a papermakers fabric comprises a rigid frame 11 of generally C-shape arranged in vertical disposition, the remote end of the upper limb 12 of the frame supporting a load-applying means 13 in overlying relationship with respect to a reaction member 14 supported

on the extended remote end of the lower limb 15.

The frame 11 is of lightweight construction and is conveniently formed from an aluminium bar of rectangular transverse cross-section.

The load-applying means 13 comprises a tubular body part 16 secured to and transversely of the remote end of the upper limb 12 of the frame 11 and the axis thereof passes through the lower limb 15 of such frame. Load-applying means 13 further includes a spindle 17 slidably mounted in the body part 16 to extend outwardly therefrom at the upper and lower ends thereof, the upper end of the spindle receiving one end of a retaining wire 18 the other end of which carries a hand grip 19 selectively engageable with a lug 20 provided on the upper limb 12 of the frame, there being a pulley 21 supported in a bracket 22 secured above and in spaced disposition relative to the body part 16 and about which the retaining wire 18 is entrained. At its lower end spindle 17 carries an angular bracket 23 supporting a freely rotatable wheel 24, the axis 25 of the wheel being arranged in offset relationship with respect to the axis of the spindle 17 as is apparent from Fig. 2. Ball races 26 and 27 are provided at the underside of the body part 16 and at the upper side of angular bracket 23 respectively, the ball races 26, 27 receiving and locating the ends of a constant tension spring 28 disposed about spindle 17. A digital or analogue read-out electronic depth gauge 29 is attached to the body part 16 of

the load applying means 13, the depth gauge 29 having a probe 31 extending downwardly therefrom, said probe 31 being sensitive to movement of angular bracket 23 in the axial direction of the spindle 17.

Reaction member 14 comprises a ring mounted on the lower limb 15 in a plane perpendicular to the plane of frame 11 and at a position in symmetrical alignment with spindle 17.

In use, the frame is engaged with and at right angles to the edge of a running fabric, the fabric being interposed between wheel 24 and reaction member 14, and the retaining wire 18 is released by disengagement of handgrip 19 from lug 20 to bring the wheel into pressure contact with the fabric. The loading applied by spring 28 deflects the fabric overlying the ring, the extent of the deflection as determined by depth gauge 29 being a measure of the running tension of such fabric.

In the particular arrangement under consideration the spring tension is 200 Newtons and, for a fabric having a running tension of 4 - 5 kg/cm and with a ring of 200 mm diameter, such tension will give rise to a deflection within the ring of approximately 11°. We have found that we are able to measure deflections to an accuracy of 0.01 mm with the apparatus as hereinproposed and that readings are reproducible and properly comparable in view of the fact that, by using a reaction member of the kind proposed,

measurements are shielded from such outside influences as the presence of machine rollers and other apparatus. The reproducibility of readings is thought to be due, in part, to limiting the range of movement of the spindle, and thereby ensuring uniformity of spring pressure, and in this regard a maximum movement of 50 mm can be tolerated. In the present instance the construction is such as to limit movement to 20 mm, being the axial dimension of the ring.

Calibration of the apparatus can be effected by reference to, for example, measuring devices on other machines, and in this regard we propose to relate measurements taken on the apparatus of the invention to similar measurements of fabric tension obtained by such as load cells on a fabric stretcher.

It is to be observed that, in applying the apparatus to a relatively slowly moving fabric such apparatus can be engaged with the fabric edge by movement in a direction at right angles to that edge. However, in the case of fast running fabrics it is thought desirable to bring the apparatus into an operative position by pivotal motion in an horizontal plane about an axis adjacent the fabric edge.

Whilst the primary purpose of the apparatus is to measure the tension of a moving fabric, such apparatus does lend itself to the measurement of fabric thickness, and in an analogous structure for use in this context it is proposed to insert a plate into the ring of a thickness corresponding to

the axial dimension of the ring, a different spring-loading being utilised or not, as preferred.

