(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 382 671 A2**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: **90500010.5**

(51) Int. Cl.5: **F04B 39/12**

(22) Date of filing: **06.02.90**

(30) Priority: **08.02.89 ES 8900435**

(43) Date of publication of application: **16.08.90 Bulletin 90/33**

(84) Designated Contracting States: **DE FR IT**

(71) Applicant: **UNIDAD HERMETICA S.A.**
Zona Industrial
E-08192 Sant Quirze del Valles
(Barcelona)(ES)

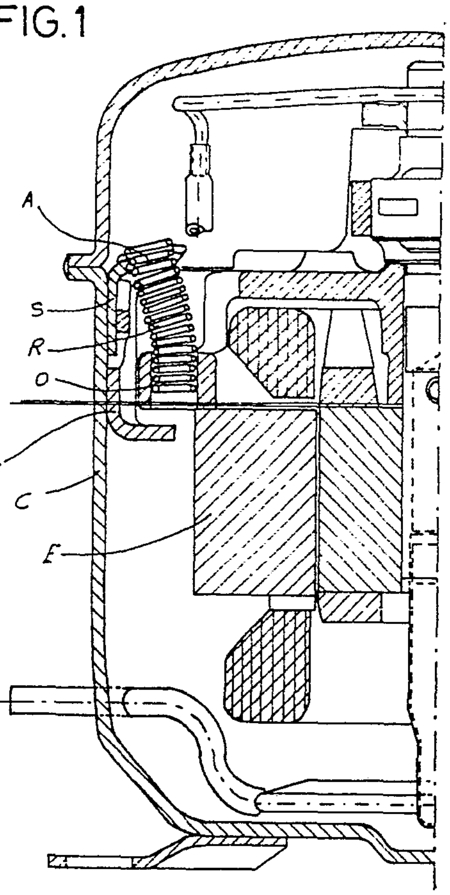
(72) Inventor: **Catala Daban, Pedro**
C. Barcelona, 9
E-08190 Sant Cugat Del Valles(ES)

(74) Representative: **Ponti Sales, Adelaida et al**
Paseo de Gracia, 33
E-08007 Barcelona(ES)

(54) **Motor suspension improvements in tight refrigerating compressors.**

(57) In a suspension in which the motor-compressor ensemble is suspended through helical springs (R) arranged between a support (S) of the compressor tub walls (C) and a point of the compressor body (E), the border of an opening (A) for receiving the spring end is formed with a circumferential inclined surface with two ends (2,3) mutually close, spaced apart in the axial direction of the opening and connected by a short run (3a), and a tenon (3b,4,6) is formed to protrude from the upper face of the support (S), forming a stop for a bent end (5) of the helical spring (R) to limit the introduction length of the said spring in the support (S). The borders of the opening (A) form an inclined surface, either straight or arcuate, to rest between the spring turns. It is thus avoided the tapping or beating of the spring turns onto the support, and the thus arising noise.

FIG.1



EP 0 382 671 A2

MOTOR-COMPRESSOR SUSPENSION FOR SEALED REFRIGERATOR COMPRESSORS

The present invention relates to the suspension assembly of the motor-compressors units within the tub of a sealed refrigerator compressor.

BACKGROUND OF THE INVENTION

As it is already known, the assembly of the motor-compressor units within the tub of a sealed compressor shows always the problem of damping the unavoidable vibrations that occur during operation of the compressor owing to the special assembly of the plungers.

Several solutions have been devised to obviate this drawback, consisting in spring hanging the motor-compressor unit, such that the above vibrations are absorbed by this elastic assembly and cannot be transmitted to the tub walls and cause shocks between the metal parts of the assembly and the corresponding noises.

Most of the adopted solutions are based upon inserting sets of helical springs between the tub and the motor-compressor unit, secured at one end on the compressor body, and at the opposite end to the tub or to supports provided in view of facilitating the assembly of the motor-compressor unit within the said tub.

Thus, the US patent specification No 3 089 639 (Tecumseh) and the Spanish patent specifications 304 450 (Thomson), 405 551, 405 603 and 405 809 (Danfoss), describe several embodiments of this kind of assembly based on the use of helical springs in a suitable number which are locked at their ends in corresponding holes of the body of the motor stator and holes of the seats or supports provided on the inner walls of the tub enclosing the unit. The holes of the stator body and the tub supports are formed with inner surfaces mating with the outer surface of the spring ends so that a forced screw thread engagement is obtained.

