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Hallókészülék-egység egy fülbevalóval és egy hallókészülékkel

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

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SZTNH-100010107

HEARING AID DEVICE WITH A PIECE OF EAR JEWELLERY AND A HEARING AID

The invention relates to a hearing aid unit with a hearing aid, which is disposed in an earpiece, which serves to hold the hearing aid with the receiving function and the reproducing function and thus the attachment of the hearing aid at the human ear.

Hearing aid technology currently has two basic approaches. On the one hand, there are the in-the-ear devices, also in-the-ear hearing aids, which are worn completely in the ear. These are adapted as a compact, one-piece device individually to the anatomy of the ear, so that they can be inserted more or less into the auditory canal. This version is cosmetically very sophisticated, since it is hardly visible if at all. However, the position in the auditory canal proves to be disadvantageous for various reasons. Aside from the limited space, the occlusion effect, that is, the closure of the auditory canal by the hearing aid, and the distorted acoustics are problematic for the wearer and the hearing aid. The occlusion of the auditory canal permits only a small amount of ventilation, if any at all, which makes the auditory canal and also the technique more susceptible to disturbances. In addition, the wearer perceives intrinsic noises such as eating noises or his own voice particular disturbing and unnatural.

In-the-ear devices, in combination with jewellery, are known, for example, from FR 2 820 937 A1 and US Patent 5,828,757.

As an alternative, behind-the-ear devices (BTE hearing aids) are known. In the case of these systems, the hearing aid is designed in two parts, the actual hearing aid, which, in particular, comprises a microphone, electronics, batteries and sound transducers in a housing and is worn behind the ear, and a tailor-made ear mold, the otoplastics, which is connected by a signal conductor to the main device behind the ear. The ear fitting is disposed in the auditory canal. The ear fitting does not close the auditory canal completely or at least provides sufficient ventilation. In addition, the BTE hearing system allows sound to exit near the eardrum. The latter, for example, is made possible by designing the signal conductor as a sound tube when the sound transducer is integrated in the hearing device and the sound is transmitted as an acoustic signal over the hearing tube to the eardrum.

Alternatively, the sound transducer can also be designed as an external sound transducer, which is referred to as a receiver. In this case, the receiver is connected to the main device behind the ear by a signal conductor, here an electrical signal conductor. In this embodiment, an audio signal is transmitted, that is, an electrical signal, which relays acoustic information. Such external receivers permit the sound to be generated near the eardrum, thereby reducing the minor distortions of the sound, for example, those due to losses, distortions or feedback.

The hearing devices of the BTE systems usually are provided with a prefabricated housing. Only the ear pieces are adapted appropriately to the anatomical circumstances and are therefore correspondingly more flexible in shape. The in-the-ear systems, on the other hand, have not yet been housed as

commercially available components, since they are obtained, as a whole, by casting such a housing, which is adapted to the auditory canal of the wearer. With that, the units provided by the manufacturer are significantly smaller in the case of the in-the-ear hearing aids than in the BTE hearing aids and, for the further processing by the hearing aid technician, more flexibly, particularly in the shape of the housing.

In the following, regardless of whether the sound transducer is arranged internally or externally, the actual main device is referred to as a hearing aid. If an external receiver is designed, this is referred to explicitly as an external component of the hearing aid, but is a component of the hearing aid.

For the conceptual differentiation of the components of the BTE hearing aid systems, those, which are disposed in one piece in a housing, are referred to as a hearing aid and the entire arrangement, which optionally comprises external components, particularly such as external receivers, as a hearing system.

The BTE hearing aids avoid the occlusion effect, offer the wearer a better hearing feeling as well as more space for the electronics and thus more diverse technical options, but are not acceptable for many hearing impaired for cosmetic reasons, even if the housings are increasingly smaller.

For this reason, there are BTE hearing systems, the hearing aids of which are integrated in or at ear jewellery. For example, the DE 87 05 651 U1 describes ear jewellery, in which the jewellery is hollow and thus accommodates at least some components of the hearing aid. The sound is directed to the auricle (concha) by way of a rear sound outlet opening, which is directed towards the auditory canal or a sound tube.

