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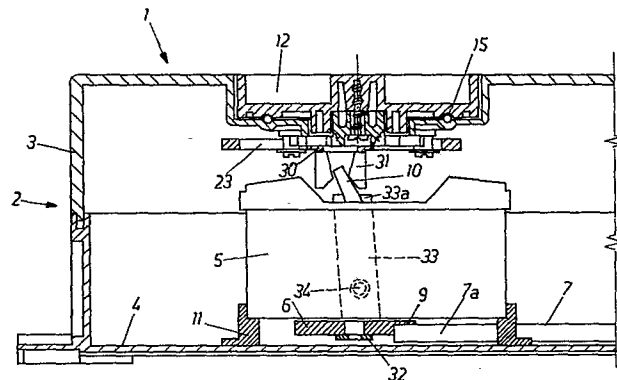
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## (54) Heavy-duty electrical outlet with mechanical interlock switch.

(57) The object of the invention is a heavy-duty electrical outlet with mechanical interlock switch, where the multipole switch consists of single-pole circuit breakers (5) placed side by side in a number to the polarity of the outlet, with the control levers (10) of these single-pole switches connected rigidly together so that a single opening and closing device can act simultaneously on these same switches, by rotation of a knob (12) installed outside the outlet casing and so that another device transforms the swinging movement of these levers (10) into the rotary movement of the disk (6) in the mechanical interlock assembly, permitting the plug to be inserted or removed only when the switch is open.



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Heavy-duty electrical outlet with mechanical interlock switch

The object of the present invention is a heavy-duty electrical outlet with mechanical interlock switch.

- Heavy-duty electrical outlets with mechanical interlock switches are known technology. These consist of a box made of an insulating material, closed by a cover, containing a multi-pole outlet facing an opening through which the plug is inserted or removed. The outlet is controlled by a multi-pole switch which can be used to apply or remove current from the outlet. This switch is housed inside the aforementioned box, and is maneuvered from the exterior by a sealed knob that extends out from the cover.
- 15 A mechanical interlock mechanism is provided for safety reasons, preventing insertion or removal of the electrical plug from the outlet with the switch closed- with, therefore, current present, and stopping the switch from being closed when the plug is absent.

- The switches used in these heavy-duty outlets are of rotary type, known as "pack switches", and consist of an axial shaft, placed perpendicular to the bottom of the box. At its top end this shaft is engaged with the control knob that extends out from the cover, and at its bottom end it carries a disk, or cam, that revolves together with the shaft. A hole is made on the face of this disk which takes on a specific angle when the switch is open.
- 5
- 10 The hole, placed in this position, permits the rear end of a bar to be inserted into it. When the bar is in this position it removes the restraint from a lever, which becomes free to swing as it is pushed by plugging in or pulling out the plug. When the plug is removed this bar remains fixed in the hole, due to an elastic mechanism,
- 15 so that it stops the switch from closing.

These electrical outlets present several problems, due to use of a rotary "pack switch".

20

One first problem is due to the fact that the pack switch is often heavy and bulky, so that its box is out of proportion to the size of the outlet, and, above all, to the nominal current levels forecast for the outlet itself.

25

- Another problem is that, because of their structure, pack switches cannot be put together at the job site, and thus the installer cannot adapt them to meet unforeseen requirements, arising both during installation and during normal maintenance. Another problem is that if one of the
- 30

components of the switch breaks down the entire switch must be removed and replaced, since on-site repair would be extremely costly. Another very important problem is that these pack switches are only manually controlled switches, so that each heavy-duty outlet also requires installation of separate multipole protection devices that intervene in case of overload, short-circuits and, often, leakage of current to ground.

- 10 All this leads to increased installation and appliance costs and to substantial bulk.

The heavy-duty electrical outlet object of the present invention has as its goal elimination of all the aforementioned problems.

