OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

(12) (19) (CA) **Brevet-Patent**

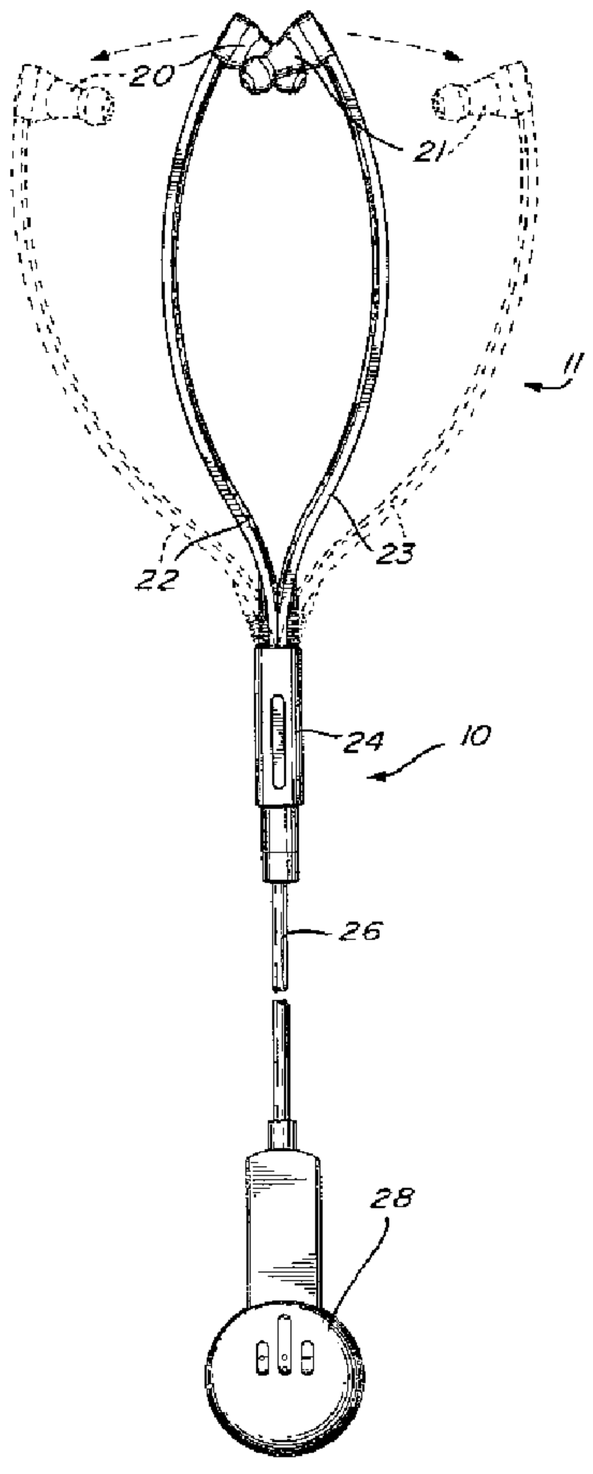
(11) (21) (C) **2,188,794**
(86) 1995/04/21
(87) 1995/11/09
(45) 2000/10/03

(72) Savage, Garry, CA
(72) Swift, Michel, CA
(73) ANDROMED INC., CA

(51) Int.Cl.[6] A61B 7/04, H04R 1/10
(30) 1994/04/28 (08/234,254) US

(54) **COMBINE ECOUTEUR POUR STETHOSCOPE ELECTRONIQUE**

(54) **HEADSET FOR ELECTRONIC STETHOSCOPE**



(57) Un combiné écouteur (11) comprend des branches allongées gauche et droite (22, 23) présentant respectivement des premières extrémités, destinées à recevoir des embouts auriculaires (20, 21), et des deuxièmes extrémités interconnectées (60, 61). Chaque branche (22, 23) comporte un corps allongé monobloc (34, 35) réalisé en un matériau souple et faisant ressort, courbé vers l'extérieur pour épouser la

(57) The headset (11) comprises left and right elongate ear pieces (22, 23) having respective first ends to receive ear tips (20, 21) and respective, interconnected second ends (60, 61). Each ear piece (22, 23) includes a one piece elongate body (34, 35) made of flexible and resilient material and curved outwardly to skirt round the user's head when the ear tips (20, 21) are applied to a user's ears. The elongate body (34, 35) is formed with a

OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

(11) (21) (C) **2,188,794**
(86) 1995/04/21
(87) 1995/11/09
(45) 2000/10/03

forme de tête de l'utilisateur quand les embouts auriculaires (20, 21) sont appliqués dans les oreilles de celui-ci. Le corps allongé (34, 35) est constitué d'un premier segment, à section transversale réduite et donc plus souple à proximité de la deuxième extrémité (60, 61) de la branche correspondante (22, 23), et d'un deuxième segment moins souple situé entre ce premier segment et l'embout auriculaire correspondant (20, 21). La courbure des corps allongés (34, 35), quand les branches (22, 23) sont écartées, est donc plus marquée sur les premiers segments et la pression appliquée aux oreilles de l'utilisateur par les embouts (20, 21) provient essentiellement de ces premiers segments courbes et elle est transmise à ces embouts par l'intermédiaire des deuxièmes segements moins souples. Les branches allongées (22, 23) présentent respectivement des deuxièmes segments terminaux (60, 61) assemblés côte à côte, et un manchon fileté (50) est fixé sur ces segments (60, 61) et peut tourner et se déplacer longitudinalement pour donner un réglage de la pression appliquée par les embouts (20, 21) aux oreilles de l'utilisateur.

first length of smaller cross section and therefore of greater flexibility proximate the second end (60, 61) of the corresponding ear piece (22, 23) and with a second length of lower flexibility situated between that first length and the corresponding ear tip (20, 21). Bending of the elongate bodies (34, 35) when the ear pieces (22, 23) are spread apart is therefore concentrated in the first lengths and pressure applied to the user's ears by the ear tips (20, 21) is mainly produced by the bent first lengths and transmitted to the ear tips (20, 21) through the second lengths of lower flexibility. The elongate ear pieces (22, 23) have respective second end sections (60, 61) assembled laterally adjacent to each other, and a threaded sleeve (50) is mounted on these laterally adjacent second end sections (60, 61) and is rotated and displaced longitudinally to adjust the level of pressure applied to the user's ears by the ear tips (20, 21).

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
A61B 7/04, H04R 1/10

A1

(11) International Publication Number: **WO 95/29632**

(43) International Publication Date: 9 November 1995 (09.11.95)

(21) International Application Number: PCT/CA95/00235

(22) International Filing Date: 21 April 1995 (21.04.95)

(30) Priority Data:
08/234,254 28 April 1994 (28.04.94) US

(71) Applicant: THERATECHNOLOGIES INC. [CA/CA]; 7701, 17e avenue, Montreal, Quebec H2A 2S5 (CA).