The hearing aid is also disclosed in an ear clip in DE 93 19 114 U1, in EP 0 512 354 A2 and also in DE 70 40 072, and has a sound tube, which leads from the clip into the auricle.

However, this earpiece, designed to receive a hearing aid, is fixedly connected with the hearing aid, so that a change, as is customary for ear jewellery, cannot take place. In addition, the jewellery design is also limited. In order to allow at least a certain jewellery variability here, the cover caps are designed to be exchangeable by means of magnetic holders in DE 93 19 114 U1. However, these can adversely affect the electronics of the hearing aid.

In DE 88 15 571 U1, the housings of the hearing aid are to be fastened to a basic body of an ear clip by means of threaded pins and nuts. However, this again requires an adaptation of the hearing aid to the respective fastening means, as well as appropriate tools, as a result of which a simple exchange of the ear jewellery by the wearer is difficult.

Hearing aids with a directional microphone system for improving speech intelligibility are disclosed in EP 0 942 627 A2.

The invention is therefore based on the objective of indicating possibilities, which adapt the variability of the jewellery design and use, as well as a simple and quick exchangeability for wearing a hearing aid without having to accept losses in hearing aid technology or being unable to use further developments in technology.

In order to achieve this objective, a hearing aid unit with a hearing aid and ear jewellery of claim 1 is described. The respective dependent claims describe advantageous embodiments.

Generically, the ear jewellery has a jewellery body with a cavity and at least one sound opening discharging into the cavity, and the hearing aid for realizing the receiving and reproducing function, at least one microphone for receiving acoustic signals, a signal processing unit for processing the acoustic signals received, a sound transducer and a signal conductor for the transmitting acoustic or audio signals into the auditory canal.

Pursuant to the invention, at least one sound opening is provided in the jewellery as a sound entry opening on the front side, that is, on the side averted from the ear and the cavity is designed in position and shape in such a way, that a hearing aid can be inserted loosely and removed. The removability of the hearing aid is thus linked to the arrangement of at least one microphone in the hearing aid in such a way, that the microphone is assigned to the sound entry opening with loose insertion. Both features, in conjunction with one another, permit the user to exchange the ear jewellery easily and quickly.

A sound entry opening is understood here to be any opening, which passes through the wall of the cavity and thus acoustically connects the cavity with the external environment.

Every partial surface of the jewellery, which is not directed directly to the ear and thus to the head of the wearer and is suitable for taking up acoustic signals from the environment of the ear, is considered as part of the front side of the ear jewellery. In particular, these are surfaces of the piece of jewellery, which point back and to the side in the viewing direction of the wearer of the jewellery.

The inventive design of the hollow space in the jewellery body, which is intended to enable the loose insertion and the removal of a hearing aid, allows the ear jewellery to be changed quickly and in any way without changing the individually fitted hearing aid, the loose insertion being understood in such a way, that filigrane mounting or assembly aids are not necessary. It is only necessary to allow the hearing aid to slide into the cavity so that it lies in the appropriate position for use. The position is determined particularly by the position of the one or more sound entry openings, through which the sound meets a microphone of the hearing aid and / or through possible connections, such as to a signal conductor of the hearing aid, which must be passed through the wall of the hearing aid because of the design of the cavity. On the other hand, if the cavity is relatively open, the sound entry openings and / or the connections can be realized by the openings of the cavity, which are present in any case.

A hearing device, which can be used for the hearing device unit, usually comprises at least one microphone, provided that the directional selection technique is constructed for spatially selective hearing, also a plurality of microphones, for recording acoustic signals, and a signal processing unit for processing signals received, for example, for the time and / or frequency and / or amplitude-dependent evaluation, for amplifying and controlling the generating the acoustic signal, which the wearer of the hearing device receives, by a sound transducer. The sound transducer can be integrated in the hearing device or can be constructed as a separate receiver, which is connected with the hearing aid over the signal conductor. Such a hearing aid is variable and can be combined with different ear jewellery without a filigreed assembly or assembly aids, as a result of which the user of the hearing aid can benefit with regard to hearing aid technology as well as cosmetic claims.

