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(54) Method and workpiece for making a sealing band for a slotted rodless cylinder

(57) A method for making elongated, flexible sealing bands for inner sealing of axial slots in rodless cylinders, wherein the band includes a main portion (2,12), and extending therefrom, two sealing lips (3,13) for sealing co-operation with the cylinder in areas on each side of the slot, wherein a band workpiece (1,11) is produced from a synthetic material and fed through a cutting station, wherein the sealing lips are cut (B-B, C-C) from elements (3,8,13,14) protruding from the main portion (2). The invention is distinguished by a band workpiece (1) being produced which besides the main portion and the protruding elements includes an integral strip portion (4,14) along the longitudinal extension of the band workpiece, and that, in a cutting operation (A-A), the strip portion is longitudinally cut away from the main portion after having been used for guiding and/or feeding the band at least while cutting the sealing lips (3,13). The invention also concerns a band workpiece.

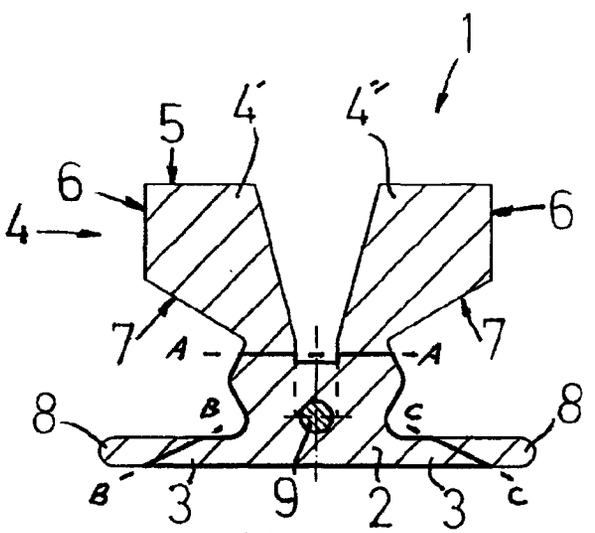

FIG 1

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Description

[0001] The invention concerns a method and a workpiece according to the preamble of claim 1 and 5 respectively.

[0002] In a rodless cylinder, an inner sealing band is arranged to seal the slot against overpressure in the cylinder spaces between the piston, which is moveable inside the cylinder, and the cylinder end walls. Conventional flexible sealing bands are typically provided with a main portion, being received inside the slot in one way or the other, and sealing elements sealingly co-operating with the areas around the slot. In order to allow a movement transferring means, being connected to the piston, to pass through the slot, the band is guided downwards into the central portion of the piston between. the axially separate cylinder seals, thus leaving the slot free. When the piston is moving, there is thus a continuous deformation of the band radially inwards for movements from the slot and outwards for movements towards the slot. In all rodless cylinders, this continuous deformation result in that work which could be used for the piston movement is instead used for effecting the band. This amount of work is generally of no greater importance with respect to operating cylinders with large dimensions, but in case of small cylinders, and in particularly miniaturised cylinders, having piston diameters as small as close to 10 mm and even less, this work is an important part of the total displacement work for the cylinder. The reason for this is that conventional sealing bands for smaller cylinders have dimensions and proportions resulting in a great deformation work as seen in the particular application.

[0003] It is an aim of this invention to provide a method and a workpiece according to the above whereby flexible sealing bands may be produced, so that the above problem is essentially reduced.

[0004] This aim is achieved according to the invention in a method of the above mentioned kind through the features of the characterizing portion of claim 1 and by a workpiece as mention above through the feature of the characterizing portion of claim 5.

[0005] This way it is possible to optimise the band workpiece for subsequent cutting operation, wherein the sealing lips are cut. Further, hereby the main portion may be dimensioned only in view of the demands put forward on the sealing band in the environment of the slot cylinder, without having to take account of the fact that the main portion has to be used for feeding and guiding when the sealing lips are cut. The guiding and feeding function is instead provided for by the integral strip portion, which, when it has fulfilled its function for assuring adequate handling of the band and the band workpiece when cutting of the sealing lips, may be eliminated by cutting it away lengthwise. This way the resulting sealing band may be given such dimensions that the deformation work associated with the bending of the band when operating the cylinder is reduced, particularly radically in cases of small cylinders. A further advantage with the invention is that the sealing band having reduced dimensions demands less space in the inside of a piston as well as in the slot.