(72) Inventors: SAVAGE, Gary; 5625, 17e Avenue, Montreal, Quebec H1X 2R7 (CA). SWIFT, Michel; 444 Edouard Charles, Outremont, Quebec H2P 2N4 (CA).

(74) Agent: PRINCE, Gaetan; Goudreau Gage Dubuc & Martineau Walker, 3400 The Stock Exchange Tower, P.O. Box 242, Victoria Square, Montreal, Quebec H4Z 1E9 (CA).

(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).

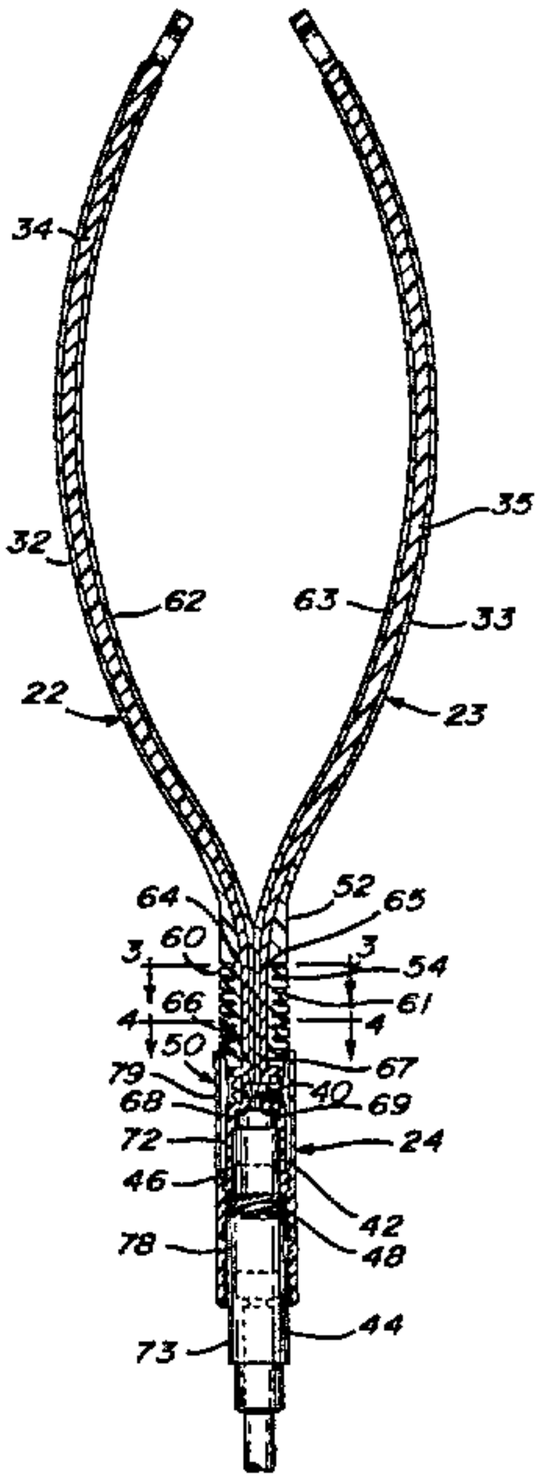
Published
With international search report.
With amended claims.

2188794

(54) Title: HEADSET FOR ELECTRONIC STETHOSCOPE

(57) Abstract

The headset (11) comprises left and right elongate ear pieces (22, 23) having respective first ends to receive ear tips (20, 21) and respective, interconnected second ends (60, 61). Each ear piece (22, 23) includes a one piece elongate body (34, 35) made of flexible and resilient material and curved outwardly to skirt round the user's head when the ear tips (20, 21) are applied to a user's ears. The elongate body (34, 35) is formed with a first length of smaller cross section and therefore of greater flexibility proximate the second end (60, 61) of the corresponding ear piece (22, 23) and with a second length of lower flexibility situated between that first length and the corresponding ear tip (20, 21). Bending of the elongate bodies (34, 35) when the ear pieces (22, 23) are spread apart is therefore concentrated in the first lengths and pressure applied to the user's ears by the ear tips (20, 21) is mainly produced by the bent first lengths and transmitted to the ear tips (20, 21) through the second lengths of lower flexibility. The elongate ear pieces (22, 23) have respective second end sections (60, 61) assembled laterally adjacent to each other, and a threaded sleeve (50) is mounted on these laterally adjacent second end sections (60, 61) and is rotated and displaced longitudinally to adjust the level of pressure applied to the user's ears by the ear tips (20, 21).



HEADSET FOR ELECTRONIC STETHOSCOPE

BACKGROUND OF THE INVENTION

1. Field of the invention:

The present invention relates generally to a headset, more specifically to a headset for electronic stethoscope providing for adjustment of the pressure applied to the ears of the user by the ear tips.

2. Brief description of the prior art:

Many prior art methods have been used to apply with sufficient pressure the ear tips of a stethoscope to the ears of the user. One method consists of interconnecting the lower ends of the two elongate ear pieces through a spring element which is deformed and tensioned when the ear pieces are spread apart to apply the ear tips to the user's ears. The ear pieces tend to return to their original position to thereby hold the ear tips on the user's ears.

A drawback of this prior art method is that the level of pressure applied to the ears by the ear tips is not adjustable whereby insufficient or excessive pressure may be produced. For example, excessive pressure is detrimental to the user's comfort and can even lead to tissue damage under prolonged use.

Other prior art methods have been proposed to adjust the pressure applied to the user's ears by the ear tips. However, these methods are generaally complex, costly and/or difficult to implement and use. An example is described in U.S. patent No. 3,746,124 granted to Wilson, deceased et al. on July 17, 1973.

OBJECTS OF THE INVENTION

A general object of the present invention is to overcome the above discussed drawbacks of the prior art.

Another object of the invention is to provide a headset in which the pressure applied to the ears by the ear tips is easily adjustable, even when the headset is worn.

SUMMARY OF THE INVENTION

More specifically, in accordance with the present invention, there is provided an ear piece for a headset for applying an ear tip to a user's ear, comprising a bendable elongate body curved to skirt

round the user's head when the ear tip is applied to the user's ear. The bendable elongate body comprises:

a proximal end to be connected to the headset;

a distal end structured to receive the ear tip;

a proximal portion including the proximal end; and

a distal portion having a first flexibility and extending between the proximal portion and the distal end.

The bendable elongate body is made of flexible and resilient plastic material, and the proximal portion is shorter than the distal portion and comprises a reduction of cross sectional area of the plastic material forming the elongate body to reduce the quantity of plastic material by unit of length in order to weaken the proximal portion and thereby raise the flexibility of the proximal portion to a second flexibility higher than the first flexibility. In this manner, bending of the elongate body is concentrated in the weakened proximal portion.

