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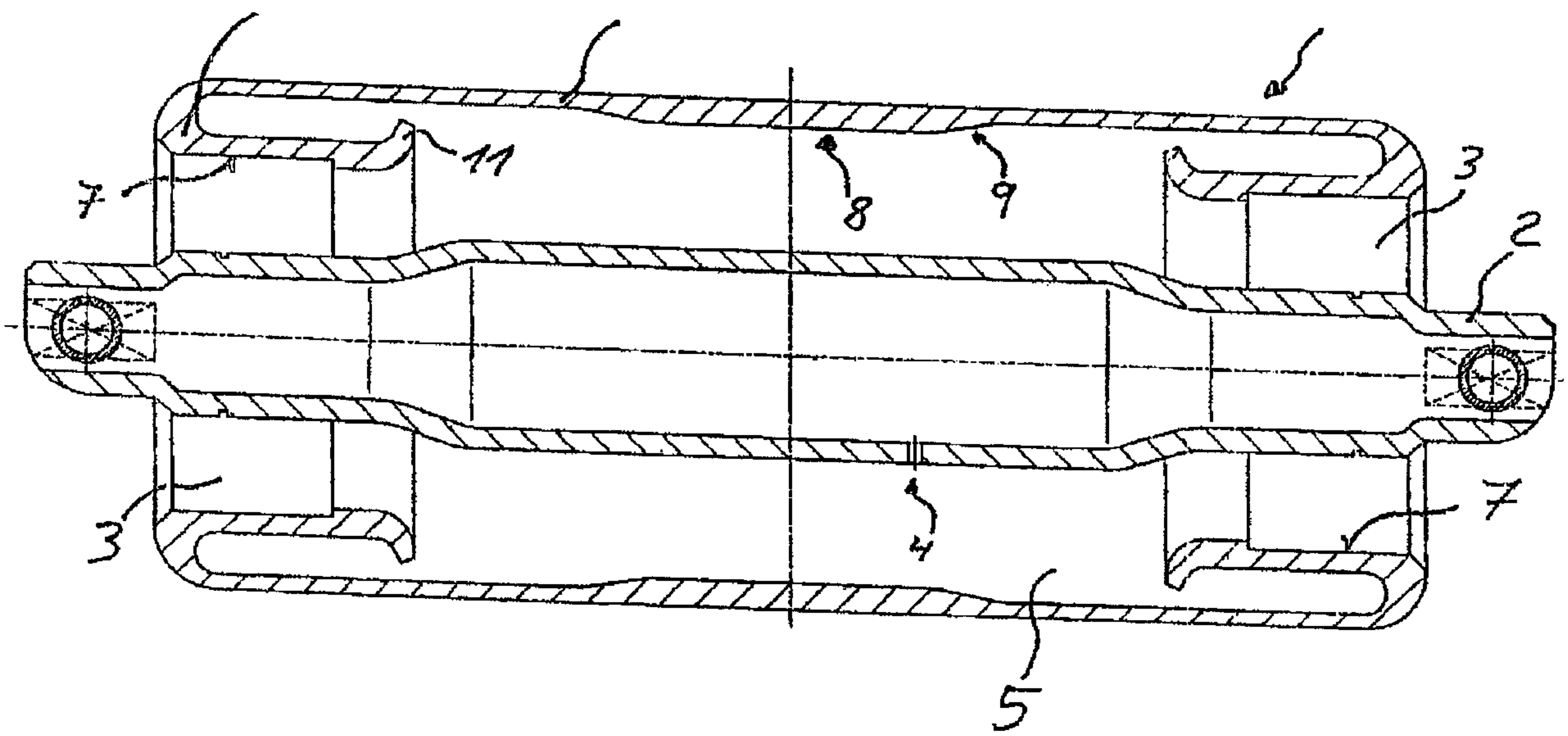


(57) Abrégé/Abstract:
The invention relates to a roller for a conveyor, especially a belt or a band conveyor, comprising a roller body (1) and an axle (2) mounted in at least two roller bearings (3). Said roller body (1) comprises a hollow cylindrical roller tube (6) comprising roller bearing seats (7) for the roller bearings (3) on the two outer end sections thereof. According to the invention, the roller tube (6) has a reinforcement (8) in the central section thereof.

