



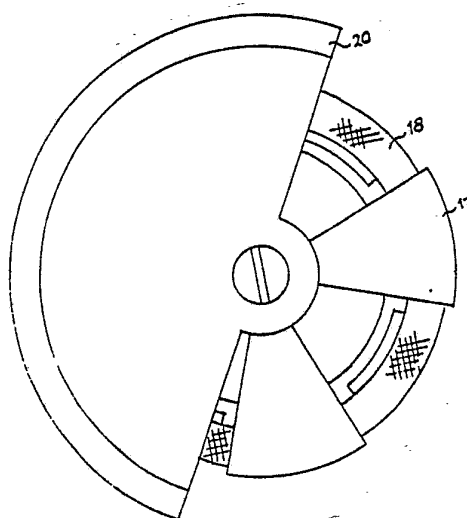
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification<sup>3</sup> :</b> <b>G04C 10/00; H02K 21/14</b> <b>H02J 9/06; A61N 1/36</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 84/ 01041</b> <b>(43) International Publication Date:</b> 15 March 1984 (15.03.84)
<b>(21) International Application Number:</b> PCT/NL83/00034 <b>(22) International Filing Date:</b> 2 September 1983 (02.09.83) <b>(31) Priority Application Number:</b> 8203443 <b>(32) Priority Date:</b> 3 September 1982 (03.09.82) <b>(33) Priority Country:</b> NL  <b>(71)(72) Applicant and Inventor:</b> KNAPEN, Petrus, Ma- theus, Josephus [NL/NL]; Korvelseweg 157, NL-5025 JD Tilburg (NL).  <b>(81) Designated States:</b> AT (European patent), AU, BE (Eu- ropean patent), BR, CH (European patent), DE (Eu- ropean patent), FR (European patent), GB (European patent), JP, KP, LU (European patent), NL (Euro- pean patent), SE (European patent), SU, US.		<b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt</i> <i>of amendments.</i> <i>In English translation (filed in Dutch).</i>

**(54) Title:** PORTABLE MINI AC GENERATOR/DC ACCUMULATOR FOR A MINI POWER CAPACITY

**(57) Abstract**

A portable mini AC generator/DC accumula-  
 tor for mini power capacity such as e.g. in use for a  
 wrist, pocket or necklace watch, a pacemaker or a  
 battery powered hearing-aid, in which, under the in-  
 fluence of the individual movement of its bearer, a  
 mass inertia or rotor (20) is set into motion with re-  
 spect to a stator (18), not moving simultaneously  
 therewith, and, under the application of the principle  
 of generating magnetic induction currents and via a  
 rectifier known per se, a mini DC current is generat-  
 ed, which serves the purpose of directly supplying or  
 temporarily accumulating a mini current. Since a mi-  
 ni device has a very limited space for housing a mini  
 generator/accumulator and nevertheless a sufficient  
 loading current has to be generated, this strongly af-  
 fects on the one hand its shape and on the other  
 hand its costprice. Samarium-cobalt is very suitable  
 material for a permanent magnet, applicable in an is-  
 otropic and an anisotropic version under the condi-  
 tion that the magnet must be executed with at least 4  
 poles. Especially the application in a quartz genera-  
 tor watch can be favourable for use of a magnet hav-  
 ing 4 or more poles of a permanent magnet of the  
 samarium-cobalt type, provided with an iron yoke  
 with claw poles. However the use of a permanent magnet (22) in the shape of an ellipsoide with an iron yoke (23), resulting  
 in a cylindrical assembly, may also be preferred. A loose unit of the generator/accumulator for use in a quartz watch can  
 be manufactured while using the invention, having a minimum thickness of 1.5 mm and a minimum diameter of 5 mm.



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Portable mini AC generator/DC accumulator for a mini power capacity.

- The invention relates to a portable mini AC generator/DC accumulator for a mini power capacity as used e.g. for e wrist, a pocket or a necklace watch, a pacemaker or a battery powered hearing-aid, in which, under the influence of the individual movement of the bearer, a mass inertia or a rotor, set
- 5 into motion with respect to a stator not moving simultaneously therewith, and under the application of the principal of generating magnetic induction currents and via a rectifier known per se, transferring a mini AC into a mini DC, servicing the purpose of supplying directly or temporarily accumulating respectively a mini current.
- 10 There is a growing need for stopping the replacement of batteries in a battery powered mini equipment, such as for a watch or a pacemaker. At the most inconvenient moments a battery is exhausted and it is even sooner replaced than is strictly necessary just to avoid the risk of being empty e.g. for a pacemaker.
- 15 It is the purpose of the invention while using means known per se, to provide for for the generation and accumulation respectively of a mini power capacity, no longer depending upon replaceable mini battery cells such as from Hg batteries, Li batteries or Ni batteries.