In either case, it has been ascertained that the spring engaged with the tub supports, always suffer from a mobility originating, under the vibration of the motor-compressor unit during operation, small movements of the spring turns, which are the source of the above referred to noises. This is worsened by the fact that the holes of the supports joined to the tub have their mouth usually flared or rounded off to make the introduction of the spring easier, and as the spring enters the hole in a forced and slightly slanted position, the vibration of the ensemble causes a escape and reinsertion of the spring last turn engaged on the hole, with the resulting tapping and|or beating which are the origin of the ensuing noise.

Another solution adopted for avoiding such tapping or beating between the spring and its support, is that disclosed in the US specification No 3 849 028 (Sanyo), in which the tapped hole of the tub supports is substituted by a fork shaped terminal in which the spring end is engaged by making the said fork to penetrate between two end spring turns. It will be understood that this solution is subject to a very low affidability in view of the constant vibration which the ensemble of the coupling is subject to.

Finally, in some cases recourse has been had to insert between the spring and its support a layer of adhesive or metallic cement with the purpose of ensuring the immobilization.

DESCRIPTION OF THE INVENTION

The invention is intended to solve all of the above indicated problems and reach a thoroughly stable and silent assembly, based on the technique of suspension through helical springs as above explained. More specifically, the invention relates to the engagement of the springs on the supports of the tub inner walls, with a view of avoiding the beating or tapping between the elements and, furthermore, with the advantage that the machining of the supports is extremely simplified and may be performed by means of simple stamping, pressing and|or punching operations.

To this end, in a motor-compressor suspension for sealed refrigerator compressors of the kind in which the motor-compressor unit is joined through helical springs to a support secured to the walls of the compressor tub, the springs being screw thread locked at one end to a tapped hole of the compressor body, and at their other end in a tapped hole of the support, according to the invention the support hole is formed by means of a deformation of the borders of this latter such that it assumes a closed helical profile of a single screw thread pitch the ends of which are located at different levels, mutually close and joined by a short longitudinal run, whereas at the same time a protruding stop is formed in the support, as well by deformation of its material, to limit the penetration of the spring end into the support.

The spring penetration stop may be obtained through very diverse manners, for example by embossing a tenon to protrude from the upper face of the support, by punching and rising a fin of the support material, or by a protruding deformation of the run joining the two ends of the helical pitch defined by the edges of the support opening.

With the purpose of enhancing the immobilization of the spring turns, according to the invention, the borders of the support opening in which the said turns are screw thread engaged, can be formed with a profile of several shapes such as inclined surfaces, preferably symmetric, straight or curvilinear, upon which the spring turns will perfectly seat from both support sides.

BRIEF DESCRIPTION OF THE DRAWINGS

The enclosed drawing show a practical embodiment of the invention by way of an example with no restrictive character at all. In the said drawings:

Figure 1 is a view in half section of a sealed compressor unit for a refrigerator, showing the suspension system according to the invention;

Figure 2 shows a perspective exploded view of the elements making up the suspension;

Figure 3 is a detail in section of the stop for limiting the spring introduction;

Figure 4 corresponds to an elevational front view of the support piece which is to be engaged to the tub walls of the compressor;

Figure 5 is a side elevational and sectional view of the same piece of the previous Figure; Figure 6 is a plan view from the uderside of the ame support piece;

Figure 7 is a side elevational view showing the engagement of the spring in the support piece;

Figures 8 and 9 show at a greater scale, respective sectors of the engagement and stop zone of the spring in feasible embodiments;

Figures 10, 11 and 12 are details in section of the spring engagement sector, showing several embodiments of the insertion stop of the same, and

Figures 13, 14 and 15 are views similar to those of Figures 4, 5 and 6 for a possible embodiment variation of the support.

DESCRIPTION OF PREFERRED EMBODIMENTS

The suspension shown in the drawings is of the type in which a spring R is screw thread engaged by one its ends in the opening A, tapped or formed to mate the outer surface of the spring end, of a support S which is fitted on the inside of the walls of the tub C of a moto-compressor unit, whereas its opposite end is engaged in an orifice O formed in the body of the unit stator E such that it conforms as well to the spring end outer surface.