This outlet is characterized by the fact that it uses, as a multi-pole switch controlling the outlet itself, a number of single-pole circuit breakers placed side by side equal to the number of outlet poles. These switches are maneuvered by swinging levers which are rigidly connected together to provide simultaneous manual control, said switches are mounted on a rail installed on the bottom of the container box, a device is provided for simultaneous maneuver of these levers using a swivelling knob that extends out from the box cover, the lever assembly is connected to the disk of the interlock mechanism so that the swinging movement of these levers is transformed into the rotaty motion of said disk, for normal operation of the interlock device.

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The use of single-pole circuit breakers gives heavy-duty electrical outlets all the technical and practical advantages these switches can offer.

5     Their limited bulk, even for very high nominal current levels, permits a reduction in both the weight and the bulk of heavy-duty outlets. Their assembly-line manufacture and relatively low cost make it advantageous for them to replace a pack switch, giving a cost savings.

10

They also permit, at the installation site, individual replacement of each circuit breaker, changes in their polarity, and changes in their number, as installation and maintenance needs dictate.

15

Another big advantage is that single-pole circuit breakers themselves constitute protective appliances that shield against current problems, leading to a drastic reduction in materials and installation costs and in bulk.

20

These and other characteristics will be seen in the description that follows of a non-limiting embodiment of the invention, illustrated in the enclosed drawings, where:

25

Figure 1 shows a partially sectioned side view of a box containing a heavy-duty electrical outlet and housing the single-pole circuit breaker assembly and the control device for these;

30

Figures 2 and 3 are exploded views illustrating the parts that compose, respectively, the control knob and

device installed for simultaneous maneuvering of the switch levers;

Figure 4 is a view from below of the assembled items in figures 2 and 3;

5 Figure 5 shows a plan of the bottom of the box, with the layout of the interlock disk;

Figure 6 is an isometric view of the lever connecting the switch control levers to the aforesaid disk, to make it rotate.

10

With reference to these figures, number 1 indicates part of a casing containing a heavy-duty outlet with mechanical interlock switch.

15 Casing 1 consists of box 2 and cover 2, which seals the box.

Housings are made on the bottom 4 of box 2, to hold an outlet appliance (not illustrated in the figures); a multi pole switch 5, electrically connected to the outlet and to  
20 the electric mains by cables which are also not illustrated, and mechanical interlock mechanism of mechanism of which we can see, in figures 1 and 5, a disk 6 and a safety bar 7, sliding but restrained within guide 8. Safety bar 7 is designed to engage one end 7a, within a slot 9 made radially  
25 in disk 6. It is also, in a known and standard manner, coupled approximately at its other end, not represented in the figure, to a lever that is pinned to the base and that can be moved, when the switch is open, by a plug as it is inserted or removed from the outlet. This outlet has also  
30 not been illustrated in the figure, because it is a known

and standard device.

In accordance with the present invention multi-pole switch  
5 consists of a number of normally modular single-pole  
circuit breakers placed side-by-side, with control lever  
10 in front. The levers of all the switches placed side-  
-by-side are rigidly connected together to permit  
simultaneous control.

10 The single-pole switches - figure 1 shows only one from  
the side, since the others are hidden by the first are  
mounted on a rail, schematized by 11, attached to bottom  
4 of box 2 by known fastening components which make up  
part of the single-pole switches themselves.

15 With reference to figures from 1 to 4, lever assembly 10  
is maneuvered by knob 12, housed in its own seat 13 and  
opening on the outer surface of cover 3. Seat 13 carries  
ring groove 14 which houses seal 15 that stops water or  
20 other undesirable elements from entering box 2. Knob 12 is  
connected to lever 10 by a coupling device that transforms  
the rotary movement of knob 12 into the swinging movement  
of lever 10.

25 This device includes flange 16, equipped with toothed  
segment 17, and which carries, at its top, a polygonal  
preferably square section head 18, which functions to  
axially engage itself in corresponding cavity 19 made in  
the base of knob 12. Head 18 is hollow, and contains  
30 tubular device 20, which in turn contains self-threading

screw 21. This, engaged in hole 22 machined coaxially in the base of knob 12, permits flange 16 to be secured to the knob itself.