- According to the invention this is achieved in that a mini AC generator/DC
- 20 accumulator contains a mutually cooperating selective magnetic system of a rotor and a stator, provided with a permanent magnet having at least 4 poles.

- Extensive researches which were carried out by the Technological University of Eindhoven, Electrotechnics Department, Section of Electromechanics
- 25 and Power electronics, have shown the above requirements for a mini generator/accumulator to be used for a quartz generator watch. According to the invention there is further a need to connect the rectifier to a discharge protection for the accumulator in order to prevent an inadmissible discharge, caused e.g. if the watch is not used for a longer duration, comparable with
- 30 a lack of movement impulses.

In a preferred embodiment of the invention a lithiumcell can be applied, which by its characteristic prevents a discharge of the accumulator.

- The main problem is to generate a sufficiently powerfull and high grade magnetic field and thus the required high voltage remaining within the res-
- 35 tricted available space. Supreme material for permanent magnets is extremely



expensive. For mini-use however material costs are less decisive for the ultimate price, so that for the mini generator/accumulator of the invention succesfull use can be made of a permanent magnet of the samarium-cobalt type perefomed in its isotropic or anisotropic version. Where samarium-cobalt  
5 can be mixed with resins (plastic bonded material), even a disadvantage of less magnetic field strength can be compensated by the greater freedom of design engineering. This also makes it possible to apply a permanent magnet with radial or axial magnetisation for the rotor/stator.

Calculations and research show that a very effective embodiment of the  
10 generator/accumulator is achieved if the abovementioned permanent magnet is circumferentially provided with an iron yoke having claw poles. Under such circumstances there are no restrictions for the magnet material and the best available quality of samarium-cobalt can be chosen. According to  
15 the invention a very favourable embodiment of a permanent magnet is effected by an ellipsoide, being provided with an iron yoke that a cylindrical assembly is obtained. By this choice it can be expected that the magnetic saturation, which otherwise would be caused at critical points, does not occur.

Since the available space for a battery in existing watches becomes now  
20 available for the generator/accumulator of the invention, a loose unit appears to be most effective. Specifically for a quartz watch the sizes of the unit must measure between a thickness of at least 1.5 mm and at most 4 mm, whereas the diameter will be between 5mm and 11.5 mm at the most.

The invention will be explained by means of the drawing of a quartz watch  
25 with its parts.

Fig. 1 shows the schematic drawing of a selfloading quartz generator watch. Fig. 2 shows perspectively a similar watch in which the invention is embodied. Fig. 3 is a modified version according to Fig. 3 of a quartz generator watch. Fig. 4-9 each show various embodiments of the construction of the generator/  
30 accumulator in a top view and in a vertical cross section respectively; Fig. 10 is a cross section of a permanent magnet.

In Fig. 1, the principle is shown in which a quartz generator watch 1 is powered by an accumulator 2. This mini accumulator is charged by a mini DC generator 3 which converts kinetic energy into electric energy and by  
35 means of a rectifierblock 4, a voltage regulates 5 and a discharge protection



6 a mini DC is given to the accumulator 2. The watch 1 is, by resorption of kinetic energy provided by its bearer powered by the mini generator/accumulator, no battery replacement being required and thereby enjoying the advantages of the invention.

- 5 In Fig. 2 and 3 various parts of a quartz generator watch according to the scheme of Fig. 1 can be found back. The usual parts of the analog quartz watch consist of the battery 7, the oscillating circuit with quartz crystal 8, the coil 9 of the step by step motor 10 with its rotor. Further the watch is provided with a rotor 11 and a stator 12 and on the rotor 11 there are  
10 mounted a number of permanent magnets 13, which magnets also provide for the mass inertia causing the rotor 11 to be brought out of balance. The way of generating energy shall not be discussed hereinafter since this is supposed to be known.

- While in Fig. 2 the rotor 11 is provided with permanent magnets 13, a rotor  
15 can also in it self be selectively become magnetised and the stator instead of containing a single coil, can consists of a number of self inductions or otherwise be made of a self inductive element. For the application of the invention it makes no difference if the rotor is selectively magnetic and the stator is selectively inductive or reversely, it is only necessary to take  
20 the generated current away to the accumulator 7 via the rectifier ccircuit, see Fig. 1. To generate a mini power, caused by the bearer's kinetic energy, in stead of a rotating movement also an alternating movement can be used, in the plane of the rotor but also perpendicular thereto.