With the inventive hearing aid unit, ear ornaments, very different in art and spirit and, at the same time, exchangeable variations, are available, to the wearer. The latter relates to the type of jewellery, which according to alternative configurations, such as plug-like, that is to say, as a compact plug of a pierced ear or as an ear clip or creole-like, that is to say, jewellery designed as a full or partial circle, which can also be attached to the ear by means of a clip or piercing pin. In addition, the position of the jewellery at the ear can also be varied more with the inventive hearing aid unit. In addition to the jewellery at the earlobe (lobulus), jewellery at the auricle (Auricula), at the tragus or at the anti-tragus is also possible. Inventive ear jewellery, for example, in the form of an earphone, can also be placed in the concha or the auricle, so that the actual function of this ear jewellery as a carrier of a hearing aid is not visible.

The jewellery itself can largely be made more attractive and more variable separately from the requirements of the hearing device, provided that it is of such a size that the conventional hearing aids fit into its cavity, and it can simultaneously use the current technology of BTE as well as of in-the-ear hearing systems without special adaptation. Jewellery items for men can also act in form and function in this way and become more attractive, the piece of ear jewellery exploiting the fact that technical refinements appeal particularly to the male.

Through the described ear jewellery, an improved and cosmetically more sophisticated hearing aid can be provided and the image of hearing aids can be improved significantly. At the same time, the hearing loss can be supplied openly as is known from BTE devices and described above.

The variability of the ear jewellery is realized by the fact that only one cavity has to be provided in the jewellery, which takes up the hearing aid. According to the above description of the structure and function of the BTE hearing aids, this means that the actual main device is inserted into the cavity of the ear jewellery. The signal conductor and, optionally, the signal conductor with an external receiver protrude from the cavity in order to be able to bring about the connection to the auditory canal.

No further fasteners are necessary since the position and opening of the cavity are sufficient for fixing

the hearing aid in the ear jewellery during use. According to various embodiments, the position and shape of the cavity can also be designed so that the fixing of the hearing device is realized solely by attaching the ear jewellery and / or by the accuracy of fit of the cavity and the hearing aid. For example, the ear closes the entrance of the cavity, through which the hearing aid is inserted and removed, when the jewellery is used to a sufficient degree. Or the fastener of the ear jewellery simultaneously fixes the jewellery to the ear and the hearing aid to the jewellery.

In addition, the hearing devices are constantly becoming more filigree and require less space, so that the fixing becomes simpler and the design freedom of the ear jewellery becomes greater. The frequently standardized, commercially available forms of BTE hearing aids and, in particular, those with an external receiver, contribute to the variable interchangeable nature of the ear jewellery, which is adapted to the circumstances and is also priced more advantageously. For such embodiments, accurately fitting cavities, for example, are available. Optionally, the loose connection of ear jewellery and BTE hearing aid also allows the hearing aid to be worn temporarily without ear jewellery.

If in-the-ear hearing aids are used, their shape can also be adapted by casting cavities and thus adapted for special ear jewellery designs. Such an embodiment uses the advantages of the in-the-ear technique, particularly with regard to a small and adaptable shape, as well as a variable but fixable position of one or more microphones together with that of the BTE technique, which permits a spatial separation from the cast components to the receiver and, in addition, the open signal supply due to the external receiver.

However, the change in the hearing aid, such as adjusting or improving the signal processing, can be made without having to replace the ear jewellery. This is possible while maintaining the original, commercially available form of the hearing device or with a sufficiently large cavity or with an encapsulation, which can be reproduced by the hearing aid technician, for example, by casting.

In a further embodiment of the ear jewellery, at least two sound entry openings are disposed on the front side and at a distance from one another. This makes it possible to use hearing aids, which use directional microphone technology in jewellery. For this technique, at least two microphones with different orientations are integrated in the hearing aid and the signals from the individual microphones are evaluated differently for spatial selection. In this way, disturbing sound, which arrives from the rear or as a background noise, can be faded out comparably to human hearing.

