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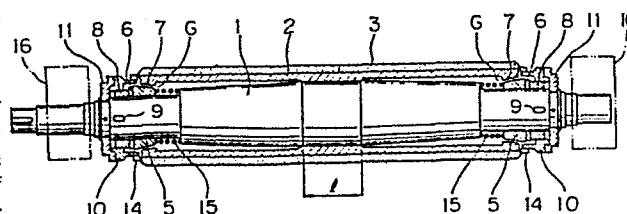
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54 **Deflection-adjustable squeeze roll.**

57 A deflection-adjustable squeeze roll of which the width-wise distribution of degree of deflection can be easily and accurately controlled, comprises a support core shaft having two opposite end portions thereof borne by bearings; a cylindrical tube concentrically covering and fixed at the middle portion thereof to the corresponding middle portion of the support core shaft, which tube has a pair of annular guide projects each extending from the corresponding end portion of the cylindrical tube toward the support core shaft and having an inner conical surface; a pair of annular conical pistons each mounted slidably on the corresponding end portion of the support core shaft and each having an outer conical surface adequate to slidably contact the corresponding inner conical surface of the annular guide projection; a pair of flanges each fixed to the corresponding end portion of the support core shaft between the corresponding annular conical piston and bearing; a pair of annular external thread members each mounted slidably on the corresponding end portion of the support core shaft between the corresponding annular conical piston and flange in contact with the corresponding annular conical piston; and a pair of annular internal thread members each rotatably connected to the corresponding flange in engagement with the corresponding annular external thread member.

Fig. 1



DEFLECTION-ADJUSTABLE SQUEEZE ROLL

BACKGROUND OF THE INVENTION

1. . Field of the Invention

The present invention relates to a squeeze roll usable for a squeezing machine for a liquid-
5 -containing textile fabric. More particularly, the present invention relates to a squeeze roll whose deflection can be controlled so as to uniformly squeeze a fabric over the entire width thereof or, if necessary, to adjust the widthwise distribution of pressure applied
10 to the fabric in such a manner that the pressure applied to a desired portion, for example, a middle portion of the fabric, is made smaller or larger than that of the other portions of the fabric.

2. Description of the Prior Art

15 Japanese Examined Patent Publication (Kokoku) No. 48-36226 discloses a squeezing machine for squeezing a textile material to remove a liquid therefrom. The squeezing machine comprises a pair of squeezing rolls each having an inner support shaft having two opposite
20 ends thereof borne by bearings connected to a pressure cylinder and an outer tube having two opposite ends also borne by the bearings.

The Japanese publication is, however, completely silent as to how the degree of deflection of
25 the roll can be controlled to uniformly squeeze the fabric.

Japanese Examined Patent Publication (Kokoku) No. 52-17146 (Japanese Patent No. 887,108) discloses another type of a squeeze roll whose degree of deflec-
30 tion can be controlled mainly by controlling the pressure applied to the squeeze rolls. In this machine, the degree of deflection of the rolls sometimes varies to some extent depending on the pressure imparted by the pressure applying device or on the frictional
35 resistance of the roll.

U.S. Patent No. 4,305,191 discloses a squeezing machine similar to that described in former Japanese publication. In this type of squeezing machine, the degree of deflection of the rolls can be controlled by
5 controlling the contact pressure between the end portions of the inner shaft and the end portions of the outer tube by means of a pneumatic device.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a
10 deflection-adjustable squeeze roll usable for a squeezing machine for a liquid-containing textile fabric, the degree of deflection of which roll can be controlled without using a pneumatic device.

Another object of the present invention is to
15 provide a deflection-adjustable squeeze roll usable for a squeezing machine for a liquid-containing textile fabric, the degree of deflection of which roll can be accurately adjusted, and the deflected roll being capable of being easily restored to its original state.