- Fig. 3 shows a perspective view of another quatrs generator watch, the shape  
25 of the generator rotor 14 being different whereas the accumulator 15 and the combined rectifier circuit/voltage regulator/discharge protection 16 are shown as a single unit. From the difference in design between the generator 11 and 14 some freedom in design is apparent, this being the result of the application of permanent magnets of the samarium-cobalt type in its  
30 isotropic or anisotropic version. It appears that this material is highly suitable for the mini power aimed at, despite its relatively high price, in combination with the advantages already discussed before.

- In Figs. 4-9 there are shown some constructional embodiments of the mini generator making it possible to provide for a loose unit having minimum  
35 and optimal dimensions respectively.



In various design embodiments a stator 17 with an induction coil 18 and a permanent magnet 19 of samarium-cobalt have been applied, together with a rotor 20 which is turnable around a fixed shaft 21. The embodiments shown in the Figs. enable to give the complete loose unit for use in a quartz watch a minimum thickness of 1,5 mm with a diameter of 5mm and having a thickness of at most 4 mm with a diameter of 11,5 mm.

This makes it possible to build the individual unit in existing battery powered watches.

The already mentioned researches and calculations show how optimal results are obtained while using permanent magnets with at least 4 poles, whereby, depending on the constructional choice, use can be made of radial or axial magnetisation.

It also appeared that preference may be given to a permanent magnet, provided with at least 4 poles, circumferentially provided with an iron yoke having claw poles.

Fig. 10 shows a possible embodiment in a cross section of a permanent magnet in the shape of an ellipsoide, having such an iron yoke, that magnetic saturation is just being prevented.

This can e.g. be done by making the iron thicker at the critical points.

In Fig. 10 the permanent magnet 22 is surrounded by the iron yoke 23 which provides for a cylindrical assembly.

It appears to be very well possible to produce the unit referred to for an attractive price which is lower than the price of a replaced battery.

Surely for use with a pacemaker the advantages with the generating mini power are more remarkable and also while applying this for hearing-aids, etc., total independency exists with respect to replacement batteries.

## PATENT CLAIMS

1. A portable mini AC generator/DC accumulator for mini power capacity, such as e.g. in use for a wrist, pocket or necklace watch, a pacemaker or a battery powered hearing-aid, in which, under the influence of the individual movement of its bearer, a mass inertia or rotor, set into motion with respect to a stator, not moving simultaneously therewith, and under the application of the principle of generating magnetic induction currents and via a rectifier known per se, transferring a mini AC into a mini DC, servicing the purpose of supplying or temporarily accumulating respectively a mini current, characterized in that the generator/accumulator consists of a mutually cooperating selective magnetic system of a rotor and a stator, provided with a permanent magnet, having at least 4 poles.
2. Generator/accumulator according to claim 1, characterized in that the rectifier is connected to a discharge protection for the accumulator.
3. Generator/accumulator according to claim 1, characterized in that a lithiumcell is used as a discharge protection.
4. Generator/accumulator according to claim 1, characterized in that a permanent magnet is used of the type samarium-cobalt in an isotropic or anisotropic version.
5. Generator/accumulator according to claim 4, characterized in that the rotor/stator assembly contains a permanent magnet provided with an axial magnetisation.
6. Generator/accumulator according to claim 4, characterized in that the rotor/stator assembly contains a permanent magnet provided with a radial magnetisation.
7. Generator/accumulator according to one of the claims 1 and 4-6, characterized in that a permanent magnet of the samarium-cobalt type having at least 4 poles along its circumference, is provided with an iron yoke having claw poles.
8. Generator/accumulator according to one of the claims 1 and 4-6, characterized in that the permanent magnet has the shape of an ellipsoïde with such



an iron yoke, that a cylindrical assembly is created.

9. Generator/accumulator according to one of the preceding claims, characterized in that the assembly of rotor/stator consists of a separate loose unit.

5 10. Generator/accumulator according to claim 9, characterized in that the loose unit to be used for a quartz watch has a thickness between at least 1,5 mm and no more than 4 mm and having a diameter of at least 5 mm and no more than 11,5 mm.





