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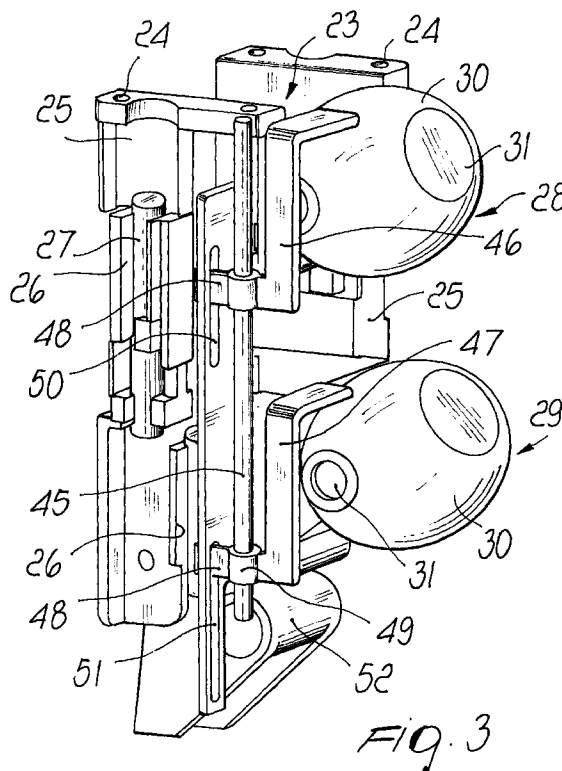
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(54) **Improved gas-accumulation Buchholz relay**

(57) A gas-accumulation Buchholz relay, which comprises, to be immersed in an oil bath, a supporting frame (23) for magnetic switches (27) for closing circuits and at least one movable device (28,29) of the float type for actuating the switches. The relay is characterized in that the float (30) is of the lever type with a rotation axis which is fixed to the frame (23) and is operatively connected to a magnet holder which acts as a counter-weight. The float (30) is articulated in its rotation with respect to the magnet holder through a given angle.



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Description

[0001] The present invention relates to an improved gas-accumulation Buchholz relay.

[0002] It is well-known that in oil-immersed transformers it is necessary to install relays of this type so that they detect and signal both the presence and the generation of gas.

[0003] The presence of gas in a transformer is in fact always associated with a malfunction, because the gas either originates from the outside through circulation pumps or is produced by the decomposition of the liquid or solid insulators inside the transformer.

[0004] This decomposition of the insulators is caused by their overheating or by the onset of electric arcs.

[0005] The Buchholz relay must be installed in the transformer below the expansion vessel, commonly known as conservator, and is filled with oil during normal operation.

[0006] Constructively, this type of relay is constituted by a body which is obtained from aluminium alloy castings inside which a supporting frame for at least one movable device is arranged; the movable device comprises a float for actuating at least one magnetic switch of a per se known type enclosed in a bulb.

[0007] Actually, Buchholz relays are usually provided with an upper float which enables and disables an alarm circuit and with a lower float which is directly connected to a disconnection circuit.

[0008] If gas forms inside the transformer, it tends to escape upward, flowing toward the expansion vessel and thus gradually accumulating inside the relay.

[0009] This accumulation of gas inside the body of the relay causes a lowering of the level of the oil that is detected by the upper float, which accordingly actuates the magnetic switch with which it is associated and by means of which the alarm circuit is closed.

[0010] If the accumulation of gas continues, inside the relay the level of the oil undergoes a further drop which is detected by the lower float, which is directly connected to the circuit for disconnection of the transformer from the power supply line.

[0011] Moreover, Buchholz relays all have a further protection which is capable of detecting strong oil currents generated, for example, by short-circuits.

[0012] This protection is constituted by a suitably adjusted flap which is sensitive to the flow-rate of the oil current and is also connected to the circuit for disconnecting the transformer from the power supply.

