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(12) # EUROPEAN PATENT APPLICATION

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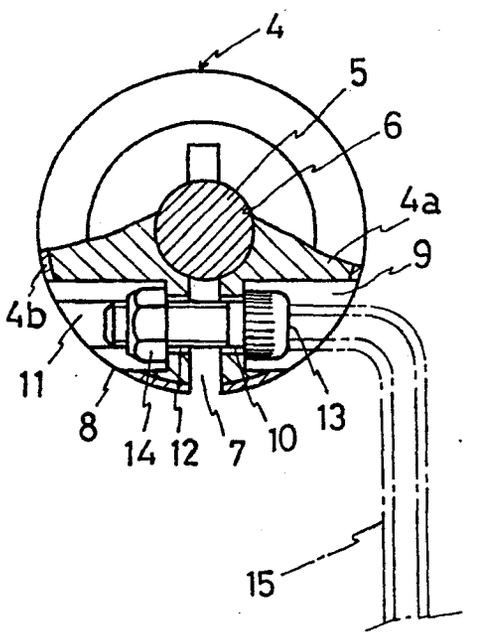
(54) **DOG.**

(57) A dog for a detection switch such as a limit switch or the like in which a slotted groove part (8) opening onto a slotted groove (7) communicating with a through hole (6) through which a screw stud (5) is inserted is formed with a hexagonal counterbored hole (9) and a bolt hole (10) perpendicularly crossing the slotted groove (7) on one side of the outer periphery of the slotted groove part (8), and with a hexagonal counterbored hole (11) and a bolt hole (12) corresponding symmetrically to the holes (9) and (10), on the other side of the outer periphery of the groove portion (8), thereby enabling the insertion or engagement of a bolt with a hexagonal hole (13) or a hexagonal nut (14) from either counterbored hole (9) or (11), and the tightening thereof.



EP 0 115 541 A1

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DESCRIPTION

DOG

Technical Field:

This invention relates to a dog for a detector switch, for example, a limit switch, which is used to detect a position to which a machine is moved.

Background Art:

A conventional dog of this kind, which is shown in Figs. 1-3, is made of steel. The dog has in its central portion a through bore b, through which a screw stud a is inserted, the bore b extending in the axial direction of the dog. The dog is further provided with a slit c extending in the same direction as the through bore b and having portions extending above and below the through bore b. A slit portion d of the dog, through which the lower portion of the slit c extends to be opened downward, is provided at one side of an outer circumferential surface thereof with a circular spot-faced bore e and a bolt-inserting bore f, which extend at right angles to the slit c, and which communicate with each other. ~~At~~ The other side of the outer circumferential surface of the ~~crescent~~ slit portion d is provided with a threaded bore g communicating with the bolt-inserting bore f. When a hexagonal bore-carrying bolt h is

inserted into the spot-faced bore e to be tightened by turning a hexagonal rod spanner S, the slit portion d is bent, tightening on the screw stud a inserted in the through bore b and causing the dog i to be fixed thereto.

The operation for making the threaded bore g in the conventional dog constructed as described above is started at a predetermined portion of a curved outer circumferential surface thereof. Therefore, an edged tool used shows a marked tendency to escape along the curved surface at the initial stage of the bore-making operation. Consequently, the bore to be made cannot be centered, and is difficult to make. Since the bore must be made accurately, a considerably skilled hand is required.

Setting and regulating ~~adjusting~~ such a dog is often done in a narrow place between the machine and ~~another~~ various other machines. In a dog of a conventional construction, the hexagonal rod spanner S can be fitted into only one side thereof, i.e. the side in which the spot-faced bore e is provided. This causes much trouble in the handling of the spanner S.

Therefore, it is an object of the present invention to provide in view of the above-mentioned

points a dog capable of being tightened from either side and manufactured very simply, eliminating the drawbacks encountered in a conventional dog of this kind.

Disclosure of Invention:

The dog according to the present invention is provided at both sides of an outer circumferential surface of a slit (-carrying) section 8 thereof with hexagonal spot-faced bores 9, 11 and bolt-inserting bores 10, 12, which extend at right angles to a slit 7, and which communicate with each other, in such a manner that the bores 9, 11 and the bores 10, 12 are symmetrically opposed to each other. Accordingly, either a hexagonal bore-carrying bolt 13 or a hexagonal nut 14 can be inserted or fitted into either the spot-faced bore 9 or the spot-faced bore 11, and the dog can be tightened from either of two opposite directions. This enables setting and adjusting the dog to be done easily in a narrow space, and the efficiency of the operation to be improved.

