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(54) Benævnelse: **System til styring af indgangsluft**

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DESCRIPTION

Field of the Invention

[0001] The present invention relates to a system for control of a flow of a media in a duct, which duct comprises means for flow measurement, which duct comprises means for flow regulation, which system comprises a control system, which control system receives at least input from the flow measurement, which control system controls at least one regulation damper.

Background of the Invention

[0002] The granted Danish patent PA 2012 70241 discloses a system and a method for measuring flow in a flow duct, comprising at least two ultra sound transducers. It is the object of this Danish patent application to measure the flow of air in a duct by one or more transducers transmitting beams of ultra sound controlled by a microcontroller based electronic system. The object can be achieved if the microcontroller stores a vector of data samples for each direction of transmission, which vector comprises an appropriate number of N samples forming a frame, which microcontroller multiply each value of the frame which a complex number, which microcontroller based on the result calculates the flow in the duct. By the invention according to the present patent application an efficient flow measurement of air flowing in a duct can be achieved.

[0003] DE10001165A1 discloses a system for controlling the flow of media in a duct, wherein the controller, pressure sensors and signalling lines are arranged on a printed circuit board. However the position detection means is located at the damper location, leading to a less compact system.

Object of the Invention

[0004] It is the object of the pending patent application to achieve an effective control of inlet air in a heating or air condition systems in buildings. A further object of the invention is to control the air flow in every air inlet in a building.

Description of the Invention

[0005] The object can be achieved by a system as disclosed in claim The flow measurement and the damper control are performed by a common control system, which control system comprises at least one common printed board, which printed board comprises at least one processor, which printed board further comprises a magnetic position detection means for detecting the actual position of the damper by means of at least one magnet on the damper, with the magnetic position detection means being placed on the printed circuit board.

[0006] Hereby can be achieved that all electronic functions necessary for control the inlet flow of air can be achieved at one common electronic circuit placed on one single printed board. It is further possible that a common processor takes care of flow calculation and also takes care of damper regulation. In that way highly effective control of the inlet air can be achieved. Actual flow is measured and if a difference to a fixed value exists then a damper can be adjusted so that the correct air flow is achieved. By continuously measuring air flow it is possible even to adjust a flow level into what is necessary in an office or a room. Especially in large air condition systems in large buildings it is important that the inlet in each single air inlet is under control. The air flow is probably generated by one or more large blowing means and then is more or less a common air flow sent through relative large ducts towards different inlet openings. In uncontrolled situations changes in air flow from one outlet, maybe by manual adjustment, will have some influence at the air flow in other parts of the same system. Therefore in a traditional air condition system the air flow into each single air inlet is adjusted once and any adjustment according to the actual demand because of changes of the atmosphere of a room is difficult to achieve. By the pending application where also the flow is measured and the damper can adjust the actual flow it is possible by communication from the common processor towards a central control system to directly inform the need for actual air in the room at a sufficient moment. Therefore, a background system that comprises larger air blow systems can get information of the demand for air flow for each single outlet and it is possible also to control the larger system and thereby increase the effectivity and reduce the energy consumption.

[0007] In a preferred embodiment for the invention can the means for flow measurement comprise at least a pair of ultrasound transducers for generating at least one path of ultrasound partly in the flow direction and partly against the flow direction in a channel. Flow measurement performed by ultrasonic method is one of the more effective ways of measuring air flow. Especially by using a path first in one direction and then in the second opposite direction it is possible by measurement of the difference in time delay to achieve information about a flow velocity. Depending on the size of the duct it can be possible to use a plurality of ultrasonic transducers and then generate a number of tracks of ultrasound in order to measure the flow in different areas of a duct.

[0008] Hereby a better result by non-linear flow can be achieved.

[0009] By a further preferred embodiment for the invention can the ultra sound transducers be connected to a transmitter circuit and to a receiver circuit, which receiver circuit comprises at least a band pass filter, which band pass filter is further connected to a microcontroller, which microcontroller comprises either internally or externally an analogue to digital converter, which digital converter converts the analogue signal into digital data samples representing at least transit times and time difference, which microcontroller stores the data samples in a memory, whereby a transmitter circuit and a receiver circuit are controlled by a switch, which switch perform continuous switching of transmitter circuit into a receiver circuit and the receiver circuit into a transmitter circuit, which microcontroller stores a vector of data sample for each direction of transmission, which vector comprises an appropriate number of N samples forming a frame, which microcontroller multiply each value of the frame with a complex number with fixed magnitude and a phase representing the transmitted frequency corresponding to the transmitted signal:

$$Y_n = X_n \cdot e^{j\omega \cdot t_s \cdot n} = X_n \cdot (\cos(\omega \cdot t_s \cdot n) + j\sin(\omega \cdot t_s \cdot n))$$

where X_n is the stored value at the n[th] location, $j\omega$ the angular frequency of the transmitted signal, t_s the sampling time interval and n is the sample number $0 \leq n < N$, which microprocessor generates imaginary values and a real values, which imaginary values and real values are low pass filtrated in a digital filter, which filtrated values are sent to an amplitude function and to a phase detection function, which microcontroller based on the result of the amplitude function and the result of the phase detection function calculates the flow in the duct. In this way an effective measurement of the flow can be achieved. Most of the calculations can be made in an algorithm which is programmed into the processor. Because calculations are the same each time measurement is performed a single algorithm that has to be run through by the processor is able by relatively short time intervals to calculate the flow. In fact will a relative simple processor have a capacity that is much higher than necessary. Further it can be achieved by an algorithm that is performing calculation as shown above gives the result that a very precise measurement of actual flow is achieved in the duct.

[0010] By a further preferred embodiment for the invention can the position detection means for detecting the actual position of the damper be achieved by a rotatable shaft carrying the damper, which shaft further comprises indication means, which indication means cooperates with at least one detector, which detector is placed at the common printed board. In this way it is possible to achieve an effective feedback of the actual position of a damper. The damper opening is important in a HVAC (Heating, Ventilation and Air Conditioning.) systems for minimizing power loss. The common ventilator speed is reduced until one damper in the system is close to its full opening, hereby is the power loss in the HVAC system minimized. By a further preferred embodiment for the invention can the damper be formed as a linear movable damper, which linear movable damper comprises at least one toothed bar, which toothed bar is by one or more tooth wheels activating indicator means, which indication means cooperates with at least one detector, which detector is placed at the common printed board. In some situations where for example there is less room for a damper can a linear damper be used instead of a damper that is rotated around a shaft. In that way by for example a tooth in combination with one or more tooth wheels can be used for position detection. Position detection is by magnetic technology.

[0011] By a further preferred embodiment for the invention can the transducers be placed in transducer housing, which transducer housing is placed in an opening in a transducer foot, which transducer foot is placed in an opening in a duct, which transducer foot has an outer shape that follows openings in duct having different diameters. Forming a standard foot having sufficient height of the foot it is possible that this foot could be used in ducts having different diameters. Maybe starting by a flat surface and accepting into a relative small diameter for a duct the same transducer foot could be possible. This transducer foot will probably be moulded in a rather flexible material so that the transducer foot will be able to more or less be air tight when it is filling out the opening.

[0012] By a further preferred embodiment for the invention can the transducer foot comprise at least one first protrusion for interacting with the inner surface of the duct, which transduce foot further comprises a second protrusion for interacting with the outer surface of the duct, which second protrusion comprises at least one fastening means for fastening the transducer foot to the duct. Hereby can be achieved that a fast and effective fixation of the transducer foot into a hole in a duct is performed in a rather effective way. The fastening means could be as primitive as a pop rivet or maybe a screw. Other possibilities for fastening are also possible.

[0013] By a further preferred embodiment for the invention can the transducer be paced inside the transducer foot, which transducer food is moulded partly around the transducer by low pressure moulding. In that way it is possible that the transducer foot is moulded around the transducer. This will be a highly effective way of producing two different foots for transducers, one to each side of a duct. The duct as such can be pre-produced having the cut outs for the transducer foots.