According to the invention, the opening A of the metal plate support S in which the wires of the helical spring R are to be screw thread engaged, is formed by giving to it a helical profile extending over a single pitch or turn 1. To this end the border of said opening is deformed, with no cutting of the support metal plate, such that it assumes a progressive circumferential inclined surface between two opposite points 2,3 of its periphery, close with one another though mutually spaced apart in the axial direction of the opening and joined by a short intermediate plate material run 3a (see Fig. 4 and 5).

The border 1 of the opening A is advantageously beveled or tapered on at least one edge, either in an inclined surface, as seen in Figures 5 and 8, or in arcuate or merely stepped shape as shown, respectively in solid and dotted lines in Figure 9, with the purpose of facilitating the entrance of the turns of the spring R.

As shown in Figures 2 to 9, a tenon 4 is stamped from the material of the support S to protrude from the upper face of this latter at a short distance of the edge of opening A, against which the outwards bent end 5 of the spring R will impinge when the spring is inserted in the opening, to limit the insertion length of the spring end engaged in the opening A of the support S. However, the stop in question can also be formed by merely rising a vertical fin 6 (Fig. 10), an inclined fin 7 (Fig. 11), or under a deep deformation of the material run 3a joining the two ends 2,3 of the helical pitch 1 of the opening A, thus forming in the same a protruding angle 3b (Fig. 12).

The deformation of the walls of the opening A can be effected such that the helical pitch formed by the edges of said opening are terminated at its front part (Fig. 1 and 14) or, with just the same result, at its rear part, as shown in the embodiment depicted in Figures 13 to 15.

In the same way, the support S, as already known in the known embodiments, may form an independent piece which is removably engaged on a shoulder and fixed to the wall inner surface of the tub C, or made of a single piece directly joined to the tub walls in a fast manner.

In either of the represented cases, the obtained advantage resides on the fact that the spring wires are firmly retained in the helical pitch 1 of the opening A, with no risk that the normal vibration caused by the to and fro motion of the compressor piston can escape, thus preventing any kind of beating or tapping.

Another advantage resides on the fact of the formation of the support S, either fast or removable as regards the compressor tub C, because it can be obtained by means of simple stamping and pressing operations with no additional machining, such that the manufacture costs are significantly diminished.

Claims

1. Motor-compressor suspensions for sealed refrigerator compressors, of the kind in which the motor-compressor unit is joined through helical springs (R) to a support (S) arranged either fast or removable to the walls of the unit tub (C) the spring (R) being screw thread locked at one end to a tapped hole (O) of the compressor body (E), and at their other end in a tapped hole of the support (S), characterized in that the opening (A) of the support (S) is formed by a deformation of the border of the opening (A) such that this border (1) assumes a closed helical profile of a single screw thread pitch the ends (2,3) of which are mutually close spaced apart in the axial direction of the opening (A), and joined by a short material run (3a), whereas at the same time a protruding stop (4) is formed on the support (S) by deformation of the support material as well, to limit the penetration length of the suspension spring (R) into the support (S).

2. Suspension according to the claim 1, characterized in that the stop for limiting the penetration length of the spring (R) is formed by embossing a tenon (4) to protrude from the upper face of the support (S).

3. Suspension according to claim 1, characterized in that the stop for limiting the penetration length of the spring (R) is formed by punching and rising a fin (6) of the support material.

4. Suspension according to claim 1, characterized in that the atop for limiting the penetration length of the spring (R) is formed by a protruding deformation (3b) of the material run (3a) joining the two ends (2,3) of the helical pitch defined by the edge (1) of the support opening (A).

5. Suspension according to claims 1 to 4, characterized in that at least one of the edges of the opening (A) for the suspension spring (R) in the support (S), are arranged in an inclined surface, either straight or arcuate, to enhance displacement and seating of the spring turns.