Preferably, the reduction of cross sectional area comprises a longitudinal series of transversal outer grooves of the proximal portion.

The present invention also relates to a headset for applying ear tips to a user's ears, comprising:

right and left elongate ear pieces as described hereinabove; and

means for assembling together the weakened proximal portions of the elongate bodies of the right and left ear pieces.

Bending of the elongate bodies when the ear pieces are spread apart to apply the ear tips to the user's ears is concentrated in these weakened proximal portions, and pressure applied to the user's ears by the ear tips is mainly produced by the weakened proximal portions and transmitted from these weakened proximal portions to the ear tips through the distal portions. The assembling means comprises:

- a sleeve in which the weakened proximal portions of the elongate bodies of the first and second ear pieces are mounted laterally adjacent to each other;
means for maintaining the laterally adjacent weakened proximal portions in fixed relative longitudinal positional relationship in the sleeve; and

- means for manually displacing the sleeve longitudinally on the laterally adjacent weakened proximal portions to thereby adjust the level of pressure applied to the user's ears by the ear tips when the ear pieces are spread apart to apply the ear tips to the user's ears.

According to a preferred embodiment of the headset, the sleeve is internally threaded over at least a portion of its length, and the headset comprises a generally cylindrical externally threaded sleeve-receiving surface axial with the laterally adjacent weakened first portions and on which the sleeve is screwed whereby manual rotation of the sleeve causes longitudinal displacement of that sleeve on the laterally adjacent weakened proximal portions to thereby adjust the level of pressure applied to the user's ears by the ear tips.

The objects, advantages and other features of the present invention will become more apparent upon reading of the following non restrictive description of a preferred embodiment thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the appended drawings:

Figure 1 is a front elevational view of an electronic stethoscope comprising a headset in accordance with the present invention;

Figure 2 is an enlarged, partly cross sectional view of a pressure adjusting mechanism of the stethoscope's headset of Figure 1, comprising a sleeve mounted on the laterally adjacent lower end sections of the two elongate ear pieces of this headset;

Figure 3 is a cross sectional view of the headset taken along line 3-3 of Figure 2;

Figure 4 is a cross sectional view of the headset taken along line 4-4 of Figure 2;

Figure 5 is a front elevational view of the pressure adjusting mechanism of Figure 2, showing the maximum angle of deflection of an ear piece;

Figure 6 is a front, partly cross sectional elevational view of the pressure adjusting mechanism showing how a connector forming part of a cable of the stethoscope's thoracic coupler is assembled;

Figure 7 is a front, partly cross sectional elevational view of the pressure adjusting mechanism in a position in which the pressure applied to a user's ears by the ear tips is minimum; and

Figure 8 is a front, partly cross sectional elevational view of the pressure adjusting mechanism in a position in which the pressure applied to the ears of the same user is maximum.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1 of the appended drawings, a stethoscope 10 is illustrated. The stethoscope 10 comprises a headset 11, a thoracic coupler 28, and an electric cable 26 interconnecting the thoracic coupler 28 and the headset 11. The headset 11 essentially comprises left and right ear tips 20 and 21, left and right elongate ear pieces 22 and 23, and a pressure adjusting mechanism 24.

In the preferred embodiment of the invention, the stethoscope 10 is an electronic stethoscope. Accordingly, the thoracic coupler 28 comprises an electroacoustic transducer (not shown) for converting sounds produced by the patient's body into an electric signal, and an electronic circuit (not shown) for amplifying and filtering this electric signal before it is supplied to miniature loudspeakers (not shown) encased in the ear tips 20 and 21. Therefore, the miniature loudspeakers reproduce the

sounds picked up by the thoracic coupler 28 to allow the user of the stethoscope to listen thereto.

Figure 1 also illustrates in dashed lines spreading apart of the two ear pieces 22 and 23 for applying the ear tips 20 and 21 to the user's ears. As can be seen, each ear piece 22,23 is curved outwardly to skirt round the user's head when the ear tips 20 and 21 are applied to the user's ears.

Referring to Figures 1 and 2, the left and right ear pieces 22 and 23 each have an upper end structured to receive the corresponding one of the ear tip 20 or 21. The ear pieces 22 and 23 further comprise lower end sections 60 and 61 assembled laterally adjacent to each other.

The ear pieces 22 and 23 are identical and each comprise a one-piece elongate inner body 34,35 made of flexible and resilient material enveloped by soft plastic material 32,33 molded over the elongate body 34,35. The elongate body 34,35 can be made for example of plastic material such as Delrin® and the soft plastic material 32,33 may comprise flexible PVC (polyvinyl chloride), rubber material, etc.

The elongate body 34,35 have a constant width (Figures 3 and 4) but gradually passes from a first larger thickness (point 62,63) to a smaller thickness (point 64,65) as the distance from lower end 68,69 of the elongate body 34,35 reduces. Between point 64,65 and point 66,67, the elongate body 34,35 has a constant thickness equal to that at point 64,65.

The elongate body 34,35 is accordingly formed with a first length of smaller cross section and therefore of greater flexibility between point 62,63 and point 66,67 and with a second length of constant cross section and of lower flexibility situated between point 62,63 and the upper end of the elongate body 34,35. Thus, bending of the elongate bodies 34 and 35 when the ear pieces 22 and 23 are spread apart (Figure 1) to apply the ear tips 20 and 21 to the user's ears is concentrated in the first lengths and pressure applied to the user's ears by the ear tips 20 and 21 is mainly produced by the bent first lengths and transmitted from these first lengths to the ear tips 20 and 21 through the second lengths of lower flexibility.

The envelope 32,33, made of soft plastic material, has a thickness that increases from point 62,63 toward the lower end 68,69 of the elongate body 34,35. More specifically, the thickness of the envelope 32,33 varies in function of the cross section of the inner elongate body 34,35 to keep the cross section of the ear piece 22,23 essentially constant from the ear tips 20 and 21 to the lower end section 60,61. Also, the soft plastic envelope 32,33 of the lower end section 60,61 defines a semicylindrical outer surface 70,71 (Figure 4). Accordingly, the soft plastic envelopes 32 and 33 of the laterally adjacent lower end sections 60 and 61 defines a cylindrical outer surface 52 of essentially constant diameter. The cylindrical surface 52 is formed with lateral, transversal grooves such as 54 to prevent interference of the envelopes 32 and 33 to bending of the elongate

bodies 34 and 35 and therefore to bending of the elongate ear pieces 22 and 23 (see Figure 1).

