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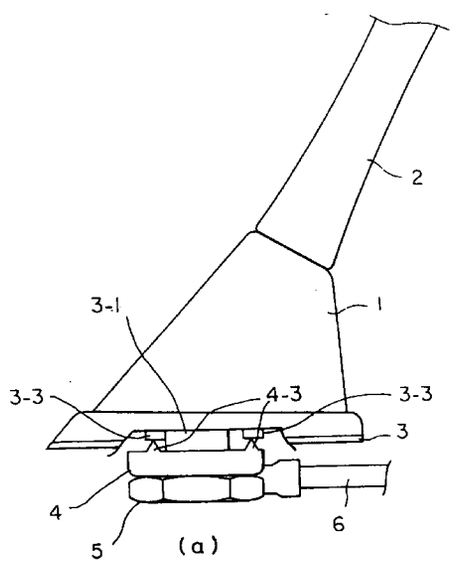
(71) Applicant: **Nippon Antena Kabushiki Kaisya**
Tokyo 116 (JP)

(72) Inventor: **IMAHIGASHI, Hirotsugu,**
Nippon Antena Ka. K.
Warabi-shi Saitama (JP)

(74) Representative: **Moncheny, Michel et al**
c/o Cabinet Lavoix
2 Place d'Estienne d'Orves
75441 Paris Cedex 09 (FR)

(54) ANTENNA MOUNTING DEVICE

(57) An antenna mounting device for facilitating a mounting operation without a risk of falling-off nut. A washer (4) is rotatably secured to a nut (5) by caulking a ring-like rib formed on one side of the nut (5). A spacer (7) having a fit-in piece is press fitted in the washer (4) having a U-shaped cross section. Thus, the nut (5), washer (4) and spacer (7) are integrated into a nut with a washer. When this nut with a washer is set on lower surface of a base-screw portion (3-1), the fit-in piece fits in a slit (3-4) formed in the base-screw portion (3-1), whereby the nut with a washer is prevented from falling off.



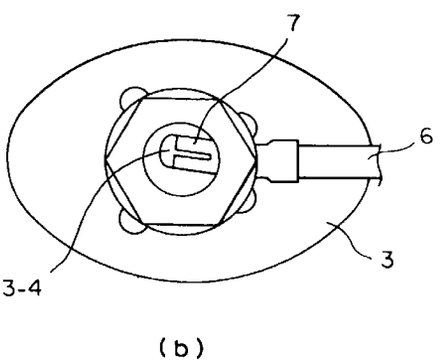


FIG. 1

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Description

TECHNICAL FIELD

The present invention relates to an antenna attachment device, and is particularly suitable for application to an automobile antenna.

BACKGROUND ART

The antenna attachment device shown in Figure 10 has been proposed in the past as an antenna attachment device for attaching an automobile antenna.

In Figure 10, an antenna (not shown) is mounted on a bottom plate 115, and a slit 119 is formed in the threads 118 that project out from the lower surface of this bottom plate 115. This bottom plate 115 is opposite a thin sheet 117 that forms an automobile roof or the like, between which is interposed an intermediate element 116 that is used for cushioning. At this point, the threads 118 are passed through an attachment hole formed in the thin sheet 117.

A nut 121 is threaded onto these threads 118, and a disk 120 is rotatably fixed to one side of the nut 121. This fixing is accomplished by means of a ring-shaped band 124 that is partially cut away. Specifically, a ring-shaped groove 114 is formed in the upper inside surface of the nut 121, and the outer periphery of a through-hole formed in the disk 120 is sandwiched between a first ring-shaped protrusion formed on the outer periphery of the band 124 that engages with this ring-shaped groove 114 and a second ring-shaped protrusion formed thereover, which results in the disk 120 being rotatably fixed to the nut 121.

Also, a tongue 122 that engages with the slit 119 formed in the axial direction of the threads 118 is formed on the disk 120, and this tongue 122 projects in the inner peripheral direction thereof.

After the disk 120 has been rotatably fixed to the nut 121, the above-mentioned tongue 122 is fitted into the slit 119 formed in the threads 118, and the nut 121 is engaged with the threads 118, which results in the secure fixing of the bottom plate 115 to the thin sheet 117. In this case, teeth-like members 123 formed on the upper end of the disk 120 bite into the lower surface of the thin sheet 117. Furthermore, the tongue 122 fits into the slit 119, which results in the disk 120 being prevented from rotating with respect to the bottom plate 115 even if the nut 121 is rotated.

A notch is provided to a position on the outside of the tongue 122 in the disk 120, and the power lead connected to the antenna element is pulled out in the lateral direction from the notch formed in the disk 120 through a space formed on the inside of the threads 118.

The upper surface of the nut 121 is slanted such that it becomes lower from the inside toward the outside, and the lower surface of the disk 120 is also formed in a slant that matches this slant of the nut 121, which results in the disk 120 being centered with respect to the nut 121.

However, because the nut 121 and the disk 120 are rotatably fixed to each other by the band 124, which is thin-walled and resilient, it is difficult to center the disk 120 with respect to the nut 121. A slant has been provided in the past to the nut 121 and the disk 120 as mentioned above in an effort to solve this difficulty, but the problem with this machining was that it drove up the cost.

Also, since the tongue 122 formed on the disk 120 was formed by punching with a press, it could not be of the same width as the slit 119, there was looseness between the disk 120 and the slit 119, and there was a shift in the position with respect to the protrusion of bottom plate 115 formed opposite the teeth-like members 123 of the disk 120.

Another problem was that the power lead was susceptible to damage since it was pulled out from a notch formed in the disk 120 by the cutting of the metal sheet.

Still another problem was that when an attempt was made to thread the nut 121 onto the threads 118, since the tongue 122 was fitted in a loose state in the slit of the threads when the nut 121 was set on the bottom plate 115, the nut 121 would fall off if the worker let go of it during assembly work, and this made the assembly work more difficult.

In this case, it is possible to temporarily fasten the nut 121 and the disk 120 by means of the resilient band 124, but the band 120 serves to fix the nut 121 and the disk 120, and therefore has resiliency toward the outside, so it is difficult to use this band to perform temporary fastening which requires resiliency toward the inside.