[0014] By a further preferred embodiment for the invention can the damper position detection means be formed by a Wheatstone bridge, which Wheatstone bridge comprises at least two magneto resistive resistors placed perpendicular to each other for detecting the position of a magnet, which magnet follows the position of the damper. The use of Wheatstone bridge gives the possibility that a rather effective measurement can be performed of the position of a magnet. In one situation it can be achieved that one of the signals is used as a sinus signal where the other signal is used as a cosine signal. In that way can be achieved that normal triangulation can be used which is effective and easily achieved in a processor to find the correct position of the damper.

[0015] The same function can be achieved by Hall elements, which are likewise sensitive to the direction of the magnetic field. However there is a difference between the two methods in that the magneto resistive is sensitive to the magnetic field direction, but not on the polarity. Hence for one full rotation of the damper will result in two full cycles of the sine and cosine functions whereas the Hall devices will give only one cycle pr revolution. Choice of technology here is a matter of cost since both methods do function equally well.

[0016] The pending patent application also concerns use of a system as disclosed previously whereby the system is used to control inlet of air into rooms, which inlet air is used for air condition or heating of the room.

[0017] Hereby can a high effectively air condition or heating system be achieved where each single air inlet is controlled by both the measurement of the flow and a regulation damper. Hereby can the correct air flow be achieved through every single air inlet in large building systems. It is further possible that each of the inlet control systems is communicating with a master control system so that set points could be generated centrally. In that way can be achieved that air for air condition or heating can be centrally regulated and in that way adjusted into the actual situation and the actual request for fresh air. This can lead to rather big savings in energy consumption in larger buildings.

Blade dampers

[0018] Has a turning, circular blade. The blade is steeples adjustable 0-90°. The dampers can be manually adjusted or motor driven. Here only the motor driven damper is considered. The combined controller, motor, gear, flow meter, position monitor and damper can be placed on top of the blade damper. A magnet on the shaft shall give the blade angle to a magnetic sensor placed on the circuit board adjacent to the microcontroller. Therefore the shaft must go all the way through the gear so the magnet can be placed on top of the blade axle just under the circuit board. The position sensor is a pair of magneto resistive sensors capable to give a voltage proportional to the field strength in the sensor direction. By having two sensors orthogonal to each other the angle can be calculated and the opening determined. It is preferred to have motor, gear, circuit board with controller and sensors all placed in the same capsule. The noise from the gear shall be low, under 25 dBA in 1m distance from the damper. It means that the motor shall be rather slow running and the first gear wheels may be in PA or there must be other means for preventing noise. The blade must turn one quarter of a revolution in 150 seconds or 0.1 revolutions per minute. Output torque shall be minimum 5 Nm.

Box damper

[0019] The regulation can be performed by a piston which can move back and forth in the perforated tube creating more or less resistance to the airflow. The setting in the shown box is actually done by pulling in strings connected to the piston until the flow is as desired. When the condition in the ventilation changes. A door or a window is opened or more people are in the room it is desired that the ventilation is changed accordingly. A controller keeping the flow either constant or changed after demand shall be applied to the existent box. In order to make the setting variable after demand a flow meter combined with an electric motor shall be mounted to set the position of the piston. If the flow is under demand the piston is moved toward the centre of the box activating more holes in the perforated tubes. Opposite if higher than demand the piston is moved away from the centre. It is preferred to have a spindle, inside the perforated tube, fitting a nut in the centre of the piston. The piston includes means for preventing it from turning. The spindle and nut will have threads with elevation 1.25 mm per revolution. The velocity of the piston shall be 1 mm per second. Hence the turning rate of the spindle shall be 48 revolutions per minute. The friction of bearings and piston shall be kept low because of the low power of the motor. The position of the piston shall be measured by the controlling electronic.

Description of the Drawings

[0020]

Fig. 1
discloses a possible embodiment for a combined measurement and regulation system.

Fig. 2
shows an alternative embodiment for a combined regulation and measurement device.

Fig. 3
discloses a transducer placed in a transducer fixture.

Fig. 4
shows a possible embodiment for a transducer foot.

Fig. 5
shows section of ducts 104, 104a with different diameters.

Fig. 6
discloses an alternative embodiment for a transducer foot and its fixation to a duct.

Fig. 7
shows a possible embodiment for the invention used with a box damper.

Fig. 8
shows same embodiment as fig. 7, but seen from a different end.

Fig. 9
shows a sectional view of the embodiment as shown at fig. 7 or 8.

Fig. 10
shows an alternative embodiment for the invention, where traditional flow regulation is indicated.

Fig. 11
shows a possible embodiment for a control device.

Detailed Description of the Invention

[0021] Fig. 1 discloses a possible embodiment for a system 2 comprising a duct 4 in which duct ultrasound transducers 6, 8 are generating beams of ultrasound between the transducers. The transducers 6, 8 are connecting by wiring 7, 9 towards a common printed circuit board 17. The system 2 further comprises a damper 10, which by a shaft 14 can be rotated by a servo motor 12, which servo motor 12 is connected by wiring 13 to the printed circuit board 17. The servo motor is placed on a cup 18 to allow space for insulation of the duct 4. Further is indicated that magnetic means 21are fastened to the shaft 14 and placed very near the printed circuit board so that magnetic detection means are able to detect the position of the damper 10. Further is indicated the electronic circuit 16, which is mounted at the printed board 17. This electronic circuit 16 is connected by a communication line 22, which for example could be

RS485 MODBUS. Further is indicated a connection wiring 20 comprising single wirings 24 which is a power connection to a 24 volt AC supply where the line 26 indicates the position of the damper which could be performed as an analog voltage between 2-10 volt. Further is the line 28 indicating a set point for the air flow which also is communicated as an analog value between 2-10 volt. The line 30 is indicating a ground connection. Further is indicated wireless communication 32 which in a possible embodiment for the invention is an 868 MHz radio communication line. In operation will the system 2 be able to measure the actual flow in the duct 4 by the ultrasonic transducers 6, 8. The electronic circuit 16 placed at the common printed board 17 performs the total analysis of the difference in transmission period from one transducer to the other and reverse transmission. This delay time and difference in delay times is necessary for indicating the flow. Probably is from outside received an indication about the wanted flow in the duct 4 and the system is therefore automatically adjusting the damper 10 by the servo motor 12 onto a flow that is as close as possible to the wanted set point.

[0022] Fig. 2 discloses an alternative embodiment which only differences is that the electronic circuit 16 placed at circuit board 17 is now placed at the same side of the duct as the servo motor 12. Further is indicated that magnetic means 21are fastened to the shaft 14 and placed very near the printed circuit board so that magnetic detection means are able to detect the position of the damper 10.

[0023] Fig. 3 discloses a possible invention for fixation of a transducer 106 in the fastening means 134. Further is indicated the wiring 107. The fastening means 134 is probably formed in a soft material so that the fixture 134 can be placed in an opening in a duct and the outer form of the soft material is formed so it is difficult to remove the fixture. Using a soft material for fixation of an ultrasound transducer 106 gives the benefit that mechanical vibrations are widely damped in the soft fixture 134 and in that way not further transmitted into the duct where ultrasonic mechanical vibrations can be transmitted towards the other transducer 108 and in that way interfere with the received signal which makes precise measurement impossible.

[0024] Fig. 4 shows a possible embodiment for a transducer foot 140 which is adapted to be used in ducts 104, 104a with different diameters. By a very special calculation of the changes in the size of an opening, where the openings are made in the duct before the duct is formed into a tube, where the opening is performed probably by punching while the material is a flat plate. Therefore the afterwards bending of the duct will give some differences in the actual size of the opening in the duct. By forming the transducer foot in a relative soft material and performing the correct size of the transducer foot, same foot can be used to different diameters of a duct maybe starting from a flat surface at a duct into a number of different diameters for the duct.

[0025] Fig. 5 shows section of ducts 104, 104a with different diameters. A transducer housing 135 with a transducer foot 140 is placed in opening in the ducts 104, 104a.

[0026] Fig. 6 shows a possible embodiment for the invention where a duct 204 comprises a media, for example air, where the velocity has to be measured by a pair of ultrasound transducers such as 206, which transducer 206 is placed in a transducer foot 240. This transducer foot 204 comprises a first protrusion 246 which is performing an inner fixation of the transducer foot 240. Further is indicated a protrusion 248 which is placed at the outer side of the duct 204. The protrusion 248 comprises fastening means 244 such as screw or maybe pop rivet Other kinds of fastening means could also be used. Probably is the transducer foot 240 formed of a relative soft melt material which is isolating the mechanical vibrations generated by the transducers 206.