[0006] Through the feature of claim 2 it is achieved that the cut between the strip portion and the main portion is located on the side of the latter which is turned against the outside of the cylinder, where there are not particular demands for surface smoothness and where thus a certain roughness can be tolerated.

[0007] Further advantages are achieved through the features according to the other claims and these advantages will appear in the following detailed description of embodiments with reference to the annexed drawings, wherein:

Fig. 1 diagrammatically shows a section through a longitudinal workpiece for making a sealing band according to the invention, and

Fig. 2 diagrammatically shows a cross section through a workpiece having an alternative form.

[0008] In Fig. 1 numeral 1 concerns a cross section through a longitudinal workpiece for making a sealing band for inside sealing of a slot cylinder, which may be of a kind being known per se and therefore is not necessary to show here. The workpiece include a main portion 2, having protruding elements 3, 8 and a guiding/feeding strip portion 4, which in this embodiment is comprised of two parallel strips 4', 4", and which is intended for guiding and/or feeding the workpiece in a cutting operation for producing the sealing lips 3. The division of the strip portion 4 into two strips 4', 4" is related to production technical reasons and is associated with an operation wherein the reinforcement thread 9 is placed. The strip portion 4 provides guiding surfaces 5 - 7, which are intended to contact corresponding guiding means in a machine for carrying out a cutting process.

[0009] The reason for having to cut the sealing lips 3 is that the cutting procedure assure that the sealing lips are really provided with a sufficiently sharp edge as seen at the outer pointed areas on Fig. 1. Other methods of forming the sealing band, such as moulding etc. can not guarantee such sufficiently sharp edges in this region, which in use of the band might result in insufficient sealing of the slot cylinder, since when the edges have too great radius, pressure fluid might find its way between the sealing lips and the cylinder material thus resulting in leakage.

[0010] The cutting is achieved such that the workpiece is fed through obliquely positioned knives, that cut the band along the cutting planes B-B and C-C for cutting the sealing lips 3, whereupon the main portion may be cut free from the strip portion 4 by a knife acting along the cut A-A.

[0011] In an alternative form of the band workpiece, according to Fig. 2, the strip portion is a strip 14 placed

as a continuation of the lower surface of the resulting sealing band, whereby one single cutting operation is necessary, which is made in the plane D-D, whereby in one operation the sealing lips 13 are cut at the same time as the main portion 2 is cut free from the guiding/feeding strip 14. Further, the band workpiece 11 provides corresponding guiding surfaces 15 - 17 and, within the body of the main portion 12, correspondingly as the main portion 2 in Fig. 1, a reinforcement thread 19, which preferably is a steel wire.

[0012] The material of the workpiece is a suitable synthetic material whereof polyurethane may be mentioned.

[0013] Shapes of the workpiece other than the one shown, may come into question, for example, the strip portion 4 may instead of being arranged on an upper side of the main portion, as seen in Fig. 1, be arranged centrally but not extending over the entire width of the sealing lips on the bottom side of the main portion. It is however, preferred that the strip portion is attached as is shown in Fig. 1, since, at the upper surface of the main portion, certain surface smoothness deviations may be tolerated emanating from the cutting which is less tolerable at the inside of the sealing band. Further, the strip portion 4 in Fig. 1 may be made from one single strip instead of two strips 4', 4" as in the Figure.

[0014] Through the invention it is achieved that sealing bands having essentially smaller dimensions may be manufactured, particularly in the vertical dimension as seen on Figs. 1 and 2 while maintaining, and even improving the provisions for guiding the band when cutting the lips. Using conventional techniques the sealing band would have essentially larger final dimensions, particularly in the vertical direction, resulting in the above mentioned drawbacks.