In view of this, an object of the present invention is to provide an antenna attachment device with which the centering of the nut and the washer is easy.

Another object of the present invention is to provide an antenna attachment device with which there will be no looseness between the washer and the antenna base during attachment.

Still another object of the present invention is to provide an antenna attachment device with which the cable can be pulled out in the lateral direction without the cable being damaged.

Still another object of the present invention is to provide an antenna attachment device with which the nut is temporarily fastened to the base threads during assembly work so that it will not fall off.

SUMMARY OF THE INVENTION

In order to achieve the stated objects, the antenna attachment device of the present invention comprises: a base threaded component that projects downward from an antenna base and that has threads formed around its outer periphery and a slit in the axial direction thereof; a nut that is threaded onto said base threaded component and has a ring-shaped rib on one side; a washer that has formed in it a through-hole through which the

above-mentioned ring-shaped rib provided to said nut can pass, and that has a U-shaped cross section; and a spacer that is integrally fastened to said washer and has formed on it a fitting tab that fits into the above-mentioned slit provided to the above-mentioned base threaded component; wherein the above-mentioned ring-shaped rib is passed through the above-mentioned through hole formed in the above-mentioned washer, and said ring-shaped rib is caulked, which rotatably fastens the above-mentioned washer to the above-mentioned nut; the fastening of the above-mentioned spacer on said washer results in the integrated washer/nut assembly being set in the above-mentioned base threaded component so that said spacer faces the lower surface of the above-mentioned antenna base; and the fitting of the above-mentioned fitting tab into the above-mentioned slit keeps the above-mentioned integrated washer/nut assembly from falling from the above-mentioned base threaded component.

Also, in the above-mentioned antenna attachment device, an engagement groove formed in an engagement tab that projects out from the outer periphery of the above-mentioned spacer is engaged with a notch component formed in the above-mentioned washer, and the above-mentioned spacer is pressed into and integrated with the above-mentioned washer;

the above-mentioned fitting tab is molded such that it will be elastic in a forked shape, and ridges are formed at the positions that come into contact with the above-mentioned slit; and

the upper edge of the above-mentioned fitting tab is formed lower than the upper surface of the above-mentioned spacer.

With the present invention, since the fitting tab is fitted tightly into the slit, the integrated washer/nut assembly consisting of the nut, washer, and spacer can be temporarily fastened to the slit. Therefore, it is easier to thread the above-mentioned washer/nut assembly from below onto the base threaded component projecting out from the lower surface of the antenna base, and the looseness of the washer with respect to the antenna base can be eliminated.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view and a bottom view of the assembled antenna attachment device of the present invention;

Figure 2 shows the structure of the washer in the antenna attachment device of the present invention;

Figure 3 shows the structure of the nut in the antenna attachment device of the present invention;

Figure 4 shows the structure of the spacer in the antenna attachment device of the present invention;

Figure 5 shows the structure of the antenna base in the antenna attachment device of the present invention;

Figure 6 is an exploded view of the antenna attachment device of the present invention;

Figure 7 is a top view and a side view of the washer/nut assembly in which the washer, nut, and spacer are integrated in the antenna attachment device of the present invention;

Figure 8 shows the structure of a variation example of the spacer in the antenna attachment device of the present invention;

Figure 9 shows the structure of another variation example of the spacer in the antenna attachment device of the present invention; and

Figure 10 shows the structure of a conventional antenna attachment device.

BEST MODE FOR CARRYING OUT THE INVENTION

Figure 1a shows a side view of the assembled antenna attachment device of the present invention, part of which is cut away. Figure 1b shows a bottom view of the same.

In Figure 1a, 1 is an antenna case to which an antenna element 2 is mounted and which houses a wave separator, an amplifier, a wave synthesizer, or the like in its interior; 2 is an antenna element capable of receiving three waves, namely, those in the telephone band, the FM band, and the AM band; 3 is a metal antenna base that is made by die casting or the like and whose lower surface is in contact with an automobile roof or another attachment member; 4 is a washer, on the upper end of which are protrusions 4-3 whose tips are opposite from a plurality of protrusions 3-3 provided to the lower surface of the antenna base 3, and which comes into contact with the automobile roof or other attachment member with a U-shaped cross section; 5 is a nut that is threaded onto a base threaded component 3-1 that projects downward from the lower surface of the antenna base 3; and 6 is a cable whose front end is connected to the antenna element 2 and which is pulled out in the lateral direction from a slit 3-4 provided to the base threaded component 3-1 as shown in Figure 1b.

Figure 1b shows how the engagement tab formed on the spacer 7 is fitted into the slit 3-4. The bottom surface of the antenna base 3 is elliptical here.

As will be discussed below, the washer 4 is rotatably fixed to the nut 5, the spacer 7 is installed within the washer 4, and the nut 5, the washer 4, and the spacer 7 are integrated into a washer/nut assembly.

Although mentioned above, the antenna case 1 is attached to the attachment member through the sandwiching of the attachment member between the washer 4 and the antenna base 3. In this case, the base threaded component 3-1 is inserted into an attachment hole provided to the attachment member.

Next, Figure 2 shows the structure of the washer in the antenna attachment device, Figure 3 shows the structure of the nut 5, Figure 4 shows the structure of the spacer 7, and Figure 5 shows the structure of the

antenna base 3.

Figure 2a is a top view of the washer 4, while Figure 2b is a cross section along the A-A line. As shown in the figures, the washer 4 has a plurality (eg, 4) of pointed protrusions 4-3 on its upper end, a through-hole 4-4 through which the ring-shaped rib formed on the nut 5 (discussed below) is formed in the bottom surface, and a notch 4-1 in which the spacer 7 engages is formed in the side surface.

The purpose of the protrusions 4-3 is to ensure proper grounding to the attachment member.

Figure 3a is a half cross section of the nut 5, while Figure 3b is a top view of the nut. As shown in these figures, a ring-shaped rib 5-1 that is passed through the through-hole 4-4 formed in the above-mentioned washer 4 is formed on one side of the nut 5, the outer periphery of the nut 5 is hexagonal, and nut threads 5-2 that are threaded onto the base threaded component 3-1 are formed around the inner periphery of this nut 5.