For this purpose, it is advantageous if the two or more sound entry openings, comparable to the directional effect of the auricle, are disposed so that, when the ear jewellery is attached to the ear, they are aligned in the viewing direction of the wearer, that is, to the front, and in the direction opposite thereto, that is, to the rear, and the microphones are assigned to the sound entry openings by the insertion of the hearing aid in the cavity of the ear jewellery. Due to the attachment of the ear jewellery to the ear, such an alignment achieves a directional effect of the sound absorbed, which comes comparatively close to that of natural hearing.

Here, such a position of the microphone and the sound entry opening relative to one another is to be understood to mean that the directional dependence of the sound can be detected with the microphones according to its alignment. An assignment can be achieved in the most favorable case if the sound entry opening leads to the microphone. However, a larger number of sound entry openings or frequently perforated, but also net-like walls of the cavity of the ear jewellery ensure such a spatial selection.

For the adaptation of the ear jewellery to the position of the one or more directional microphones on the hearing aid, either standardized hearing aids may be used or one or more sound entry openings are realized through the entrance of the cavity. With in-the-ear hearing aids, it is also still possible to vary the position of the microphones before the casting. Alternatively, according to a further embodiment, variable sound entry openings can also be achieved if the wall of the jewellery, which surrounds the cavity, is perforated at least in sections. This is also an appealing design means, whereby design and functionality can be combined favorably.

Depending on the position and shape of the cavity, it may alternatively also be advantageous to arrange a further opening for the passage of a signal conductor in the direction of the auricle in the cavity, so that the signal conductor is positioned at the jewellery and ends correctly with the attachment of the ear jewellery to the ear. This concerns both signal conductors, which are designed as sound tubes, as well as electrical connectors to an external receiver.

The fixing of the hearing aid in the cavity of the jewellery is effected, as described above, particularly by the design of the ear jewellery, possibly in conjunction with its attachment to the ear.

For the attachment of the hearing aid in the jewellery on the ear, it may be advantageous for various designs of the ear jewellery for the signal conductor to be detachably fixable to the ear jewellery. This is advantageous for a sound tube as well as for an electrical conductor as a signal conductor for improving the signal quality.

The invention is to be explained in greater detail in the following by means of an example. In diagrammatic representations, the associated drawings of

Figures 1A to 1E	show a creole as inventive ear jewellery in different views,
Figures 2A and 2B	show an ear clip as inventive ear jewellery in various views and
Figures 3A and 3B	show a creole of Figures 1A to 1E with a hearing aid in two different perspective representations.

The creole of Figure 1A to Figure 1E is formed by a hook-shaped, rearwardly bent piece of jewellery 1, which is formed from two side and a bottom surface and is open towards the ear (not shown). In the front view (Figure 1A), the piece of jewellery 1 is therefore visible as a rectangle. According to the definition, the limiting surface of the piece of jewellery 1 facing the ear is intended to be referred to as

the rear side of the ear jewellery. The remaining bounding surfaces are to be designated as the front side 5. In Figure 1A, this is to be the bottom surface and the right side surface so that a left ear ring is shown in Figure 1A. In the lower region of the rounding, a small, circular sound entry opening 4 is let into the bottom surface.

Figure 1B shows the left side view of the ear jewellery, that is, the view from the ear, and illustrates the hook-shaped design. In the upper region of the ear jewellery a means for fastening 3 in the form of a plug is shown with a plate-shaped counterpart, which can be pushed onto the plug. These fasteners 3 are generally known for earplugs for attachment to the earlobe (not shown).

Figure 1C shows the rear view of the creole. The bottom and side surfaces with the plug as fastening means 3 can be recognized again in the upper region of the floor surface. For the sake of better clarity, the second part of the fastening means 3, the counterpart, is not shown. In the region of the bottom surface directed rearwards, a sound entry opening 4 likewise is arranged analogously to the forwardly directed region (Figure 1A), so that the bottom surface of the creole has two sound entry openings 4. One points backward and the other forward. The forwardly directed sound entry opening 4 is concealed in Figure 1C by the slightly upwardly extended floor surface. In addition, the piece of jewellery 1 has a clamp 11, which serves to attach a signal conductor (not shown).