[0013] This type of relay is also used to signal any leaks of oil from the tank of the transformer, because in this case also the general level of the oil lowers and accordingly the floats move downward.

[0014] This lowering of the floats determines the activation of the external alarm and/or disconnection circuits connected thereto.

[0015] Furthermore, it is extremely important that the relays be capable of operating correctly in the presence

of vibrations caused by seismic activity.

[0016] For this reason, all Buchholz relays are subjected, before being marketed, to experimental tests during which they are arranged on a table shaker and, by means of a suitable tool, the test operator records the accelerations with which the alarm and disconnection circuits are closed; these accelerations are higher than the values set by standards and/or by the specifications of the users of the relays.

[0017] However, unfortunately during the starting of the transformer the relay is commonly affected by an impact due to handling operations and, due to the vibrations generated by this impact, the floats improperly close the alarm and/or disconnection circuit.

[0018] It is evident that this causes an enormous and useless waste of time for starting over with the maneuvers for starting the transformer.

[0019] The aim of the present invention is to provide a Buchholz relay which is sensitive to variations in the level of the oil and insensitive to the occurrence of vibrations due to seismic activities or maneuvers for starting the transformer, adequately acting on the alarm and/or disconnection circuits.

[0020] Within the scope of this aim, an important object of the present invention is to provide a Buchholz relay which ensures good characteristics in terms of assured intervention.

[0021] Another important object is to provide a Buchholz relay whose configuration is simpler than that of conventional types.

[0022] Another object of the present invention is to provide a Buchholz relay whose assembly and maintenance are simpler and quicker to perform with respect to conventional relays.

[0023] This aim, these objects and others which will become apparent hereinafter are achieved by a gas-accumulation Buchholz relay, which comprises, to be immersed in an oil bath, a supporting frame for magnetic switches for closing circuits and at least one movable device of the float type for actuating said switches, characterized in that said float is of the lever type with a rotation axis which is fixed to said frame and is operatively connected to a magnet holder which acts as a counterweight, said float being articulated in its rotation with respect to said magnet holder through a given angle.

[0024] Further characteristics and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment, illustrated by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a partially sectional view of a transformer provided with a Buchholz relay according to the present invention;

Figure 2 is a front view of a Buchholz relay according to the invention;

Figure 3 is a perspective view of the internal mech-

anism of the relay of Figure 2;

Figure 4 is a perspective exploded view of the mechanism shown in Figure 3;

Figure 5 is a perspective view of the details of the mechanism of the relay of Figure 2;

Figure 6 is a perspective exploded view of the details shown in Figure 5.

[0025] With reference to the above figures, an oil-filled transformer is generally designated by the reference numeral 10 and has a tank with radiators 11 above which an expansion vessel 12 of a per se known type is connected.

[0026] The transformer 10 is conventional and Figure 1 illustrates high-voltage insulators 13, an oil drain 14 and a thermometer 15 for detecting the temperature of the oil.

[0027] The transformer 10 is provided with a Buchholz relay, according to the invention, which is generally designated by the reference numeral 16 and is integrated between the transformer and the expansion vessel 12.

[0028] The relay 16 is constituted by a body 17 which is preferably hermetic and made of cast aluminum alloy and in which inspection ports 18 are defined, preferably made of tempered glass or very sturdy plastics, provided with graduated scales 19.

[0029] In the upper part, the relay 16 is provided with a cover 20 from which a cock 21 for discharging the gas and a pneumatic test valve 22 protrude.

[0030] The frame 23 is arranged inside the relay 16, is made of plastics, and is provided, in an upward region, with through holes 24 for engagement with the cover 20 by way of fixing screws which are not shown in the above figures for the sake of simplicity.

[0031] The frame 23 has, in this configuration, a mainly longitudinal structure which includes two uprights 25 in which there are seats 26 for accommodating magnetic switches 27.

