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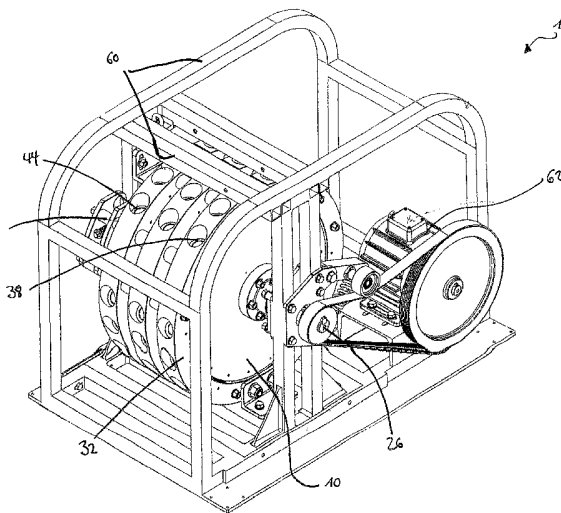
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(54) Title: PERMANENT MAGNET MACHINE



(57) Abstract: The invention provides a magnetic repellant motor which comprises: a shaft (26) rotatable about its longitudinal axis, a first set (16) of magnetics (14) arranged about the shaft (26) in a rotor (10) for rotation with the shaft (26), and a second set (42) of magnetics (40) arranged in a stator (32) surrounding the rotor (10), wherein the second set (42) of magnetics (40) is in interaction with the first set (16) of magnetics (14), wherein the magnetics (14, 40) of the first and second sets (16, 42) of magnetics are at least partially magnetically screened so as to concentrate their magnetic field strength in the direction of the gap between rotor (10) and stator (32).

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## PERMANENT MAGNET MACHINE

**Field of the invention**

This invention relates to a magnetic repellent motor, or drive mechanism. Such a mechanism may be useful for driving an electrical generation means, a vehicle, a vessel, an aircraft or the like.

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**Background to the invention**

Conventional power sources rely on fossil fuels or secondary power sources such as nuclear power or electricity derived by whatever means for its source of driving power.

All of the above sources of power suffer from disadvantages such as being the cause of pollution, requiring transportation or transmission over long distances to the point of use, and being costly to purchase.

Thus, there is a need for a power source which is substantially pollution-free to operate, requiring substantially no external power, and is simple to maintain.

**Summary of the invention**

The invention provides a magnetic repellent motor which comprises: a shaft rotatable about its longitudinal axis, a first set of magnetic sources arranged about the shaft in a rotor for rotation with the shaft, and a second set of magnetic sources arranged in a stator surrounding the rotor, wherein the second set of magnetic sources is in magnetic communication with the first set of magnetic sources, wherein the magnetic sources of the first and second sets of magnetic sources are at least partially magnetically screened so as to direct their magnetic field into a gap between the two sets of magnetic sources. Thus, the interaction of at least some of the magnetic sources of the first and second set urges the shaft to rotate.

The interaction may be the net repelling force of like magnetic poles repelling each other thereby urging the magnetic sources away from each other, however, since only the magnetic sources of the first set of magnetic sources are able to be displaced under the urging of the force, the shaft is urged to rotate into a position in which the repelling force is less.

The rotor may be substantially disc shaped, and the first set of magnetic sources may be located in a peripheral region of the rotor which rotates together with the shaft.

The stator may be in the form of a pair of arms, which co-operates with the corresponding rotor.

The arms of a pair may be displaceable relative to each other and their corresponding rotor, such that a gap between the arms and the rotor may be selectively set. The gap may be set manually, for example by a hand wheel, or automatically, for example by a centrifugal distributed weights system, thereby to effect control over the rotational speed of the shaft. i.e. the smaller the gap the greater the repulsion forces between the magnetic sources of the rotor and the stator.

The rotor may have a plurality of magnetic source receiving zones provided therein for receiving the magnetic sources of the first set of magnetic sources.

The stator may have a plurality of magnetic source receiving zones provided therein for receiving the magnetic sources of the second set of magnetic sources.

The receiving zones may be in the form of circumferentially extending spaced apart sockets.

The sockets may be substantially cylindrical and may be arranged in a plane perpendicular to the longitudinal axis of the shaft.

The sockets may be angled at an acute angle relative to the tangent to the circumference of the rotor at the mouth opening of its sockets and to the inner circumference of the stator at the mouth opening of its sockets.

This angle may be between 18 degrees and 40 degrees, preferably between 30 degrees to 35 degrees.

The sockets may receive or incorporate a socket lining consisting at least partially of a magnetic screening material. The socket lining may line the entire extent of the sockets so that only the opening to the exterior remains unlined.

The socket lining may comprise a shield of another magnetic screening material. The shield may envelop the entire extent of the socket lining so that only the opening to the exterior remains unlined. In another preferred embodiment, the shield covers a substantial percentage of the socket lining, e.g. 50% thereof.

The magnetic sources may be Nd-fe-B magnets sized and dimensioned to snugly fit into the sockets and socket linings, respectively.

The magnetic sources may be constituted by a 37mm diameter 75mm length cylindrical magnet having 360000 gauss.

The socket lining, the shield and the magnetic sources may comprise through holes to receive a securing pin, preferably in a direction parallel to the longitudinal axis of the shaft.

The number of sockets in the rotor and the corresponding stator may differ so that there is not a one to one relationship between the sockets in the rotor and the sockets in the corresponding stator. Likewise, the number of magnetic sources in the first and second sets may differ so that a proportion of the magnetic sources of the two sets are out of register at any given time. Some sockets may be empty i.e. without a magnetic source, in either the rotor or the stator, or in both.

The magnetic repellent motor may have one or more rotors and stators of the above type arranged in a stack.

It is preferable for magnetic sources of adjacent rotors to be out of register i.e. staggered or offset relative to each other.

### Description of the drawings

Without in any way limiting the scope of the invention, the invention will now be illustrated with reference to the accompanying drawings.

