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EUROPEAN PATENT APPLICATION

②① Application number: **88306940.3**

⑤① Int. Cl.4: **G 01 D 5/22**
F 15 B 15/28

②② Date of filing: **28.07.88**

③⑩ Priority: **31.07.87 GB 8718173**

④③ Date of publication of application:
01.02.89 Bulletin 89/05

⑥④ Designated Contracting States: **DE FR GB IT**

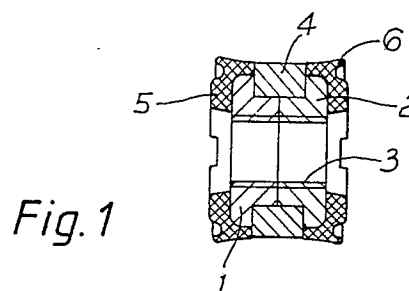
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⑤④ **Sensing system.**

⑤⑦ A non-contact positional sensing system for a piston movable within a cylinder in which the piston is formed entirely from magnetic material (except for any seals used to seal the piston within the cylinder)



Description

Sensing System

This invention relates to non-contact positional sensing systems and has particular reference to non-contact positional sensing systems for a piston movable longitudinally within a cylinder.

Non-contact positional sensing of pneumatic cylinder pistons is common practice. Normally, a magnet is fitted to the piston and a reed switch or magnetically sensitive proximity sensors are attached to the cylinder barrel around its diameter. The magnets which have been used heretofore have been of the ring type in various materials dependent upon the required field strength. Typical examples have been Samarium Cobalt, Ceramic Ferrite or a plastics material with a ferrite filler. The magnetic ring may be located between split piston halves.

Unfortunately, the magnetic materials which have a high strength tend to be very expensive and this makes the magnetic piston system expensive.

By the present invention there is provided a non-contact positional sensing system for a piston movable longitudinally within a cylinder, in which the cylinder is formed of non-ferromagnetic material, there is a magnetically sensitive proximity sensor on the outside of the cylinder and the piston is magnetic, characterised in that the piston is formed substantially entirely from magnetic material.

The piston may be moulded from magnetic material. The magnetic material may comprise magnetic particles in a non-magnetic matrix. The piston may be moulded by injection moulding. The proportion of magnetic particles is preferably as high as practical and may be in the range 60-90% or 70-90% or 80-90% of the material. The plastics material may be nylon and is preferably nylon 6/10. The magnetic material may be a strontium ferrite filler. There may be present 88% by weight of strontium ferrite material.

The piston may be provided with non-magnetic seals which may be of conventional form. The seals may be cup seals or 'O' ring seals or disc seals.

By way of example embodiment of the present invention will now be described with reference to the accompanying drawings of which

FIGURE 1 is a cross section of a prior art piston with ring magnet

FIGURE 2 is a cross section of one form of the invention, and

FIGURE 3 is a cross section of a second form of the invention.

In Figure 1 there is provided a piston comprising a pair of moulded plastics halves 1, 2 which are conjoined together by an inner sleeve 3. The two halves 1 and 2 trap between them a ring magnet 4. The pair of seals 5, 6 seal the piston within a cylinder. The cylinder and proximity sensors are well known and conventional and are not described herein.

In Figure 2, the magnetic piston comprises an injection moulded body 7 formed of 6/10 nylon containing 88% by weight of strontium ferrite. The piston has a blind bore 8 permitting it to be attached to a piston rod, further piston or other piston

follower. Cup seals 9 and 10 seal the piston within the cylinder.

The piston may be a hollow piston as shown in Figure 3 in which the piston 11 is in the form of an injection moulded tubular member having cup seals 12 and 13.

The use of an injection moulded piston assembly enables the complete piston to be produced from magnetic material. This permits a greater volume of magnetic material within the piston envelope (compared to conventional designs), which permits the use of weaker and hence cheaper magnetic material and also significantly cheaper plastics materials may be used.