Next, Figure 4a is a top view of the spacer 7, while Figure 4b is a cross section along the B-B line, Figure 4c is a bottom view, and Figure 4d is a cross section along the C-C line.

As shown in these figures, the spacer 7 is provided in its center with a through-hole that allows the passage of the base threaded component 3-1, and a fitting tab 7-1 projects into this through-hole. This fitting tab 7-1 is formed in a forked shape, and the forked portion is elastic enough to resist compression. This fitting tab 7-1 is fitted into the slit 3-4 formed in the base threaded component 3-1. Also, an engagement tab 7-4 is provided such that it extends to the opposite side from the fitting tab 7-1 and projects out from the outer periphery, and this engagement tab 7-4 is provided on both sides with an engagement groove 7-2 that engages with the end edge of the notch 4-1 formed in the washer 4. Furthermore, a cable supporting groove 7-3 that has an arc-shaped cross section and slants so that it gradually becomes lower toward the outer periphery is formed on one side of the engagement tab 7-4 from the fitting tab 7-1.

Figure 5b is a bottom view of the antenna base 3, while Figure 5a is a cross section along the D-D line. The base threaded component 3-1, which has threads formed around its outer periphery, is formed such that it projects downward from the lower surface of the antenna 3, and in the axial direction thereof is formed a slit 3-4 that has a rectangular cross section. A cable through-hole 3-2 that communicates with this slit 3-4 is provided to the lower surface of the antenna base 3. Furthermore, four (for example) protrusions 3-3 are formed on the lower surface of the antenna base 3, and these protrusions 3-3 are formed at positions opposite from the protrusions 4-3 formed on the upper end of the washer 4. Fixing thread through-holes 3-5, through which fixing threads that fix the antenna case 1 to the antenna base 3 pass, are also formed on the lower surface of the antenna base 3.

Next, Figure 6 is an exploded view of the attachment of the antenna case 1 to the attachment member 8 by means of the attachment of the nut 5, the washer 4, and the spacer 7 to the base threaded component 3-1.

As shown in this figure, first, the base threaded component 3-1 is passed through the attachment hole formed in the attachment member 8, and the attachment member 8 comes into contact with the lower surface of the base threaded component 3-1. Here, the cable 6 is pulled out in the lateral direction via the cable through-hole 3-2 and the slit 3-4. The nut 5 is then threaded onto the base threaded component 3-1, and at this point the ring-shaped rib 5-1 formed in the nut 5 is caulked into the through-hole 4-4 formed in the washer 4, which makes it possible for the washer 4 to rotate on the nut 5. Further, the spacer 7 is mounted inside the washer 4, creating an integrated washer/nut assembly.

Figure 7 shows how this washer/nut assembly looks. Figure 7a is a top view, while Figure 7b is a side view.

As shown in these figures, the spacer 7 is press fitted into the washer 4, which has a U-shaped cross section, and during this press fitting [the spacer] is inserted such that the end edges of the notch 4-1 formed in the washer 4 engage with the engagement grooves 7-2 formed on both sides of the engagement tab 7-4. In this case, the upper end edges opposite the washer 4 may be caulked prior to press fitting so that the press-fitted spacer 7 will be less apt to come loose.

When the spacer 7 side of this washer/nut assembly is set on the lower end surface of the base threaded component 3-1, the fitting tab 7-1 of the spacer 7 is inserted into the slit 3-4 in the base threaded component 3-1, and is fitted such that it is deformed slightly toward the inside. Since this fitting tab 7-1 has elasticity, as mentioned above, this fitting keeps the washer/nut assembly from falling out of the base threaded component 3-1.

When the nut 5 is turned and threaded onto the base threaded component 3-1 in this state, the washer 4 is kept from turning by the action of the fitting tab 7-1 since the washer 4 is integrated with the spacer 7, so the washer 4 rises while maintaining the same position. When the protrusions 4-3 formed on the upper end of the washer 4 bite into the lower surface of the attachment member 8, the attachment member 8 is sandwiched between the antenna base 3 and the washer/nut assembly, and the antenna case 1 equipped with its antenna element 2 is thereby attached.

Also, the protrusions 4-3 allow a good ground to be established when they bite into the lower surface of the attachment member 8 at this point, and the cable 6 is supported by the cable supporting groove 7-3 and is pulled out in the lateral direction without being damaged.

Further, since the fitting tab 7-1 is fitted tightly in the slit 3-4, the looseness of the washer 4 in the rotational direction with respect to the antenna base 3 can be eliminated. Therefore, the tips of the protrusions 3-3

formed on the lower surface of the antenna base 3 never separate from the surface of the protrusions 4-3 formed on the washer 4, and the attachment member 8 can be reliably sandwiched by the washer 4 and the protrusions 3-3 formed on the lower surface of the antenna base 3. Moreover, when the attachment member 8 is an automobile roof or the like formed from a thin sheet, the attachment member 8 will be deformed if the tips of the protrusions 4-3 separate from the protrusions 3-3.

In addition, the centering of the washer 4 can be performed to a high degree of precision at the same time.

Thus, the antenna attachment device of the present invention allows an integrated washer/nut assembly comprising the nut 5, the washer 4, and the spacer 7 to be temporarily fastened in the slit 3-4, so the work is facilitated when the above-mentioned washer/nut assembly is threaded from below onto the base threaded component 3-1 that projects out from the lower surface of the antenna base 3.

Next, Figure 8 shows the structure of the spacer 7 in a variation example of the antenna attachment device of the present invention. In this variation example, narrow ridges 7-5 are provided to both sides of the forked fitting tab 7-1 (the tip portion is particularly favorable). These ridges 7-5 exert a great deal of pressure on the fitting tab 7-1 to come into contact with the slit 3-4 when the fitting tab 7-1 has been fitted into the slit 3-4. Therefore, they allow the fitting force of the fitting tab 7-1 with respect to the slit 3-4 to be increased. As a result, the dimensional precision of the fitting tab 7-1 is not as crucial.