20 The above-mentioned objects can be attained by the deflection-adjustable squeeze roll of the present invention, which comprises a support core shaft having two opposite end portions thereof borne by bearings; a cylindrical tube concentrically covering and fixed at
25 the middle portion thereof to the corresponding middle portion of the support core shaft, which tube has a pair of annular guide projections each extending from the corresponding end portion of the cylindrical tube toward the support core shaft and having an inner
30 conical surface converging toward the center portion of the support core shaft; a pair of annular conical pistons each mounted slidably on the corresponding end portion of the support core shaft and each having an outer conical surface converging toward the center
35 portion of the support core shaft and being adequate to slidably contact the corresponding inner conical surface of the annular guide projection; a pair of

flanges each fixed to the corresponding end portion of the support core shaft at a location between the corresponding annular conical piston and bearing; a pair of annular external thread members each mounted
5 slidably on the corresponding end portion of the support core shaft at a location between the corresponding annular conical piston and flange, in contact with the corresponding annular conical piston; and a pair of annular internal thread members each rotatably
10 mounted on the corresponding end portion of the support core shaft and rotatably connected to the corresponding flange in engagement with the corresponding annular external thread member, whereby the widthwise distribution of the degree of deflection of the roll can be
15 adjusted by rotating the annular internal thread members to move the annular external thread members and the annular conical pistons along the end portions of support core shaft, and to place the annular conical pistons in desired relative positions to the annular
20 guide projections.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional view of an embodiment of the squeeze roll of the present invention in a non-deflected state;

25 Fig. 2 is a side view of an embodiment of a flange usable for the squeeze roll of the present invention,

Fig. 3 is an explanatory partially cross-sectional view of a pair of squeeze rolls of the present invention in a deflected state under pressure; and

30 Fig. 4 is an enlarged cross-sectional view of an end portion of the squeeze roll indicated in Fig. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiment of the squeeze roll of the present invention will be illustrated hereinafter with
35 reference to the accompanying drawings.

Referring to Figs. 1 and 4, a squeeze roll has a support core shaft 1 and a cylindrical tube 2 concen-

trically covering and fixed at the middle portion thereof to the corresponding middle portion of the support core shaft 1.

5 The length l of the fixed middle portions of the support core shaft 1 and cylindrical tube 2 is limited to a certain value or less at which the resultant squeeze roll can be deflected to a necessary extent.

10 The cylindrical tube 2 may be covered with an outer elastic material layer fixed thereto. The elastic material is usually a synthetic rubber.

The two opposite ends of the support core shaft 1 are borne by bearings 16.

15 The cylindrical tube 2 has a pair of annular guide projections 7 each extending from the corresponding end portion of the cylindrical tube 2 toward the support core shaft 1 and each having an inner conical surface converging toward the center portion of the support core shaft 1.

20 In each end portion of the support core shaft 1, an annular conical piston 5 is slidably mounted on the end portion. This annular conical piston 5 has an outer conical surface converging toward the center portion of the support core shaft 1. This outer conical surface of the annular conical piston 5 is
25 adequate to slidably contact the corresponding inner conical surface of the annular guide projection 7.

30 A pair of flanges 11 are each immovably fixed to the end portions of the support core shaft 1 at a location between the corresponding annular conical piston 5 and bearing 16.

A pair of annular external thread members 8 are each slidably mounted on the end portions of the support core shaft 1 at a location between the corresponding annular conical piston 5 and flange 11 in
35 contact with the corresponding annular conical piston 5. The annular external thread members 8 are slidable on the surface of the end portions of the support core

shaft 1 by being guided by keys 9 fixed to the end portions of the support core shaft 1 and extending in parallel to the axis thereof. The annular external thread members 8 may be provided with thrust bearings 6
5 located in contact with the annular conical pistons 5.

A pair of annular internal thread members 10 are mounted on the end portions of the support core shaft 1 and rotatably connected to the flanges 11 in engagement with the annular external thread members 8.

10 Referring to Figs. 2 and 4, the flange 11 has a long arc-shaped slit 12. The annular internal thread member 10 is connected to the flange 11 with a bolt 13 through the slit 12. The bolt 13 connected to the
15 annular internal thread member 10 can move along the arc-shaped slit 12 by loosening it. The gap between the annular internal thread member 10 and the cylindrical tube 2 is sealed by a sealing ring 14.

Referring to Figs. 1, 3, and 4, the end portion of the support core shaft 1 may have a smaller diameter
20 than that of the remaining portion so as to form a step between the end portion and the remaining portion.

In each end portion of the support core shaft 1, a spring member 15 may be mounted at a location between the above-mentioned step and the annular conical
25 piston 5. In this arrangement, the inside end of the spring member 15 is fixed by the step and the outside end of the spring member 15 pushes the annular conical piston 5 outward.