[0027] Fig. 7 shows a box damper 302, which box damper in combination with an inlet 310 indicates ultrasound transducers 306 and 308. Communication lines 307, 309 are leading to a control device (not shown). The box itself is indicated as 312.

[0028] Fig. 8 shows same embodiment as at fig. 7, but seen from the opposite end. The inlet 310 together with one of the transducers 306 can be seen together with the two communication lines 307 and 309, which are connected to an electronic control device 314. This electronic control device 314 takes care of the calculation of the flow based on signals from the ultrasound transducers 306,308 and also for regulation of actual flow through the box 312.

[0029] Fig. 9 shows a sectional view of same embodiment as indicated at fig. 7. Fig. 9 shows the two ultrasound transducers 306, 308 and the two communication lines 307 and 309. Further is indicated the inlet 310 into the box 312, which box has an outlet 316. The electronic device 314 comprises an electro motor, which motor is rotating a spindle 318 which spindle 318 is moving a piston 322 linearly inside a perforated tube 320 hereby regulating the flow of air through the box 312.

[0030] Fig. 10 shows an alternative embodiment for a blade damper. A tube 402 has an inlet 410. This tube comprises ultrasound transducers 406 and 408. These transducers are connected by wiring 407 and 409 towards the control box 414. This control box is able to rotate a spindle 418 to which spindle blade 422 is fixed. In that way a spindle 418 can regulate the flow through the tube.

[0031] Fig. 11 shows the electronic control box 502 comprising a motor unit 504 in which a gear box (not shown) is driving a first spindle 506 for a box damper regulation indicating one further spindle 508 for a blade damper, which further comprises magnets 510 for position sensors. Further is indicated at for example a printed circuit board, a micro-processor 506 together with a plurality of other electronic components. The micro-processor controls the rotation of the motor 504 and receives input from sensors 510 and from not shown ultrasound transducers. In that way one common control circuit can be used for as well regulation of a damper and in the same way measuring actual flow through a tube. Further is achieved that the same electronic control device can be used for two different types of dampers. Fast rotating spindle 506 is more or less directly coupled to the motor 504, but a rather complicated gearing, probably comprising several gear wheels, are necessary to reach the very slow rotating shaft 508 for blade damping.

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- DK201270241 [0002]
- DE10001165A1 [0003]

Patentkrav

1. System (2) til styring af en strømning af et medium i en kanal (4, 104, 104a), hvilken kanal omfatter et middel til strømningsmåling (6, 8), hvilken kanal omfatter midler til strømningsregulering (10), hvilket system (2) omfatter et styresystem (16), hvilket styresystem (16) er konfigureret til at modtage mindst input fra strømningsmålingsmidlet (6, 8), hvilket styresystem (16) er konfigureret til at udføre styring af mindst en reguleringsdæmper (10), hvor strømningsmålingen og dæmper (10)-styringen udføres af et fælles styresystem (16), hvilket styresystem (16) omfatter mindst en fælles printplade (17), hvilken printplade (17) omfatter mindst en processor, **kendetegnet ved, at** printpladen (17) endvidere omfatter et magnetisk positionsdetekteringsmiddel til detektering af den faktiske position af dæmperen (10) ved hjælp af mindst en magnet (21) på dæmperen, hvor det magnetiske positionsdetekteringsmiddel er anbragt på printpladen (17).

2. System ifølge krav 1, **kendetegnet ved, at** midlet til strømningsmåling omfatter mindst et par ultralydstransducere (6, 8) til generering af mindst en ultralydsbane dels i strømningsretningen og dels imod strømningsretningen i kanalen (4, 104, 104a).

3. System ifølge krav 2, **kendetegnet ved, at** ultralydstransducerne (6, 8) er forbundet med et transmitterkredsløb og med et modtagerkredsløb, hvilket modtagerkredsløb omfatter mindst et antialiaseringsfilter, hvilket antialiaseringsfilter endvidere er forbundet med en mikrocontroller, hvilken mikrocontroller omfatter, enten internt eller eksternt, en analog-digital-konverter, hvilken digital-konverter er konfigureret til at konvertere det analoge signal til digitale dataprøver, der repræsenterer mindst transittider og tidsforskel, hvilken mikrocontroller er konfigureret til at lagre dataprøverne i en hukommelse, hvor et transmitterkredsløb og et modtagerkredsløb styres af en omskifter, hvilken omskifter er konfigureret til at udføre kontinuerlig omskiftning af transmitterkredsløbet til et modtagerkredsløb og modtagerkredsløbet til et transmitterkredsløb, hvilken mikrocontroller er konfigureret til at lagre en vektor af dataprøve for hver transmissionsretning, hvilken vektor omfatter et passende antal på N prøver, der danner en ramme, hvilken mikrocontroller er konfigureret til at multiplicere hver værdi af rammen med et komplekst tal med fast størrelse og en fase, der repræsenterer den transmitterede frekvens svarende til det transmitterede signal:

$$Y_n = X_n \cdot e^{-j\omega \cdot t_s \cdot n} = X_n \cdot (\cos(\omega \cdot t_s \cdot n) + j \sin(\omega \cdot t_s \cdot n))$$

hvor X_n er den lagrede værdi ved den n'te lokation, *jw* vinkelfrekvensen af det transmitterede signal, t_s er prøvetidsintervallet, og *n* er prøveantallet $0 \leq n < N$, hvilken mikroprocessor er konfigureret til at generere imaginære værdier og reelle værdier, hvilke imaginære værdier og reelle værdier lavpasfiltreres i et digitalt filter, hvilke filtrerede værdier sendes til en amplitudefunktion og til en fasedetekteringsfunktion, hvilken mikrocontroller baseret på resultatet af amplitudefunktionen og resultatet af fasedetekteringsfunktionen er konfigureret til at beregne strømningen i kanalen.

4. System ifølge krav 1, **kendetegnet ved, at** det magnetiske positionsdetekteringsmiddel til detektering af den faktiske position af dæmperen (10) opnås gennem en roterbar aksel (14), der bærer dæmperen (10), hvilken aksel endvidere omfatter et visningsmiddel, som er magneten, hvilken magnet er konfigureret til at samvirke med det magnetiske positionsdetekteringsmiddel, der er anbragt på printpladen (17).

5. System ifølge krav 1, **kendetegnet ved, at** dæmperen (10) er udformet som en lineær bevægelig dæmper, hvilken lineær bevægelig dæmper omfatter mindst en tandstang, hvilken tandstang gennem et eller flere tandhjul aktiverer et visningsmiddel, hvilket visningsmiddel er konfigureret til at samvirke med det magnetiske positionsdetekteringsmiddel, der er anbragt på printpladen (17).

6. System ifølge krav 1 eller 5, **kendetegnet ved, at** dæmperen er udformet som en kassedæmper, hvilken kassedæmper omfatter mindst et perforeret rør, i hvilket perforerede rør et stempel bevæges af en lineær aktuator, der er dannet af en roterende spindel.

7. System ifølge krav 3, **kendetegnet ved, at** transducerne (6, 8) er anbragt i et transducerhus (134, 240) med en transducerfod (140, 240), hvilken transducerfod (140, 240) omfatter en åbning, i hvilken en transducer (6, 8) er anbragt, hvilken transducerfod (140, 240) er anbragt i en åbning i en kanal (4, 104, 104a), hvilken transducerfod (140, 240) har en udvendig form, der følger åbninger i kanalen (4, 104, 104a) med forskellige diametre.

8. System ifølge krav 7, **kendetegnet ved, at** transducerfoden (240) omfatter mindst et første fremspring (246) til samvirke med den indvendige overflade af kanalen (204), hvilken transducerfod (240) endvidere omfatter et andet fremspring (248) til samvirke med den udvendige overflade af kanalen (204), hvilket andet fremspring (248) omfatter mindst et fastgørelseselement (244) til fastgørelse af transducerfoden (240) til kanalen (204).

9. System ifølge krav 7 eller 8, **kendetegnet ved, at** transduceren (206) er anbragt inden i transducerfoden (240), hvilken transducerfod (240) er støbt delvist omkring transduceren (206) ved hjælp af lavtryksstøbning.