Figures 1D and 1E show the described creoles in perspective, so that the cavity 2, which is formed between the bottom surface and the two side surfaces and is open upwards towards the earlobe, can be seen. The shape and size of the cavity 2 can be recognized directly through the rectangular connection between the base surface and the two lateral surfaces by the shape and size of a side surface. In Figure 1D, as a perspective rear view, the fastening means 3, the clamp 11 and the two sound entry openings 4 can be seen once again. In Figure 1D, the front and in Figure 1E the rear sound entry opening 4 is only partially visible as a passage through the bottom surface.

Figures 2A and 2B show a cuboid, hollow piece of jewellery 1 of an ear clip. Figure 2A shows the open, rear side with the known bracket-shaped fastening means 3, which is usually used for ear clips. The fastening means 3 holds the ear clip on the ear lobes (not shown), so that the cavity 2 in the interior of the piece of jewellery can be largely closed off by the earlobe. In the front side 5 of the piece of jewellery 1 opposite the fastening means, two parallelogram-shaped sound entry openings 4 are arranged next to one another and, at a distance from one another, lead to the cavity 2 (Figure 2A).

Figures 3A and 3B represent the creole of Figure 1A to Figure 1E also in a perspective front and rear view, but with an inserted hearing aid 7. For the design of the ear jewellery, reference is made to the explanations of Figures 1A to 1E.

A housed, lens-shaped hearing aid 7 is inserted. In the cavity 2 of the piece of jewellery 1. Such housing shapes are known, for example, from commercially available BTE hearing aids. The hearing aid 7,

solely due its weight, lies in the lower, horizontal part of the hook-shaped cavity 2. The length of this part of the cavity 2 is designed exactly so that the front and rear of the hearing device 7 rest on the floor surface, so that the two sound entry openings 4 in the piece of jewellery lead precisely to the two microphones 8 of the hearing device 7. This position of the cavity 2 also causes the earlobe to protrude through the fastening by means of plugs into the hook-shaped curvature of the creole and thus prevents the hearing aid from falling out. Alternatively, for this and also for other embodiments, a supplementary clamp or a comparable fixation can hold the hearing device 7 at least for fixing the ear jewellery to the ear in the cavity 2. Such fixation may, for example, be integrated in the fastening means 3 of the ear jewellery.

A signal conductor 9, which connects the hearing aid to an external receiver 10, protrudes from the hearing aid 7. The external receiver 10 is, as described above, an external sound transducer, so that the signal conductor 9 is an electrical conductor for transmitting an audio signal. The signal conductor 9 is attached to the terminal 11.

If the sound transducer is integrated in the hearing device 7 in an alternative embodiment, the signal conductor 9 is designed as a filigree sound tube with an open end, the sound tube being fixed by means of the clamp 11 so that it lies permanently at or in the auditory canal while the creole is being worn.

HEARING AID DEVICE WITH A PIECE OF EAR JEWELLERY AND A HEARING AID

REFERENCE LIST

- | | |
|----|---------------------|
| 1 | jewellery |
| 2 | cavity |
| 3 | fastening means |
| 4 | sound entry opening |
| 5 | front side |
| 7 | hearing aid |
| 8 | microphone |
| 9 | signal conductor |
| 10 | external receiver |
| 11 | clamp |