When the bolt 13 is loosened and the annular
30 internal thread member 10 is rotated so as to move the annular external thread member 8 inward along the key 9, the annular conical piston 5 is pushed inward and comes into contact with the annular guide projection 7 of the cylindrical tube 2, while compressing the
35 spring member 15. That is, the annular conical piston 5 can be accurately positioned by adjusting the rotation angle of the annular internal thread member 10.

Therefore, the gap G between the outer conical surface of the annular conical piston 5 and the inner conical surface of the annular guide projection 7 of the cylindrical tube 2 can be easily controlled by rotating the annular internal thread member 10. The width of the gap G can be represented by the rotation angle of the annular internal thread member 10 which can be indicated thereon.

The deflection of the squeeze roll will be explained below with reference to Fig. 3.

In Fig. 3, pressing forces are applied to the end portions of the support core shafts of the upper and lower rolls 21 and 20 in the directions indicated by arrows.

In this case, the upper support core shaft 1 is deflected in such a manner that the end portions of the axis L of the support core shaft 1 move downward while the middle portion of the axis L of the support core shaft 1 is maintained in its original position. This deflection results in compression of the elastic material layer in the cylindrical tube 2. Due to the resilience of the elastic material layer, a force for pushing up each end portion of the cylindrical tube 2 is created on the end portions. Therefore, the end portions of the axis M of the cylindrical tube 2 are deflected upward, while the middle portion of the axis M of the cylindrical tube 2 is maintained in its original position.

Accordingly, when pressure is applied to the squeeze roll, as indicated in Fig. 4, the end portions of the axis L of the support core shaft 1 are slightly spaced from the end portions of the axis M of the cylindrical tube 2. The distance between the end portions of the axis L of the support core shaft 1 and that of the axis M of the cylindrical tube 2 depends on the width of the gap G between the inner conical surface of the annular guide project 7 and the outer

conical surface of the annular conical piston 5.

When pressure is applied to a pair of squeeze rolls so as to press them to each other, in a nipping side portion of a squeeze roll contacting the other
5 squeeze roll, the annular conical piston 5 of the support core shaft 1 comes into contact with the annular guide projection 7 of the cylindrical tube 2 so that the gap G becomes zero. In the opposite side portion of the squeeze roll, the width of the gas G
10 increases. Referring to Fig. 4, the pressure F applied to the annular guide projection 7 of the cylindrical tube 2 from the annular conical piston 5 of the support core shaft 1 serves to deflect downward the end portion of the cylindrical tube 2. The intensity of the
15 pressure F depends on the intensity of the pressure applied to the squeeze roll and the width of the gap G in the non-deflected squeeze roll. The width of the gap G depends on the position of the annular conical piston 5. When a predetermined intensity of pressure
20 is applied to a pair of squeeze rolls, the larger the gap G, the larger the deflection of the end portion of the cylindrical tube 2 in the opposite direction to that of the deflection of the support core shaft 1. When the gap G is large, the degree of squeeze in the
25 middle portion of the squeeze roll is larger than that in the end portions. When the squeeze roll is in an unloaded condition the gap G can be made small by moving the annular conical piston 5 toward the center of the roll. In this small gap G, when pressure is
30 applied to the squeeze roll, the cylindrical tube 2 is deflected in the same direction as that of the support core shaft 1. In this case, the degree of squeeze in the middle portion of the roll is smaller than that in the end portions.

35 Accordingly, when the annular conical piston 5 is positioned at an adequate location and an adequate pressure is applied to the squeeze roll, it is possible

to maintain the cylindrical tube 2 in a non-deflected condition while deflecting only the support core shaft 1. In this condition, the widthwise distribution of the degree of squeeze of the squeeze roll becomes
5 uniform throughout the squeeze roll.

As described above, the widthwise distribution of the degree of squeeze of the squeeze roll can be easily and accurately controlled by controlling the deflection of the support core shaft and the cylindrical tube.
10 The deflection can be controlled by adjusting the relative positions of the annular conical pistons to the annular guide projections. The relative positions can be easily and accurately adjusted by rotating the annular internal thread members.

15 Also, the deflected support core shaft and cylindrical tube can be easily restored to the non-deflected condition by adjusting the relative positions of the annular pistons to the annular guide projections.

If necessary, it is possible to make the widthwise
20 distribution of the degree of squeeze of the squeeze roll asymmetric with respect to the center of the squeeze roll by making the relative positions of the annular conical pistons to the annular guide projections different from each other.

25 Referring to Fig. 4, the annular conical piston 5 is usually pressed outward due to a force created in reaction to the force F. Therefore, the spring member 15 may be omitted.