- Fig. 1 is a perspective view showing a rotor of the magnetic repellent motor according to the invention;
- Fig. 2 is a perspective view showing a stack of rotors of Fig. 1 in assembled arrangement;
- Fig. 3 is a perspective view showing a left arm of a stator of the magnetic repellent motor according to the invention;
- Fig. 4 is a perspective view showing a right arm of a stator of the magnetic repellent motor according to the invention;
- Fig. 5 is a perspective view showing a stack of stators of Fig. 3 and 4 in assembled arrangement;
- Fig. 6 is a perspective view showing a socket lining of a stator or a rotor of the magnetic repellent motor according to the invention;
- Fig. 7 is a perspective view showing a magnetic source of the magnetic repellent motor according to the invention; and

Fig. 8 is a perspective view showing one embodiment of the magnetic repellent motor according to the invention coupled to an electrical generator.

### Description of preferred embodiments

Referring to Fig. 1, a substantially disk-shaped rotor 10 is made of a non-magnetic material. The rotor 10 comprises a plurality of magnetic source receiving zones 12 provided therein for receiving magnetic sources 28 (shown in later figures) of a first set 16 of magnetic sources. The receiving zones 12 are in the form of circumferentially extending spaced apart and substantially cylindrical sockets 18 which are located in a plane perpendicular to the rotational axis of the rotor 10 in a peripheral region thereof.

In the region of the sockets 18, the rotor 10 further comprises through holes 20 arranged in its side surfaces 22 and extending parallel to the rotational axis of the rotor 10. The rotor 10 further comprises a centre hole 24 for receiving a shaft 26 (shown in later figures).

The sockets 18 are preferably angled at an acute angle relative to a tangent to the circumference of the rotor 10 at the mouth opening of the sockets 18. Preferably, this angle is between 18 and 40 degrees, more preferably between 30 and 35 degrees. In one particularly preferred embodiment the angle is 34 degrees.

As shown in Fig. 2, the sockets 18 receive (or incorporate) a socket lining 28 (shown in more detail in later figures) which is at least partially made of a magnetic screening non-metallic or metallic material, for example graphite. The socket lining 28 covers the entire extent of the sockets 18 so that only the opening to the exterior remains uncovered.

In the rotor assembly 30 shown in Fig. 2, three rotors 10 have been stacked in a row on the shaft 26. The connection between the rotors 10 and the shaft 26 as well as the connection between the multiple rotors 10 can be established via linking means known in the art. In general, the magnetic repellent motor 1 may have any

number of rotors 10 and corresponding stators 32, since the effect of operating several rotors 10 in parallel is accumulative. However, it may be useful for a smooth operation of the motor 1 to arrange the rotors 10 such that the magnetic sources of adjacent rotors 10 are staggered or offset relative to each other.

Referring to Fig. 3 and 4, a stator 32 is depicted. The stator 32 is made of a non-magnetic material. The left arm 34 shown in Fig. 3 and the right arm 36 shown in Fig. 4 combine to form the stator 32. Each of the arms 34, 36 has a substantially semicircular shape and is adapted to enclose the corresponding rotor 10 in radial direction while still leaving a gap between the stator 32 and the rotor 10. The arms 34, 36 of one stator 32 are displaceable relative to each other and their corresponding rotor 10 such that the gap between the arms 34, 36 and the rotor 10 may be selectively set.

The stator 32 comprises a plurality of magnetic source receiving zones 38 provided therein for receiving magnetic sources 40 (shown in later figures) of a second set 42 of magnetic sources. The receiving zones 38 again are in the form of circumferentially extending spaced apart and substantially cylindrical sockets 44 which are located in a plane perpendicular to the longitudinal axis of the shaft 26.

In the region of the sockets 44, the stator 32 comprises through holes 46 arranged in its side surfaces 48 and extending parallel to the longitudinal axis of the shaft 26.

The sockets 44 are again preferably angled at an acute angle relative to a tangent to the inner circumference of the stator 32 at the mouth opening of the sockets 44. Preferably, this angle is between 18 and 40 degrees, more preferably between 30 and 35 degrees. The angle of the sockets 18 and 44 and the relative positioning between them has to be adjusted to allow for a good performance of the motor 1.

Fig 5 shows a stator assembly consisting of three stators so as to fit to the rotor assembly of Fig. 2. As described with reference to the sockets 18 of Fig. 2, the sockets 44 receive (or incorporate) a socket lining 50 (shown in more detail in later figures) which is at least partially made of a magnetic screening non-metallic or

metallic material. The socket lining 50 covers the entire extent of the sockets 44 so that only the opening to the exterior remains uncovered.

Referring to Fig. 6, a socket lining 28, 50 of the rotor 10 or the stator 32 is depicted in more detail. The socket lining 28, 50 is formed to fit into the sockets 18, 44 and may fully be made of a non metallic or a metallic material which has magnetic screening properties. In one preferred embodiment the socket lining 28, 50 is made of diamagnetic graphite and is partially surrounded by an additional shield 52 of a material having strong magnetic screening properties, e.g. stainless steel. In the embodiment shown in Fig. 6, the shield 52 surrounds about 50% of the socket lining surface.

Thus, by at least partially covering the sockets 18, 44 with a magnetic screening material the magnetic field of inserted magnetic sources 14, 40 is, so to say, focused axially with the socket 18, 44, rather than dissipated about the magnets.

Further, through holes 54 are provided in the socket linings 28, 50 which correspond to through holes 20 and 46 in the rotor 10 and stator 32, respectively. Thus, a retaining pin 56 may be inserted after the magnetic source 14, 40 has been put in the socket 18, 44 to detachably fix the magnetic source 14, 40 to the socket lining 28, 50 and the socket 18, 44 so as to prevent expulsion of the magnetic sources 14, 40 during operation.

Fig. 7 shows a typical magnetic source 14, 40 used in the motor 1 according to the invention. The magnetic sources 14, 40 may be natural magnets, induced magnets or electromagnets. The magnetic source for example is a Nd-Fe-B magnet sized and dimensioned to snugly fit into the socket 18, 44 and socket lining 28, 50, respectively. In one preferred embodiment, the magnetic source 18, 44 is a substantially cylindrical shaped magnet and preferably has a diameter of 37mm, a length of 75mm and provides 360000 gauss. However, the magnetic source 18, 44 may be shaped differently than cylindrical and may comprise different characteristics. In any case, the magnetic source 18, 44 has to comprise an through hole 58 for receiving the retaining pin 56.