5 This device also calls for a basically rectangular shaped frame 23 which carries, on two opposed sides 23a and 23b, two-by-two parallel and coaxial slots 24. Slots 24 engage with support and guide pins 25 made on the inner face of cover 2, in correspondence with seat 13 of knob 12 (fig.3).

10 The bottom section of pins 25 has a smaller cross-section than the top section, and contain a threaded hole. Fastening screws 27 and spacer washers 26 are secured in these holes. Frame 23 is installed with slots 24 facing pins 25, but fastening screws 27. In this way pins 25 furnish an axial

15 slide guide for the entire frame 23. This frame is also equipped with short rack 28, whose teeth mesh with teeth 17 of flange 16 so that, when knob 12 is rotated, a traverse movement of frame 23 will correspond to a rotary movement of flange 16.

20

Frame 23 is also equipped with a pair of raised elements 29. A cross member 30 (fig. 4) fits on these, and connects sides 23a and 23b of frame 23 together.

25

Cross member 30 has, on its bottom, at least one pair of nibs 31, placed facing each other, and designed to couple with control lever 10 of switch 5 below.

30

With reference to figures 1 and 5, and in accordance with the present invention, connection means are provided to



transform the swinging motion of lever 10 into the rotary motion of disk 6 of the mechanical interlock device.

5 In this regard note that disk 6 is installed revolving on pin 32, which is attached in an opportune position to bottom 4.

The aforementioned connection means consist of lever 33, swinging in a predetermined point on pin 34, which is  
10 housed in seat 35 machined in side wall 2a of the box.

The top end 33a of lever 33 is shaped like a yoke, folding above the switches to couple with lever 10. The bottom end 33b of lever 33 is slightly sloped towards the inside  
15 so it can engage in corresponding slot 36 machined, in a radial direction, in disk 6 of the mechanical interlock device.

As far as operation is concerned, we shall limit ourselves  
20 at this time to describing opening and closing operations of the switch assembly, operations which interact with the mechanical interlock mechanism and cause the rotation of disk 6. But we shall not go into the subject of inserting or removing a plug from the outlet, which causes the  
25 mechanical interlock mechanism to intervene, since this operation is standard and known, and is therefore not part of the present invention.

By rotating knob 12 polygonal head 18 transmits a similar  
30 movement to flange 16.

- During rotation toothed segment 17, meshing with rack 28 on frame 23, causes movement by translation of this last, which is also imparted to cross member 30. Thanks to the presence of teeth 31, which mesh with lever 10, a swinging  
5 movement of lever 10 will correspond to the movement by translation of cross member 30. Depending on the direction of rotation given to knob 12, lever 10 shall be moved in one direction or in the other, causing the switch to open or close.
- 10 Lever 33 shall simultaneously swing in one direction or the other, so that, with the switch open, cavity 9 in disk 6 will be brought to the position indicated by the full lines in figure 5, permitting insertion of the rear end of bar 7.
- 15 With the plug inserted, and the switch closed, the disk will be turned to an angle where cavity 9 is in the position indicated by the dashed lines, preventing the plug from being plugged into the outlet.
- 20 It has been seen that the use of single-pole circuit breakers, installed side-by-side, in place of a pack-type rotary switch, presents the advantages already indicated in the introduction to this description.
- 25 Naturally many structural variants and modifications can be brought to the putlet in achieving the present invention without, because of this, going beyond the limits of patent protection.

## Claims

1. Electrical outlet with mechanical interlock switch, of the type consisting of a box closed by a cover, containing  
5 a multi-pole electrical outlet facing an opening through which a plug is inserted, said outlet being controlled by a multi-pole switch controlled by a knob placed outside the cover, which switch can apply or remove electricity from the electrical outlet, a mechanical interlock device  
10 consisting of a disk or cam revolving when the switch is maneuvered and with a surface cavity that, when the switch is open, is placed facing the rear end of a bar which engages in this cavity and which, through a lever, permits the electrical plug to be inserted or removed from the outlet  
15 when the switch is open, and that stops the switch from closing when the plug is absent, characterized by the fact that, as multi-pole switch which actually controls the outlet, the device employs a number of single-pole circuit breakers placed side-by-side, equal to the number of outlet  
20 poles, controlled by their own swinging levers, with said levers rigidly connected together for simultaneous manual control, said switches being mounted on a rail made on the bottom of the container box, with a device provided for simultaneous operation of said levers using a swivelling  
25 knob that exits out from the cover of the box, with the assembly of said levers connected to the disk of the interlock device so that the swinging movement of the levers is transformed into the rotary movement of the disk, required for normal operation of the interlock device.

