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

(11) EP 0 867 237 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.09.1998 Bulletin 1998/40

(51) Int. Cl.[6]: **B08B 1/00**, B08B 9/00

(21) Application number: **97109205.1**

(22) Date of filing: **06.06.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV SI

(30) Priority: **26.03.1997 JP 73171/97**

(71) Applicants:
- **Komine, Tsuyoshi**
  Higashiosaka-shi, Osaka (JP)
- **Meier, Daniel**
  8965 Berikon (CH)

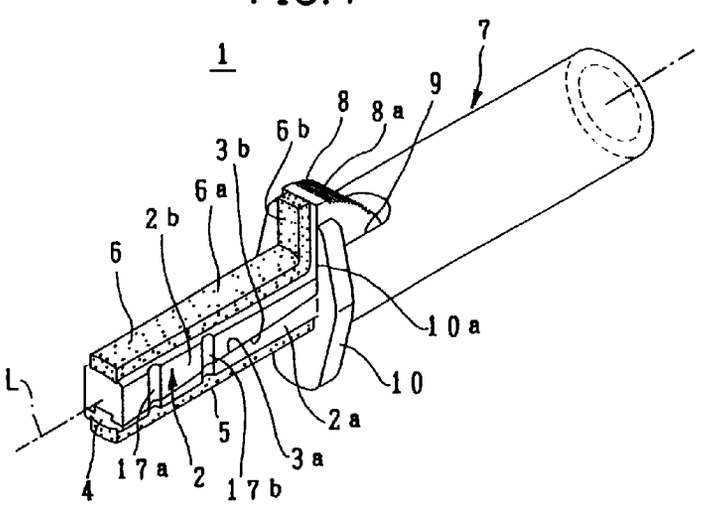
(72) Inventors:
- **Komine, Tsuyoshi**
  Higashiosaka-shi, Osaka (JP)
- **Meier, Daniel**
  8965 Berikon (CH)

(74) Representative:
Füchsle, Klaus, Dipl.-Ing.
Hoffmann Eitle,
Patent- und Rechtsanwälte,
Arabellastrasse 4
81925 München (DE)

(54) Cleaner for cylindrical bores

(57) Disclosed is a parallel bore cleaner which can quickly clean the inner cylindrical surface of a bore, improving the rate of cleaning work. The cleaner includes a body in the form of a bar which is uniform in cross section. The body is divided into a first bar half and a second bar half along a generally longitudinal section inclined with respect to the axis of the body so that each bar half has an inclined surface. The body includes a means engaging the inclined surfaces of the bar halves in slidable contact with each other. Each of the bar halves is fitted with a scraper on its outer surface. The second bar half includes a slide head formed on its rear end. By operating the head so as to slide the second bar half relatively to the first half in the direction toward the thicker side of the second half, it is possible to reduce the diameter of the body so as to insert the body easily into a bore.

FIG. 1



EP 0 867 237 A2

Description

Background of the Invention

The present invention relates to a cleaner for the inner cylindrical surfaces of straight collets, bearing races, parallel bores in gears, parallel bores machined by machine tools, water supply pipes, drain pipes, and other machine parts.

Conventionally known are cleaners for the inner conical surfaces of tapered bores. These cleaners each include a tapered body for adaptation to tapered bores. The outer conical surface of the cleaner body is surrounded by a scraper made of felt or the like. It is easy to clean a tapered bore by inser ting the cleaner body into the bore until the scraper tightly contacts the bore surface, and turning the body round its axis and/or moving it axially so that the scraper rubs dust or the like off the bore surface.

For parallel bores, a cleaner body may be made in the form of a bar as a modification of the structure of a tapered bore cleaner. This cleaner body may be surrounded by a scraper on its cylindrical surface. If the outer diameter of the cleaner body, inclusive of the scraper, is nearly equal to the diameter of a parallel bore, it is not possible to bring the craper into compressive contact with the cylindrical surface of the bore. If the outer diameter is larger than the bore diameter, it is not possible to insert the body into the bore. Therefore, the outer diameter of the body, inclusive of the scraper, of a conventional cleaner for a parallel bore is sufficiently smaller than the bore diameter. It is possible to clean this bore by inserting the body of the conventional cleaner into the bore, pressing the body against the cylindrical surface at a circumferential position of the bore, and moving the pressed body circumferentially while rotating or rolling it on its axis, or while moving it axially.