The magnetic repellent motor 1 of the example of Fig. 8 is mounted on a frame 60 and is coupled to an electrical generator 62. In this specific embodiment, the motor 1 comprises three rotors 10 of the above type which are mounted on a single rotating shaft 26 and work with three stators 32 of the above type to urge the shaft 26 to rotate about its longitudinal axis. The shaft 26 of the mechanism may be connected to a gearbox to obtain mechanical advantage. The stator arms can be moved e.g. by a stepper motor 62.

The number of sockets in the rotors 10 and their corresponding stators 32 may differ such that there is not a one to one relationship between the sockets 18 in the rotor 10 and the sockets 44 in the corresponding stator 32. Likewise, the number of magnetic sources in the stator 32 and the rotor 10 may differ so that a proportion of the magnetic sources 14, 40 are out of register at any given time. Some sockets may be empty i.e. without a magnetic source, in either the rotor 10 or the stator 32, or both.

The sockets 18 of the rotors 10 can be staggered i.e. offset relative to the sockets of adjacent rotors or they can line-up in register. Thus the magnetic repellent motor 1 may be time-tuned by the relative positioning of the magnetic sources 14 of adjacent rotors 10.

Thus, the interaction of at least some of the magnetic sources 14, 40 of the first and second set 16, 42 urges the shaft 26 to rotate. Once the shaft 26 begins to rotate the plurality of simultaneous interactions causes the shaft 26 to continue rotating.

As mentioned before, the magnetic repellent motor 1 may have any number of rotor 10 and stator 32 sets. Although the precise adjustment of the motor elements is important, one may imagine other embodiments covered by the invention according to the appended claims.

## Claims

1. A magnetic repellent motor which comprises:  
  
a shaft (26) rotatable about its longitudinal axis,  
  
a first set (16) of magnetic sources (14) arranged about the shaft (26) in at least one rotor (10) for rotation with the shaft (26),  
  
and a second set (42) of magnetic sources (40) arranged in at least one stator (32) surrounding the rotor (10), wherein the second set (42) of magnetic sources (40) is in magnetic communication with the first set (16) of magnetic sources (14),  
  
wherein the magnetic sources (14, 40) of the first and second sets (16, 42) of magnetic sources are at least partially magnetically screened so as to direct their magnetic field into a gap between the two sets (16, 42) of magnetic sources.
2. The magnetic repellent motor according to claim 1, wherein the rotor (10) is substantially disc shaped, and the first set (16) of magnetic sources (14) are located in a peripheral region of the rotor (10) which rotates together with the shaft (26).
3. The magnetic repellent motor according to claim 1 or 2, wherein the stator (32) is formed as a pair of arms (34, 36), which co-operate with the corresponding rotor (10).
4. The magnetic repellent motor according to claim 3, wherein the two arms (34, 46) of a pair are displaceable relative to each other and to the corresponding rotor (10), such that a gap between the arms (34, 36) and the rotor (10) may be selectively set.

5. The magnetic repellent motor according to any one of the preceding claims, wherein the rotor (10) may have a plurality of magnetic source receiving zones (12) provided therein for receiving the magnetic sources (14) of the first set (16) of magnetic sources.
6. The magnetic repellent motor according to any one of the preceding claims, wherein the stator (32) may have a plurality of magnetic source receiving zones (38) provided therein for receiving the magnetic sources (40) of the second set (42) of magnetic sources.
7. The magnetic repellent motor according to any one of the preceding claims, wherein the receiving zones (12, 38) are formed as circumferentially extending spaced apart sockets (18, 44).
8. The magnetic repellent motor according to claim 7, wherein the sockets (18, 44) are substantially cylindrical and are arranged in a plane perpendicular to the longitudinal axis of the shaft (26).
9. The magnetic repellent motor according to claim 7 or 8, wherein the sockets (18, 44) are angled at an acute angle relative to the tangent to the circumference of the rotor (10) at the mouth opening of its sockets (18) and to the inner circumference of the stator (32) at the mouth opening of its sockets (44), respectively.
10. The magnetic repellent motor according to claim 9, wherein the angle is between 18 degrees and 40 degrees, preferably between 30 degrees and 35.
11. The magnetic repellent motor according to any one of claims 7 to 10, wherein the sockets (18, 44) comprise or receive a socket lining (28, 50) consisting at least partially of a magnetic screening material.
12. The magnetic repellent motor according to claim 11, wherein the socket lining (28, 50) may comprise a shield (52) of another magnetic screening

material, which covers a substantial extent of the socket lining, preferably about 50% thereof.

13. The magnetic repellent motor according to any one of the preceding claims, wherein the magnetic sources (14, 40) are Nd-Fe-B magnets sized and dimensioned to snugly fit into the sockets (18, 44) and socket linings (28, 50), respectively.
14. The magnetic repellent motor according to any one of the preceding claims, wherein the magnetic sources (14, 40) are constituted by a 37mm diameter 75mm length cylindrical magnet providing 360000 gauss.
15. The magnetic repellent motor according to any one of claims 18 to 28, wherein the rotor (10) and stator (32), the socket lining (28, 50), and the magnetic sources (14, 40) comprise through holes (20, 46, 54, 58) to receive a retaining pin (56), preferably in a direction parallel to the longitudinal axis of the shaft (26).
16. The magnetic repellent motor according to any one of claims 7 to 15, wherein the number of sockets (18) in the rotor (10) filled with magnetic sources (14) and the number of sockets (44) in the corresponding stator (32) filled with magnetic sources (40) differ.
17. The magnetic repellent motor according to any one of the preceding claims, wherein it comprises a plurality of rotors (10) and stators (32) arranged in a stack.
18. The magnetic repellent motor according to claim 17, wherein the magnetic sources (14) of adjacent rotors (10) are staggered or offset relative to each other.