Hallókészülék-egység egy fülbevalóval és egy hallókészülékkel

Szabadalmi igénypontok

1. Hallókészülék-egység, amely egy, ékszeresttel (1) rendelkező fülbevalót és egy, felhangszóró- és lejátszófunkcióval rendelkező hallókészüléket (7) tartalmaz, ahol az ékszerest a hallókészülék (7) befogadásához való üreget (2) tartalmaz, amelybe egy vagy több kifelé húzódó hangnyílás torkollik, és ahol a hallókészülék (7) tartalmaz legalább egy, akusztikus jelek felvételéhez való mikrofont (8), egy, a felvett akusztikus jelek feldolgozásához való jelfeldolgozó-egységet, egy hangátalakítót és egy, akusztikus- vagy audiojeleknek a hallójáratba történő átviteléhez való jelvezetőt (9), **azzal jellemezve**, hogy a hallókészülék (7) az ékszerest (1) üregében (2) lazán van behelyezve és kivehető, valamint legalább egy mikrofon (8) úgy van a hallókészülékben (7) elrendezve, hogy a hallókészülék (7) behelyezett állapotában, az akusztikus jelek felvételéhez, a fülbevalóban lévő hangbelépőnyíláshoz (4) van hozzárendelve.
2. Az 1. igénypont szerinti hallókészülék-egység, **azzal jellemezve**, hogy a fülbevaló bedugós vagy kreola típusú fülbevalóként van kiképezve.
3. Az előző igénypontok bármelyike szerinti hallókészülék-egység, **azzal jellemezve**, hogy a hallókészülék (7) egy, a hallókészülékben (7) integrált hangátalakítót vagy egy külső hangszórót (10) tartalmaz.
4. Az 1. vagy a 2. igénypont szerinti hallókészülék-egység, **azzal jellemezve**, hogy hallókészülék (7) egy zárt alakban van kiképezve, amely a legalább egy mikrofon (8) pozicionálását egy hangbelépőnyíláson (4) pontosan illeszkedő módon valósítja meg és az ékszerest (1) üregének (2) felel meg, valamint egy külső hangszórója (10) van, amely egy jelvezetőn (9) keresztül a zárt hallókészülékkel (7) van összekötve.
5. Az előző igénypontok bármelyike szerinti hallókészülék-egység, **azzal jellemezve**, hogy a hallókészülék (7) legalább két mikrofont (8) tartalmaz és mindegyik mikrofon (8) az egyik hangbelépőnyíláshoz (4) van hozzárendelve.
6. Az 5. igénypont szerinti hallókészülék-egység, **azzal jellemezve**, hogy a hangbelépőnyílások (4) a fülön lévő fülbevaló rögzítésénél a hordozó nézésirányában és az azzal ellentétes irányban helyezkednek el.



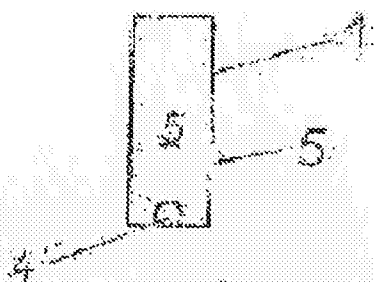


Fig. 1A



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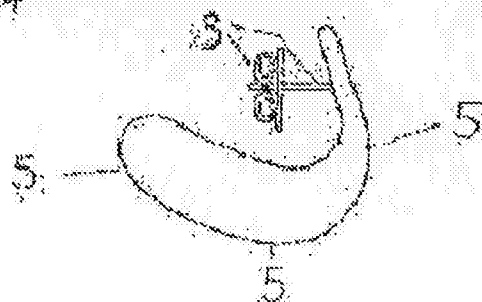