Figure 9 shows the structure of the spacer 7 in another variation example of the antenna attachment device of the present invention. In this variation example, the upper end surface of the forked fitting tab 7-1 is formed such that it is lower by *d* than the upper end surface of the spacer 7. This lowered upper end surface of the fitting tab 7-1 is the surface opposite the base threaded component 3-1, and when the washer/nut assembly is set on the base threaded component 3-1, the spacer 7 will be inserted into the base threaded component 3-1 by the above-mentioned amount *d* even if there is a positional shift between the fitting tab 7-1 and the slit 3-4, so the washer/nut assembly is able to rotate without separating from the lower end surface of the base threaded component 3-1. Accordingly, it is easier to fit the fitting tab 7-1 into the slit 3-4.

The spacer 7 is made of a resin, while the washer 4 is produced by press-working a metal sheet, and the nut 5 is made of metal.

INDUSTRIAL APPLICABILITY

Because the present invention is structured as described above, the fitting tab of the spacer that is integrated with the washer is fitted into the slit without any looseness, so the washer can be reliably prevented from turning, and there is no centering deviation thereof.

Also, since the fitting tab is tightly fitted into the slit and thereby temporarily fastened, the work involved during antenna attachment is facilitated. Furthermore, the cable is supported by a cable supporting groove, so the cable is protected.

Claims

1. An antenna attachment device, comprising:

   a base threaded component that projects downward from an antenna base and that has threads formed around its outer periphery and a slit in an axial direction thereof;

   a nut that is threaded onto said base threaded component and has a ring-shaped rib on one side;

   a washer that has formed in it a through-hole through which the above-mentioned ring-shaped rib provided to said nut can pass, and that has a U-shaped cross section; and

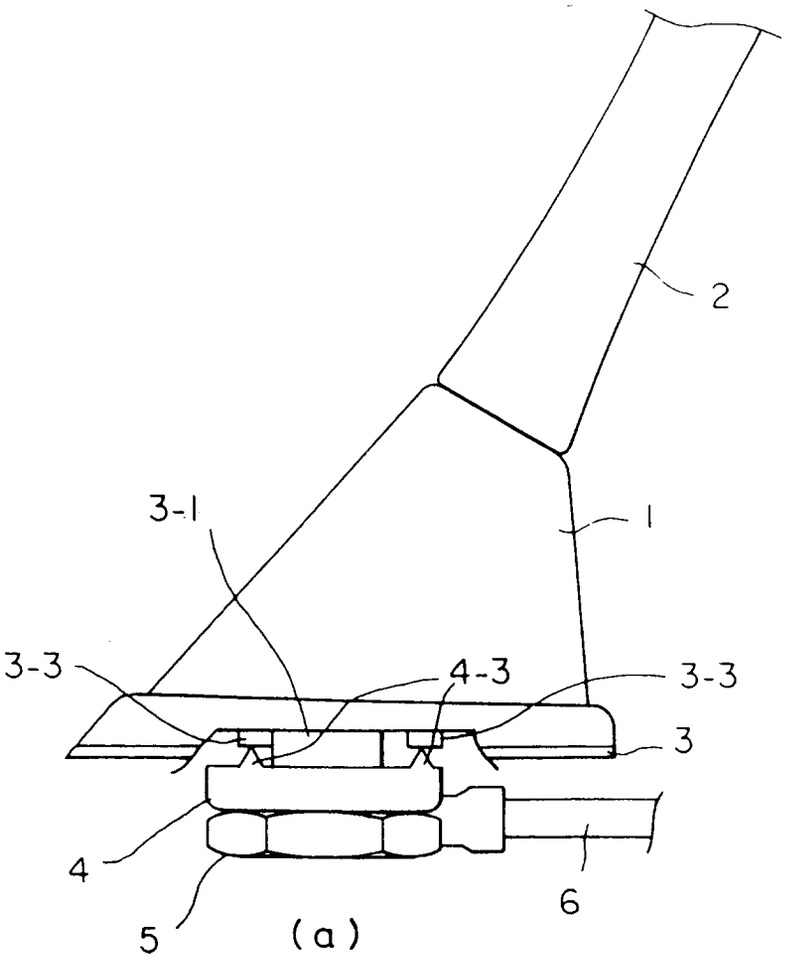
   a spacer that is integrally fastened to said washer and has formed on it a fitting tab that fits into the above-mentioned slit provided to the above-mentioned base threaded component, wherein the above-mentioned ring-shaped rib is passed through the above-mentioned through hole formed in the above-mentioned washer, and said ring-shaped rib is caulked, which rotatably fastens the above-mentioned washer to the above-mentioned nut; the fastening of the above-mentioned spacer on said washer results in the integrated washer/nut assembly being set in the above-mentioned base threaded component so that said spacer faces the lower surface of the above-mentioned antenna base; and the fitting of the above-mentioned fitting tab into the above-mentioned slit keeps the above-mentioned integrated washer/nut assembly from falling from the above-mentioned base threaded component.

2. An antenna attachment device as defined in Claim 1, characterized by the fact that an engagement groove formed in an engagement tab that projects out from the outer periphery of the above-mentioned spacer is engaged with a notch component formed in the above-mentioned washer, and the above-mentioned spacer is pressed into and integrated with the above-mentioned washer.

3. An antenna attachment device as defined in Claim 1, characterized by the fact that the above-mentioned fitting tab is molded such that it will be elastic in a forked shape, and ridges are formed at the positions that come into contact with the above-mentioned slit.

4. An antenna attachment device as defined in Claim 1, characterized by the fact that the upper edge of the above-mentioned fitting tab is formed lower

than the upper surface of the above-mentioned spacer.