ABSTRACT

The invention relates to a roller for a conveyor, especially a belt or a band conveyor, comprising a roller body (1) and an axle (2) mounted in at least two roller bearings (3). Said roller body (1) comprises a hollow cylindrical roller tube (6) comprising roller bearing seats (7) for the roller bearings (3) on the two outer end sections thereof. According to the invention, the roller tube (6) has a reinforcement (8) in the central section thereof.

Conveyor roller

Object of the present invention is a roller for a conveyor, particularly a belt or band conveyor, comprising a roller body and an axle shaft carried in at least two roller bearings, said roller body comprising a hollow cylindrical roller shell comprising roller bearing seats for the roller bearings on the two outer end sections thereof.

Such a roller for a conveyor or a transport roller is known from DE 103 42 099 A1, for example. Ordinarily, a transport system uses a multiplicity of such transport rollers parallel to each other in a framework to constitute the conveyor route. A transport belt runs over these transport rollers. For the transportation of bulk material, for example in mining, three rollers at a time are mounted in a V-shaped configuration in order for the belt to form a kind of tub. The length of the individual transport segments in such systems can be as much as several kilometers.

Due to the high weight of the transport items and the high forces to be transferred, the transport rollers must be built with sufficient stability and with relatively high wall thickness, so that they are adequately heavy. The weight of a roller is a not-insignificant quantity in laying out the conveyor, especially if the transport route is several kilometers. Because the transport rollers must be placed in rotation the driving system must be built with sufficient efficiency to provide the necessary power.

Ideally, the outer shell area of the transport roller is exactly straight in the axial or longitudinal directions, and exactly circular in cross section. Such geometry can be achieved to a large extent in the unloaded condition. During utilization, i.e. when the material under transport bears down on the roller, a vertical force acts on the essentially horizontally aligned transport roller through the weight force of the material under transport, which can lead to a deformation of the conveyor rollers.

The rotation of the roller makes its deformation subject to constant change, which permanently extracts energy for the deformation of the rotation energy. Altogether, this leads to a high energy consumption in the operation of a transport system with a multiplicity of such transport rollers.

For a roller made of a cylindrical full body, deformation leads to a downward deflection. Consequently, the transport roller is no longer longitudinally straight. Such disadvantageous deflection behavior also occurs in thick-walled hollow cylindrical roller bodies.

As wall thicknesses become increasingly thinner, the degree of bending decreases. Instead, an increasingly different deformation takes place. If the cross section of the transport roller is circular in the unloaded condition, the cross section for thin walls is flattened by the load of the transported material in the upper area. In other words, while the lower roller half remains more or less semi-circular, the upper roller half displays more or less the form of a semi-ellipse.

The constantly changing flattening of the roller body due to the rotation requires energy, as well, which is extracted from the drive power of the transport system and is consequently no longer available to drive the transport rollers.

Object of the present invention in view of this background is to reduce the energy requirement of a transport system with a multiplicity of transport rollers.

This object is achieved by a roller for a transporter with the properties of claim 1.

A roller for a transporter of the described type at the beginning of this description, is provided according to the invention in that the roller shell comprises a thickening in its middle section.

Such thickening effectively prevents an elastic deformation of the loaded transport roller, particularly the flattening of the upper side. Furthermore, the wall thicknesses according to the invention are not sufficient for the roller to flex under the load of the material being transported. Because the deformation of the roller body fails to occur, no deformation energy is extracted from the rotational energy, which improves the energy balance sheet of the entire transport facility. Finally, material can be saved by decreasing the wall thickness in the unthickened sections of the roller shell. Thus, the weight of the roller is reduced, which – in addition - reduces the energy necessary for rotation.