The cylindrical tube 2 may or may not be covered
30 with the elastic material layer. That is, the cylindrical tube 2 may consist of a stainless steel tube alone.

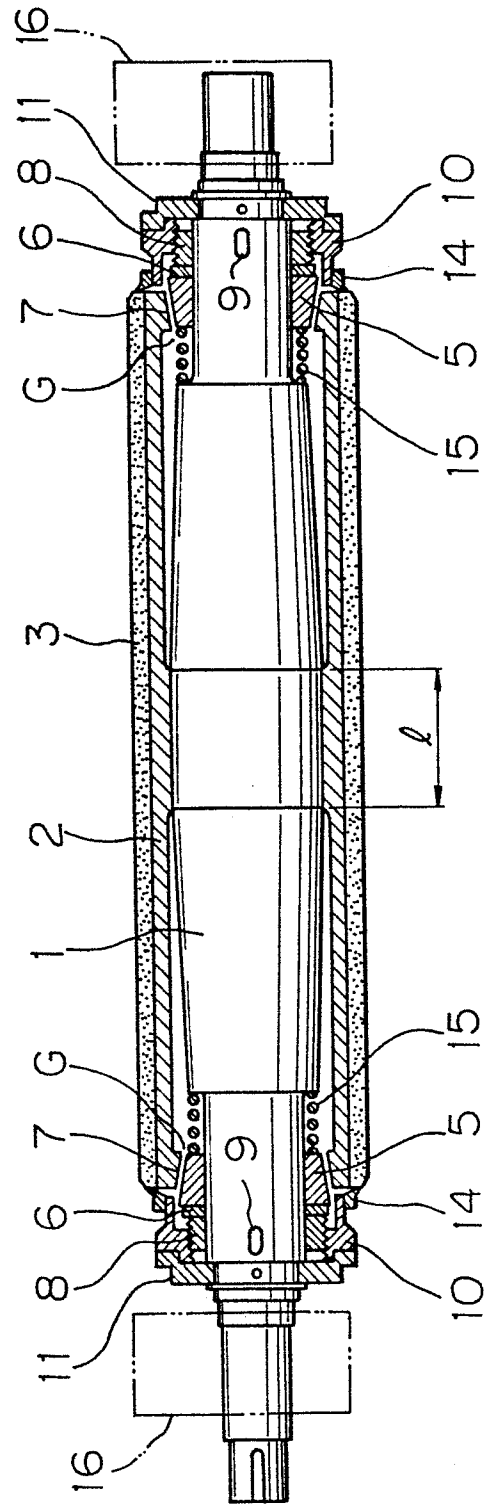
CLAIMS

1. A deflection-adjustable squeeze roll comprising a support core shaft having two opposite end portions thereof borne by bearings; a cylindrical tube concentrically covering and fixed at the middle portion thereof to the corresponding middle portion of the support core shaft, which tube has a pair of annular guide projections each extending from the corresponding end portion of the cylindrical tube toward the support core shaft and having an inner conical surface converging toward the center portion of the support core shaft; a pair of annular conical pistons each mounted slidably on the corresponding end portion of the support core shaft and each having an outer conical surface converging toward the center portion of the support core shaft and being adequate to slidably contact the corresponding inner conical surface of the annular guide projection; a pair of flanges each fixed to the corresponding end portion of the support core shaft at a location between the corresponding annular conical piston and bearing; a pair of annular external thread members each mounted slidably on the corresponding end portion of the support core shaft at a location between the corresponding annular conical piston and flange in contact with the corresponding annular conical piston; and a pair of annular internal thread members each rotatably mounted on the corresponding end portion of the support core shaft and rotatably connected to the corresponding flange in engagement with the corresponding annular external thread member, whereby the widthwise distribution of the degree of deflection of the roll can be adjusted by rotating the annular internal thread member to move the annular external thread members and the annular conical piston along the end portions of support core shaft and to place the annular conical pistons in desired relative positions to the annular guide projections.

2. The squeeze roll as claimed in claim 1, wherein the cylindrical tube is covered with an outer elastic material tube.

3. The squeeze roll as claimed in claim 1,
5 wherein a pair of spring members are mounted on the portion of the support core shaft at a location inside of the annular conical pistons in such a manner that an inside end of each spring member is immovably fixed to the support core shaft, and an outside end of each
10 spring member contacts the corresponding annular conical piston.