Summary of the Invention

It is not possible to bring the scraper of a conventional cleaner as mentioned above into contact with the cylindrical surface all over the circumference of a parallel bore at a time. As a result, it takes a long time to clean the overall circumference of the bore surface, so the rate of work is very low. It is therefore an object of the present invention to provide a parallel bore cleaner for cleaning the cylindrical surface of a parallel bore in a short time, thereby improving the rate of cleaning work.

A parallel bore cleaner according to the present invention includes a body in the form of a bar which is uniform in cross section. The body is divided into a first bar half and a second bar half along a generally longitudinal section inclined with respect to the axis of the body so that each bar half has an inclined surface. The body includes a means engaging the inclined surfaces of the bar halves in slidable contact with each other. Each of the bar halves is fitted with a scraper on its outer surface. A holder extends coaxially with the body. The rear end of the first bar half joins integrally with the holder. The second bar half includes a slide head formed on its rear end. By operating the head so as to slide the second bar half relatively to the first half in the direction toward the thicker side of the second half, it is possible to reduce the diameter of the body.

Thus, when the slide head is moved to slide the second bar half of the cleaner body in the direction toward the thicker side of the second half, the diameter of the body decreases uniformly along its axis. It is therefore possible to insert the cleaner body easily into a parallel bore and bring the scrapers on the bar halves into tight contact with the inner cylindrical surface of the bore by very simple operaion. This makes it possible to clean the cylindrical surface quickly.

A spring may be interposed between the bar halves for returning to the original position the second bar half which has slid so as to decrease the diameter of the cleaner body. When the slide head is released relatively to the first bar half after the second half is slid so as to decrease the diameter of the body, the spring returns the second half automatically to the original position or a position near there, where the scrapers come automatically into compressive contact with an inner surface to be cleaned. It is therefore possible to clean the surface securely.

The engaging means may comprise a groove formed longitudinally in one of the inclined surfaces of the bar halves, and a tenon formed longitudinally on the other surface for engagement with the groove. This makes the engaging means simple in structure, and easy to form in and on the inclined surfaces, respectively.

The groove may be a dovetail groove. The tenon may be a dovetail tenon. It is easy to form a dovetail groove and a dovetail tenon longitudinally.

The groove may be elastically deformed to expand for engagement with the tenon, its restoring force holding the tenon. This makes it possible to easily engage the groove and tenon with each other by only making the tenon face the groove and forcing the tenon into the groove. It is therefore easy to fit the bar halves to each other.

The slide head of the second bar half may have a bearing surface extending radially outward from the rear end of this half. The scraper on the second bar half may be mounted substantially in the shape of an L in side view on the bearing surface and the outer surface of this half. The radial scraper portion on the bearing surface can clean the adjacent end surface of a part at the same time when the/an inner cylindrical surface of the part is cleaned. It is therefore possible to clean a wider area of a part.

Each of the bar halves may have an outer groove formed in its outer surface along its length. The inner side of the associated scraper may engage with the

outer groove. This makes it possible to mount the scrapers firmly on the bar halves. The scrapers thus mounted do not separate easily from the bar halves while the cleaner body is turning in a bore.

At least one of the bar halves may have a mark indicating a predetermined axial position, at which they can be cut. If the cleaner body is inserted into a blind hole which is shorter than the body, the radial scraper portion does not come into contact with the outer end of the hole. In this case, by cutting the bar halves in accordance with the hole length, it is possible to insert them completely into the hole. This makes it possible to clean the hole end surface without a hitch or hindrance as well as the inner cylindrical surface.

Brief Description of the Drawings

Preferred embodiments of the present invention are shown in the accompanying drawings, in which:

Fig. 1 is a perspective view of a parallel bore cleaner according to one of the embodiments;
Fig. 2(A) is a front end view of the cleaner shown in Fig. 1;
Fig. 2(B) is an enlarged radial cross section of the body of the cleaner shown in Figs. 1 and 2(A);
Fig. 2(C) is a radial cross section of a cleaner body according to another embodiment;
Fig. 3(A) is an axial cross section of the cleaner of Figs. 1, 2(A) and 2(B), showing the cleaner before insertion into a straight collet;
Fig. 3(B) is a view similar to Fig. 2(A), but showing the cleaner inserted into the collet.