Unlike a conventional dog, the dog according to the present invention does not require a threaded bore, which is difficult to make in a curved outer circumferential surface, to be provided.

This enables the dog to be manufactured simply, and the cost of manufacturing the same to be reduced.

Brief Description of Drawings:

Figs. 1-3 are a left side elevation view, a front elevation view partially in section, and a right side elevation view partially in section, of a conventional dog;

Figs. 4-6 are a left side elevation view, a front elevation view partially in section, and a right side elevation view partially in section, of an example of a dog according to the present invention, Fig. 6 also illustrates a limit switch relative to the dog; and

Figs. 7 and 8 are a front elevation view partially in section, and a right side elevation view of another example of a dog according to the present invention, Fig. 8 also illustrates a limit switch relative to the dog.

Best Mode for Carrying Out the Invention:

An example of a dog according to the present invention applied to a limit switch will be described with reference to Figs. 4-6. Reference numeral 1 denotes a limit switch, 2 a roller for the limit switch, 3 a casing, and 4 a dog body for

the limit switch 1. A principal portion 4a of the dog body 4 is made, for example, of a synthetic resin so as to manufacture the dog easily and reduce the weight thereof. An outer circumferential surface of the principal portion 4a is plated, for example, with hard chromium 4b to prevent the portion of the outer surface of the dog which contacts the roller 2 for the limit switch 1 from being worn and the outer surface of the dog from being damaged by sparks during cutting and welding operations. When the principal portion 4a consisting of a synthetic resin is plated in such a manner, a metal film is formed on its outer circumferential surface, so that such a dog can be used not only for a limit switch but also for a proximity switch or a non-contact-carrying switch.

The dog is provided at its central portion with a through bore 6 extending in the axial direction thereof and formed to enable a screw stud 5 to be inserted therethrough, and a slit 7 extending in the same direction as the through bore 6 and consisting of portions extending above and below the through bore 6. A slit-carrying section 8, in which the slit 7 extends opening downward, is provided at both sides of its outer circumferential surface

with bolt-tightening and inserting hexagonal spot-faced bores 9, 11 and bolt inserting bores 10, 12, which bores 9, 11 and 10, 12 extend at right angles to the slit 7 and communicate with each other. The bores 9, 11 and 10, 12 are provided symmetrically opposing each other. Namely, one side of the outer circumferential surface of the slit-carrying section 8 is provided with a bolt tightening and inserting hexagonal spot-faced bore 9 and a bolt-inserting bore 10 communicating with the bore 9, so that these bores 9, 10 extend at right angles to the slit 7; the other side portion of the outer circumferential surface of the slit-carrying section 8 is provided with a bolt tightening and inserting hexagonal spot-faced bore 11 and a bolt-inserting bore 12 communicating with each other and positioned in symmetric opposition to and shaped identically with the bores 9, 10, respectively. Referring to the drawings, reference numeral 13 denotes a hexagonal bore-carrying bolt inserted into one spot-faced bore 9, and 14 a hexagonal nut inserted into the other spot-faced bore 11 to be screwed to the bolt 13.

Figs. 7 and 8 illustrate another example of the present invention, i.e. a disc type dog formed by utilizing the techniques according to the

present invention. As is clear from these drawings, the techniques according to the present invention can be applied to various shapes of dogs.

Industrial Applicability:

A method of tightening a dog according to the present invention will be described. First, the dog body 4 is fitted around the screw stud 5, and the hexagonal bore-carrying bolt 13 is inserted into either of the hexagonal spot-faced bore 9, 11 with the hexagonal nut 14 inserted into the other hexagonal ~~bore-carrying~~ spot-faced bore 11 or 9. When the bolt 13 is turned by the hexagonal rod spanner 15 into the nut 14 fitted in the bore 11 or 9, the slit -carrying section 8 is bent gradually to tighten the screw stud 5. Consequently, the dog body 4 is fixed to the screw stud 5.

WHAT IS CLAIMED IS:

1. A dog having therein a through bore 6 extending in the axial direction of said dog for a screw stud 5 to be inserted therethrough and a slit 7 communicating with said through bore 6; and including a slit-carrying section 8, hexagonal spot-faced bores 9, 11 and bolt-inserting bores 10, 12 formed in both side portions of an outer circumferential surface of said slit-carrying section 8 so as to extend at right angles to and communicate with said slit 7 and so as to be symmetrically opposed to each other, a hexagonal bore-carrying bolt 13 inserted into either of said hexagonal spot-faced bores 9, 11, and a hexagonal nut 14 fitted into the other hexagonal spot-faced bore 11 or 9, said bolt 13 being turned into said nut 14, whereby said dog can be tightened from either of two opposite directions.