The main function of the envelopes 32 and 33 is to cover the elongate bodies 34 and 35 with soft material in order to improve the comfort of the headset's user. However, it is important to point out that the flexibility of the soft plastic material of the envelopes 32 and 33 can be reduced in view of increasing the rigidity, thus reducing the flexibility of the elongate ear pieces 22 and 23. Indeed, as the elongate bodies 34 and 35, and the respective envelopes 32 and 33 can be considered as being laminated, the mechanical properties of their materials can be selected to cooperate together to give a desired degree of rigidity and flexibility to the ear pieces 22 and 23.

As illustrated in Figure 2, the lower ends 68 and 69 of the elongate bodies 34 and 35 are interconnected through a bolt-and-nut fastener 40. The lower ends 68 and 69 of the elongate bodies 34 and 35 advantageously prolong downwardly to form respective semicylindrical extensions assembled together to form a cylindrical receptacle 42 incorporating or capable of receiving an electric female connector. The receptacle 42 defines an outer cylindrical surface 72 of which the lower portion 46 is threaded.

The cable 26 (Figure 1) interconnecting the thoracic coupler 28 and the headset 11 is provided at the end thereof opposite to the coupler 28 with

another electric male connector 44 (Figure 2) fitting in the receptacle 42 to electrically connect the thoracic coupler 28 with the headset 11 through the cable 26. Electric connector 44 comprises a cylindrical outer surface 73 having an upper threaded portion 48. When connector 44 is inserted in receptacle 42 (Figure 2), the threaded portions 46 and 48 are longitudinally adjacent to each other to form a single continuous thread.

To interconnect the receptacle 42 with the miniature loudspeakers (not shown) mounted in the ear tips 20 and 21, the elongate body 34 comprise a pair of longitudinal grooves 36 and 37 (Figures 3 and 4) to receive respective wires 38 and 39. In the same manner, the elongate body 35 comprise a pair of longitudinal grooves 74 and 75 (Figures 3 and 4) to receive respective wires 76 and 77. The grooves 36, 37, 74 and 75 form longitudinal channels in which the respective electric wires 38, 39, 76 and 77 extend from the ear tips 20 and 21 to the receptacle 42. As can be appreciated, the soft plastic envelope 32 covers both the grooves 36 and 37 and the wires 38 and 39, while envelope 33 covers both the grooves 74 and 75 and the wires 76 and 77.

Therefore, the electric signals representative of the sounds picked up by the thoracic coupler 28 (Figure 1) are transmitted from that thoracic coupler 28 to the miniature loudspeakers (not shown) of the ear tips 20 and 21 through the cable 26, connector 44, receptacle 42, and wires 38, 39, 76 and 77.

The pressure adjusting mechanism 24 (Figures 1 and 2) comprises the threaded portion 46 and a hollow sleeve 50 having a lower half portion 78 internally threaded. Assembly of the sleeve 50 to the headset 11 is illustrated in Figure 6. The internally threaded portion 78 of the sleeve 50 is first screwed onto the threaded portion 46 of receptacle 42 until the sleeve 50 reaches the position of Figure 6. Male connector 44 is then inserted in the receptacle 42 and the sleeve 50 is screwed onto threaded portion 48. Of course, in the position of Figure 6, the male connector 44 can be inserted in and removed from the receptacle 42 at will. The threaded lower portion 78 of the sleeve 50 is then engaged on both the longitudinally adjacent threaded portions 46 and 48 as illustrated in Figure 2. Accordingly, a function of the sleeve 50 is to hold the male connector 44 in the receptacle 42.

Further rotation of the sleeve 50 on the threaded portions 46 and 48 will displace the sleeve 50 longitudinally along the laterally adjacent end sections 60 and 61 of the ear pieces 22 and 23. To enable longitudinal displacement of the sleeve 50, the inner diameter of the upper unthreaded portion 79 of the sleeve 50 is slightly larger than the outer diameter of the cylindrical surface 52. The sleeve 50 is rotated clockwise or counterclockwise depending on the desired axial direction of displacement.

Figures 5 and 7 show the sleeve 50 in a lowest position. In this position, the lengths of smaller diameter of the elongate bodies 34 and 35 are

situated outside the sleeve to facilitate deflection of the ear pieces 22 and 23 and to produce a weakest pressure on the ear tips 20 and 21.

In Figure 8, the sleeve is in the highest position. In this position, an important part of the lengths of smaller diameter and therefore of greater flexibility of the elongate bodies 34 and 35 are situated inside the sleeve 50 to render deflection of the ear pieces 22 and 23 more difficult and to produce a strongest pressure on the ear pieces 22 and 23 when they are spread apart to apply the ear tips 20 and 21 on the user's ears.

Referring to Figures 3 and 4, the sleeve 50 is formed with a longitudinal flat surface portion 56 projecting from the inner generally cylindrical surface of the upper unthreaded sleeve portion 79, while the outer cylindrical surface 52 of the laterally adjacent end sections 60 and 61 comprises front and rear diametrically opposed flat surface portions 58 and 59. At each revolution of the sleeve 50, the inner flat surface portion 56 of the sleeve 50 will deform the envelopes 32 and 33 of soft plastic material to cause resistance to rotation of the sleeve 50 and to releasably block the sleeve 50 in position on the laterally adjacent second end sections 60 and 61 when the inner flat surface portion 56 is applied to one of the outer flat surface portion 58 or 59. This will prevent undesirable rotation of the sleeve 50 leading to a change in the adjustment of the pressure applied to the user's ears by the ear tips 20 and 21.

Undesirable rotation of the sleeve 50 can also be prevented through friction by appropriately dimensioning the inner diameter of the sleeve 50 and to outer diameter of the cylindrical surface 52, and/or by appropriately dimensioning the respective diameters of the threaded portions 46, 48 and 78.

Although the present invention has been described hereinabove by way of a preferred embodiment thereof, this embodiment can be modified at will, within the scope of the appended claims, without departing from the spirit and nature of the subject invention.

The embodiments in which an exclusive property or privilege is claimed are defined as follows:

1. An ear piece for a headset for applying an ear tip to a user's ear, comprising a bendable elongate body curved to skirt round the user's head when the ear tip is applied to the user's ear, said bendable elongate body comprising:

a proximal end to be connected to the headset;

a distal end structured to receive the ear tip;

a proximal portion including said proximal end;

a distal portion having a first flexibility and extending between the proximal portion and the distal end;

wherein:

the bendable elongate body is made of flexible and resilient plastic material; and

the proximal portion is shorter than the distal portion, and comprises a reduction of cross sectional area of the plastic material forming said elongate body to reduce the quantity of plastic material by unit of length in order to weaken said proximal portion and thereby raise the flexibility of said proximal portion to a second flexibility higher than said first flexibility, whereby bending of the elongate body is concentrated in the weakened proximal portion.