Detailed Description of Preferred Embodiments of the Invention

With reference to Figs. 1, 2(A), 2(B), 3(A) and 3(B), a cleaner 1 for a parallel bore includes a body 2 in the form of a bar, which is originally circular in cross section and has a predetermined diameter and an axis L. The bar is cut symmetrically on both sides to form a pair of parallel side planes. The cut bar is still uniform in cross section along its length. The bar is divided into halves 2a and 2b along a generally longitudinal section inclined at a predetermined angle to the axis L. The bar halves 2a and 2b are fixed and movable, respectively.

The inclined surfaces 3a and 3b of the bar halves 2a and 2b, respectively, have means 4 for engaging the halves in slidable surface contact with each other. The circumferential surfaces of the halves 2a and 2b are fitted with scrapers 5 and 6, respectively, along their lengths. Each scraper 5, 6 takes the form of a thick belt, which is flexible and suitably elastic and may be made of felt or skin such as deer skin.

As clear from Fig. 3, the rear end of the fixed bar half 2a is larger in diameter than the body 2, and joins integrally with the front end of a cylindrical holder or grip 7, which extends coaxially with the body 2. Formed integrally with the rear end of the movable half 2b is a slide head 8, which is equal in width to this half 2b and shaped like a fan in side view. The arcuate side of the head 8 has non-slip knurls 8a in the form of grooves. The holder 7 has an opening 9 formed in its cylindrical wall at its front end. The front end of the opening 9 is open. The lower half of the head 8 extends through the slot 9 slidably along the axis L. Formed integrally with the front end of the holder 7 is a radial flange 10, which has an opening 10a (Fig. 1) formed in its upper half The top of the opening 10a is open. The head 8 can move through the opening 10a. The movable half 2b and head 8 are formed integrally out of plastic. Likewise, the fixed half 2a, holder 7 and flange 10 are formed integrally out of plastic.

As shown in Figs. 1 and 3, the inclined surface 3a makes the fixed bar half 2a thicker rearward, and the inclined surface 3b makes the movable half 2b thicker forward. Therefore, by pushing the slide head 8 so as to slide the movable half 2b from the initial position, which is shown by solid lines in Fig. 3(A), forward as shown by two-dot chain lines, it is possible to decrease the diameter of the cleaner body 2 uniformly along the length of the body 2.

The slide head 8 includes a rear end protrusion 11. A compression coil spring 12 is interposed between the protrusion 11 and the rear end of the fixed bar half 2a for returning the movable half 2b. It is therefore possible to decrease the diameter of the cleaner body 2 by pushing the head 8 so as to slide the movable half 2b forward against the bias force of the spring 12. When the head 8 is released after the diameter of the body 2 decreases, the movable half 2b returns automatically from the position shown by two-dot chain lines in Fig. 3(A) to the initial position, where the diameter of the body 2 is original.

As best shown in Fig. 2(B), the means 4 for engaging the bar halves 2a and 2b in slidable surface contact with each other include a tenon 13a and a groove 13b. The tenon 13a is formed on one of the inclined surfaces 3a and 3b of the halves 2a and 2b. The groove 13b is formed in the other inclined surface 3a or 3b. Specifically, for example, the groove 13b is a dovetail groove formed longitudinally in the surface 3b of the movable half 2b. For engagement with the groove 13b, the tenon 13a is a dovetail tenon formed longitudinally on the surface 3a of the fixed half 2a.

As shown in Fig. 2(C), the engaging means 4 might instead include a tenon 13a which is circular in cross section and formed longitudinally on the inclined surface 3a of the fixed bar half 2a, and a groove 13b formed longitudinally in the inclined surface 3b of the movable half 2b. This groove 13b consists of an expanding slot 13c and a pair of grooves 13d undercut longitudinally in the slot 13c for engagement with the tenon 13a. Of course, the structure of the engaging means 4 is not limited to that described above. It is essential that the

structure of these means 4 should make the halves 2a and 2b in longitudinally slidable engagement.