Fig. 1B

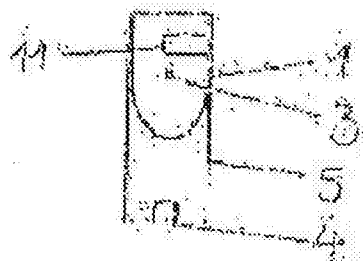


Fig. 1C

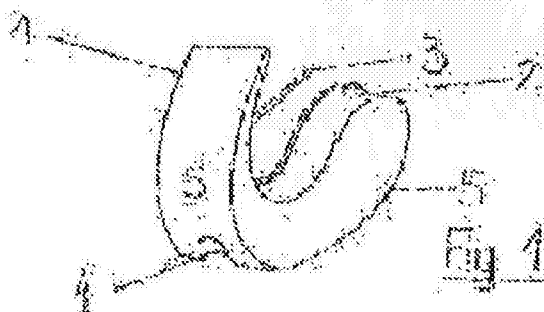


Fig. 1D

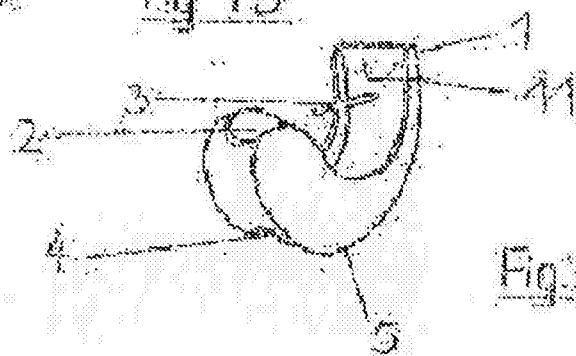
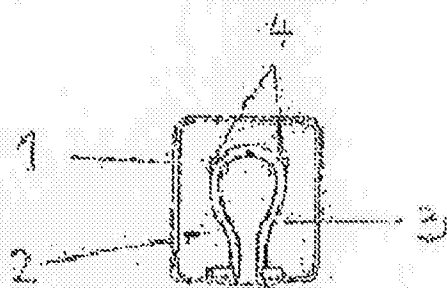
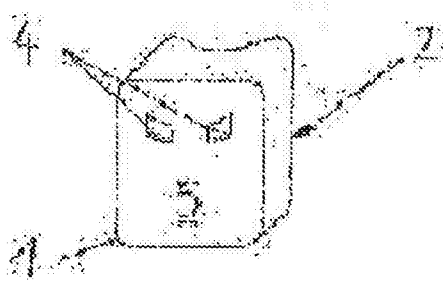


Fig. 1E

Fig. 2AFig. 2B

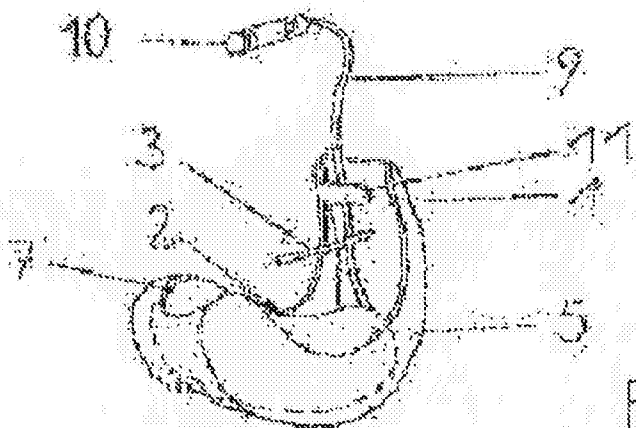


Fig. 3A

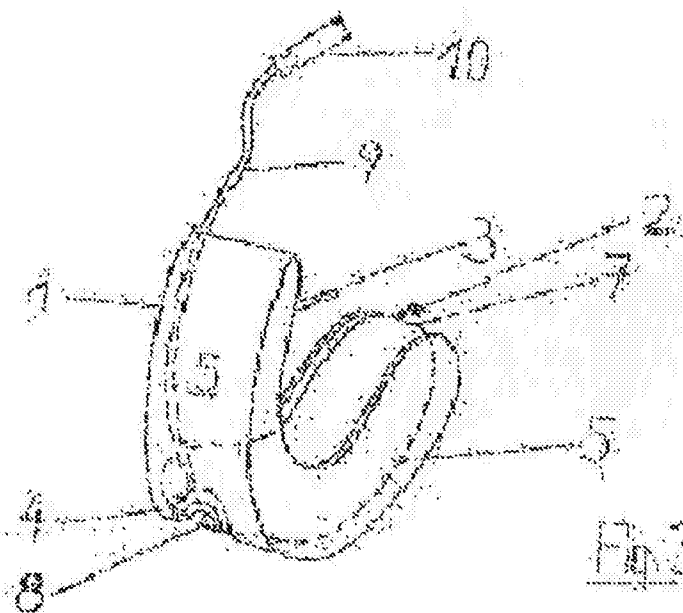


Fig. 3B