2. An ear piece as defined in claim 1, wherein said reduction of cross sectional area comprises a longitudinal series of transversal outer grooves of the proximal portion.

3. A headset for applying ear tips to a user's ears, comprising right and left elongate ear pieces as recited in claim 1 and means for assembling together the weakened proximal portions of the elongate

bodies of the right and left ear pieces whereby bending of the elongate bodies when the ear pieces are spread apart to apply the ear tips to the user's ears is concentrated in said weakened proximal portions, and whereby pressure applied to the user's ears by the ear tips is mainly produced by said weakened proximal portions and transmitted from said weakened proximal portions to the ear tips through said distal portions; wherein said assembling means comprises:

a sleeve in which the weakened proximal portions of the elongate bodies of the first and second ear pieces are mounted laterally adjacent to each other;

means for maintaining the laterally adjacent weakened proximal portions in fixed relative longitudinal positional relationship in the sleeve; and

means for manually displacing said sleeve longitudinally on the laterally adjacent weakened proximal portions to thereby adjust the level of pressure applied to the user's ears by the ear tips when the ear pieces are spread apart to apply the ear tips to the user's ears.

4. A headset as recited in claim 3, wherein the reduction of cross sectional area of each weakened proximal portion comprises a longitudinal series of transversal outer grooves.

5. A headset as recited in claim 3, wherein said sleeve is internally threaded over at least a portion of its length, and wherein said headset comprises a generally cylindrical externally threaded sleeve-receiving surface axial with said laterally adjacent weakened first portions and on which the sleeve is screwed whereby manual rotation of said sleeve causes longitudinal displacement of said sleeve on the laterally adjacent weakened proximal portions to thereby adjust the level of pressure applied to the user's ears by the ear tips.