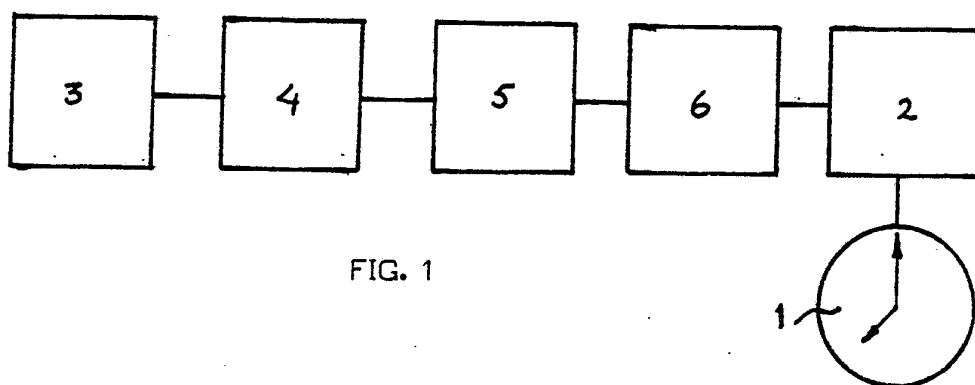


FIG. 1

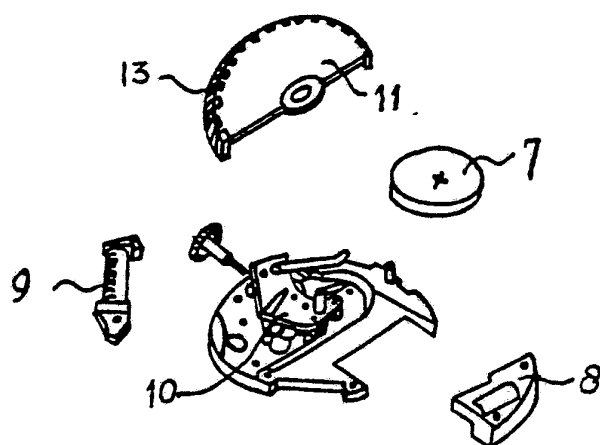


FIG. 2

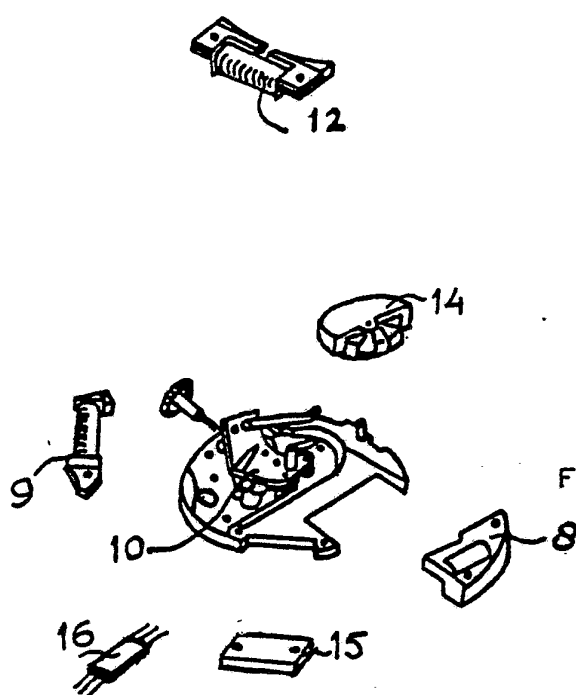