FIG.1

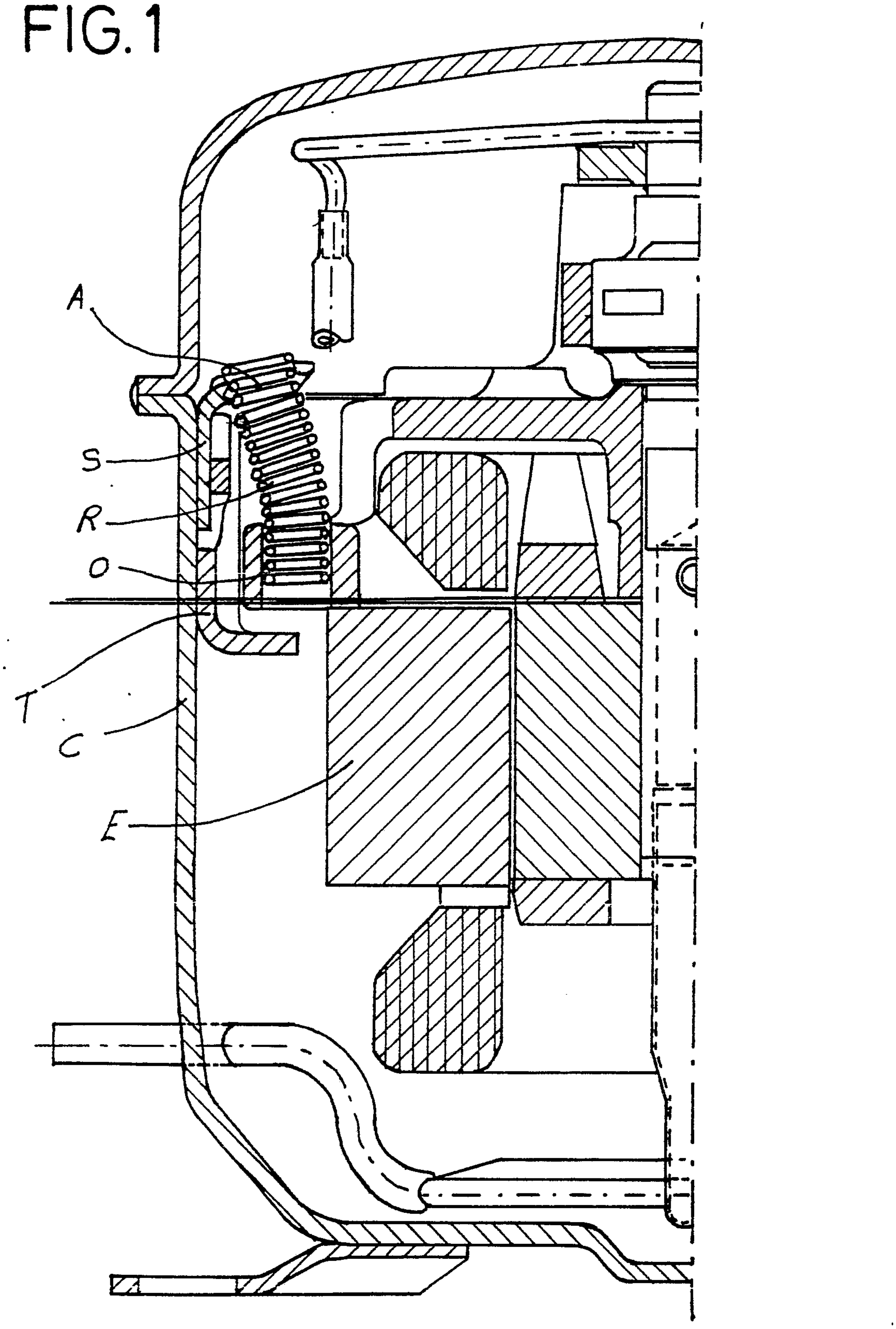


FIG. 2