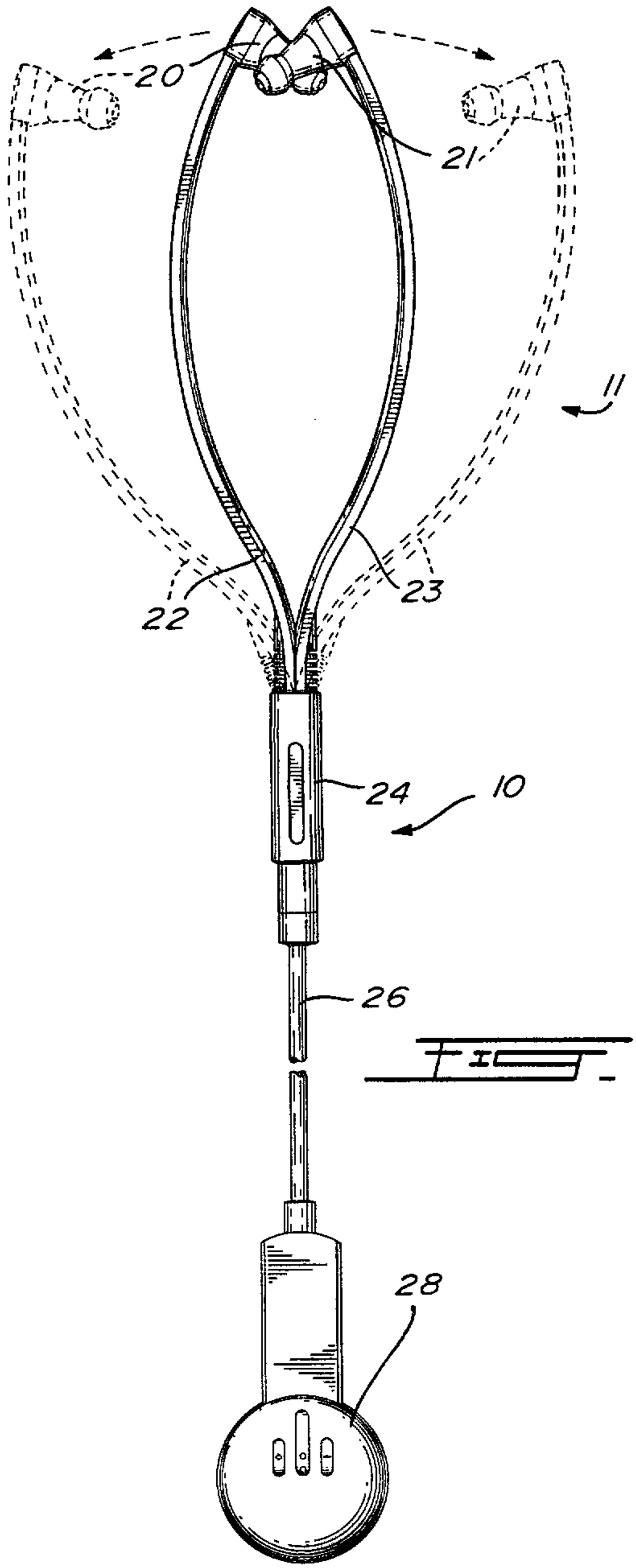


FIG. 1

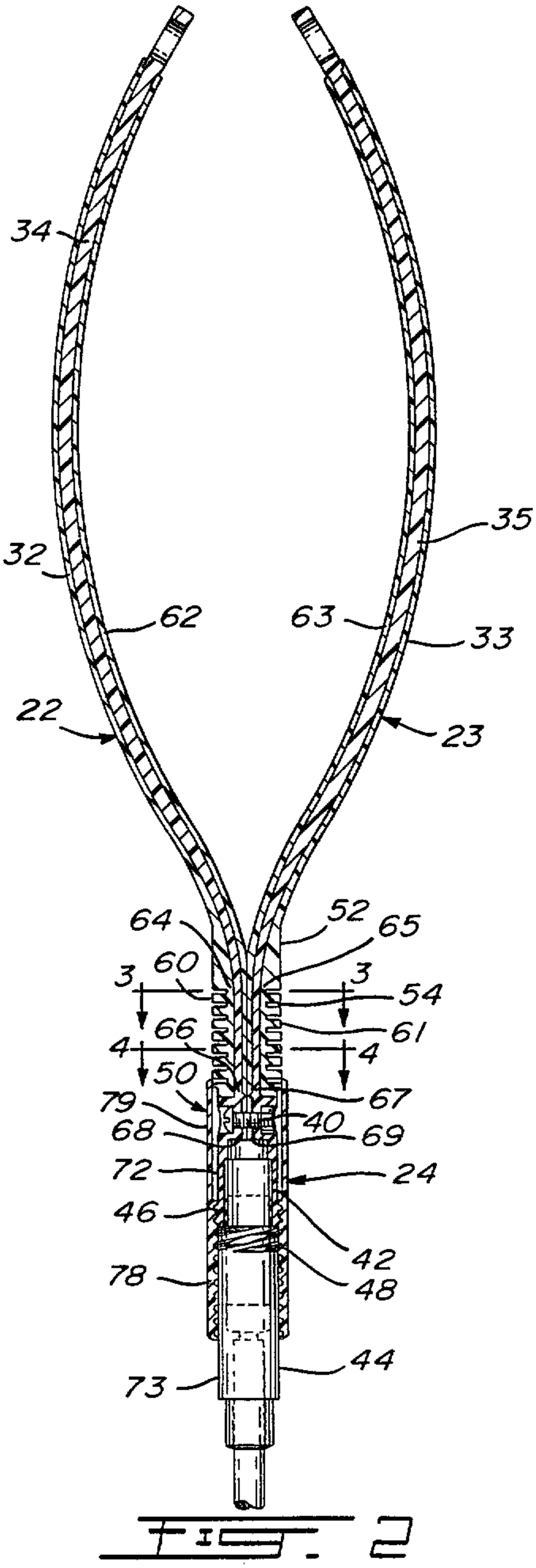


FIG. 2

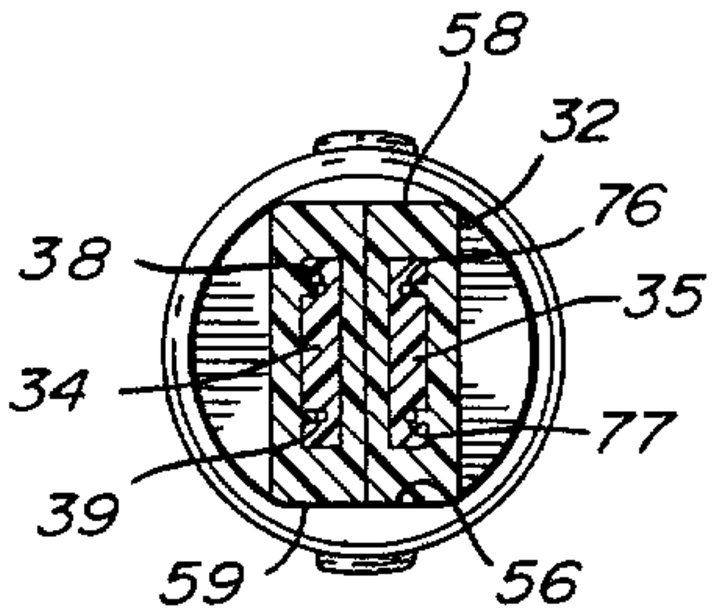


FIG. 3