30

2. Electrical outlet as per claim 1, characterized by the

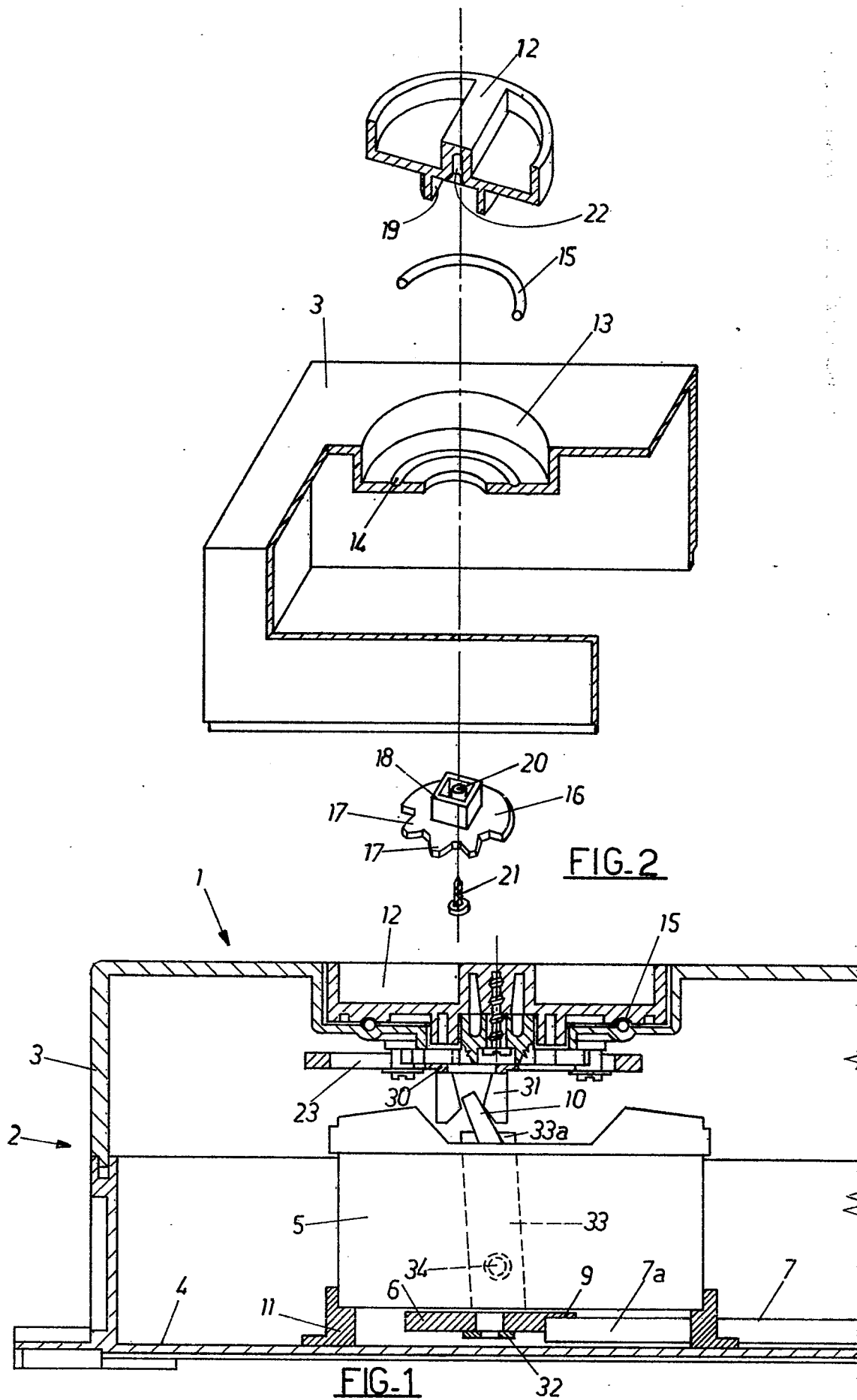
fact that the device that controls the switch control levers consists of a swivelling knob (12), housed in a sealed seat (13) and open towards the exterior, a flange (16) placed inside the cover, a toothed segment (17) placed  
5 inside the cover and revolving rigid with the knob, a small sliding frame (23) which reciprocates back and forth on the inner face of the seat (13) due to its own elongated parallel slots (24); engaged with guide pins (25), with said frame carrying a rectilinear rack (28) meshing with  
10 said toothed segment (17), so that with rotation of the knob (12) in one direction or the other, said small frame is made to move in a linear fashion in one direction or the other, plus coupling devices, including at least one pair of nibs (31), carried by a cross member on said small frame,  
15 and extending out towards the bottom, which act on the levers, rigidly connected together, of the circuit breaker assembly, so as to open or close these switches when said knob (12) is turned in one direction or in the other.