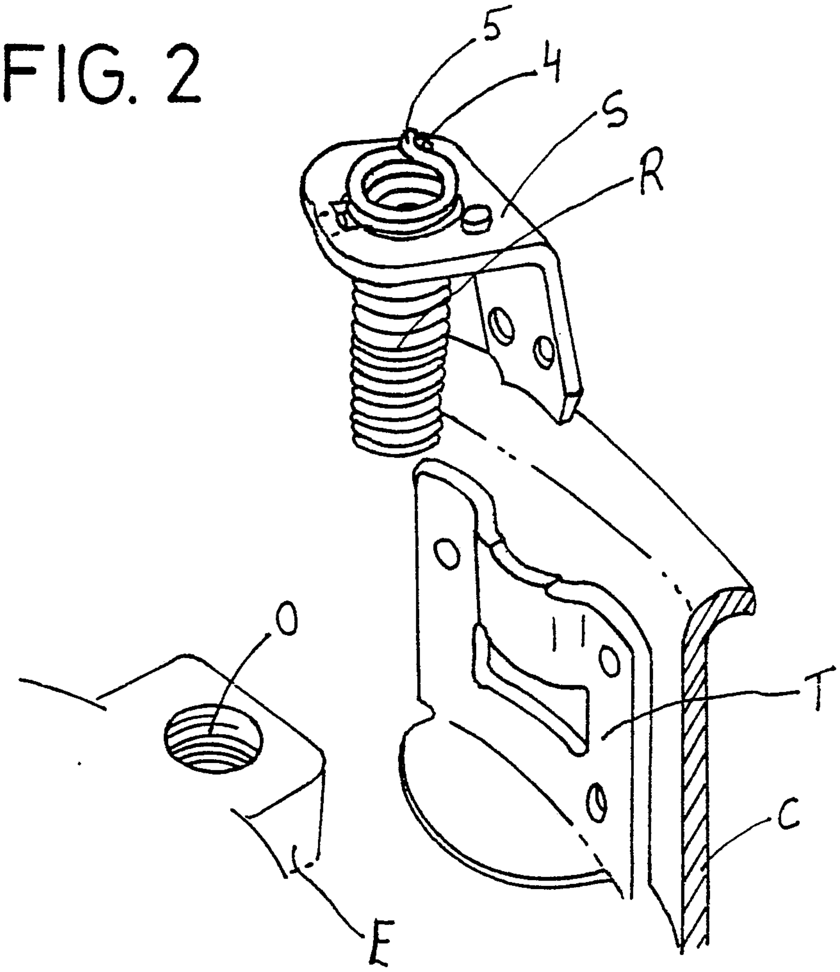
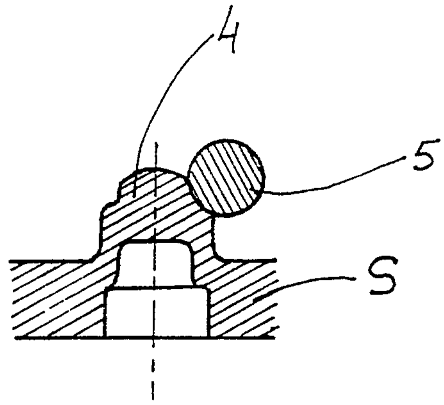