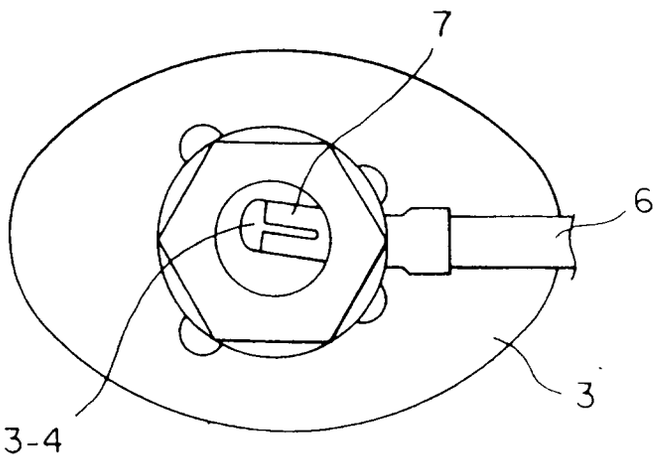


FIG. 1

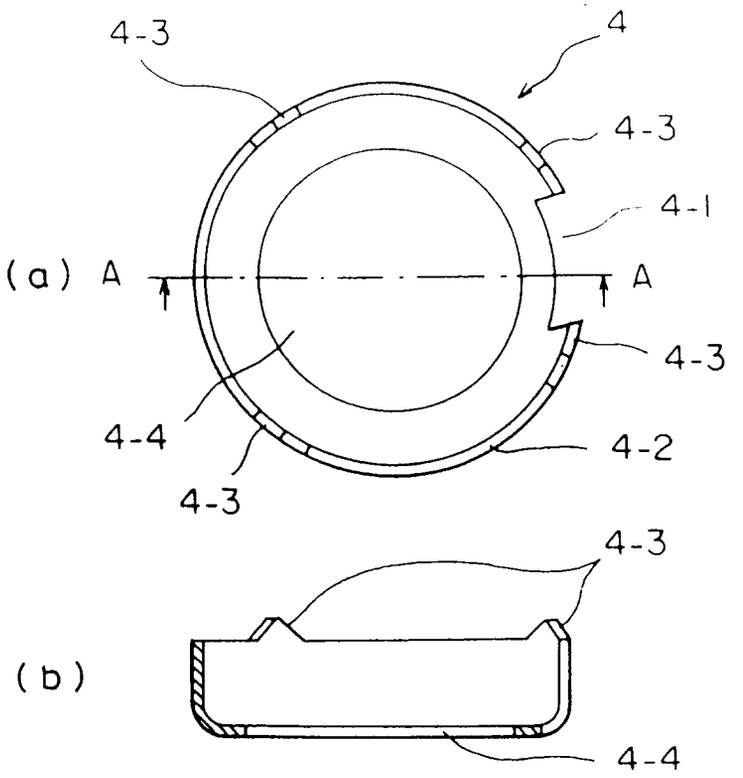


FIG. 2

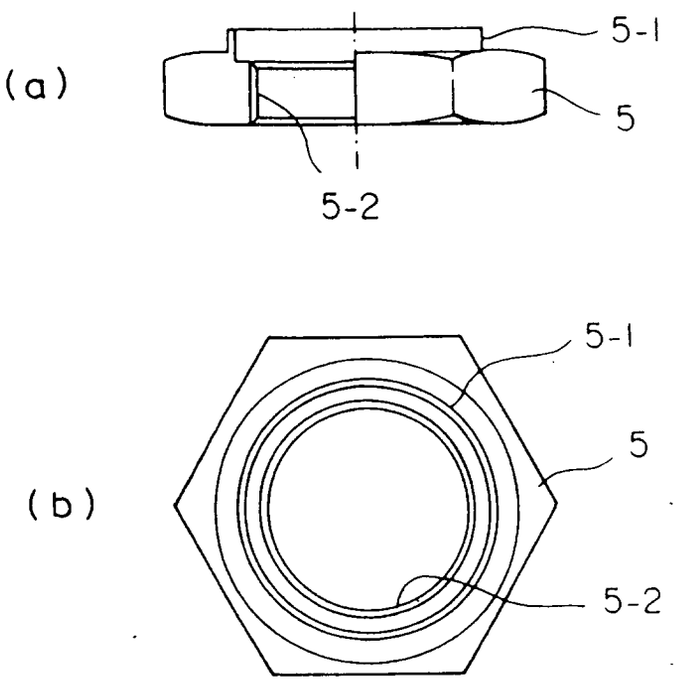


FIG. 3