Claims

1. Method for making elongated, flexible sealing bands for inner sealing of axial slots in fluid cylinder of the rodless cylinder type, wherein the band includes a main portion (2,12), and extending therefrom, two sealing lips (3,13) for sealing co-operation with the cylinder in areas on each side of the slot, wherein an elongated flexible band workpiece (1,11) is produced from a synthetic material by forming the synthetic material, and that subsequently the band workpiece is fed through a cutting station, wherein the sealing lips are cut (B-B, C-C) from elements (3,8,13,14) protruding from the main portion (2), **characterized** in that a band workpiece (1) is produced which besides the main portion and the protruding elements includes an integral strip portion (4,14) along the longitudinal extension of the band workpiece, and that, in a cutting operation (A-A), the strip portion is longitudinally cut away from the main portion after having been used for guiding and/or feeding the band while cutting the sealing lips (3,13).

2. Method according to claim 1, **characterized** in that the band workpiece (1) is produced such that the strip portion is attached to the main portion (2) at the side which in use is turned in the direction away from the cylinder room.

3. Method according to claim 1 or 2, **characterized** in that the sealing lips (3) are cut by cutting longitudinal excess material (8) away from the side of the sealing lips which in use is turned against the outside of the cylinder.

4. Method according to any of previous claims, **characterized** in that each cutting operation (A-(A-A, B-B, C-C, D-D) is carried out continuously.

5. Elongated workpiece (1,11), for a sealing band for inside sealing of axial slots in fluid cylinders of the rodless cylinder type, wherein the band includes a main portion (2,12) and, extending therefrom, two protruding elements (3,8) which are cut into sealing lips for sealing co-operation with a cylinder in regions on each side of the slot, **characterized** in that the workpiece, besides the main portion (2,12) and the protruding elements (3,8), includes a longitudinal strip portion (4,14) for guiding and/or feeding the workpiece (1,11), which is removable by cutting.

6. Workpiece according to claim 5, **characterized** in that it also includes longitudinal excess material (8) being removable by cutting, in the regions of the sealing lips (3), on the side of which in use is turned against the outside of the cylinder.

7. Workpiece according to claim 5 or 6, **characterized** in that at least one longitudinal reinforcement thread (9, 19) is included inside the body of the main portion (2,12).

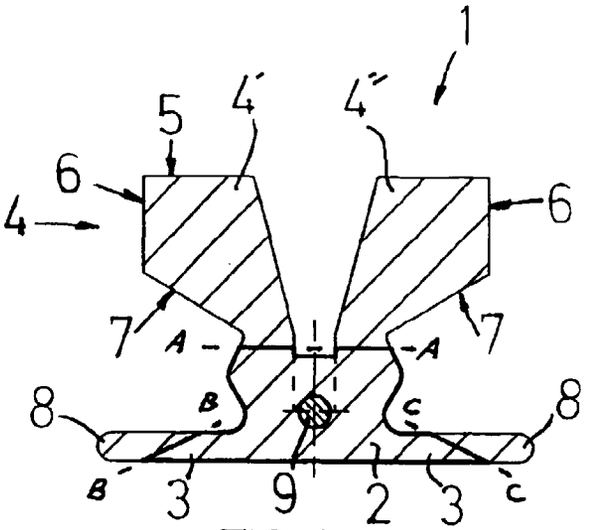

FIG 1

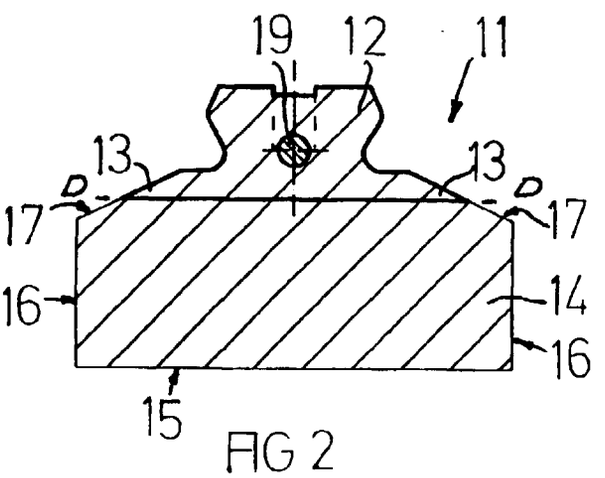

FIG 2