As shown in Figs. 1 and 2, the slide head 8 of the movable bar half 2b has a bearing surface 14 extending radially outward from the rear end of this half 2b. The scraper 6 on the half 2b is shaped like an L in side view, and includes an axial portion 6a mounted on the circumferential surface of the half 2b and a radial portion 6b mounted on the bearing surface 14. The circumferential surfaces of the halves 2a and 2b have wide grooves 15 and 16, respectively, formed along the lengths of the halves. The scrapers 5 and 6 engage with the grooves 15 and 16, respectively, and their inner surfaces are bonded with-an adhesive to the groove bottoms. By thus engaging the scrapers 5 and 6 with the grooves 15 and 16, it is possible to mount the scrapers firmly on the halves 2a and 2b. Consequently, while the cleaner 1 is used, the scrapers 5 and 6 do not separate easily from the halves 2a and 2b.

As shown in Fig. 1, the bar halves 2a and 2b have grooves or other marks 17a and 17b formed in their side surfaces on one side at a suitable interval along the axis L. The marks 17a and 17b indicate distances from the rear ends of the halves 2a and 2b. In other words, these marks indicate predetermined longitudinal positions where the halves 2a and 2b should be cut.

Figs. 3(A) and 3(B) show how to clean the inner cylindrical surface of a straight collet W, which is a machine part, with the cleaner 1. When the movable bar half 2b is at the initial position shown by solid lines in Fig. 3(A), where the diameter of the cleaner body 2 is original, the outer diameter of the body 2, inclusive of the scrapers 5 and 6, is the maximum value T_{MAX}, which should be a little larger than the inner diameter D of the collet W ($T_{MAX} > D$). While the collet W is cleaned, it is fixed by a chucking means K or the like.

Then, with the holder 7 held by a hand, the slide head 8 is pushed by the thumb against the force of the returning spring 12 so as to slide the movable bar half 2b from the initial position forward as shown by two-dot chain lines in Fig. 3(A). As a result, the outer diameter of the cleaner body 2, inclusive of the scrapers 5 and 6, decreases from the maximum T_{MAX} by a value δ and becomes To ($T_{MAX} - \delta = To$). The decreased diameter To of the body 2 is smaller than the inner diameter D of the straight collet W ($To < D$).

With its diameter thus reduced, the cleaner body 2 is inserted entirely into the straight collet W. Then, the radial scraper portion 6b on the front end of the slide head 8 is pressed against the adjacent end of the collet W. Under this condition, when the holder 7 is released from the gripping force, the restoring force of the returning spring 12 slides the fixed bar half 2a instantly forward together with the holder 7 relatively to the movable half 2b. As a result, as shown in Fig. 3(B), the movable half 2b returns to its origi nal position relative to the fixed half 2a. At the same time, the scrapers 5 and 6 on the halves 2a and 2b compressively contact the inner surface of the collet W.

With the scrapers 5 and 6 in tight contact with the inner cylindrical surface of the straight collet W, the holder 7 is turned round the axis L, pushed and pulled to clean this surface. At the same time, the radial scraper portion 6b on the bearing surface 14 of the slide head 8 can clean the adjacent end surface of the collet W.

If the cleaner body 2 is longer than the straight collet W, and if at least part of the far end of the collet protrudes radially inward, the protrusion prevents the body 2 from being inserted into the collet until the radial scraper portion 6b contacts the adjacent end of the collet. In such a case, by cutting away front portions of the bar halves 2a and 2b at the mark 17a or 17b (Fig. 1) so as to shorten the halves in accordance with the collet length, it is possible to insert the shortened halves entirely into the collet W. As a result, it is possible to clean the inner surface of the collet W securely and the adjacent end surface of the collet without a hitch or hindrance.

After the straight collet W is cleaned, the slide head 8 is pressed forward by the thumb with the holder 7 gripped by the hand so that the holder is pulled rearward with the reaction of the hand. This slides the fixed bar half 2a with the holder 7 rearward relatively to the movable half 2b, reducing the diameter of the cleaner body 2. With the diameter reduced, the holder 7 is pulled by the hand moving rearward so that the body 2 is removed from the collet W.

As described above, it is possible to reduce the diameter of the cleaner body 2 uniformly along the axis L by pushing the slide head 8 so as to slide the movable bar half 2b in the direction toward the thicker side of this half 2b. The maximum diameter of the body 2, inclusive of the scrapers 5 and 6, is a little larger than the diameter of a parallel bore to be cleaned. When the diameter of the body 2 is reduced, it is smaller than the bore diameter. It is therefore possible to insert the body 2 into the bore and bring the scrapers 5 and 6 into tight contact with the inner cylindrical surface of the bore easily by very simple operation. Consequently, this surface can be cleaned in a short time.