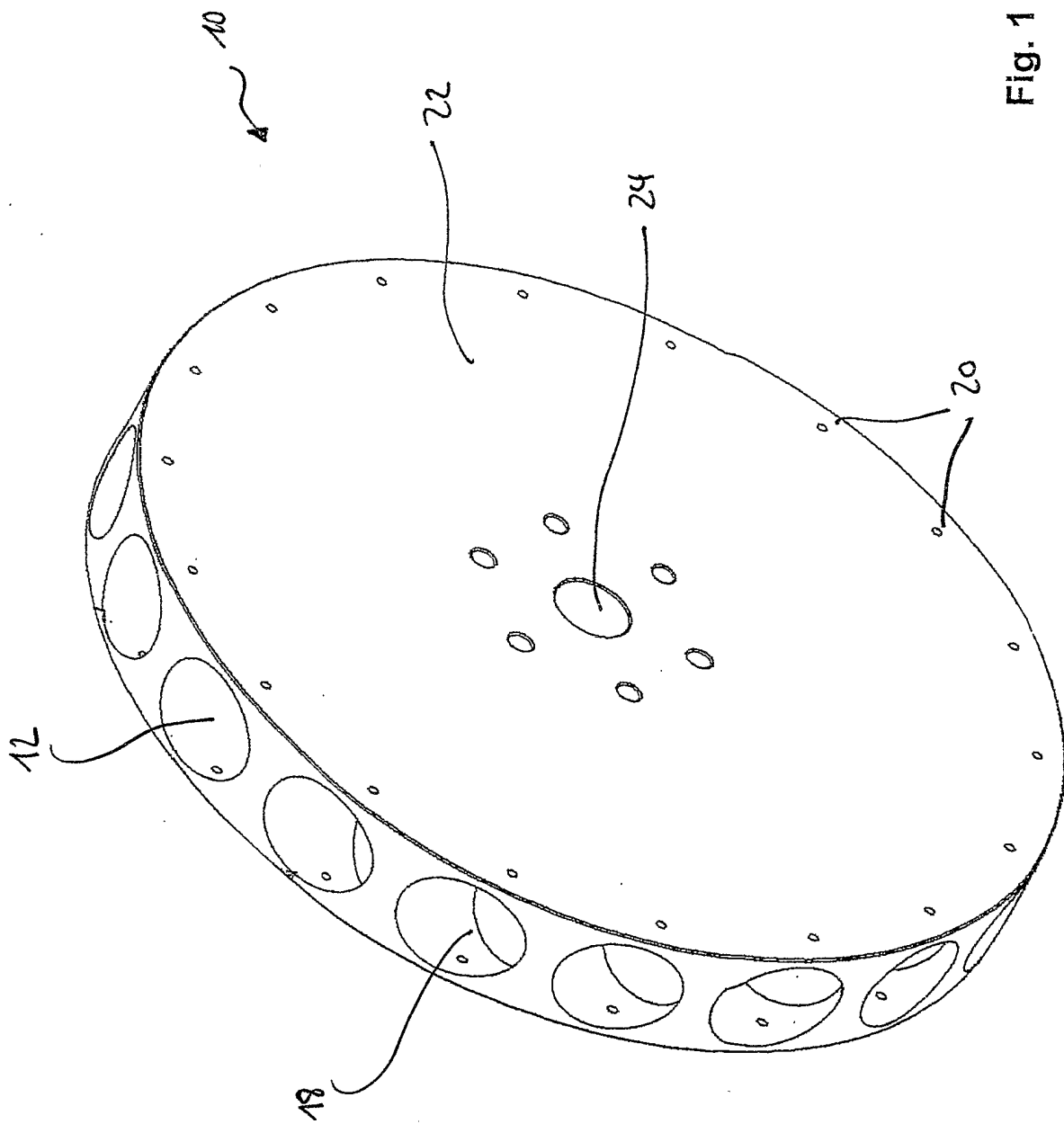


Fig. 1

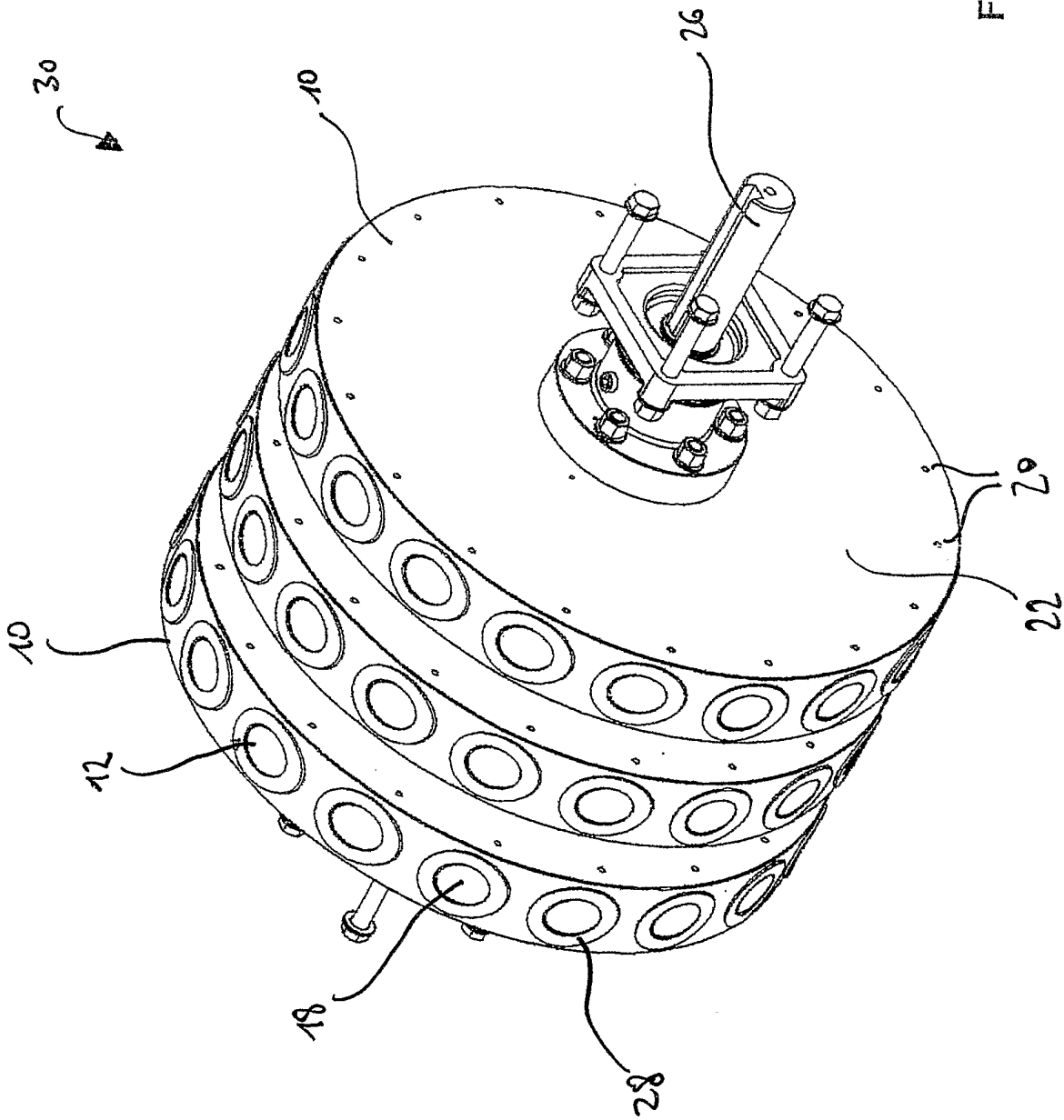


Fig. 2

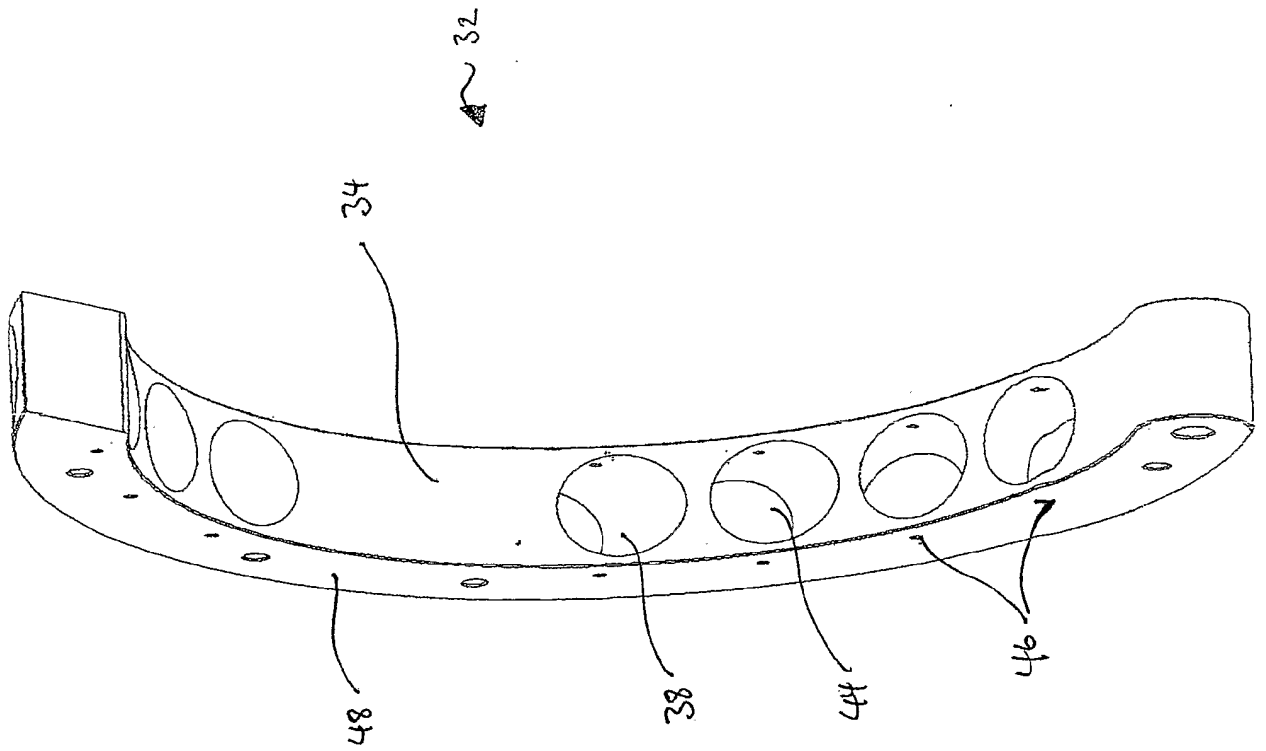


Fig. 3

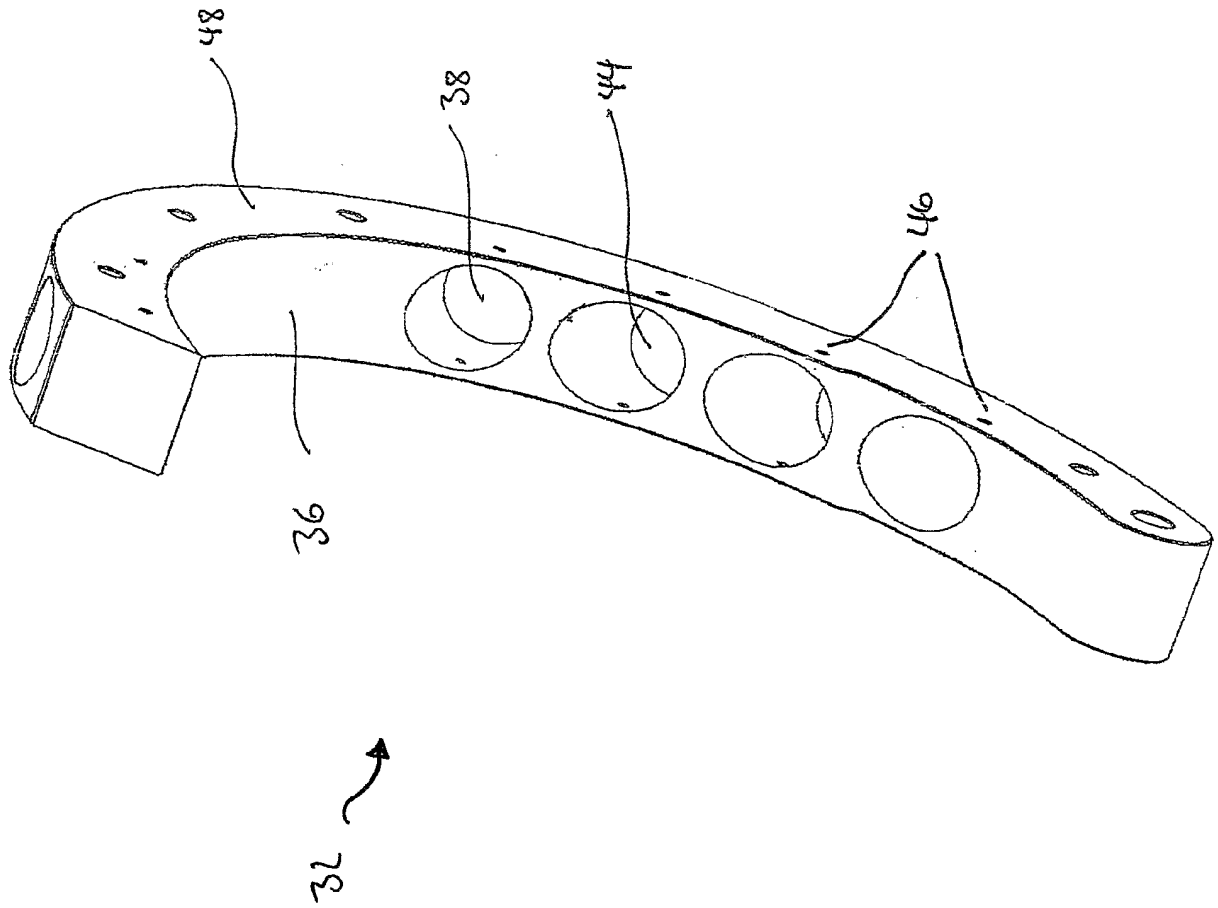


Fig. 4



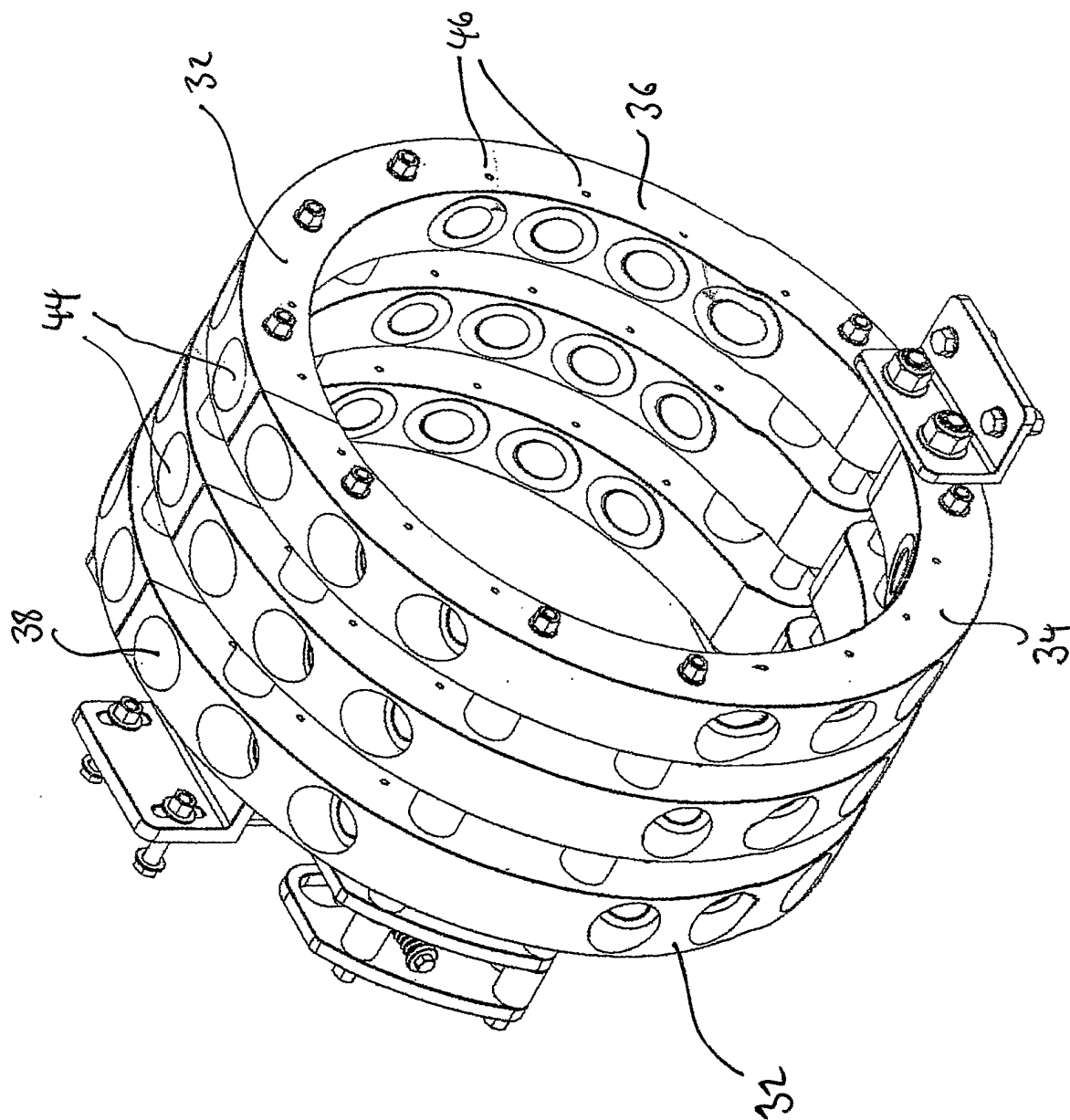


Fig. 5

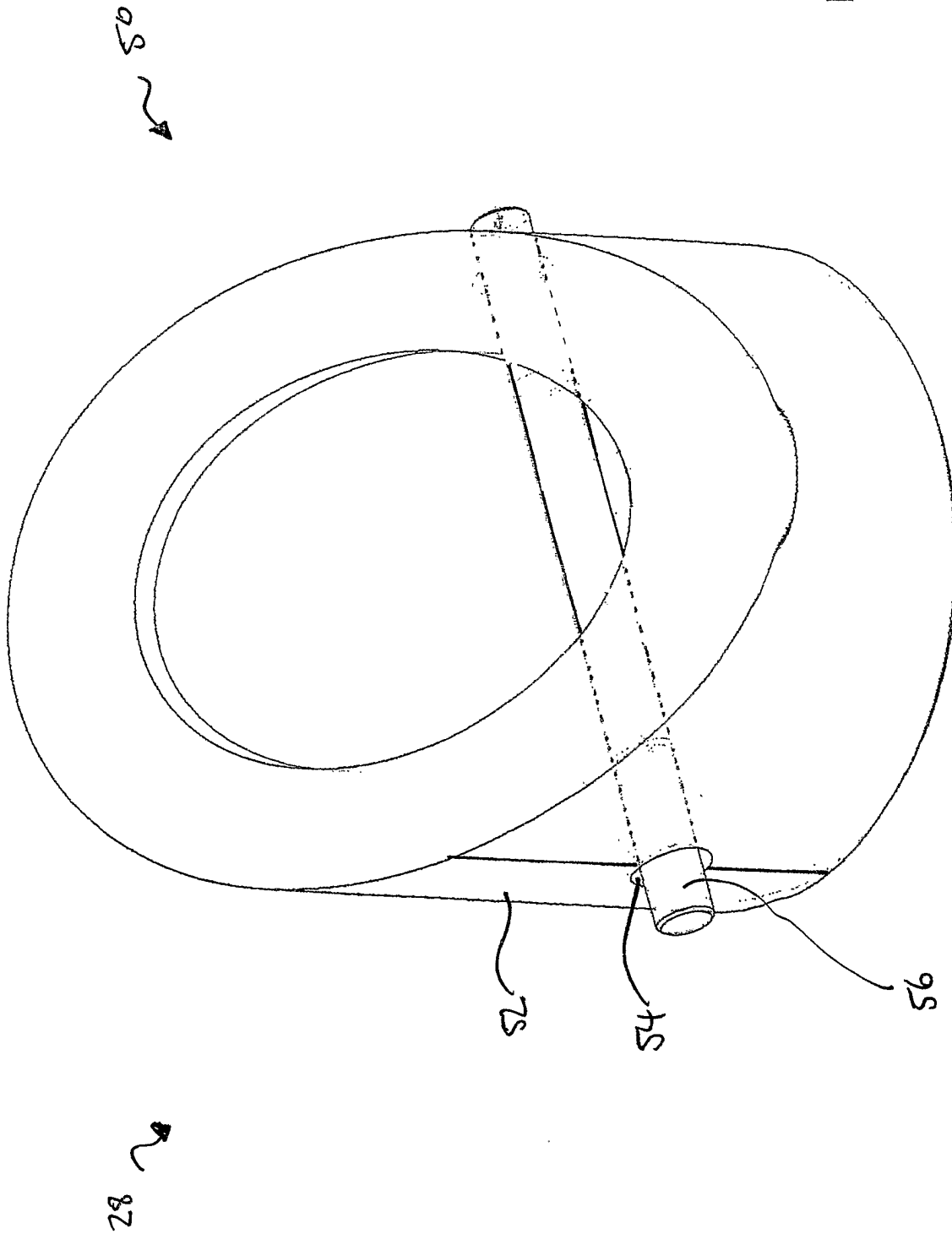


Fig. 6

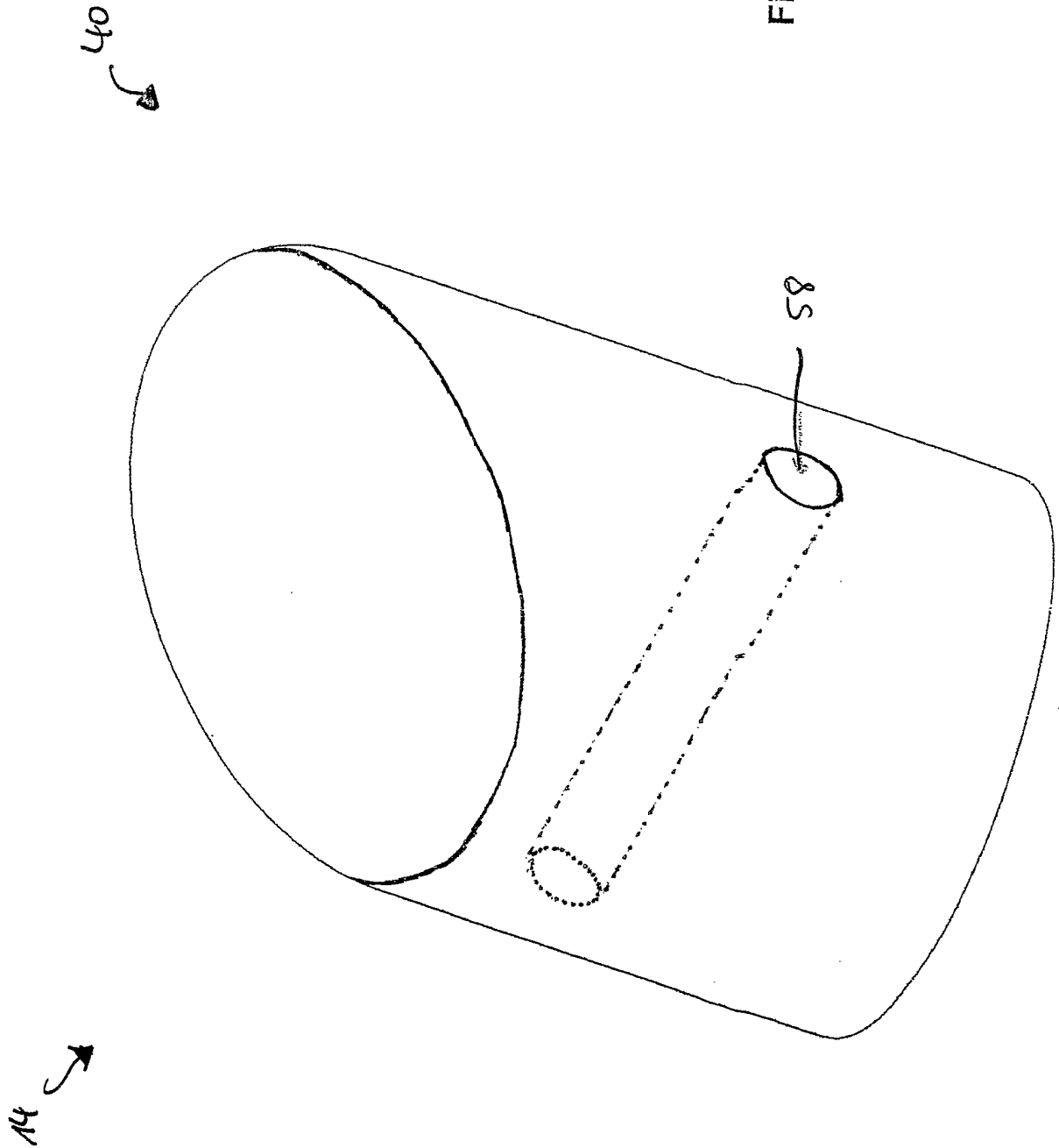
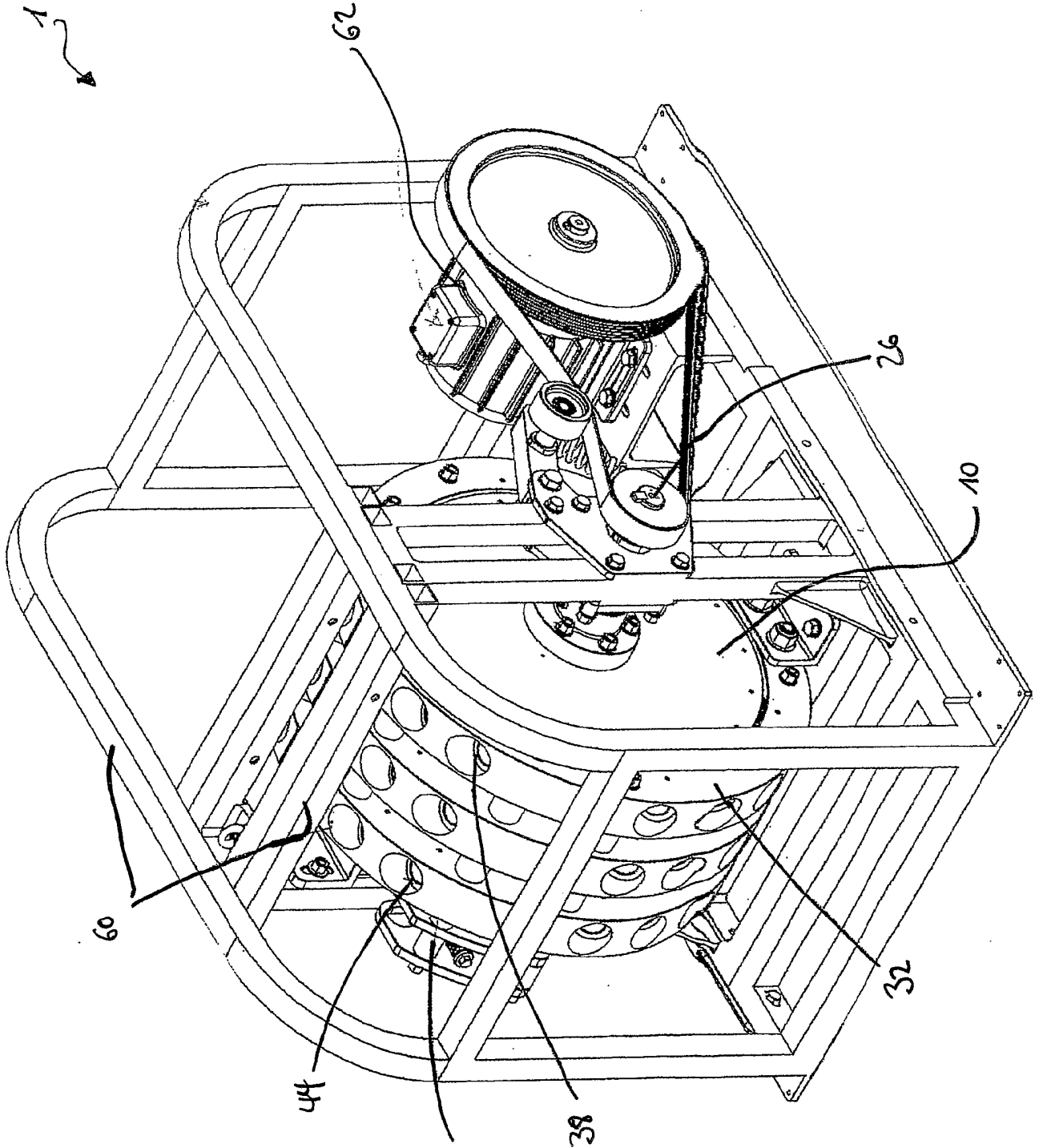


Fig. 7

Fig. 8



**INTERNATIONAL SEARCH REPORT**

International Application No  