For the outer shell area of the roller body to be longitudinally straight, the thickening is advantageously provided on the inner surface of the roller shell.

Preferably, the roller shell and the thickening are made out of a single piece for each roller according to the invention.

Advantageously, the wall thickness of the roller shell in the thickened section is about 6 mm to about 12 mm. More preferably, the wall thickness at that location is about 7 mm to about 11 mm, and most preferably from about 8 mm to about 10 mm.

Advantageously, the wall thickness of the roller shell in the unthickened sections is from about 3 mm to about 8 mm. Preferably, the wall thickness at that location is from about 4 mm to 7 mm, and most preferably from about 4.5 mm to 6 mm.

A roller according to the invention preferably provides that the wall thickness of the roller shell consistently increases from the unthickened sections to the thickened section. Thus, abrupt changes in wall thickness, which are susceptible to fracture, are avoided.

The thickening of the roller shell of the roller body is preferably formed by stretching of a blank. Avoiding machining prevents hairline cracks in the material structure, which improves the breaking strength of the roller.

In what follows, the invention is illustrated by means of the detailed description of an exemplary embodiment with reference to the figure.

The sole figure shows a longitudinal section through a roller for a belt or band conveyor according to the present invention. A multiplicity of such transport rollers is situated parallel to each other and spaced apart along the transport route, and a material for transport (not shown) runs along the upper side of the rollers in the transport direction. The transport route can comprise a section several kilometers long. In order for the conveyor belt not to prematurely wear out due to friction with the rollers, the transport rollers are rotatably mounted below the conveyor belt and are set in rotation. The belt width, for example, is 2200 mm. To be able to form a tub-like belt to be able to transport bulk material such as ore, gravel or the like, three rollers can be located in a V-pattern.

The transport roller according to the invention comprises a roller body 1 and an axle shaft 2, mounted in two roller bearings 3. The roller bearings 3 are sealed towards the outside by a suitable seal, for example a labyrinth seal (not shown). The axle shaft 2 is configured to be hollow, and its middle section is configured in a larger diameter in comparison to the two ends that are carried in the roller bearings 3. A radial passage 4 is introduced into the area of axle shaft 2 with the larger diameter, the radial passage ensuring an air exchange between the inside 5 of the roller and the atmosphere, the air exchange being necessary owing to the temperature differences resulting from the operation. During operation, the roller heats up, and the air enclosed in the interior 5 of the roller body expands. If the transporter is shut down, the roller cools down and the enclosed air contracts. Via the passage 4 in the axle shaft 2 air exchange is not only rapidly possible, but it is also ensured that the air does not flow through the roller bearings 3 and deposits contamination, which would reduce the service life of the bearings 3.

The roller body 1 displays a hollow cylindrical roller shell 6, providing roller bearing seats 7 for the bearings 3 on the two outer end sections thereof. In the middle section of roller shell 6 the wall thickness is increased so that a thickening 8 is formed, which is located at the inner side of the roller shell 6. The thickening 8 is provided for the full

circumference of the circular cross section of the roller shell 6.
In the middle, thickened section of the thickening 8, the wall thickness is initially formed uniformly. Subsequently there follows a section in which wall thickness continuously decreases so that a kind of ramp 9 can be distinguished in the longitudinal section of the figure. At the end of the ramp 9 the wall thickness has attained the value for the unthickened section of the roller shell 6. In the outer, unthickened sections, the wall thickness is sufficiently thin to reduce weight.

The thickening 8 is provided with a specified length to avoid a saddle formation of the deformation, which might appear when the roller is under load if only one reinforcing ring were employed at the inner surface of roller shell 6. In the area of the ring the flattening could indeed be avoided, but it would occur laterally to the ring, however, due to the impinging load.