As also described, the coil spring 12 for returning the movable bar half 2b is interposed between the rear ends of the halves 2a and 2b. When the slide head 8 is released after the movable half 2b is slid in such a direction that the diameter of the cleaner body 2 decreases, the spring 12 returns this half 2b automatically to the original position.

The inclined surfaces 3a and 3b make the bar halves 2a and 2b thicker rearward and forward, respectively. Therefore, when the movable half 2b slides forward relatively to the fixed half 2a, the diameter of the cleaner body 2 decreases. Alternatively, the inclined surfaces 3a and 3b might be inclined reversely so as to make the halves 2a and 2b thicker forward and rearward, respectively. In such a case, by moving the slide

head 8 rearward toward the handle 7, it is possible to slide the movable half 2b in the direction toward the thicker side of this half 2b so as to reduce the diameter of the body 2. In this case, the spring 12 for returning the movable half 2b might be a tension spring interposed between the halves 2a and 2b.

Only the straight collet W is shown as a part having a parallel bore to be cleaned by the cleaner 1. The cleaner 1 can, however, also clean the inner cylindrical surfaces of parallel bores of bearing races, gears, pulleys and other machine parts, and parallel bores cut in metallic materials directly by machine tools.

One scraper 5 or 6 is mounted on each of the bar halves 2a and 2b. Dependently on the width of the outer surfaces of the halves 2a and 2b, however, two or more parallel scrapers might extend longitudinally on each of the halves.

The cleaner 1 can be operated manually, but might be adapted to clean the inner cylindrical surface of a parallel bore automatically with the holder 7 and the slide head 8 actuated mechanically.

Claims

1. A parallel bore cleaner comprising a body in the form of a bar which is uniform in cross section and a holder which extends coaxially with the body,

   the body being divided into a first bar half and a second bar half along a generally longitudinal section inclined with respect to the axis of the body so that each of the bar halves has an inclined surface, the body including a means engaging the inclined surfaces of the bar halves in slidable contact with each other, a scraper mounted on the outer surface of each of the bar halves, the rear end of the-first bar half joining integrally with the holder, and a slice head formed on the rear end of the second bar half,
   such that, when the head is operated so as to slide the second bar half relatively to the first bar half in the direction toward the thicker side of the second bar half, the diameter of the body decreases.

2. A parallel bore cleaner according to Claim 1, and further comprising a spring interposed between the bar halves for returning to the original position the second bar half which has slid so as to decrease the diameter of the body.

3. A parallel bore cleaner according to Claim 1 or 2, wherein the engaging means comprises a groove formed longitudinally in one of the inclined surfaces of the bar halves, and a tenon formed longitudinally on the other surface for engagement with the groove.

4. A parallel bore cleaner according to Claim 3, wherein the groove is a dovetail groove, the tenon being a dovetail tenon.

5. A parallel bore cleaner according to Claim 3, wherein the groove is elastically deformed to expand for engagement with the tenon, its restoring force holding the tenon.

6. A parallel bore cleaner according to any one of Claims 1 - 5, wherein the slide head of the second bar half has a bearing surface extending radially outward from the rear end of this half, the scraper on the second bar half being mounted substantially in the shape of an L in side view on the bearing surface and the outer surface of this half.

7. A parallel bore cleaner according to any one of Claims 1 - 6, wherein each of the bar halves has an outer groove formed in its outer surface along its length, the inner side of the associated scraper engaging with the outer groove.

8. A parallel bore cleaner according to any one of Claims 1 - 7, wherein at least one of the bar halves has a mark indicating a predetermined axial position, at which they can be cut.