The invention is not restricted to the precise detail of the embodiment hereinbefore described, since alternatives will readily present themselves to one skilled in the art. Thus, for example, whilst we propose to use a self-aligning wheel through which the spring loading is applied to the fabric, it may be preferred, in some instances, to utilise a shoe in sliding relationship with the fabric, suitable provision being made to avoid undue frictional heating thereof.

The reaction member will preferably comprise a ring as hereinproposed in view of the benefit of such a structure in shielding the measuring zone from external influences, but alternatives such as spaced bars may be satisfactory in some circumstances. Indeed, it is conceivable that a single bar would suffice in limited circumstances for measurements at a predetermined location with respect to a machine roller, such roller and the single bar providing spaced reference points between which measurements could be taken.

Loading is conveniently through a spring means, and preferably a constant loading spring, but other forms of loading, for example fluid in character, may be utilised.

Claims

1. A method for measuring the tension in or thickness of a moving fabric which includes the steps of supporting the fabric at two spaced locations at a first face thereof, applying a predetermined load to the opposite face of the fabric at a position intermediate said locations, and measuring the deflection of the fabric under said load.

2. The method as claimed in claim 1, wherein one of said spaced locations comprises a roller by which the moving fabric is supported.

3. The method as claimed in claim 1 or 2, wherein the spacing of the locations whereat the fabric is supported and the applied load are constant.

4. Apparatus for measuring the tension in or thickness of a moving fabric comprising a reaction means for providing support to a fabric at two spaced locations and load applying means mounted with respect to the reaction means and engageable with a fabric at a position intermediate said spaced locations, the reaction means and load applying means being engageable with respective opposite faces of the fabric, the load applying means including a resiliently loaded contact member and displacement means sensitive to movement and position of said contact member with respect to the reaction means.

5. Apparatus as claimed in claim 4, wherein the load applying means includes a constant-load spring operable on said displacement means and loading said displacement means

towards the reaction means.

6. Apparatus as claimed in claim 4 or 5, including a plate providing a support surface co-planar with the plane defined by the upper surface of the reaction means.

7. Apparatus as claimed in any one of claims 4 to 6, wherein the reaction means comprises a ring and the displacement means is operable along a line perpendicular to the plane of the ring and passing through the centre thereof.

8. Apparatus as claimed in any one of claims 4 to 6, wherein the reaction means comprises spaced bars.

9. Apparatus as claimed in any one of claims 4 to 8, including a frame of C-shape configuration of which one limb supports the load applying means and the other limb supports the reaction means.

10. Apparatus as claimed in claim 9, wherein the load-applying means includes a tubular body, a spindle extending axially of the body, and a spring disposed about the spindle and positioned between the tubular body and said contact member.

11. Apparatus as claimed in any one of claims 4 to 10, further including a releasable retaining means adapted to secure the contact member in a retracted position.

12. Apparatus as claimed in any one of claims 4 to 11, wherein the resiliently loaded contact member comprises a freely rotatable wheel supported in an angular bracket, the wheel being in offset relationship with respect to the movement axis of the load applying means.

13. Apparatus as claimed in any one of claims 4 to 12, wherein the displacement means comprises an electronic depth gauge.

14. Apparatus as claimed in claim 13 when dependent upon claim 12, wherein the displacement means includes a probe sensitive to movement of the angular bracket towards or away from the reaction means.

15. The method of measuring the tension in or thickness of a moving fabric substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

16. Apparatus for measuring the tension in or thickness of a moving fabric substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

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Relevant Technical fields

- (i) UK Cl (Edition K) G1W
- (ii) Int CL (Edition 5) G01B; G01L

Search Examiner

T S SUTHERLAND

Databases (see over)

- (i) UK Patent Office
- (ii)

Date of Search

15 JUNE 1992

Documents considered relevant following a search in respect of claims

1 TO 14

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1283636 (GLANZSTOFF) see page 1 and Figure 5	1,2,4
X	GB 1087226 (ICI) see Figure 1	1,2,4
X	EP 0266845 A (PHILIPS) see the figure	1,2,4
X	US 3839908 (CASPER) see Figures 1 to 3	1,2,4

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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