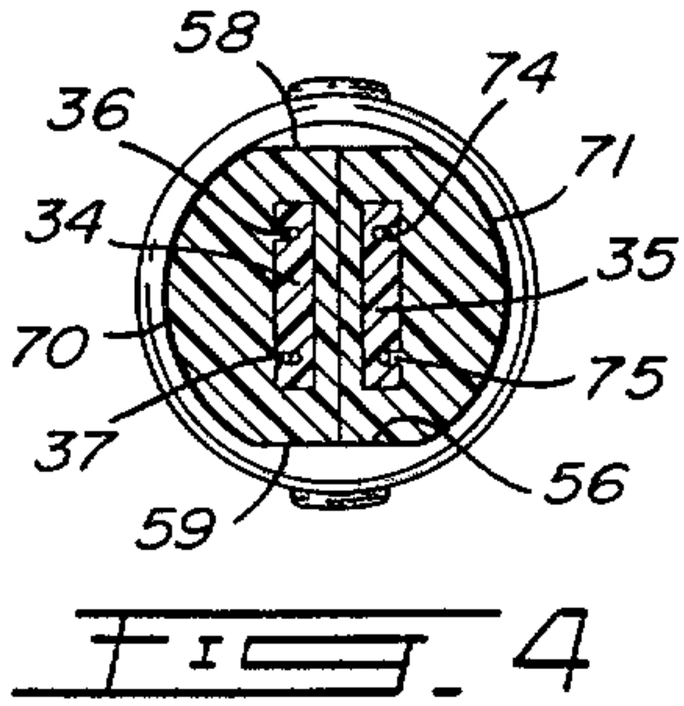


FIG. 4

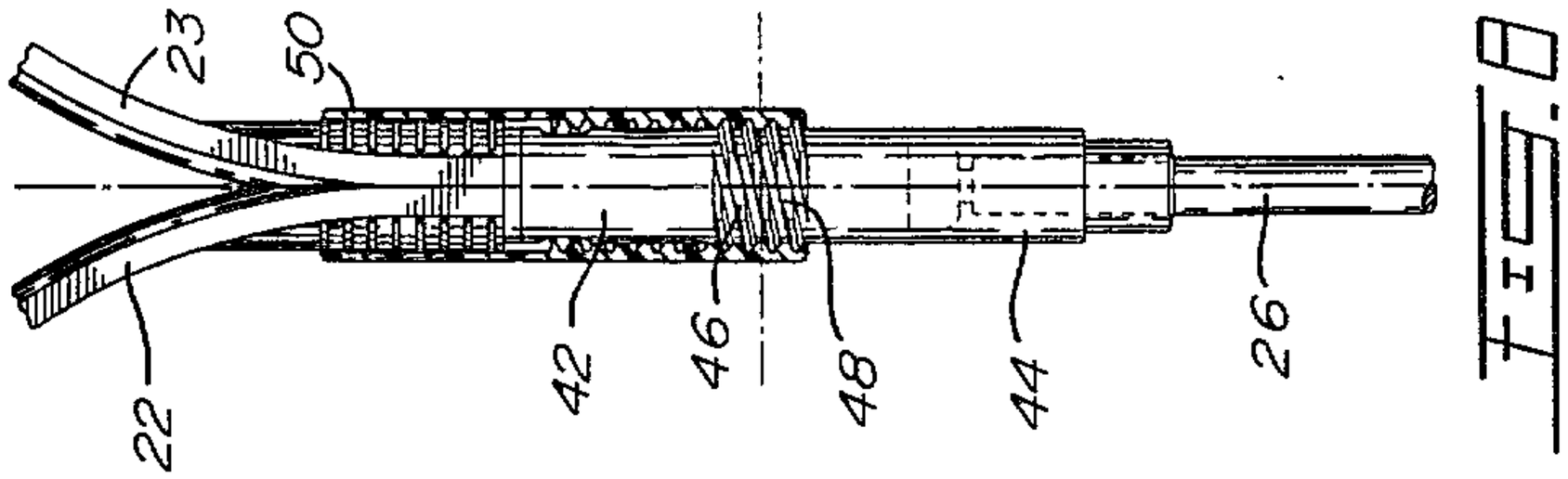


FIG. 8

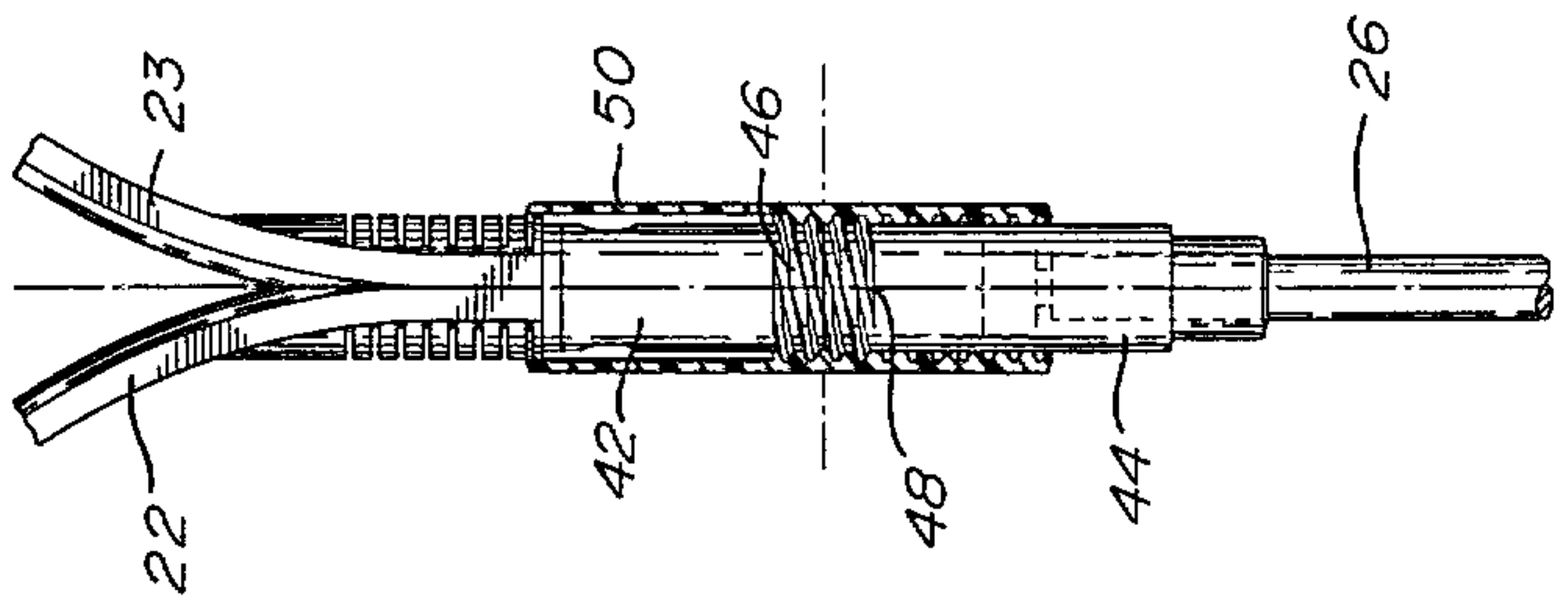


FIG. 7