[0032] Each one of said switches 27 is conventional and has, inside a bulb, a magnet and electric contacts, not shown in the figures, which are directly connected to an alarm circuit and/or to a disconnection circuit.

[0033] An upper movable device 28 and an equivalent lower movable device 29 are fixed to the frame 23.

[0034] Each one of the movable devices 28 and 29 comprises a float 30 of the lever type, which has a substantially ovoid structure in which there are flat regions 31 and from which an arm 32 protrudes starting from a longitudinal band of the float 30.

[0035] First and second elastic curved wings 34a and 34b protrude from said arm 32 and define, as a whole, a semitubular profile 33.

[0036] In particular, the first wing 34a is shorter than the second wing 34b, so as to form, together with the second wing and at each end, a seat 35 which covers a reduced angle in cross-section.

[0037] A pivot 36 is inserted in the semitubular profile 33 and is appropriately shaped complementarily to the

wings 34a and 34b.

[0038] A radial extension 36a protrudes at each end from said pivot 36, which constitutes the rotation axis for the float 30; a magnet holder 37 is associated with the radial extension, parallel to the pivot 36, has a substantially tubular configuration and is provided, at its two ends, with elastic teeth 38.

[0039] Pivot 36 is adapted to be inserted in the semitubular profile 33 between the wings 34a and 34b, so that each extension 36a is arranged at the seat 35.

[0040] A counterweight 39 can be inserted in the magnet holder 37 and has a cylindrical structure; said counterweight is to be arranged in a central position and in contact, at its two ends, with a first magnet and a second magnet which are respectively designated by the reference numerals 40 and 41 and preferably have a tablet-like structure.

[0041] The counterweight 39 is preferably made of brass.

[0042] The first and second magnets 40 and 41 and said counterweight 39 are retained in the magnet holder 37 by way of the snap-on retention provided by the teeth 38 and optionally by way of the presence of a suitable adhesive.

[0043] First and second guides 42 and 43 are provided in the uprights 25 of the frame 23, respectively in the upper and median parts of the frame 23; the complementarily shaped ends of the pivot 36 of each one of the upper and lower movable devices 28 and 29 can slide along said guides.

[0044] Each one of the guides 42 and 43 has, in the innermost end portion of its extension, a seat 44 adapted to accommodate the end of the pivot 36 of each one of the movable devices 28 and 29.

[0045] The movable devices are therefore assembled to the frame 23 by snap action after moving along the guides 42 or 43 with the ends of the pivot 36 for insertion and consequent locking in the seats 44.

[0046] The Buchholz relay 16 is also provided with a rod-like element 45 which is associated with one of the uprights 25 of the frame 23 and whose upper end is accessible to a user by way of an adapted spring-loaded push-button, which is not shown in the above-cited figures for the sake of simplicity.

[0047] An upper lever 46 and a lower lever 47 are associated with the rod-like element 45; each lever is L-shaped and has, at its engagement end, a tab 48 which is monolithic with a ring 49 inside which said rod-like element 45 is inserted substantially without play.

[0048] Each lever 46 and 47 can slide along the rod-like element 45 along the path determined respectively by an upper guide 50 and by a lower guide 51, both of which are formed in the upright 25; the tabs 48 of the levers 46 and 47 move along the guides.

[0049] The levers are required by the relay 16 respectively to mechanically test the alarm circuit, which is associated with the upper movable device 28, and the disconnection circuit, which is associated with the lower

movable device 29.

[0050] By actuating the rod-like element 45, with which said two levers 46 and 47 are associated, it is in fact possible to push down the floats 30 in order to mechanically check the closure of the alarm and disconnection circuits.

[0051] Relay 16 also has a flap 52, of a per se known type, which is associated with the frame 23 below the lower movable device 29 and is adapted to detect any presence of strong oil currents inside the relay 16.

[0052] The operation of the Buchholz relay 16 described with the present invention is extremely simple, since the lever-type floats 30 of the upper and lower movable devices 28 and 29 follow the level of the oil, moving down and up as a function of said level.