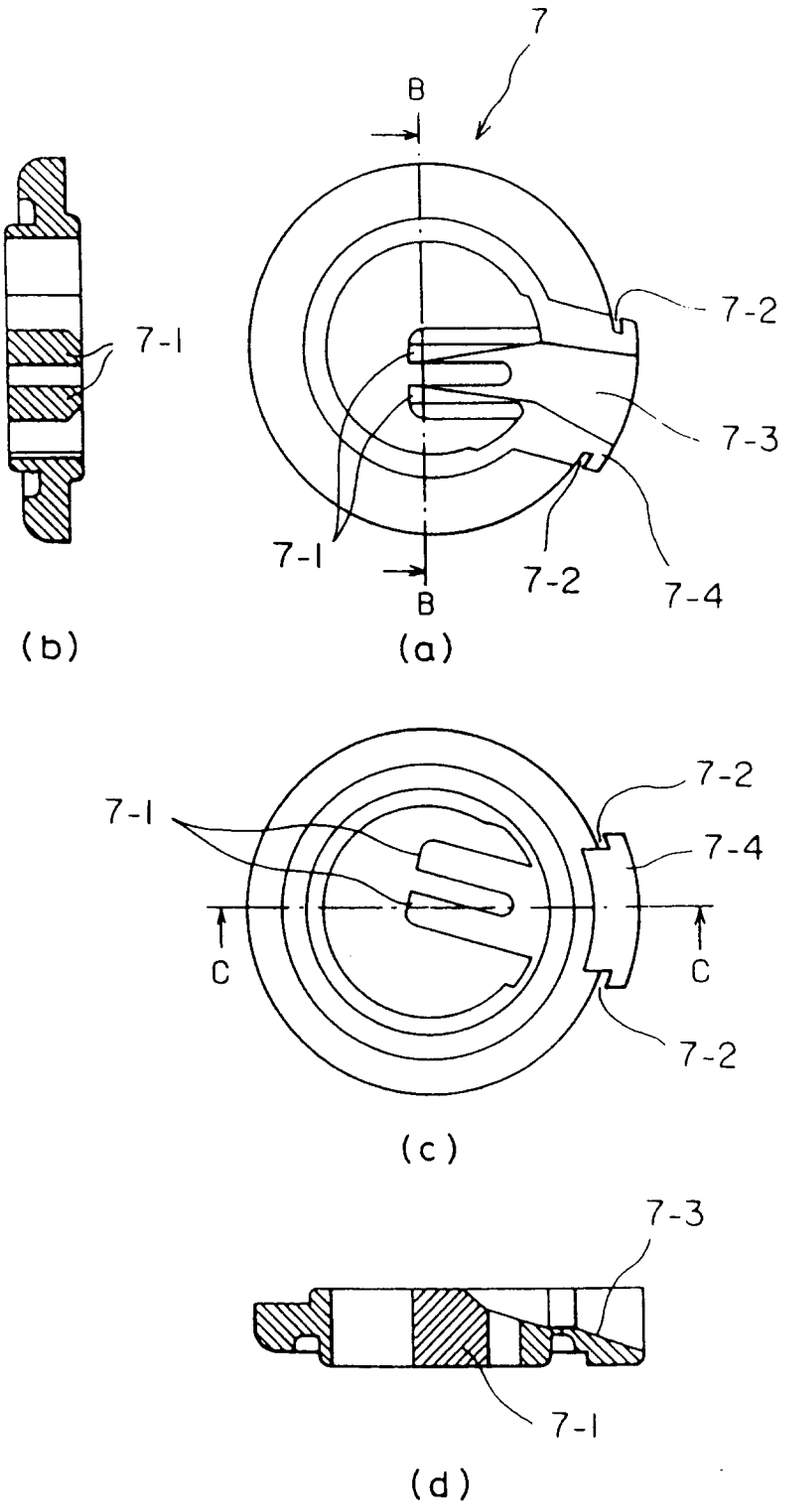
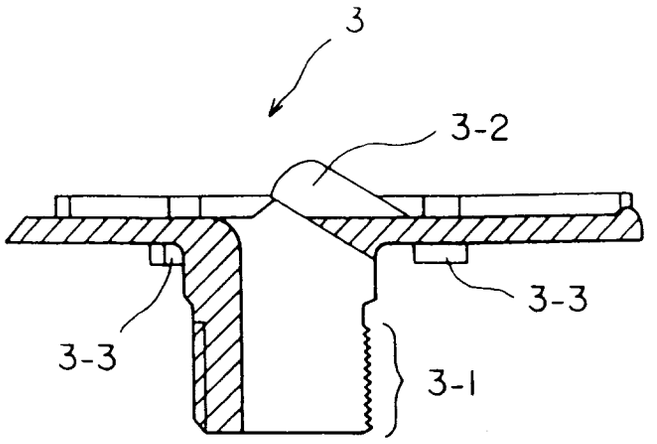
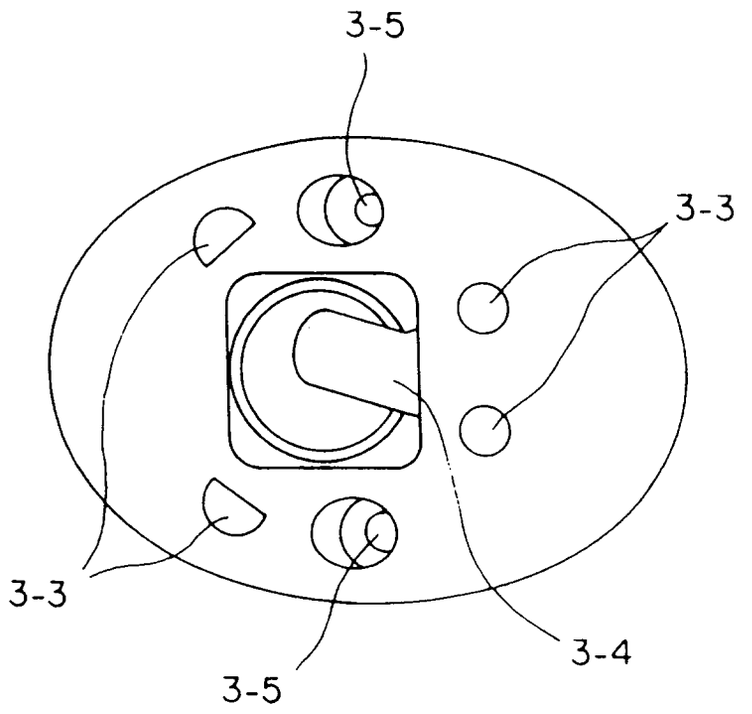


FIG. 4



(a)



(b)

