ELASTIC CALENDER ROLLER WITH COVER OF SYNTHETIC MATERIAL

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1 Claim

ABSTRACT OF THE DISCLOSURE

An elastic calender roller which includes a steel core in radially spaced relationship thereto, while an inflatable body is interposed between said core and said cover and is adapted to be inflated by fluid under pressure for frictionally and detachably holding said cover firmly to said core.

The present invention relates to an elastic roller for calenders, especially for textile and embossing calenders in which the elastic cover, instead of consisting of different permeated or non-permeated layers of fiber material, is composed of a homogeneous synthetic material. In this connection, it is known to employ primarily covers of polyamides because this material has proved highly satisfactory with regard to permanent elasticity, moisture rejection and temperature resistance. Also the resistance against the working pressure is satisfactory if the thickness of the cover is not too thin since, otherwise, depolymerization and flow phenomena show up.

Nevertheless, rollers of the above type have not been generally accepted in practice for permanent operation because heretofore it was not possible to connect the cover of polyamide with the required thickness on the steel shaft. Moreover, there still existed the problem of making tension-free tubular covers of polyamide. Since the manufacture of a sufficiently thick cover was heretofore possible only by pouring polyamide around a steel shaft, it was unavoidable that during the cooling-off period considerable tension in the material of the cover occurred which tension in the majority of the cases caused the cover to tear and break. Also complicated cooling methods during the pouring operation did not solve the above mentioned problem. It has furthermore been suggested to absorb the shrinkage tensions by an elastic cover deposited on the steel shaft, but experience has shown that also this method cannot be properly realized.

If, on the other hand, the cover of synthetic material is selected too thin for instance by the employment of extrusion-pressed hoses which are applied in warm condition, the above mentioned flow phenomena occur in the cover.

It is, therefore, an object of the present invention to provide an elastic calender roller with a cover of synthetic material, which will overcome the above mentioned drawbacks.

It is another object of this invention to provide a calender roller as set forth in the preceding paragraph, which will permit a proper connection of the cover of synthetic material to the steel shaft.

It is still another object of this invention to provide a method of making elastic calender rollers as set forth above which will greatly reduce the costs of producing the respective cover.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 illustrates in cross section a calender roller according to the invention in which between the roller cover and the roller core there is provided an inflatable layer having longitudinal passages therein.

FIG. 2 illustrates a partial section of the inflatable layer on a larger scale than that of FIG. 1.

FIG. 3 shows the arrangement of an annular conduit for the distribution of the compressed air to be conveyed to said inflatable layer.

FIG. 4 illustrates a longitudinal section through a calender roller according to the invention in which the intermediate layer comprises circumferential passages and which employs so-called pneumatic shafts.

The elastic calender roller according to the present invention is characterized primarily in that between the roller cover and the steel shaft carrying the same there is provided a pneumatic hydraulic inflatable body the radial pressure of which causes the cover in conformity with the admissible tension in the roller cover, and which is furthermore characterized in that such cover can be produced in the plant in which the synthetic material is produced, by block polymerization in a tension-free form. The cover of synthetic material may be produced in standardized sizes and in considerable length. The required intermediate sizes can be obtained by machining of a correspondingly produced pipe of synthetic material.

Referring now to the drawings in detail, the roller cover 1 shown in FIG. 1 has a relatively great wall thickness, the steel shaft 2 carrying said cover 1 is covered by an elastic layer 3 having provided therein a considerable number of longitudinal passages 4. These passages or conduit means are at one roller end connected to an annular conduit 5a shown in FIG. 3 for compressed air, said annular conduit being adapted to receive compressed air through a rotatable head. The manufacture of such layers can advantageously be effected by cementing hoses alternately with profile sections 3e upon the shaft 2 and than by wrapping a cover layer 35 (see FIG. 2) around same shaft and profile sections whereupon the thus obtained assembly is vulcanized. The bore of the elastic cover has an outside of approximately from 2 to 3 millimeters over the elastic layer so that the cover can easily be slipped therupon. After compressed air has been introduced into the bore, the elastic layer expands to such an extent that the cover will non-displaceably and fixedly be mounted and will not be able even under high stresses to turn relative to the shaft.

The pressure in the hoses will be held constant for instance by a contact manometer and will be so selected that it neutralizes from about 30 to 45% of the admissible circumferential stress of the cover of the roller.

FIG. 4 shows fundamentally the same roller cover as FIG. 1, but in contrast to FIG. 1 a customary so-called pneumatic shaft is employed as it is used for instance as winding shaft for the winding up of textile, paper and synthetic material. Such pneumatic shaft comprises a steel axle 2a and a rubber hose 7a slipped thereon which rubber hose is held on said steel shaft at regular distances over the length thereof by means of bandages 8, bands or the like. Passages 6 lead from a central compressed air feeding bore 5 to each section between the bandages whereby pressure is applied a plurality of annular concentric air chambers 7a is formed. As a result thereof, the elastic hose 7 is firmly pressed against the inner bore of the roller cover.

As will be seen from the above, the way of connecting the roller cover to the roller core in conformity with the present invention makes it possible to adjust the frictional force between steel shaft and roller cover in a precise way and to keep said frictional force substantially constant. Moreover, the arrangement according to the present
invention has the great advantage that the roller covers can be produced stress-free by block polymerization at the plant where said synthetic material is produced, while the rather difficult pouring and tempering methods herefore used in connection with the manufacture of elastic calender rollers having a synthetic cover will be obviated.

It is, of course, to be understood that the present invention is, by no means, limited to the particular constructions shown in the drawing but also comprises any modifications within the scope of the appended claim. Thus, while it has been set forth above that the passages 4, 7a receive compressed air for inflating the inflatable body, it is also possible to pass cooling fluid through said passages and to place said cooling fluid under the pressure of compressed air. In this way, the fluid serves both as cooling medium and as inflating medium.

What I claim is:

1. An elastic calender roller, which includes a steel core, a cover of resilient synthetic material surrounding said core in concentric radially spaced relationship thereto and having a radial wall thickness which is a multiple of the difference between the radius of said core and the inside radius of said cover, and a cylindrical elastic inflatable body formed by an elastic sleeve vulcanized to said steel core in the annular space between said core and said cover and having passage means provided with a plurality of longitudinal passages circumferentially distributed about said sleeve and in the form of elastic conduits provided directly within said sleeve near the inner periphery thereof and adapted to be connected and supplied with a source of fluid under pressure to expand said inflatable body for frictionally and detachably holding said cover firmly on said core.

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