Preferably, the transport roller is made from a blank, essentially showing a hollow cylindrical form. For example, the blank can have a diameter of about 168.3 mm and a total length of about 420 m. The wall thickness is about 8.8 m. The measurements of the blank have definite tolerance levels, so that distinct divergences can occur. Particularly, the blank is not exactly cylindrically hollow, i.e. the diameter can vary in the course of the length, which can be detected as flexion in a longitudinal section.

Therefore, when producing a transport roller, the roller body has until now been machined down on the outer side over the entire longitudinal extension. Subsequently, the machined down roller body must be counter balanced due to the different material loss.

The form of the blank of the transport roller according to the invention is changed by drawing, particularly by cold drawing. Such cold drawing reduces the diameter as well as the wall thickness. In return, the total length of the roller body 1 increases. The diameter is about 159 mm after forming, and the unthickened wall thickness is about 4.5 mm. In the middle section of the thickening 8 the wall thickness is about 8 mm, for example. The entire length of the roller body is about 720 mm, for example, the length of the thickening is about 80 mm, and the length of the ramps 9 on each side is about 35 mm.

Cold drawing causes material hardening based on structural refining, making the roller body 1 more wear-resistant. Roller body 1 receives its final outer shape by cold deformation. The outer shell surface of roller body 1, then, is straight in longitudinal direction, and circular in cross section. A machining of the exterior of roller shell 6 is not necessary. This avoids imbalance in the subsequent rotation of the roller. A costly counter-balancing of the roller can be omitted, which reduces the process steps for production and thus the production cost as well.

For formation of roller bearing seats 7 the ends of the hollow cylindrical roller body 1 are reformed axially towards the interior by drawing the metal tube, which forms roller body 1, over an inner arbor and heating it inductively. The heated tube is then set into rotation, and an appropriately profiled forming tool runs onto the pipe-end in a rotating manner and crimps the wall towards the interior.

The material of the wall flows radially during reforming so that the wall thickness of the resulting infolding 10 is significantly greater than the wall thickness of the non clinched pipe section. Through an appropriate profiling of the forming tool, the ends of clinch 10 move radially outwards and form a support ring 11, which increases the stability against flexion of roller body 1 or the roller bearing seats 7. After reforming, roller bearing seats 7, which accommodate the roller bearings 3, are cut into the clinch 10.

The transport roller according to the invention has improved stability of shape compared to conventionally reduced material wear. Thus, flexural deformation during rotation is prevented, which leads to improved energy consumption, since about 3 W of power can be saved per roller with a diameter of about 219 mm and a length of about 1150 mm. This output savings achieves a significant dimension for a transport unit of several kilometers with a large quantity of rollers. Furthermore, the transport roller according to the invention runs quieter compared to conventional rollers.

Finally, production of the transport roller according to the invention using the calibrated manufacturing process is cost-saving. Because the roller receives its final outer shape by means of cold drawing, machining down to the dimensional specification, or any other metal-removing treatment, or counter balancing of the roller, are now obsolete.

Claims

1. Roller for a conveyor, and more particularly for a belt or band conveyor with a roller body (1) and an axle shaft (2) mounted in at least two roller bearings (3), said roller body (1) having a hollow cylindrical roller shell (6) comprising roller bearing seats (7) for the roller bearings (3) on the two outer end sections thereof, **characterized in that** the roller shell (6) has a thickening (8) in its middle section.

2. Roller according to claim 2 [*sic*: 1], **characterized in that** the thickening (8) is provided on the inner surface of the roller shell (6).