In the preferred embodiment in which the piston is injection moulded, very close tolerances can be held to the design and a very good surface finish can be provided.

Because the piston is formed almost entirely of magnetic material, significant savings in the length of the piston can be achieved by using a moulded form of magnetic material.

Claims

1. A non-contact positional sensing system for a piston movable longitudinally within a cylinder, in which the cylinder is formed of a non-ferromagnetic material, there is a magnetically sensitive proximity sensor on the outside of the cylinder and the piston is magnetic, characterised in that the piston is formed substantially entirely from magnetic material.

2. A system as claimed in claim 1 in which the piston is moulded from magnetic material.

3. A system as claimed in claim 2 in which the magnetic material comprises magnetic particles in a non-magnetic matrix.

4. A system as claimed in claim 2 or 3 in which the piston is formed by injection moulding.

5. A system as claimed in any one of claims 3 or 4 in which the proportion of magnetic particles is in the range of 60% to 90% preferably 70% to 90% and further preferably 80% to 90% of the material.

6. A system as claimed in any one of claims 3 to 5 in which the plastic material is nylon.

7. A system as claimed in any one of claims 2 to 6 in which the magnetic material is strontium ferrite.

8. A system as claimed in any one of claims 2 to 6 in which the magnetic material is selected from the group samarium cobalt or ceramic ferrite materials.

9. A system as claimed in any one of claims 1 to 8 in which the piston is provided with non-magnetic seals.

10. The system as claimed in claim 9 in which

seals are selected from the group cup seals, 'O'
ring seals or disc seals.

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Fig. 1

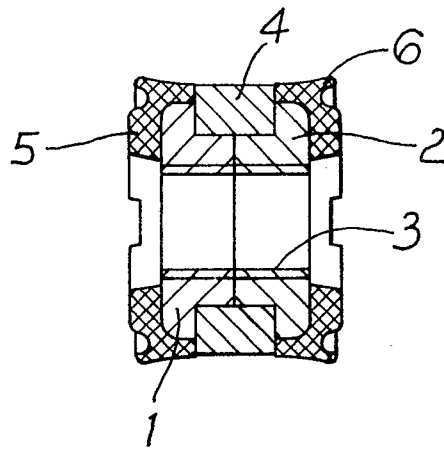


Fig. 2

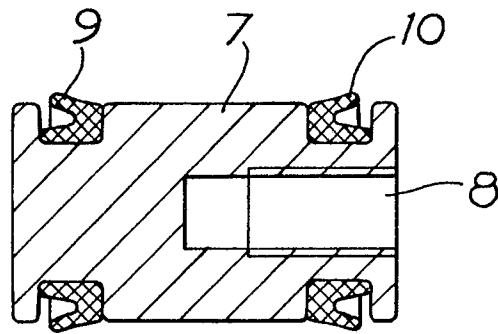
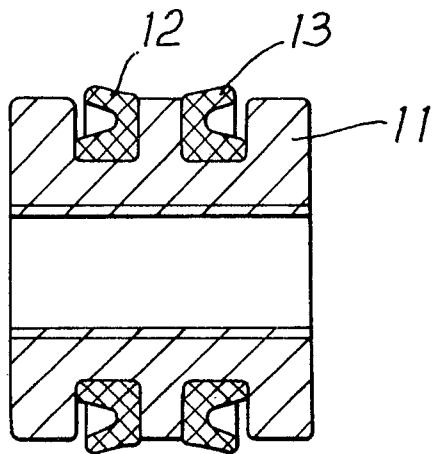


Fig. 3





DOCUMENTS CONSIDERED TO BE RELEVANT			EP 88306940.3
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	DE - A1 - 3 424 461 (KABUSHIKI KAISHA TOKYO KOKI SEIZOSHO)	1	G 01 D 5/22
A	* Fig. 1; page 5, lines 1-8 * -----	2-10	F 15 B 15/28
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			F 15 B 15/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 10-11-1988	Examiner KUNZE
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	