FIG. 3



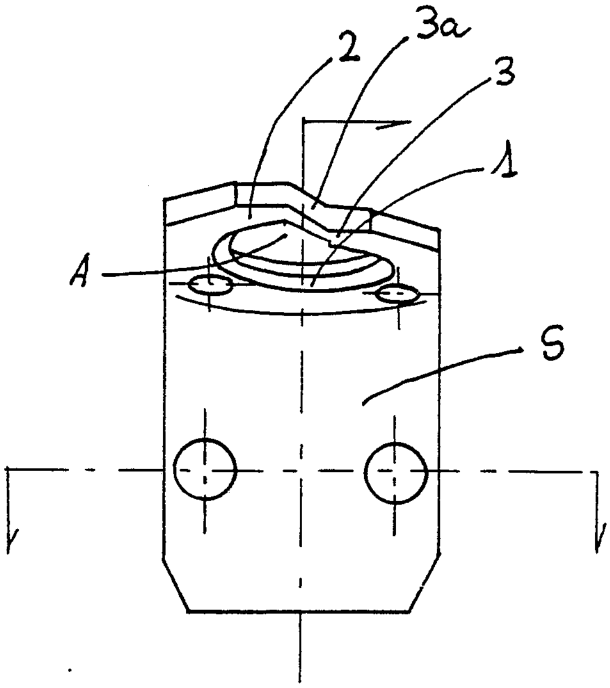


FIG.4

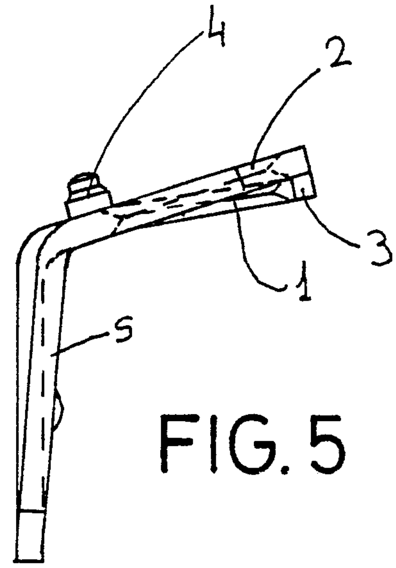


FIG. 5

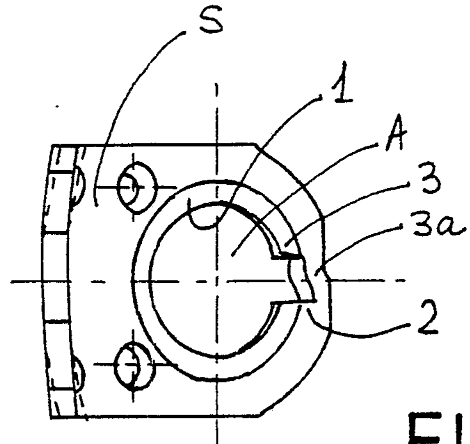


FIG. 6

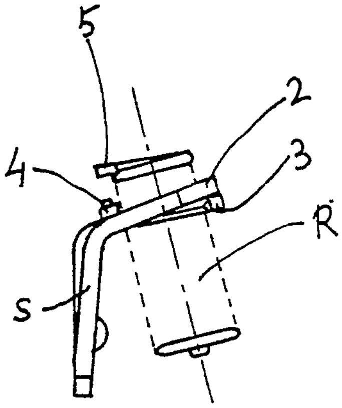
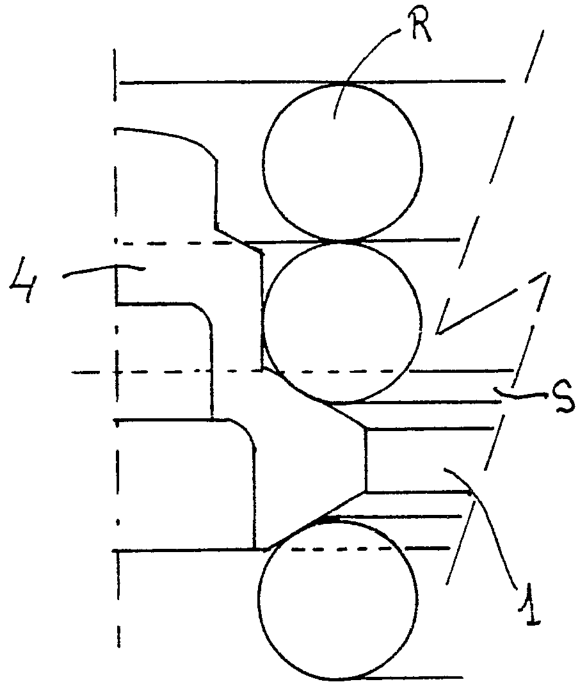