FIG. 3

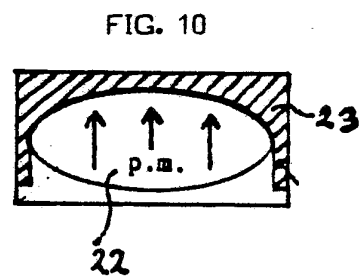


FIG. 10

FIG. 4

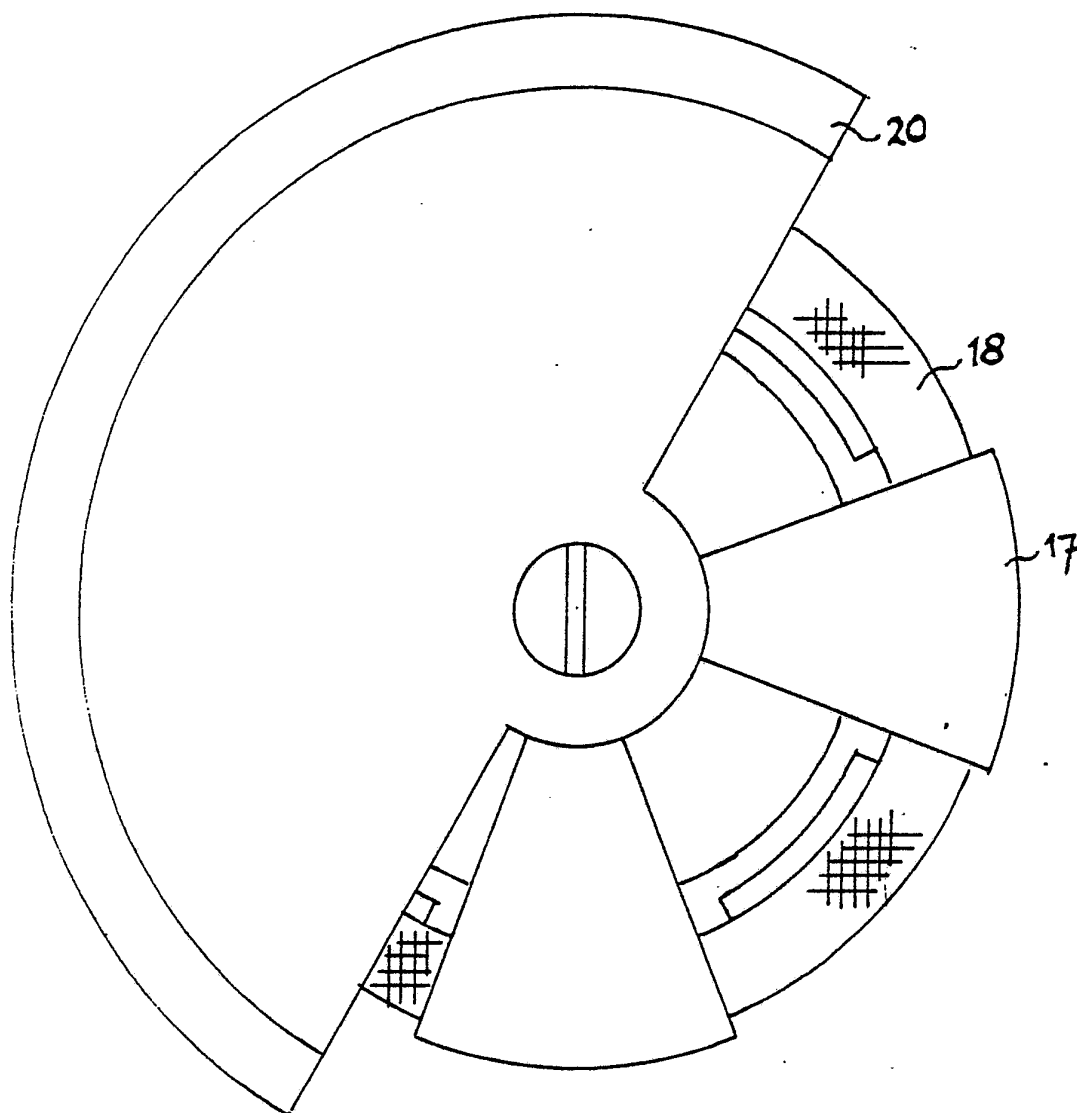
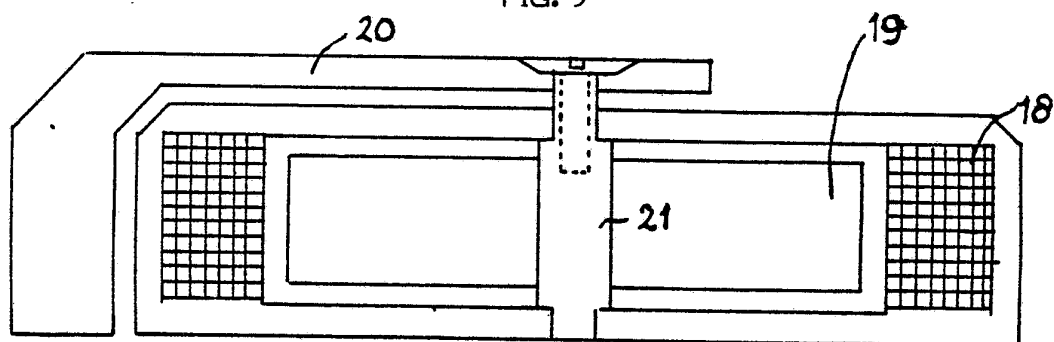