PCT/EP2004/012159

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H02K53/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H02K

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)  
EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ANGRIST S W: "PERPETUAL MOTION MACHINES" SCIENTIFIC AMERICAN, SCIENTIFIC AMERICAN INC. NEW YORK, US, vol. 218, no. 1, January 1968 (1968-01), pages 114-122, XP002036811 ISSN: 0036-8733 the whole document	1-18
X	DE 35 26 806 A1 (DELEGATE, HEIKO) 22 May 1986 (1986-05-22)	1, 2, 5-8, 11-13, 16-18
Y	page 11, paragraph 1 - page 12, paragraph 4 page 18, paragraph 1 - page 22, paragraph 4; figures 1, 2, 12, 14, 16-21	3, 4
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search  14 June 2005	Date of mailing of the international search report  24/06/2005
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  von Rauch, E
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INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP2004/012159

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2 851 092 A (RENE YHANNIS ELITCHAY) 13 August 2004 (2004-08-13) page 1, line 27 - page 3, line 25; figures 1,3d-e,5a-d,6,6a-b -----	3,4
X	FR 2 310 019 A (DELAVAL CLAUDE) 26 November 1976 (1976-11-26) page 1, line 7 - page 2, line 23; figures 1,2 -----	1,5-13
A		14
X	US 2003/234590 A1 (GITZEN CHRISTOPHER MARK ET AL) 25 December 2003 (2003-12-25) page 2, paragraph 24 - page 3, paragraph 51; figures 1,2,4,5 -----	1,2, 5-10,16
A		14

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/EP2004/012159

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3526806	A1	22-05-1986 NONE	
FR 2851092	A	13-08-2004 FR 2851092 A1	13-08-2004
FR 2310019	A	26-11-1976 FR 2310019 A1	26-11-1976
US 2003234590	A1	25-12-2003 NONE	