10. System ifølge et af kravene 1 - 9, **kendetegnet ved, at** det magnetiske dæmperpositionsdetekteringsmiddel er dannet af en Wheatstone-bro, hvilken Wheatstone-omfatter mindst to magnetoresistive modstande, der er anbragt vinkelret på hinanden til detektering af positionen af en magnet, hvilken magnet følger positionen af dæmperen (10).

11. System ifølge et af kravene 1 - 9, **kendetegnet ved, at** det magnetiske dæmperpositionsdetekteringsmiddel er dannet af to hall-sensorer, der er anbragt vinkelret på hinanden til detektering af positionen af en magnet, hvilken magnet følger positionen af dæmperen (10).

12. Anvendelse af et system (2) ifølge et af kravene 1 - 11, **kendetegnet ved, at** systemet (2) anvendes til at styre indgang af luft i rum i bygninger, hvilken indgangsluft anvendes til luftkonditionering eller opvarmning af rummet i en bygning.

DRAWINGS

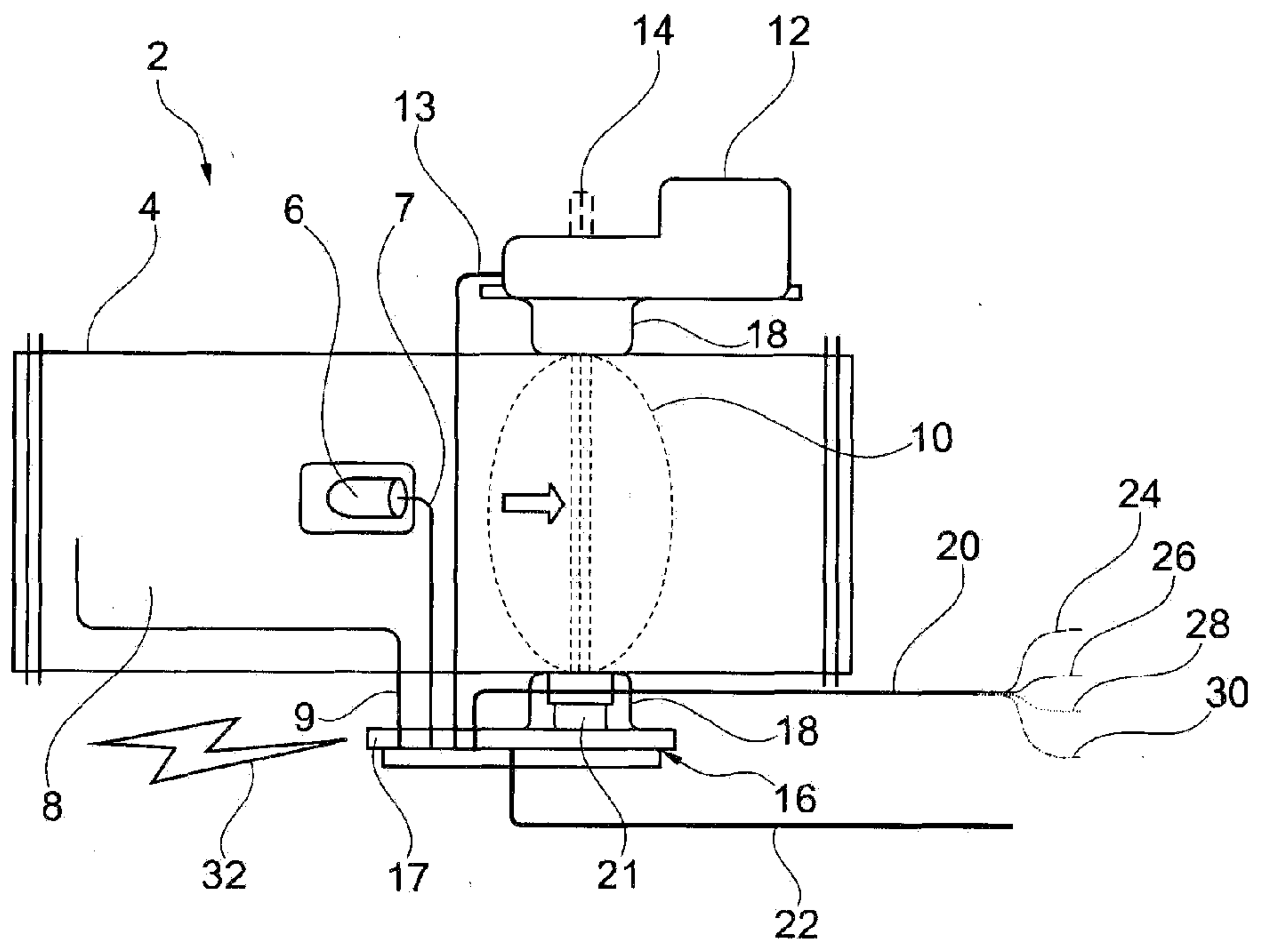

Fig. 1

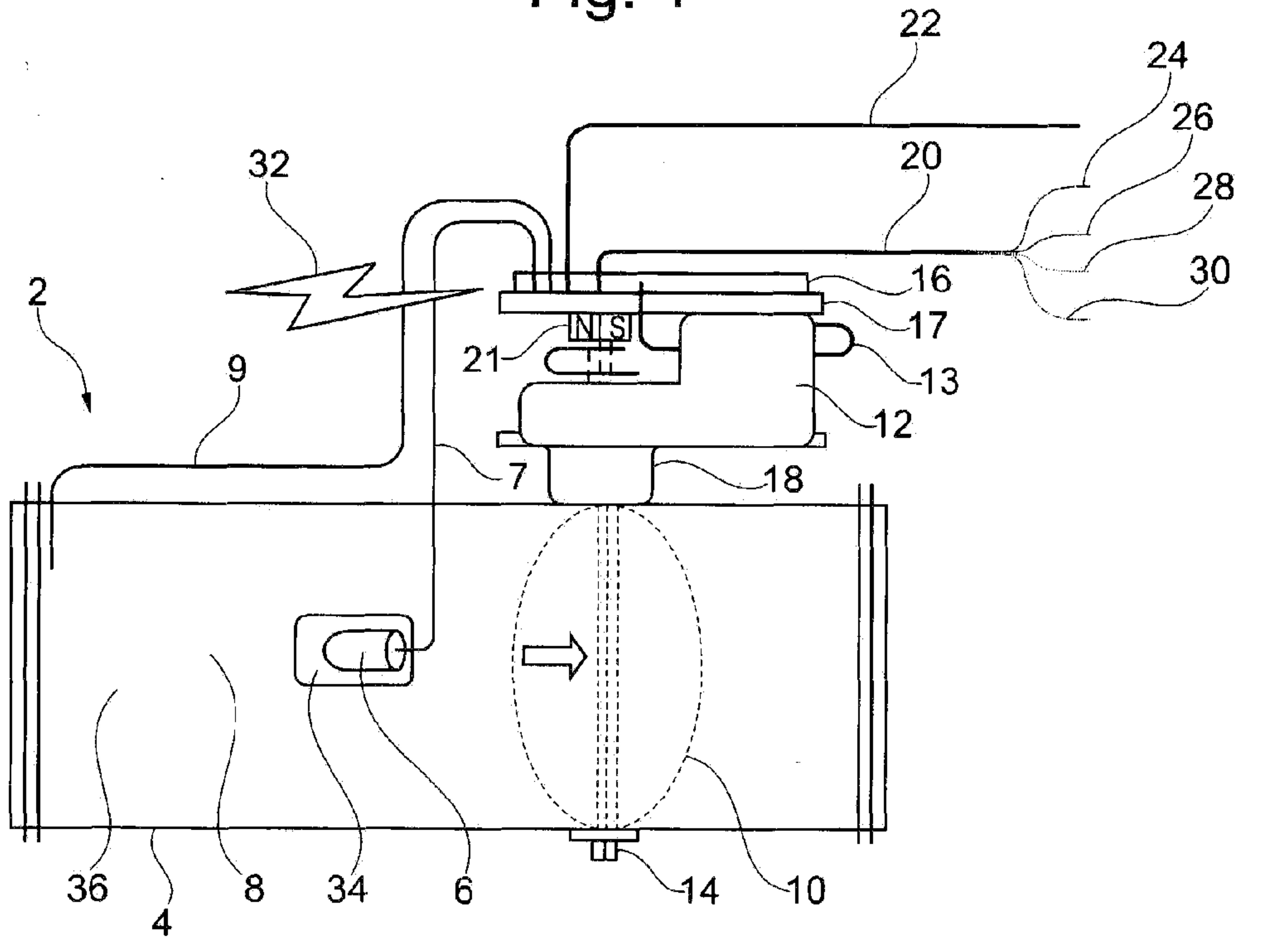

Fig. 2

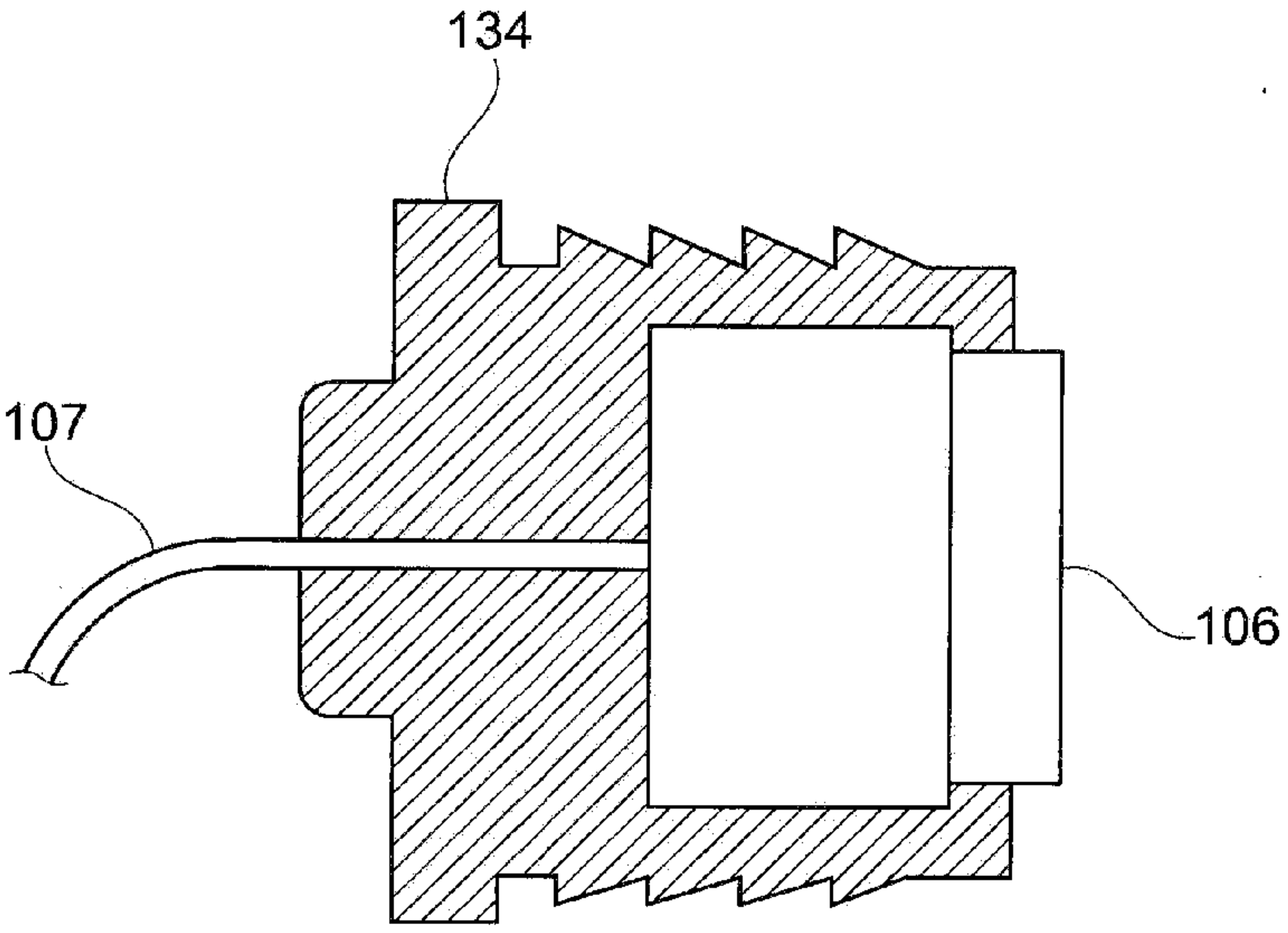

Fig. 3

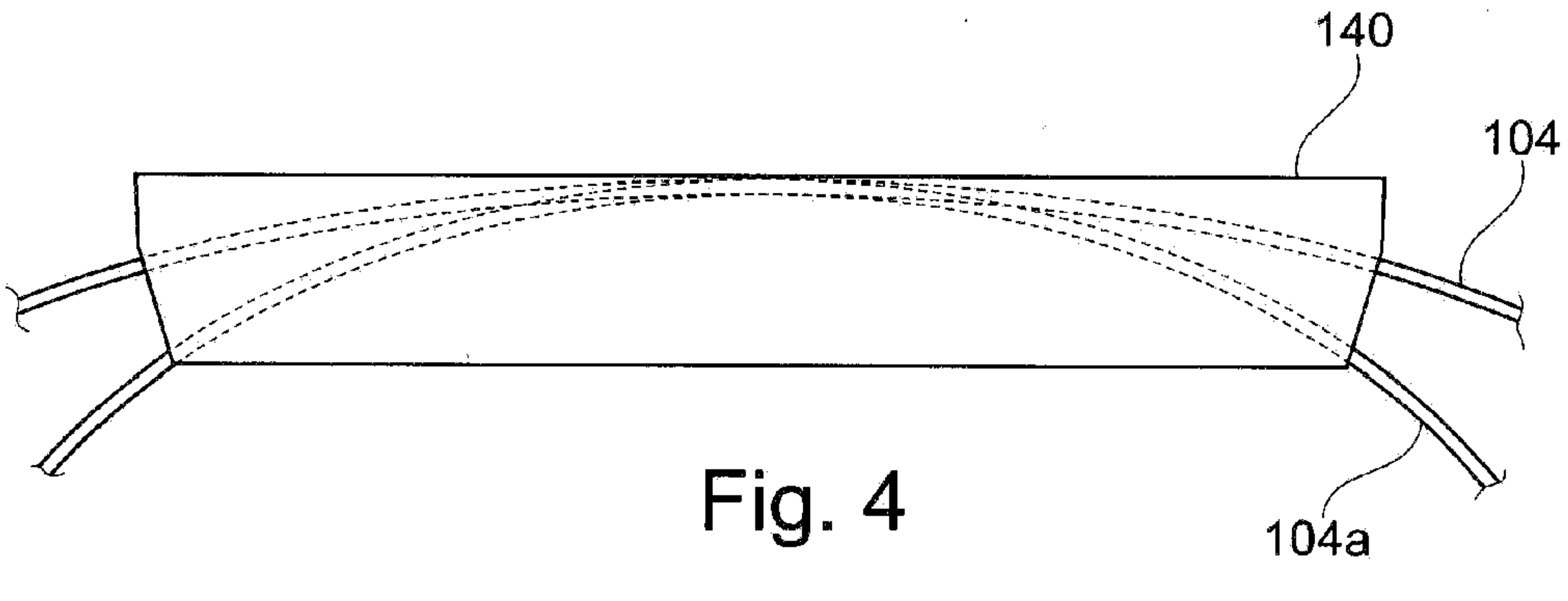

Fig. 4

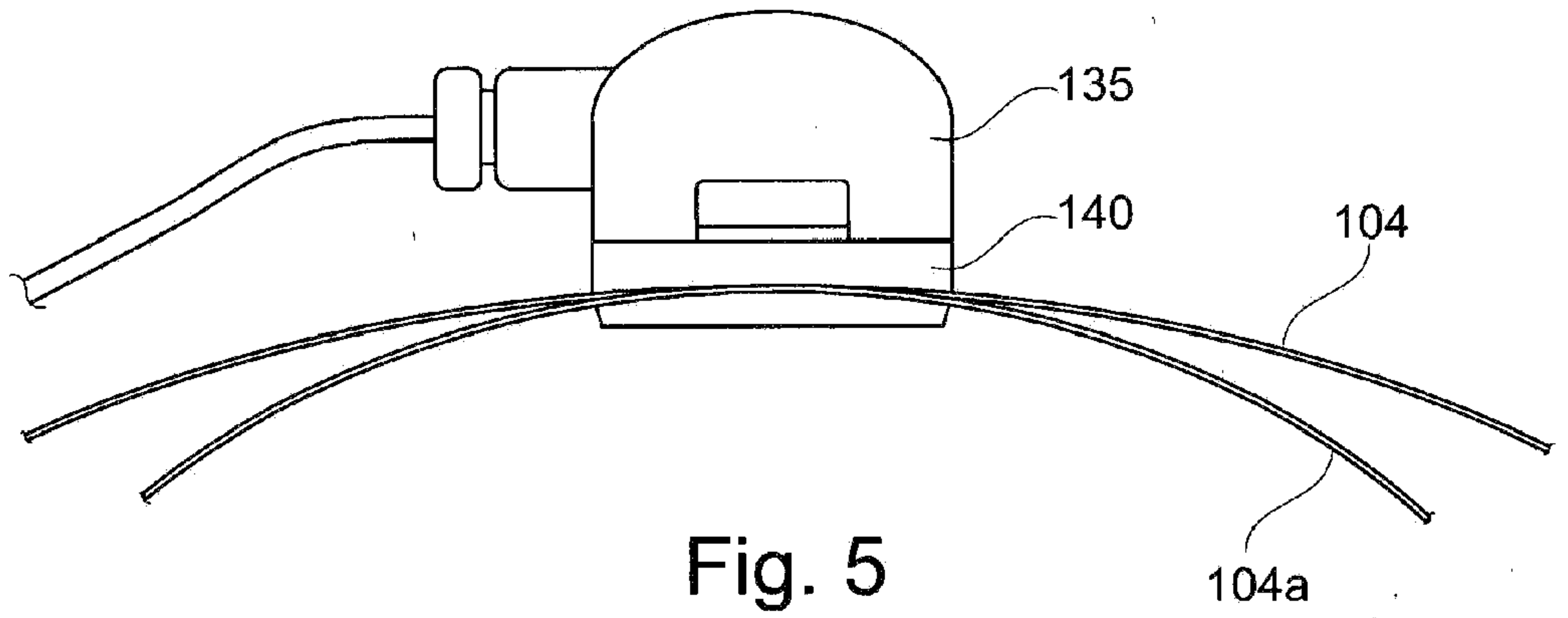

Fig. 5