FIG. 5



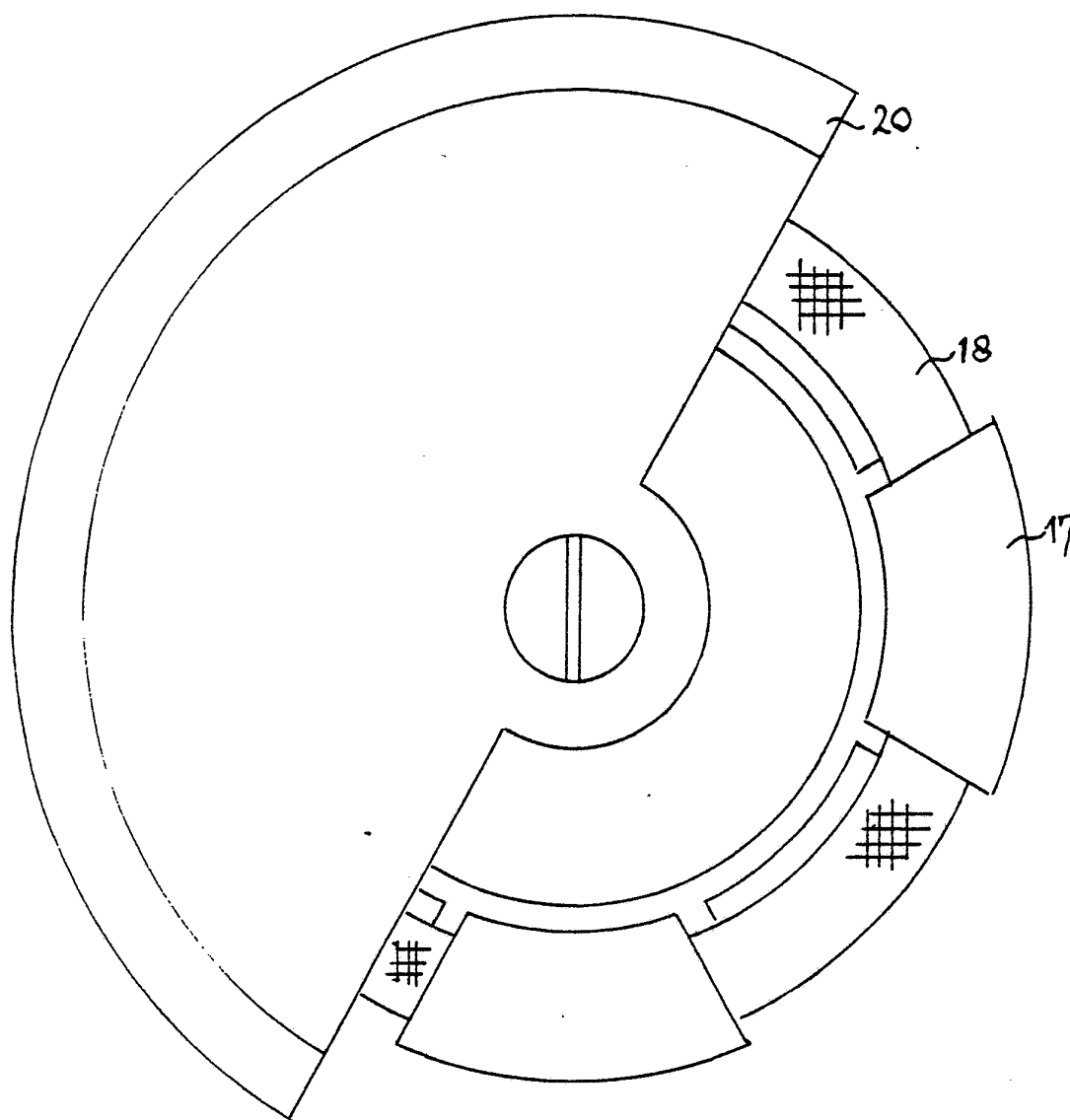


FIG. 7

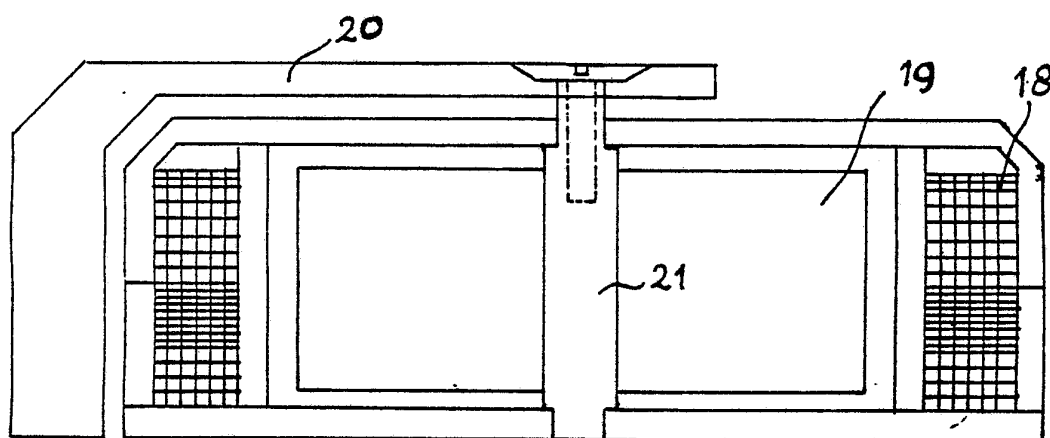