FIG. 5

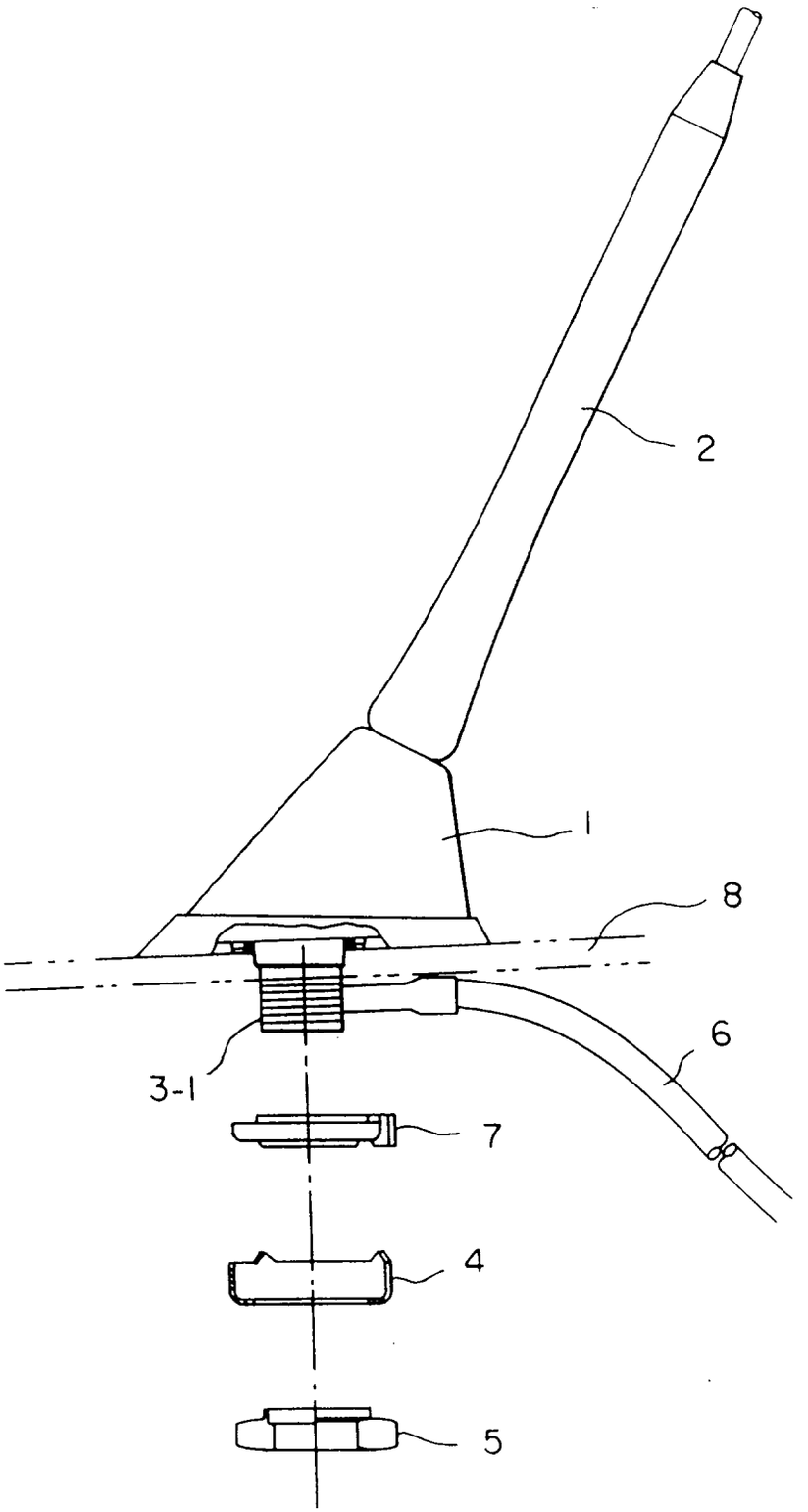


FIG. 6

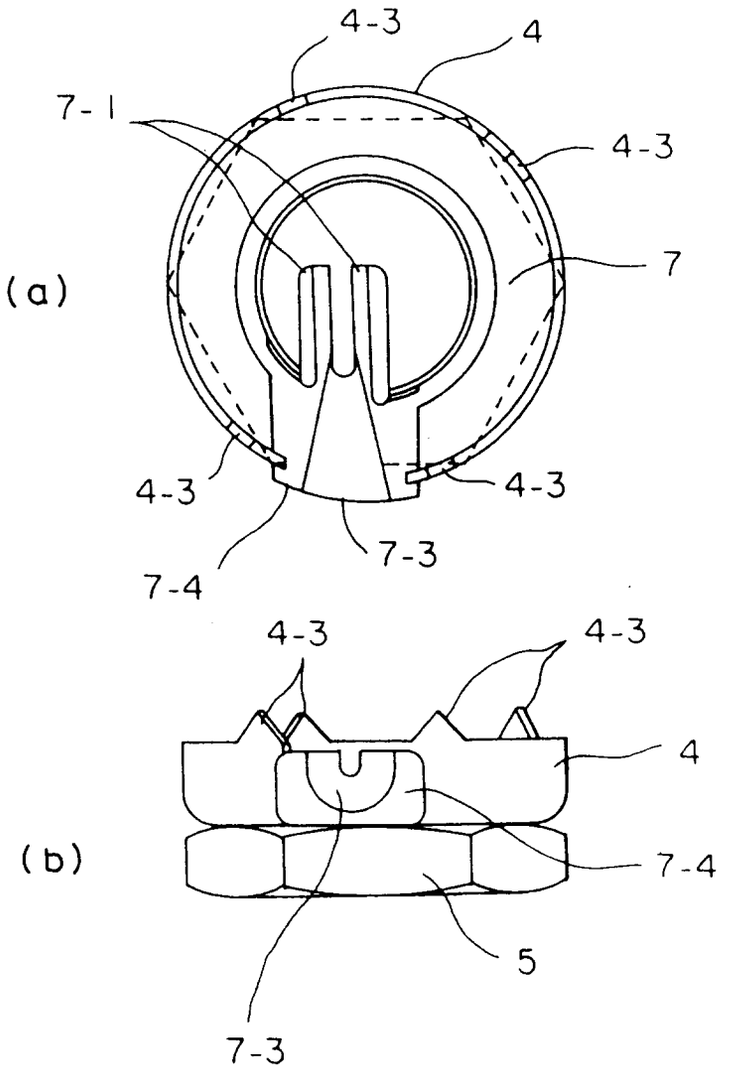


FIG. 7

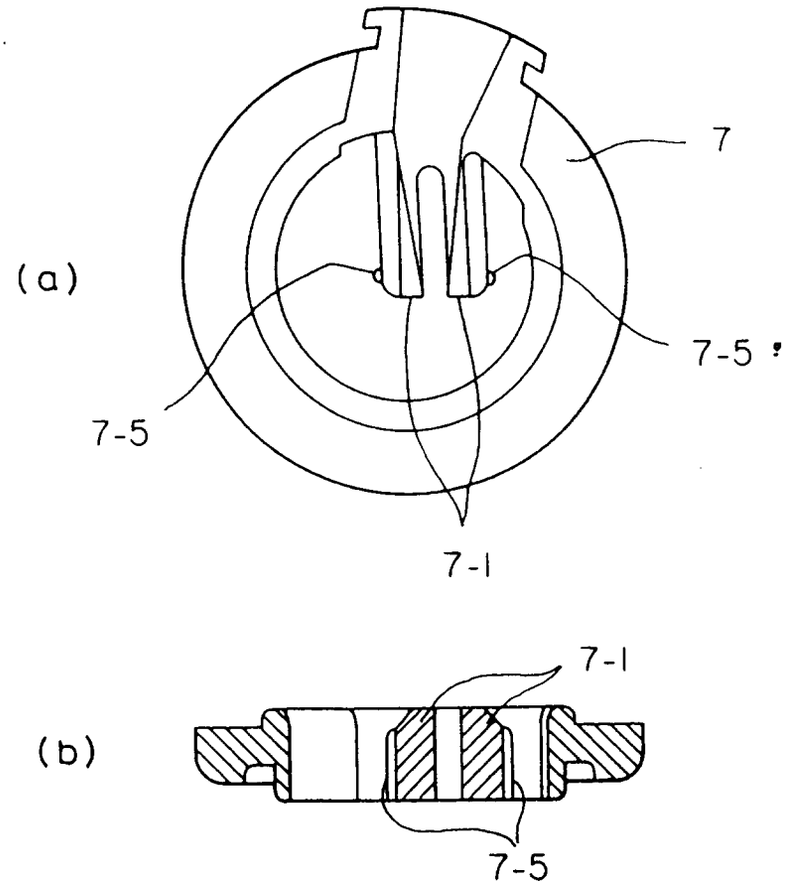


FIG. 8

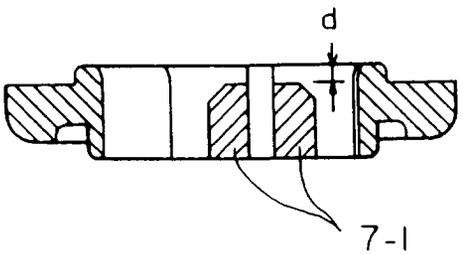


FIG. 9

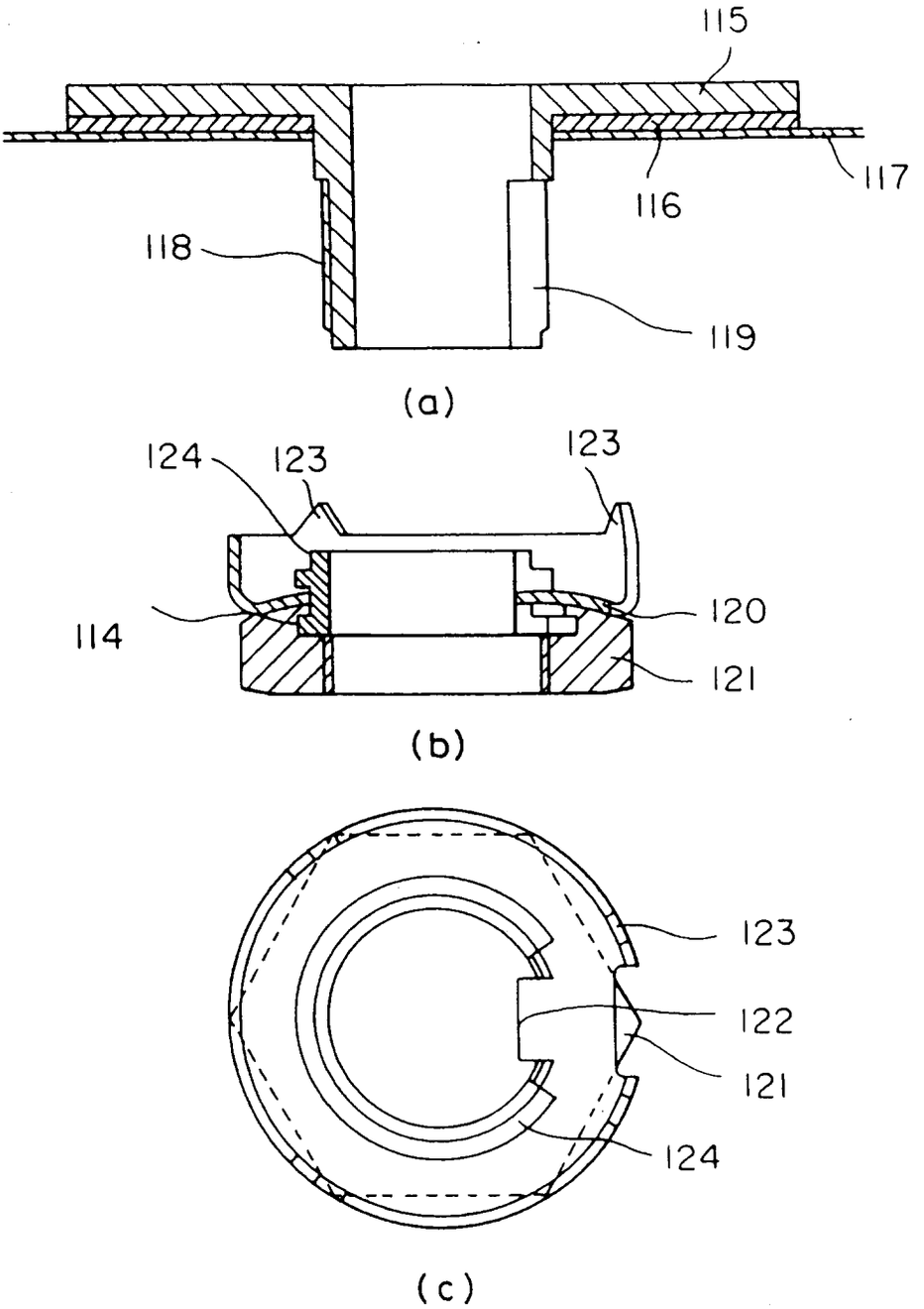


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP96/00421

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl^6 H01Q1/12
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
Int. Cl^6 H01Q1/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1926 - 1996
Kokai Jitsuyo Shinan Koho	1971 - 1996
Toroku Jitsuyo Shinan Koho	1994 - 1996

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 60-108013, U (Yokoo Seisakusho K.K.), July 23, 1985 (23. 07. 85), Figs. 3 to 4 (Family: none)	1 - 4
A	JP, 60-124117, U (Yokoo Seisakusho K.K.), August 21, 1985 (21. 08. 85), Figs. 3 to 4 (Family: none)	1 - 4
A	JP, 57-064905, U (NEC Corp.), April 17, 1982 (17. 04. 82), Figs. 2 to 4 (Family; none)	1 - 4
A	JP, 57-026105, U (Yokoo Seisakusho K.K.), February 10, 1982 (10. 02. 82), Figs. 6 to 7 (Family: none)	1 - 4
A	JP, 53-120243, A (Bankar Rermo Corp.), October 20, 1978 (20. 10. 78) & US, 4106024, A	1 - 4
A	JP, 61-062414, U (Yokoo Seisakusho K.K.),	1 - 4

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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International application No.
PCT/JP96/00421

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	April 26, 1986 (26. 04. 86)(Family: none)	
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