FIG. 1

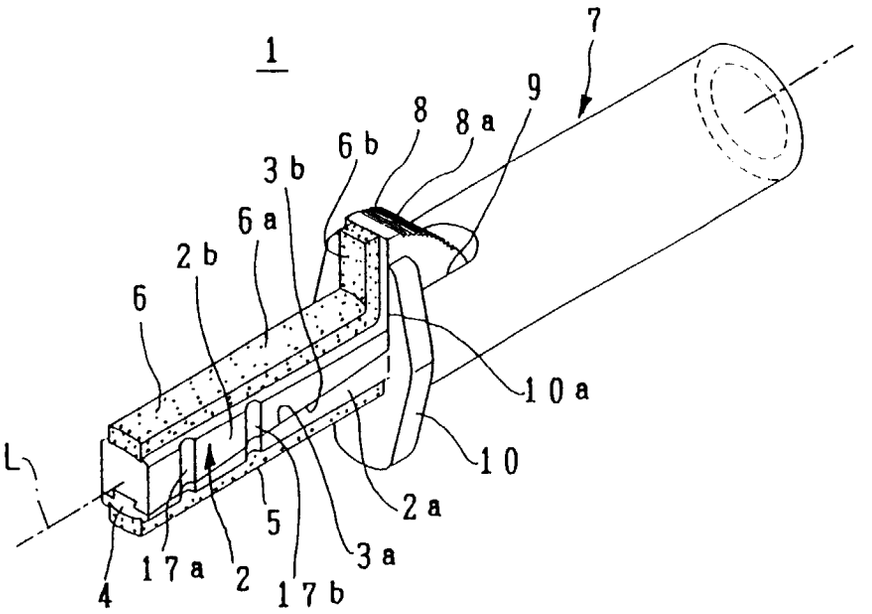

1
7
9
8
8a
6b
3b
6a
2b
6
10a
10
2a
5
3a
L
4
17a
2
17b

FIG. 2

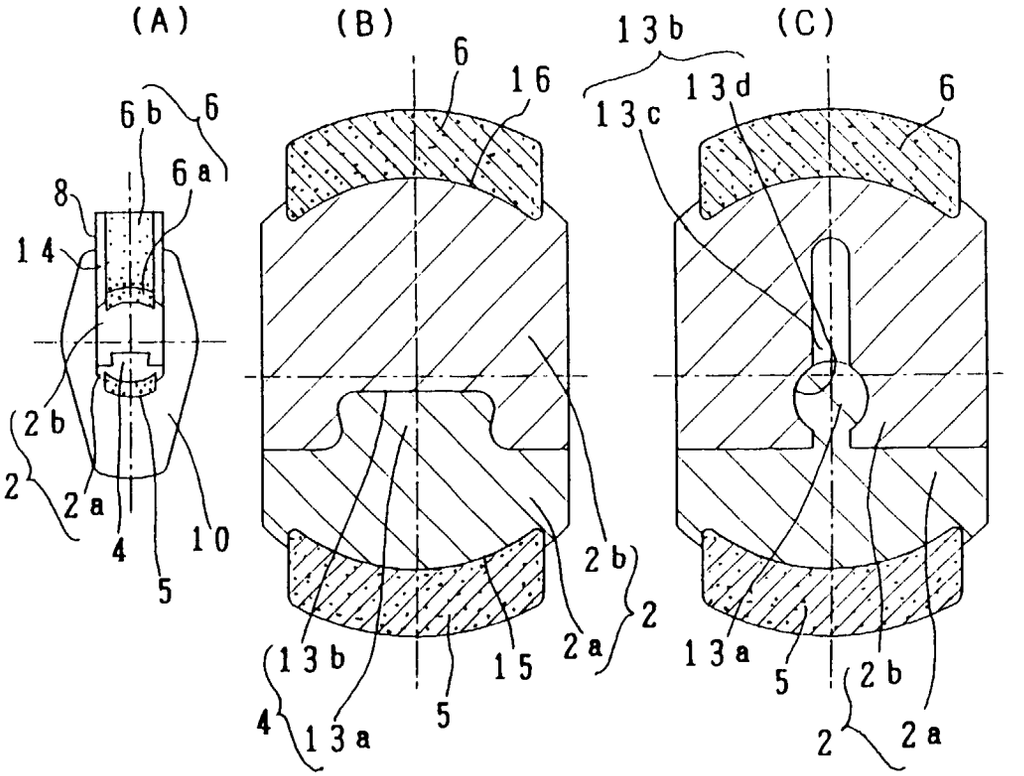

(A)
(B)
(C)
6b
6
6a
8
14
2b
2
2a
4
10
5
6
16
13b
15
13a
13c
13d

FIG. 3