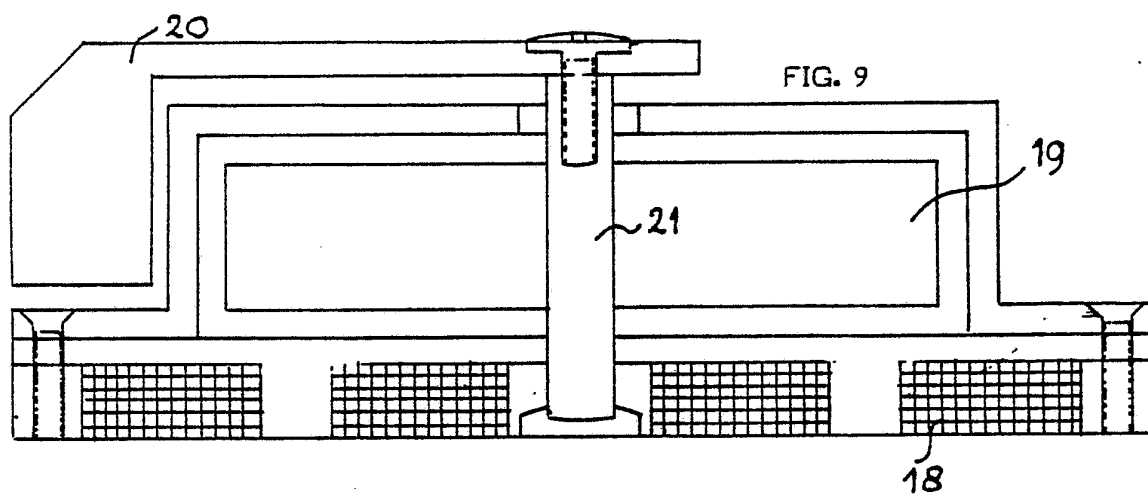
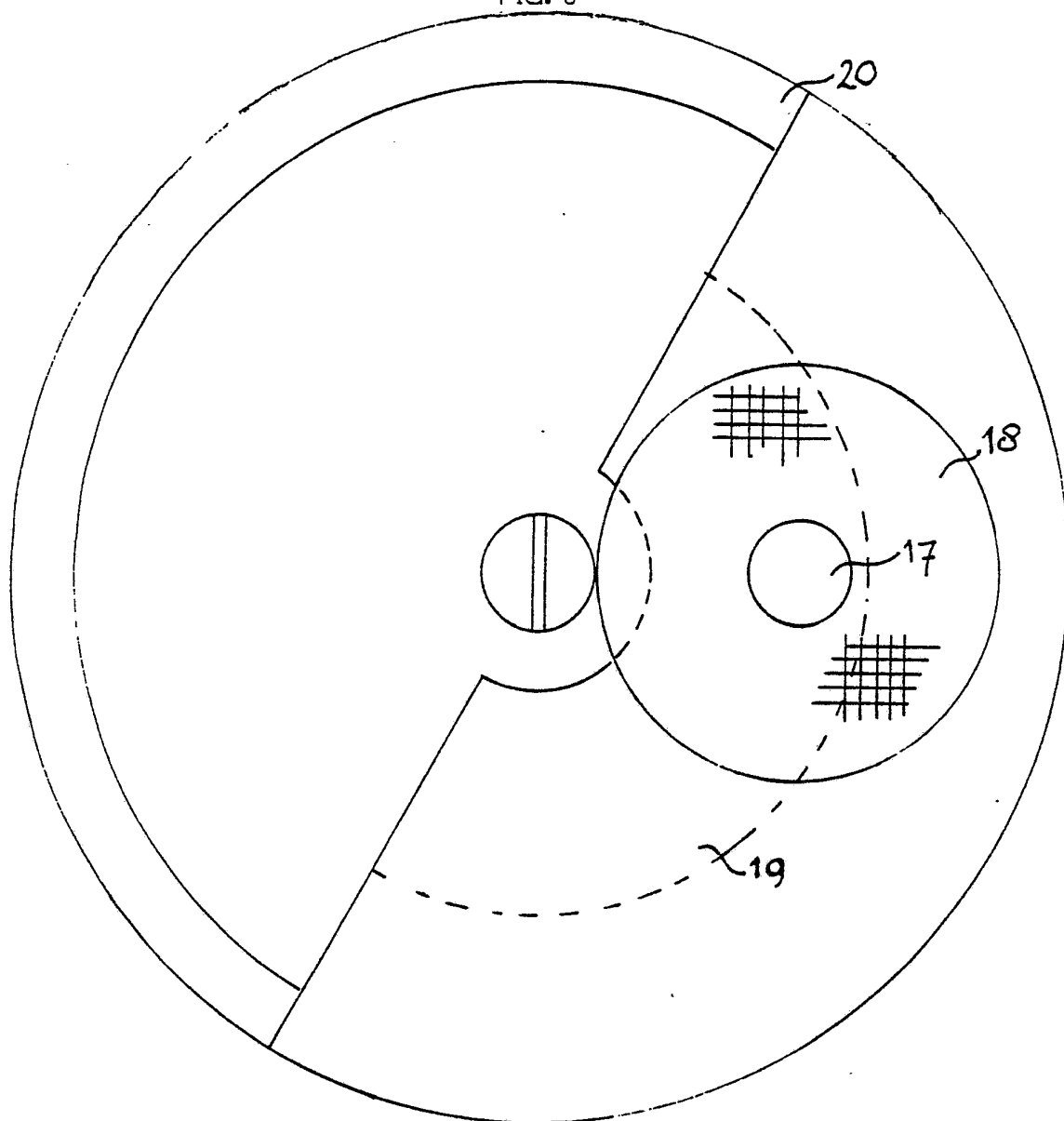