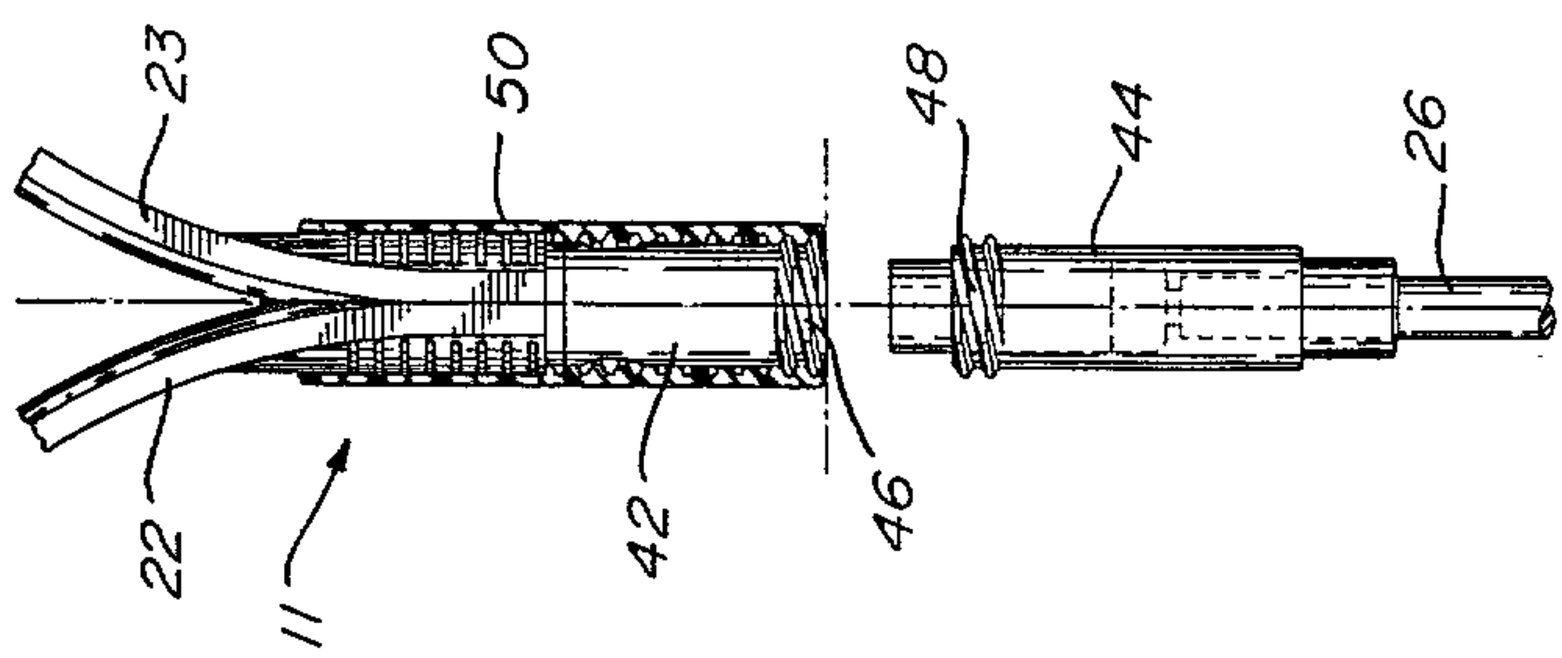


FIG. 6

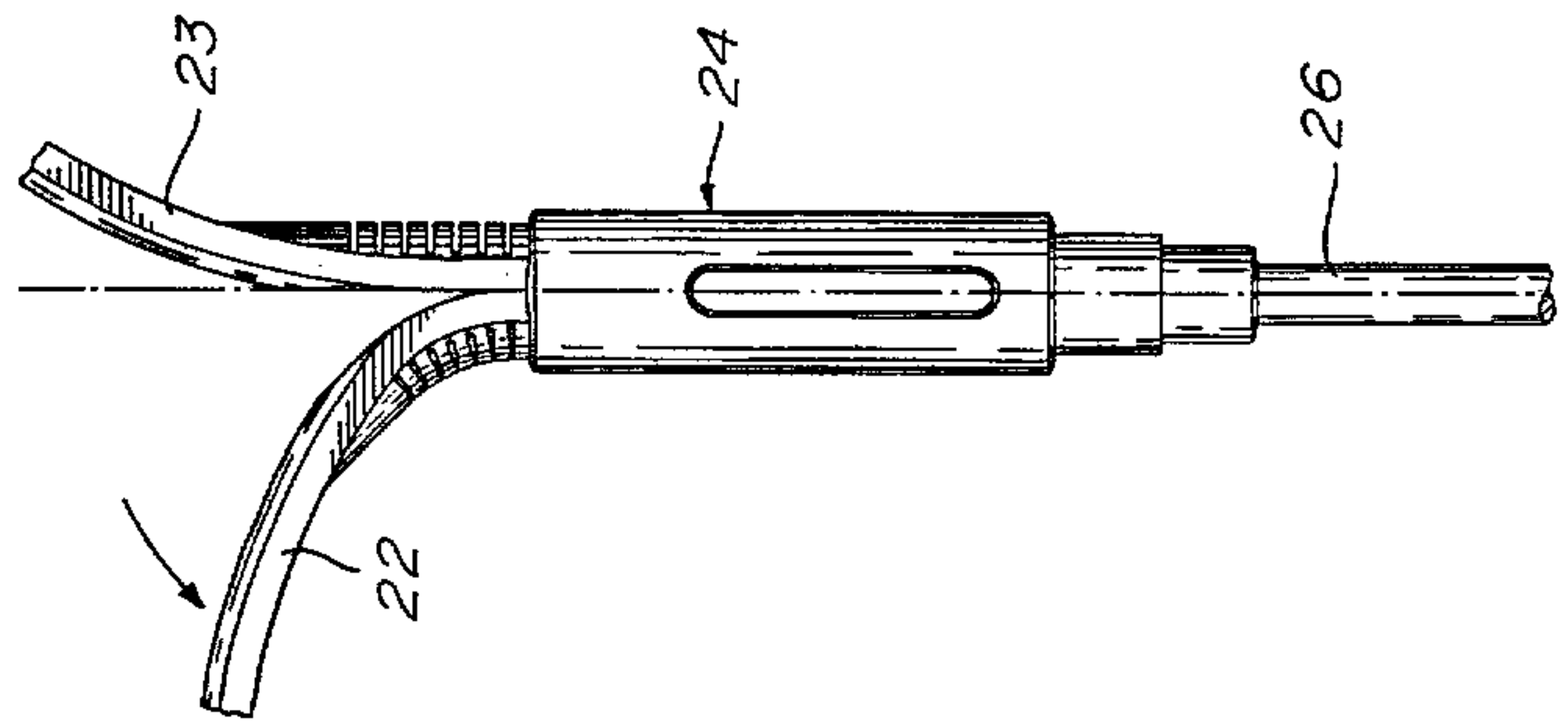
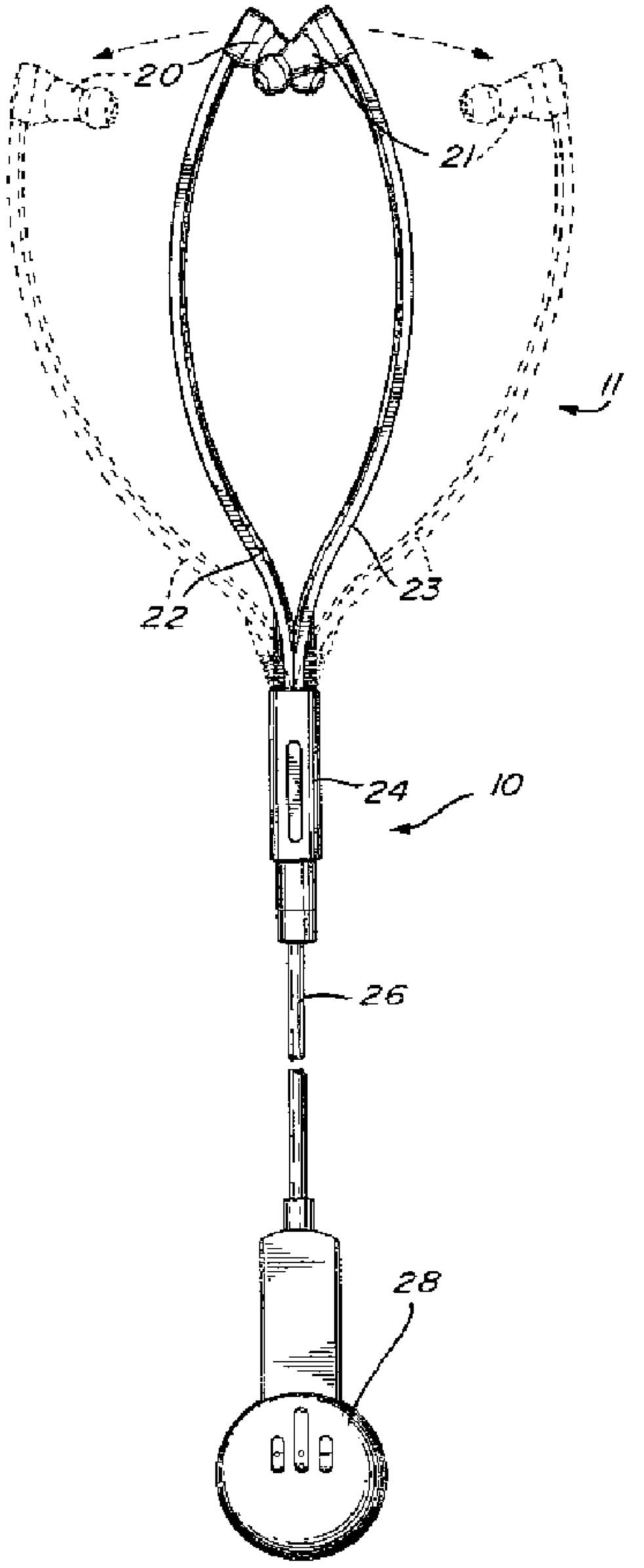


FIG. 5


20
21
11
22
23
24
10
26
28