2. A dog according to Claim 1, wherein the body of said dog is made of a synthetic resin, said dog body is plated at its outer circumferential surface.

3. A dog according to Claim 2, wherein said outer circumferential surface of said dog body is plated with hard chromium 4b.

FIG. 1

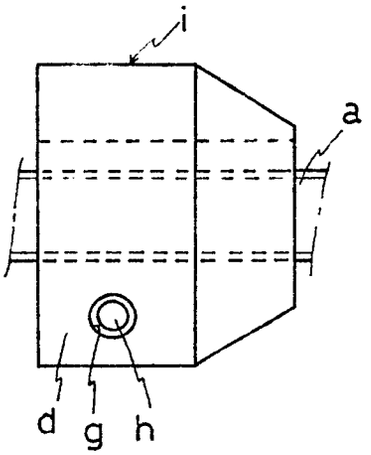


FIG. 2

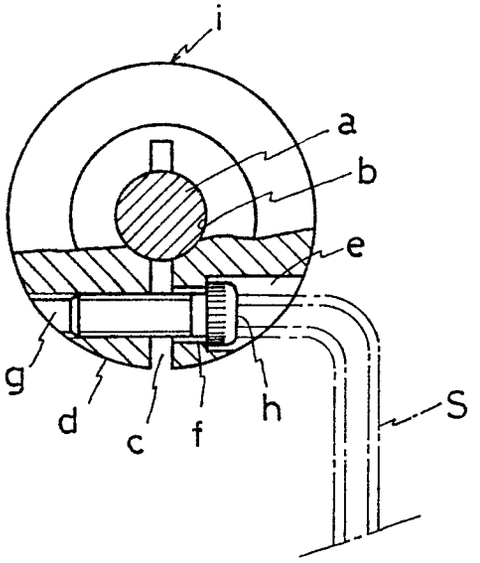


FIG. 3

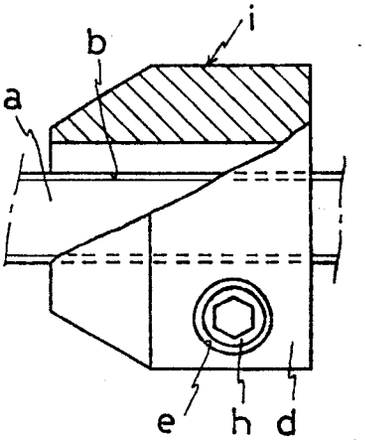


FIG. 4

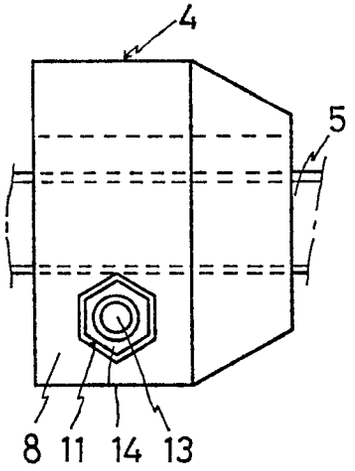


FIG. 5

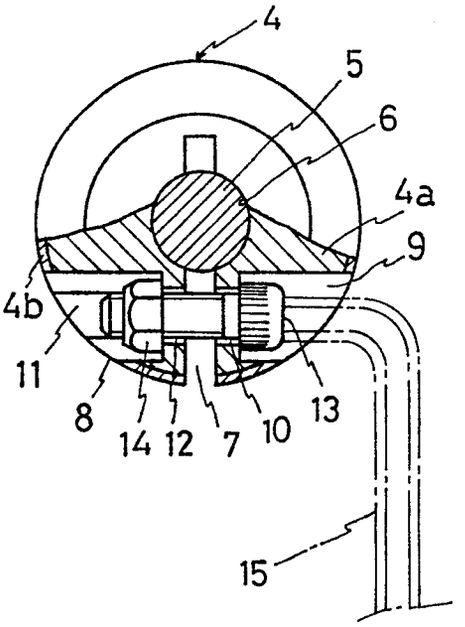


FIG. 6

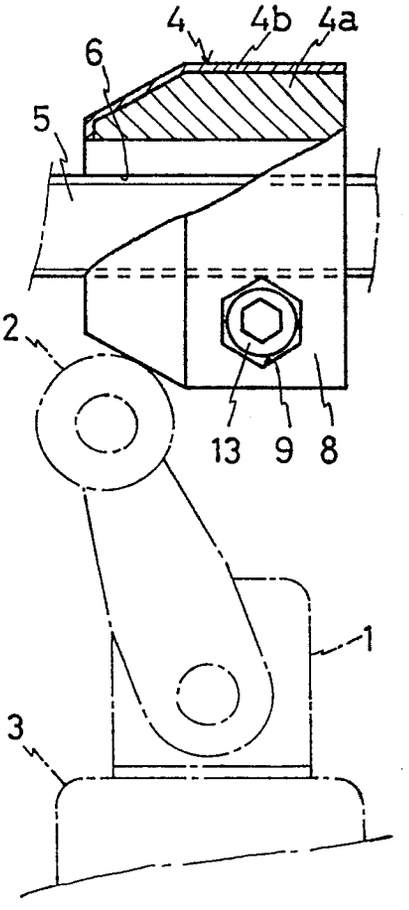


FIG. 8

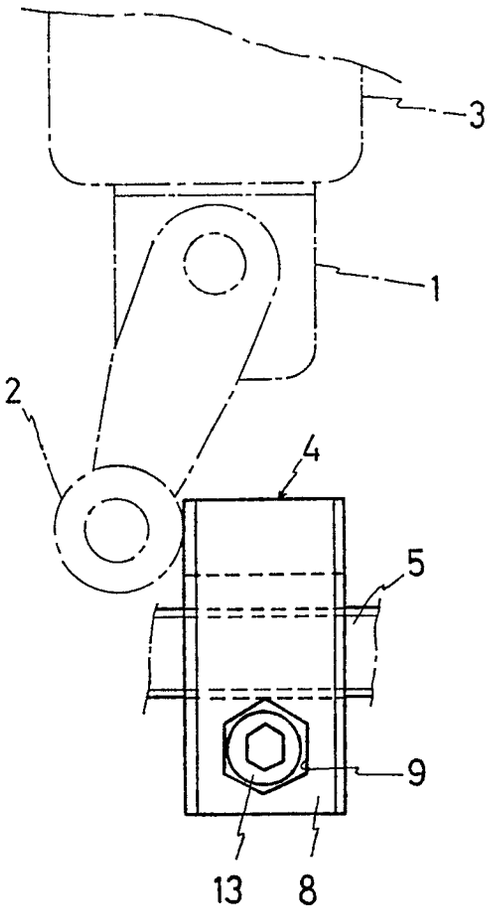
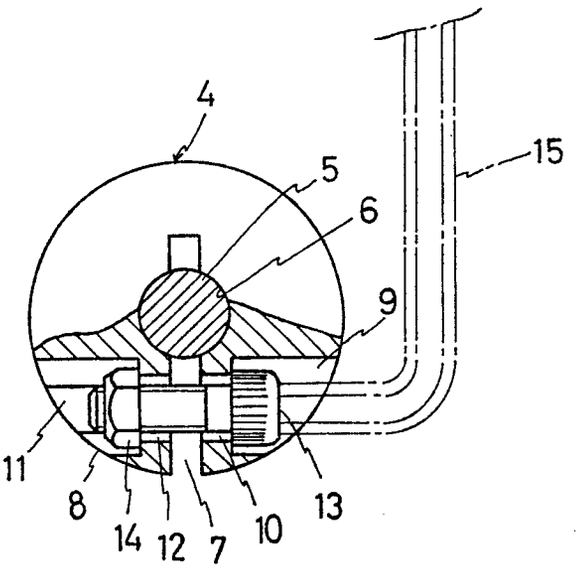


FIG. 7



INTERNATIONAL SEARCH REPORT

International Application No. PCT/JP83/00246

0115541

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[3] H01H 21/28, B23Q 5/52

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
I P C	H01H 21/28, B23Q 5/52, F16B 2/08, F16D 1/06-1/08

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho	1926 - 1982
Kokai Jitsuyo Shinan Koho	1971 - 1982

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category*	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	Nicholas P. chronis "Gear Design and Application" (1967) Mcgraw-hill Book Company (U.S.A.) P. 335	1
Y	JP,U, 48-9864 (Nagoya Gomu Kabushiki Kaisha) 3. February. 1973 (03. 02. 73) Figs. 1 to 5	1
Y	JP,Y2, 53-43505 (Matsushita Electric Works, Ltd.) 19. October. 1978 (19. 10. 78) Figs. 5, 6	1

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"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

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
October 24, 1983 (24. 10. 83)	October 31, 1983 (31. 10. 83)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
Japanese Patent Office	