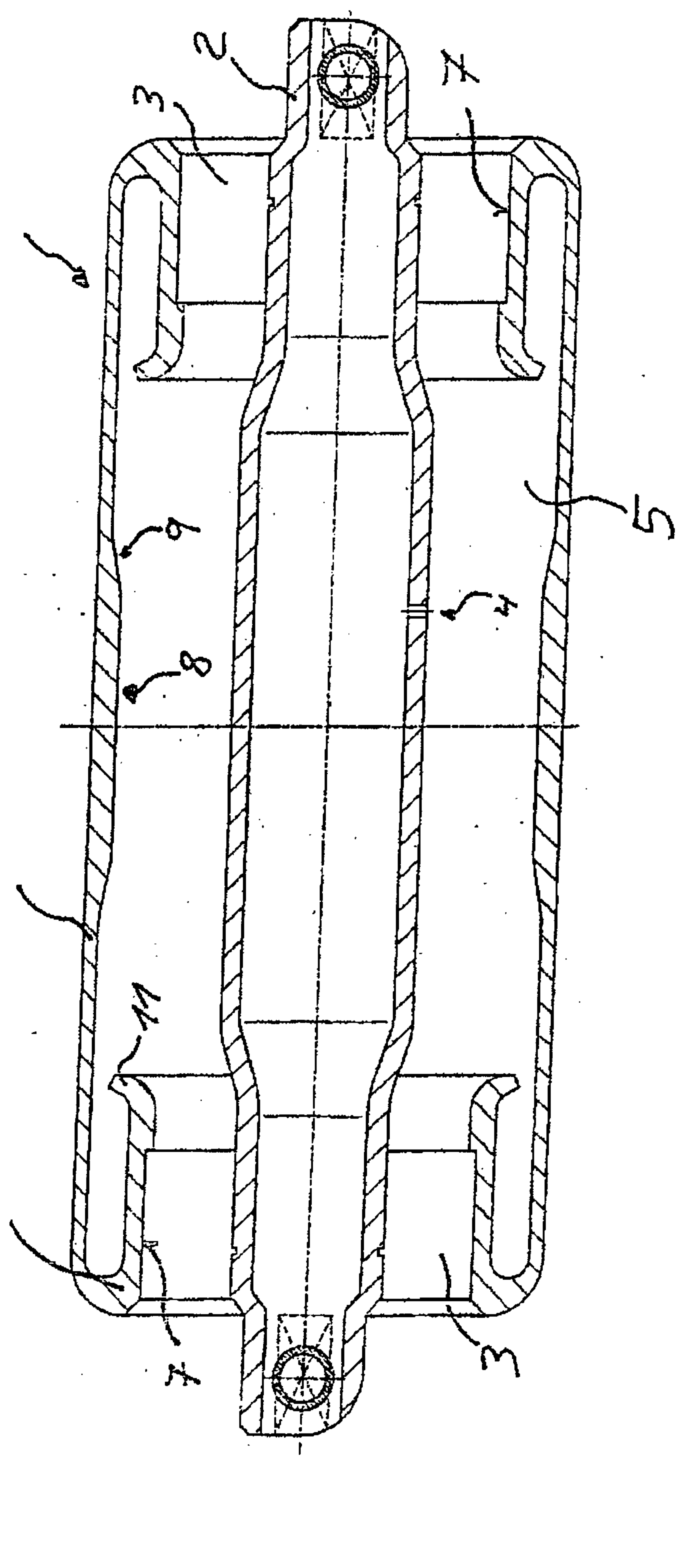
3. Roller according to claim 1 or 2, **characterized in that** the roller shell (6) and the thickening (8) are made of a single piece.

4. Roller according to one of the previous claims, **characterized in that** the wall thickness of the roller shell in the middle, thickened section is from about 6 mm to about 12 mm.

5. Roller according to one of the previous claims, **characterized in that** the wall thickness of the roller shell (6) in the unthickened sections is from about 3 mm to about 8 mm.

6. Roller according to one of the previous claims, **characterized in that** the wall thickness of the roller shell (6) continuously increases from the unthickened sections to the thickened sections.

7. Roller according to one of the previous claims, **characterized in that** the roller body (1) is formed by cold drawing of a blank to form a thickening of the roller shell (6).



Figure

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