FIG. 8



# INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 83/00034

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>3</sup> : G 04 C 10/00; H 02 K 21/14; H 02 J 9/06; A 61 N 1/36		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC <sup>3</sup>	H 02 K; H 02 H; H 02 J; H 01 M; G 04 C; G 04 G	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category *	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	DE, A, 1058942 (KIESSINGER & OBERGFELL) 4 June 1959 see column 4, lines 20-46; figure 2 --	1,6,7
X	DE, A, 2751797 (QUARTZ-ZEIT AG.) 23 May 1979 see pages 6 and 7; figures --	1
A	DE, U, 1811389 (GEBRÜDER JUNGHANS AG.) 12 May 1960 see page 4, last paragraph - page 8, paragraph 1 --	1,10
A	Patents Abstracts of Japan, vol. 1, no. 135, 9 November 1977, see abstract 6152E77, JP, A, 5268466, Suwa Seikosha K.K., 7 June 1977 --	
A	FR, A, 2376307 (J.A.L. ASTIER) 28 July 1978 see page 6, lines 1-33; figures 2-4 --	1,4,5,7
A	US, A, 3800212 (R.P. BRANCO et al.)	./.
<p>* Special categories of cited documents: <sup>15</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search *	Date of Mailing of this International Search Report *	
30th November 1983	10 JAN. 1984	
International Searching Authority *	Signature of Authorized Officer <sup>20</sup>	
EUROPEAN PATENT OFFICE	G.L.M. Kruidenberg	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No <sup>18</sup>
	26 March 1974 see figures 1-3 --	1
A	CH, A, 364297 (STANDARD TELEPHON UND RADIO A.G.) 31 October 1962 see page 1, line 52 - page 2, line 38 --	2,3
A	GB, A, 942758 (RCA) 27 November 1963 see figures --	2
A	DE, A, 1952075 (R.W. REICH) 14 May 1970 see figures --	2
A	FR, A, 2482377 (J. AUZILLEAU et al.) 13 November 1981 see pages 1 and 2 -----	2

# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/NL 83/00034 (SA 5693)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 03/01/84

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 1058942		None	
DE-A- 2751797	23/05/79	JP-A- 54079679	25/06/79
DE-U- 1811389		None	
FR-A- 2376307	28/07/78	None	
US-A- 3800212	26/03/74	None	
CH-A- 364297		None	
GB-A- 942758		None	
DE-A- 1952075	14/05/70	FR-A- 2021454	24/07/70
FR-A- 2482377	13/11/81	None	

For more details about this annex :  
see Official Journal of the European Patent Office, No. 12/82