20 3. Electrical outlet as per claim 1, characterized by the fact that the connection between the levers (10) of the circuit breakers and the disk (6) of the interlock device consists of a lever (33) swinging on a central pin (34) and with its top end (33a) in the shape of a folded yoke  
25 swinging above the switches, so that it engages with at least one of said levers, and with its bottom end (33b) sloped so that it enters a cavity (36) in said disk, so that, when said levers (10) are in the switch-open position, the cavity (9) of the disk (6) is aligned with the rear  
30 end (7a) of a bar (7) that is part of the interlock device,

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so that said end can penetrate into said cavity.



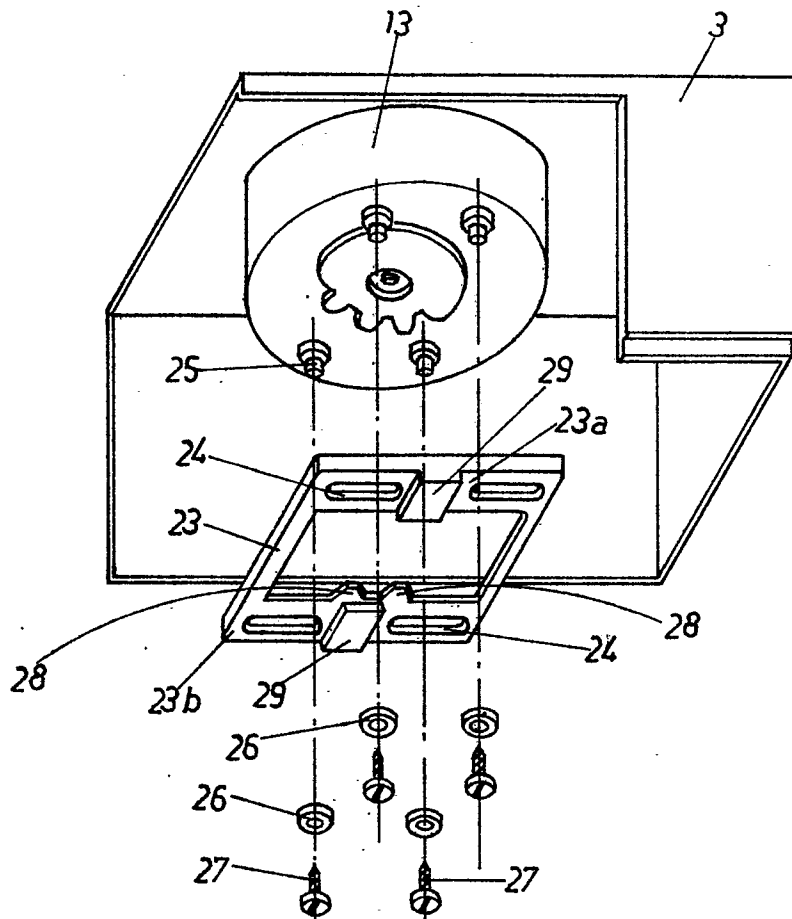


FIG. 3

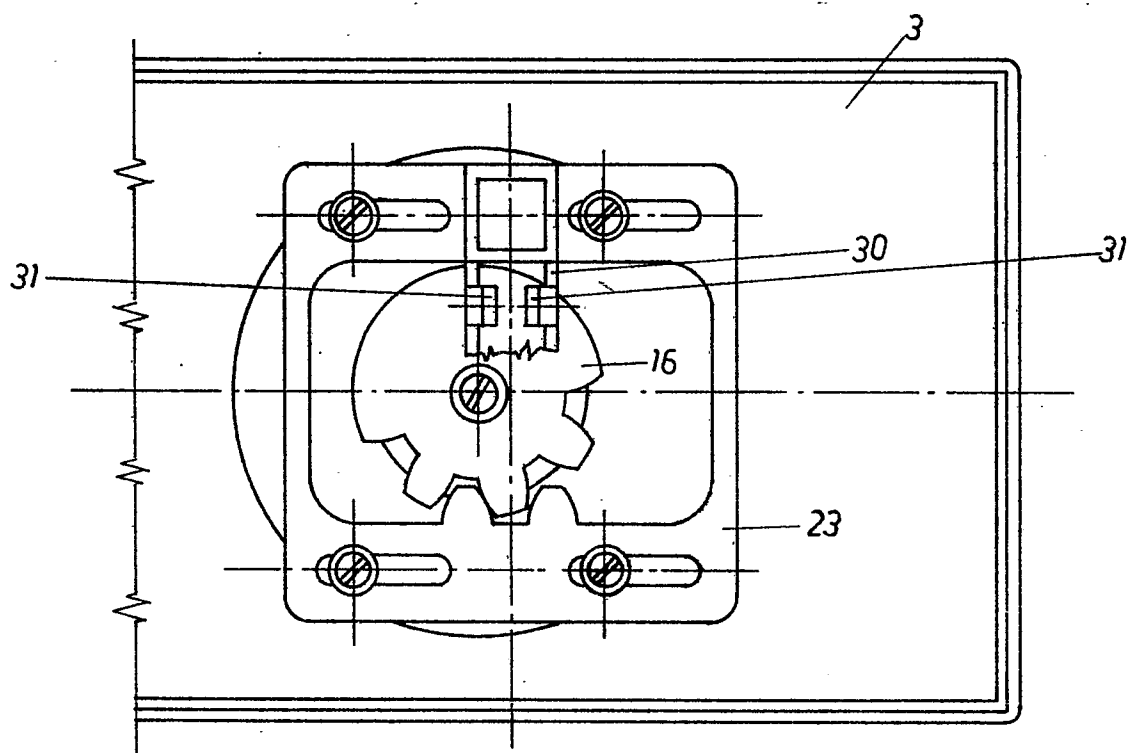


FIG. 4







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# EUROPEAN SEARCH REPORT

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Application number

EP 82 83 0102

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. <sup>3</sup> )
A	DE-A-2 924 112 (B.B.C.) * Page 6, line 28 - page 9, line 13 *	1	H 01 H 9/22 H 01 R 13/707
A	US-A-3 760 132 (WESTINGHOUSE) * Column 2, line 34 - column 3, line 56 *	1,2	
A	FR-A-1 099 129 (S.R.M.E.) * Page 1, column 2, last paragraph; page 2 *	1	
A	US-A-2 888 529 (I.T.E.) * Column 3, line 61 - column 5, line 38 *	1	
A	DE-A-1 908 187 (ELEKTRA TAILFINGEN) * Figures 3,4 *	1	<div>TECHNICAL FIELDS SEARCHED (Int. Cl. <sup>3</sup>)</div> <div>H 01 H 9/00 H 01 R 13/00</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31-08-1982	Examiner JANSSENS DE VROOM P.
<div>CATEGORY OF CITED DOCUMENTS</div> <div> 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 </div> <div> 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  &amp; : member of the same patent family, corresponding document </div>			