Fig. 1



$\frac{2}{3}$

Fig. 2

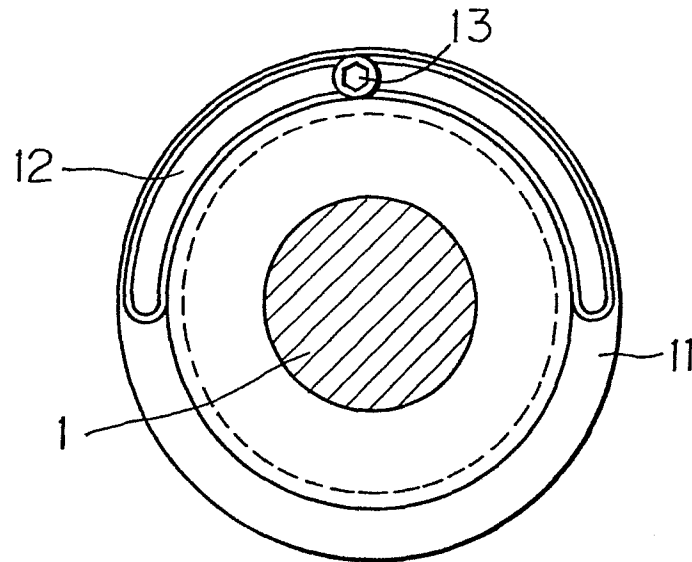
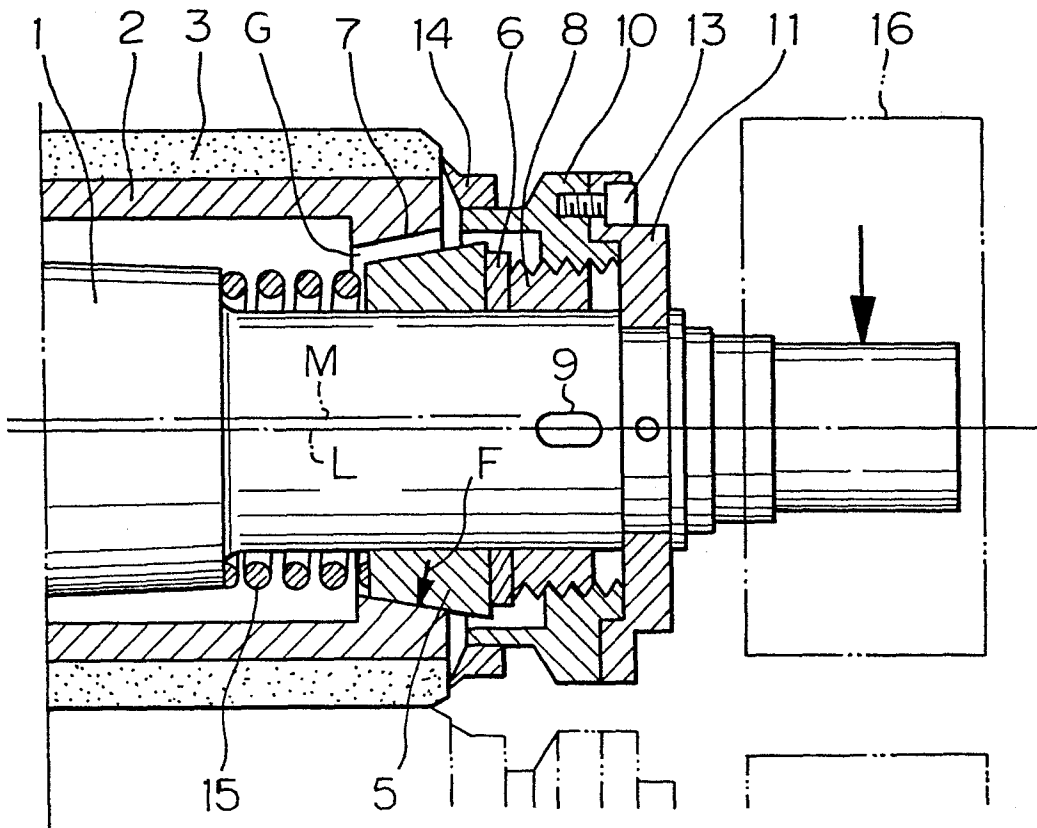
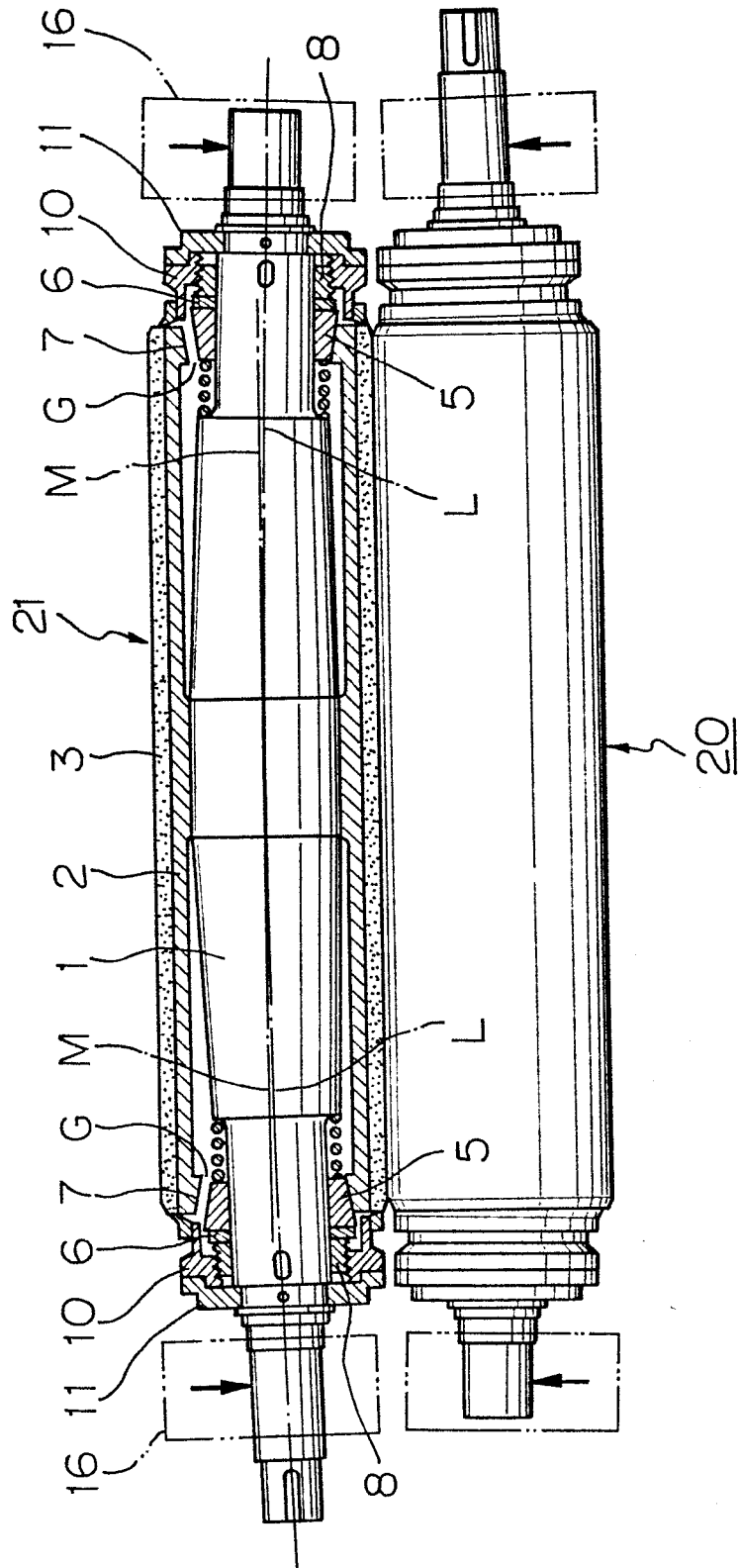


Fig. 4



$\frac{3}{3}$

Fig. 3





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)
Y	GB-A-2 081 420 (CONTINENTAL GUMMI) * Whole document *	1,2	D 06 B 23/02
Y	FR-A-2 398 915 (IVANOVSKY-NAUCHNO-ISSLEDOVATELSKY EXPERIMENTALNO-KONSTRUKTORSKY MASHINOSTROITELNY INSTITUT) * Whole document *	1,2	
Y	DE-A-3 221 011 (KUOSA) * Whole document *	1,2	
A,D	US-A-4 305 191 (SHOZO ENOMOTO)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			D 06 B D 21 G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09-11-1984	Examiner PETIT J.P.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	