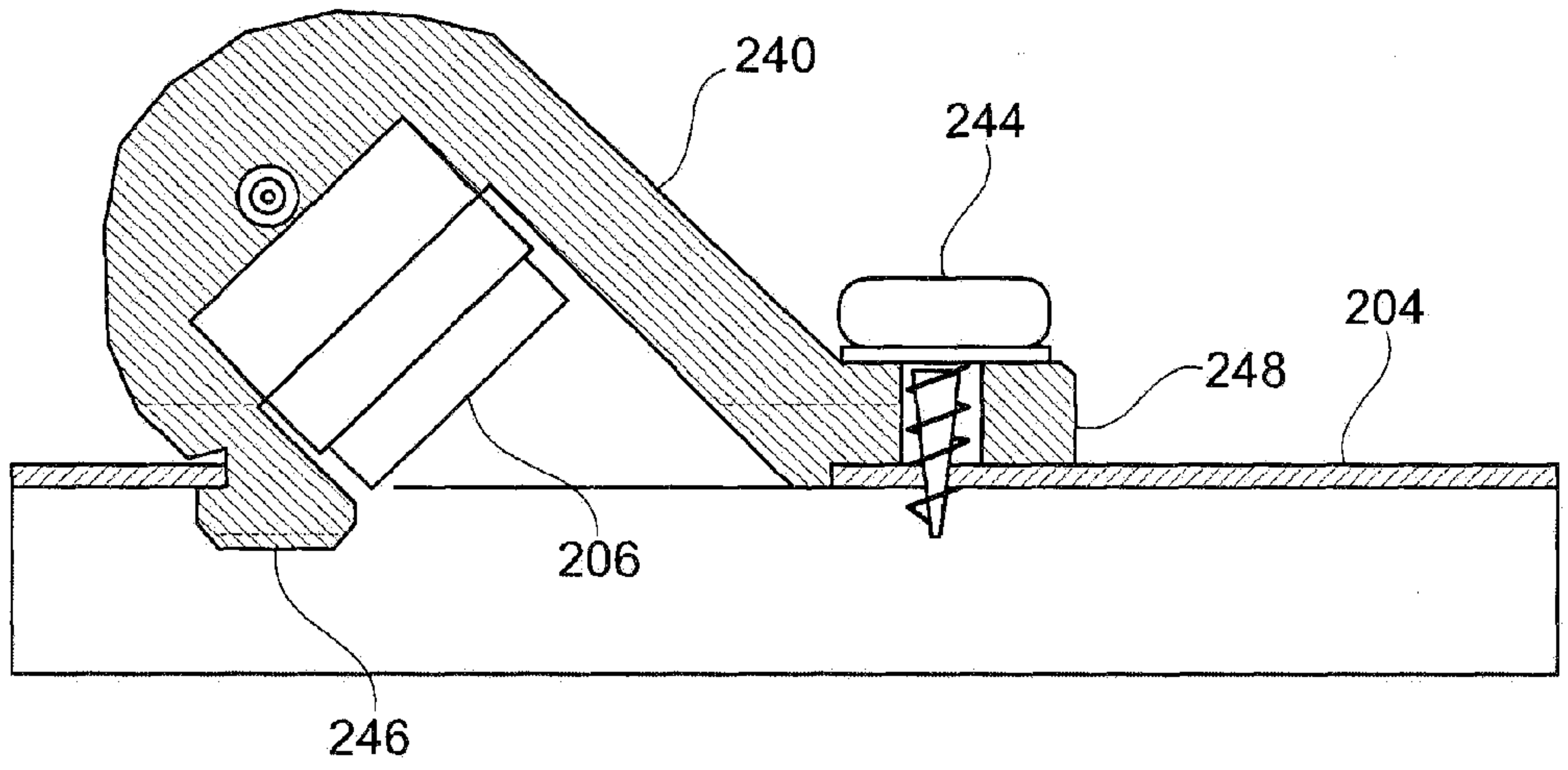

Fig. 6

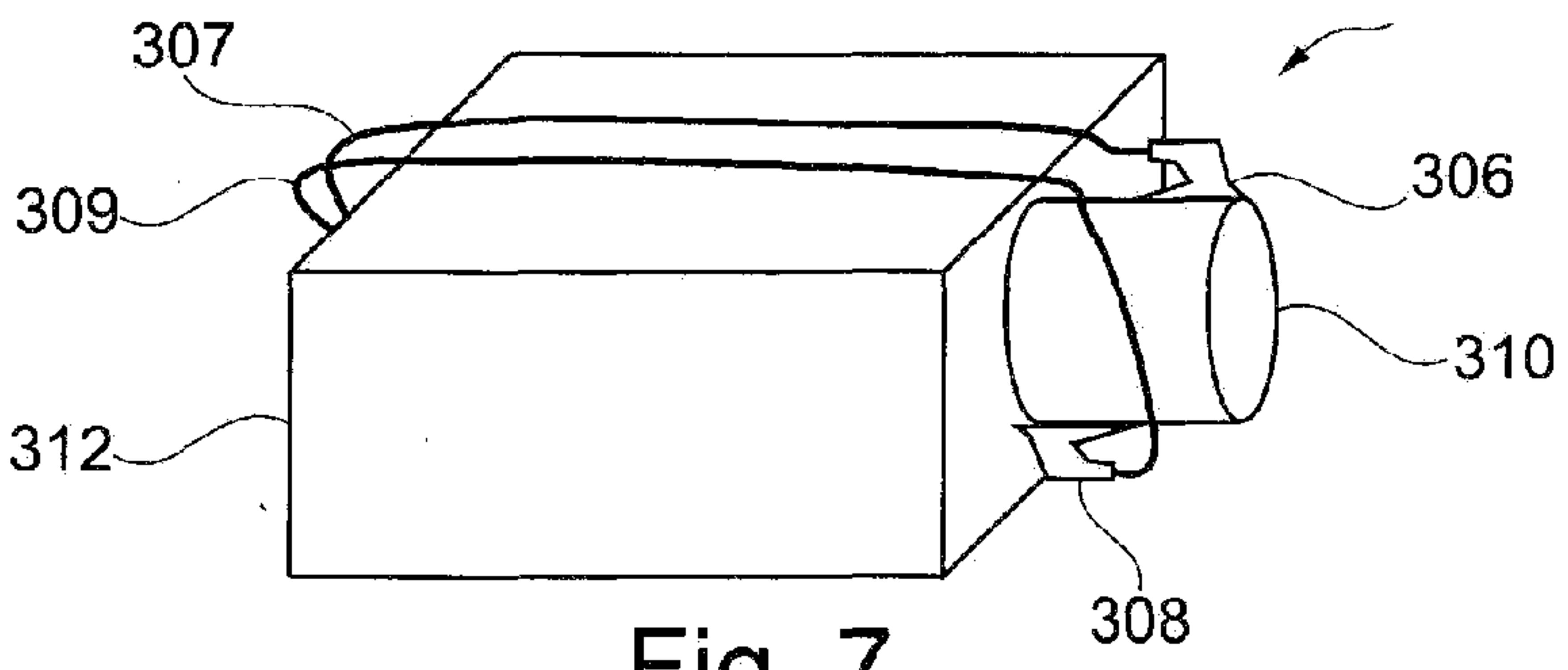

Fig. 7

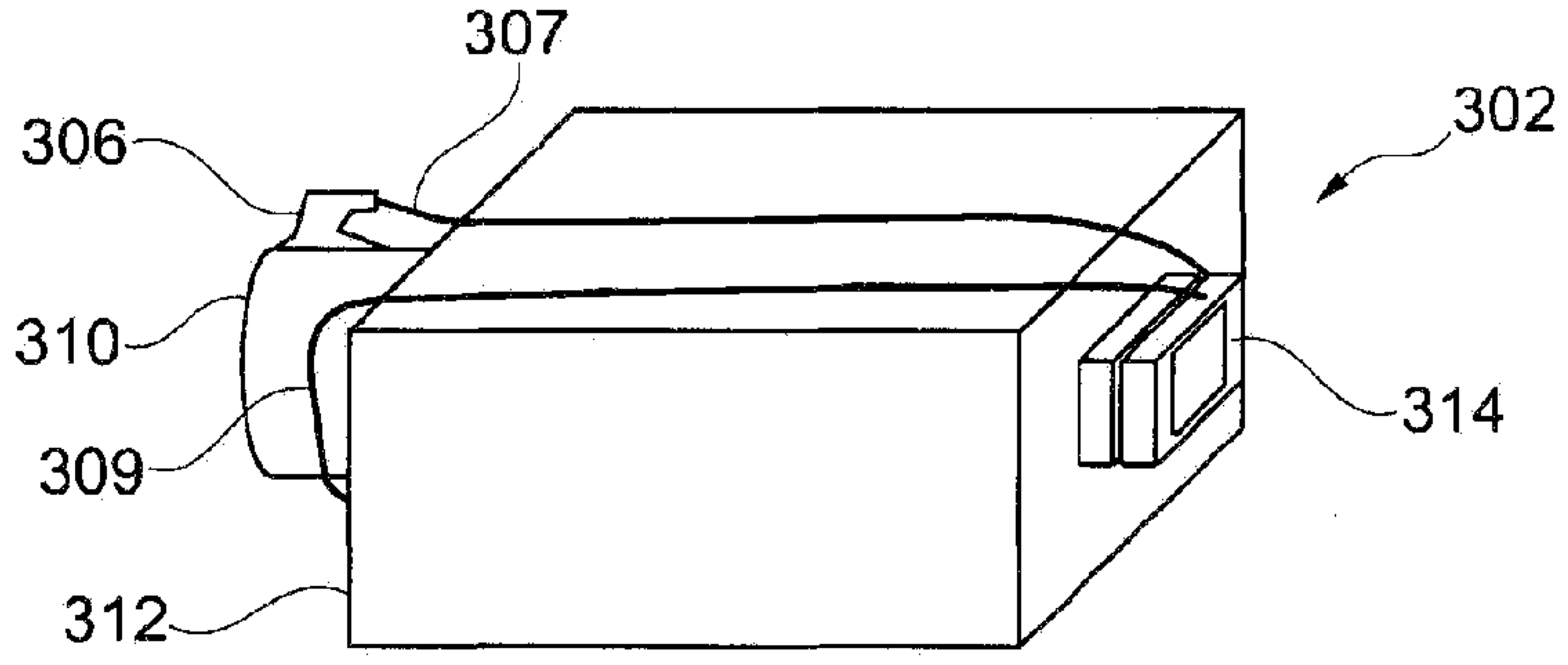

Fig. 8

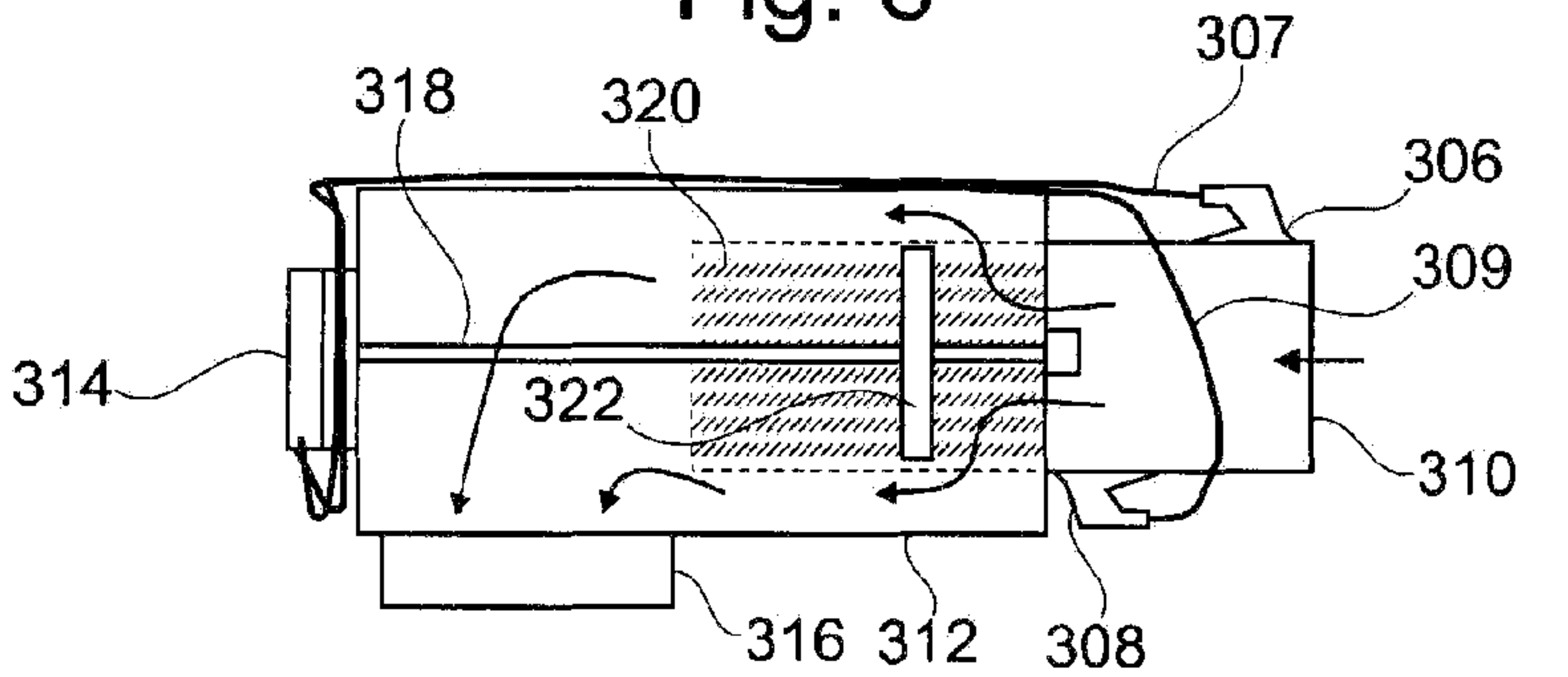

Fig. 9

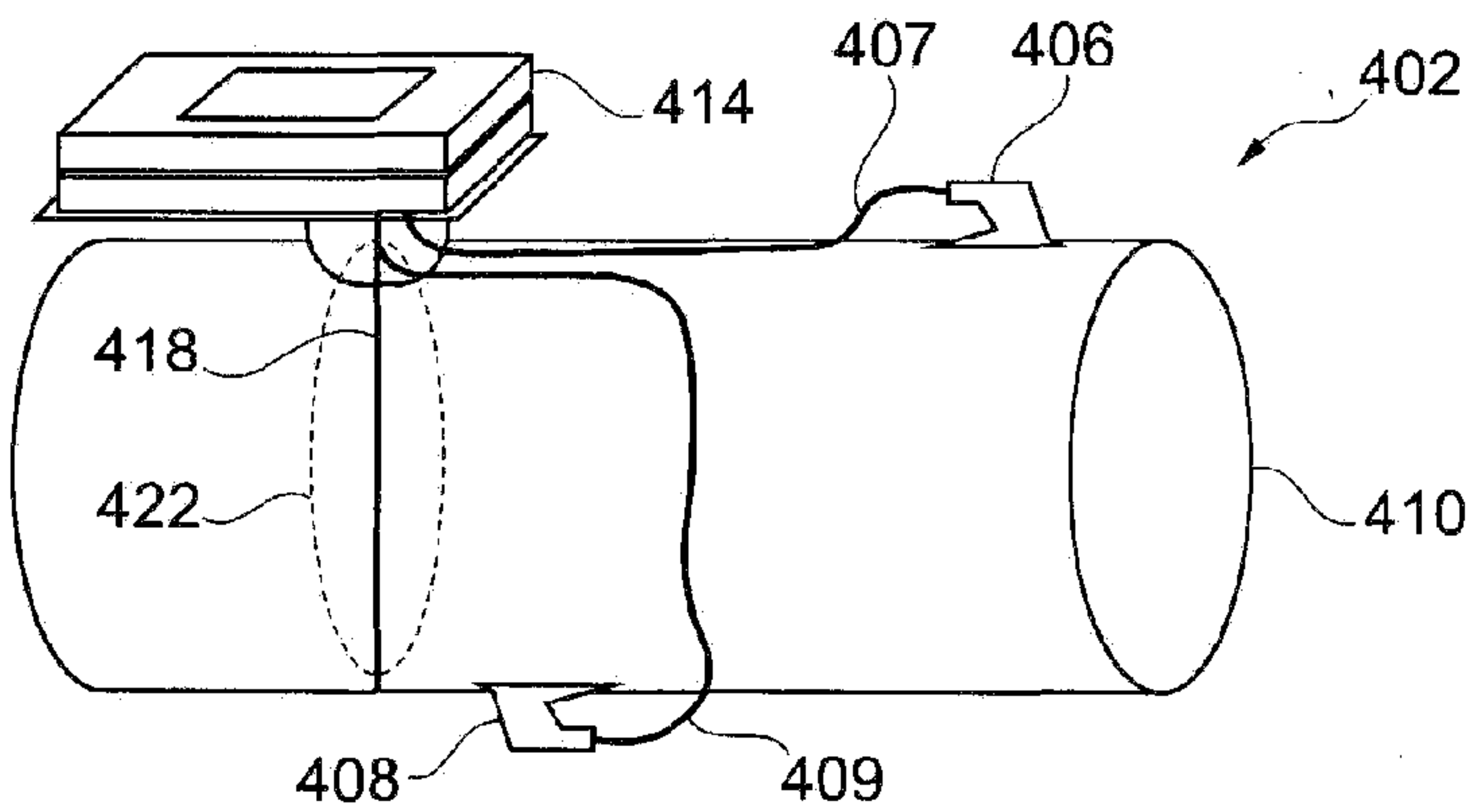

Fig. 10

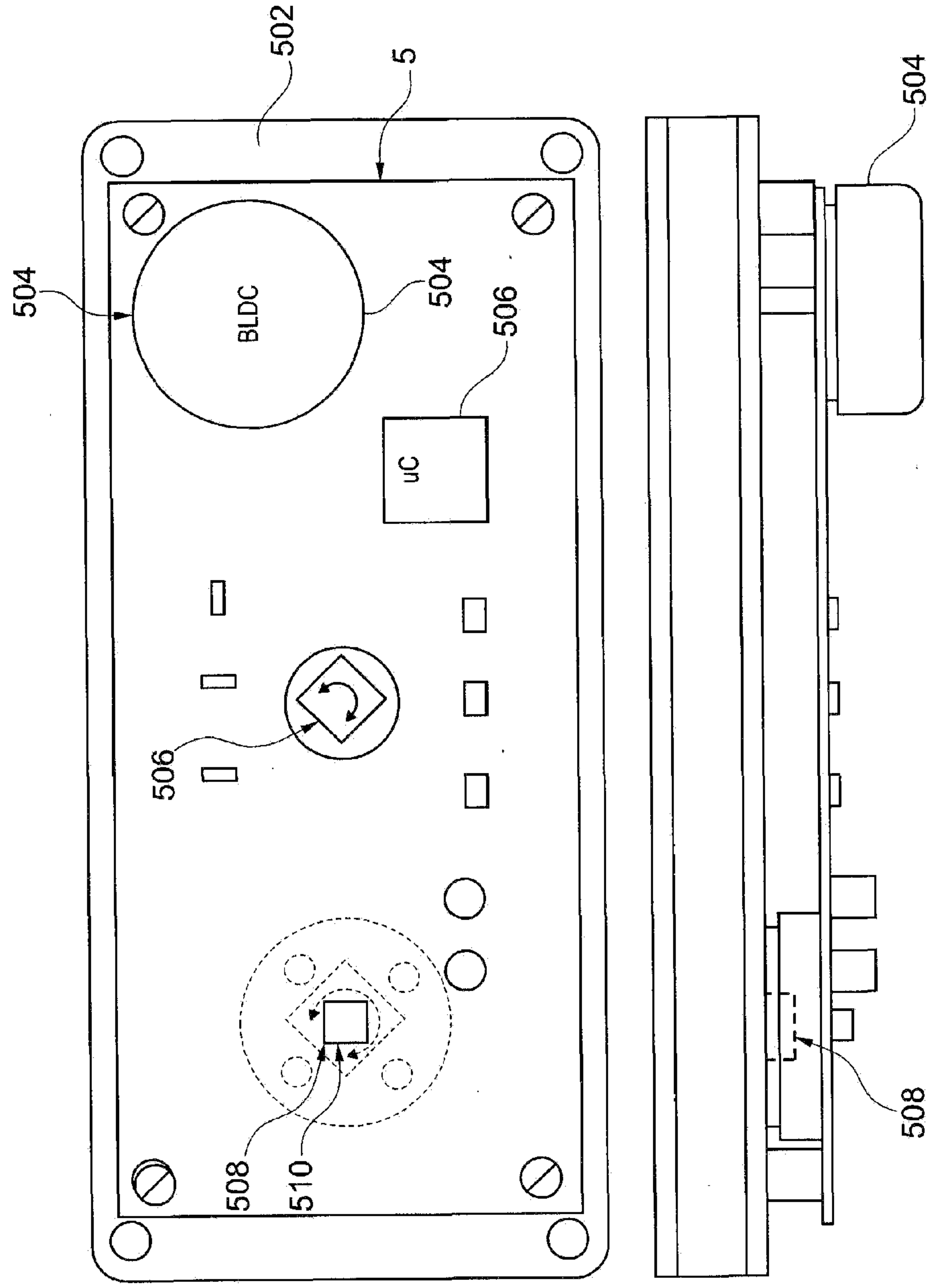

Fig. 11