FIG. 7

FIG. 8



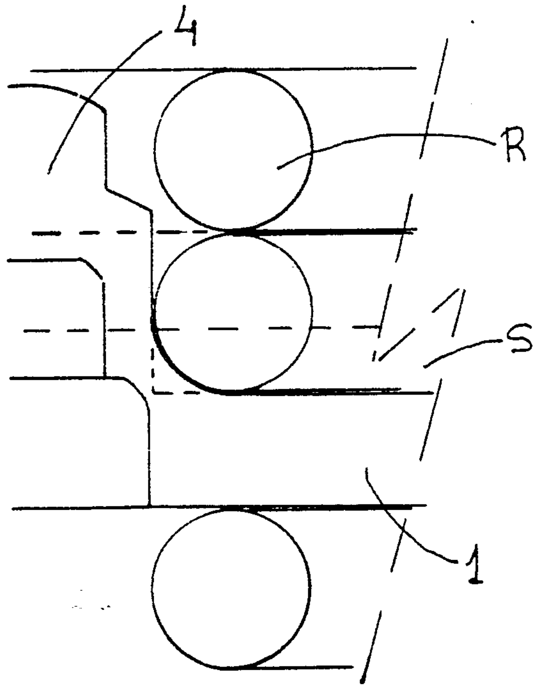


FIG. 9

FIG. 10

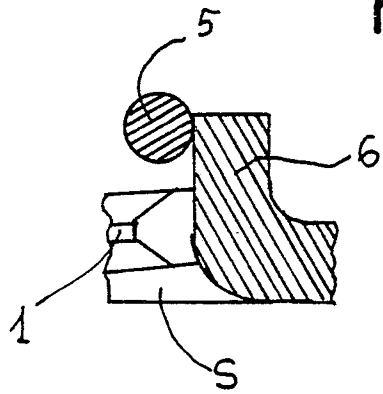
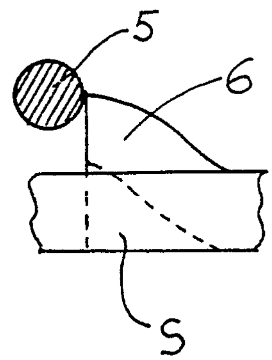


FIG. 11



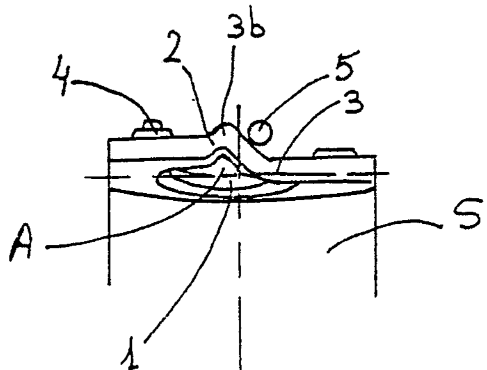


FIG.12

FIG. 13

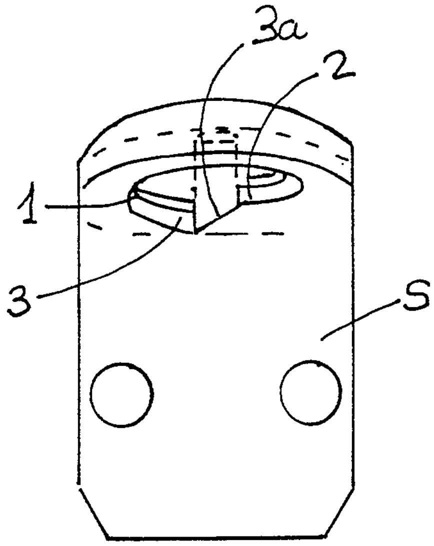
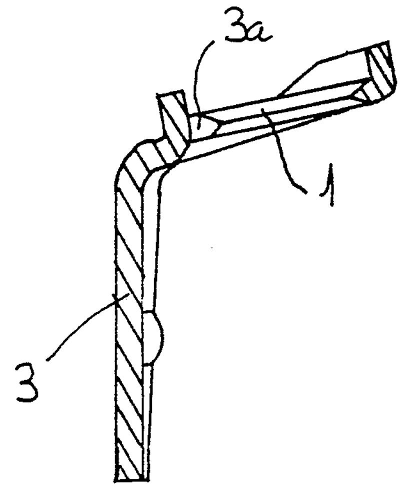


FIG. 14



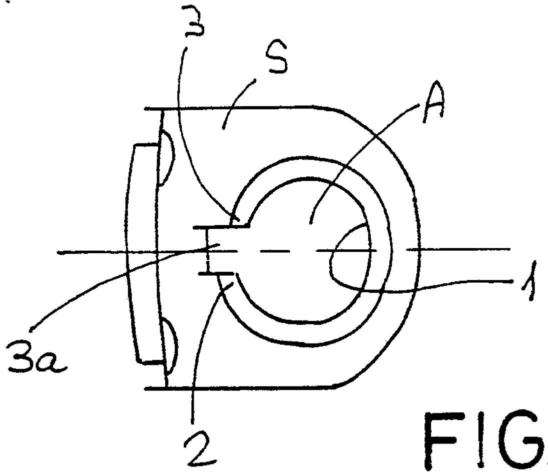


FIG. 15