[0053] In particular, each float 30, in following the level variations of the oil, rotates with respect to the pivot 36, but by way of the coupling of the two extensions 36a in the seats 35 formed in the semitubular profile 33 by the wings 34a and 34b it is partially articulated with respect to the magnet holder 37, i.e., it has a certain play.

[0054] Said play is determined by the breadth of the angle that the float 30 can move through without transmitting its motion to the two extensions 36a and accordingly to the magnet holder 37.

[0055] When contact is established between the float 30 of a movable device 28 and 29 and the corresponding magnet holder 37, the magnet holder, by rigidly following the float 30 in its rotation, in fact moves with respect to the frame 23 and so do the first and second magnets 40 and 41 with it.

[0056] The movement of the first and second magnets 40 and 41 determines an interaction with the magnets contained in the bulb of the switches 27, causing, due to consequent movements between the electric contacts enclosed in the bulb, the closure of the alarm or disconnection circuit connected thereto.

[0057] In this manner, the maximum extent of the play that can occur between the lever-type float 30 and the corresponding magnet holder 37 determines the degree of sensitivity of the relay 16 to vibrations.

[0058] It is evident that the adjustment of this angle must be studied carefully in order to make the relay 16 conveniently immune to vibrations caused by the operations for starrng the transformer 10 and to the vibrations generated by seismic activity or by other phenomena.

[0059] In practice it has been observed that the present invention widely achieves the intended aim and all the objects.

[0060] An important advantage has in fact been achieved with the present invention in that a Buchholz-type gas accumulation relay has been devised which is capable of ensuring different sensitivity depending on the speed of the oil flow whereto it is subjected, thus ensuring higher operating reliability.

[0061] Another advantage is achieved by the present invention in that a Buchholz relay has been provided which has a simple structural configuration.

[0062] Another important advantage is achieved considering that the present invention provides a relay whose assembly can be easily achieved more simply and quickly than in conventional types.

[0063] The present invention is susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept.

[0064] All the details may furthermore be replaced with other technically equivalent elements.

[0065] The materials employed, so long as they are compatible with the contingent use, may also be any according to requirements.

[0066] The disclosures in Italian Patent Application No. PD98A000061 from which this application claims priority are incorporated herein by reference.

[0067] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A gas-accumulation Buchholz relay, which comprises, to be immersed in an oil bath, a supporting frame for magnetic switches for closing circuits and at least one movable device of the float type for actuating said switches, characterized in that said float is of the lever type with a rotation axis which is fixed to said frame and is operatively connected to a magnet holder which acts as a counterweight, said float being articulated in its rotation with respect to said magnet holder through a given angle.
2. The relay according to claim 1, characterized in that an arm protrudes from said float and is provided with a semitubular profile in which a pivot can be coupled, said pivot being fixed to said frame by way of its ends and being rigidly associated with said magnet holder.
3. The relay according to claim 2, characterized in that said semitubular profile is constituted by two arc-like wings which form a seat which is shaped complementarily to said pivot, one of said wings being shorter than the other so as to form at least one seat whose angle in cross-section is reduced with respect to the remaining part of the semitubular profile, at least one extension protruding radially from said pivot in order to associate said pivot and said magnet holder, said pivot being inserted in said semitubular profile so that said extension is located at said seat.
4. The relay according to claim 3, characterized in that

said float is articulated with respect to said magnet holder by an angle which is determined by the difference between the angle covered by said seat formed in the semitubular profile and the width of said extension.

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5. The relay according to claim 1, characterized in that said magnet holder has a tubular extension which internally contains a counterweight and, at least at one end, a magnet for actuating a corresponding one of said switches.

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6. The relay according to claim 2, characterized in that mutually opposite guides are provided on said frame for the sliding of the ends of said pivot, each guide ending with a seat for the snap insertion of the end of said pivot.

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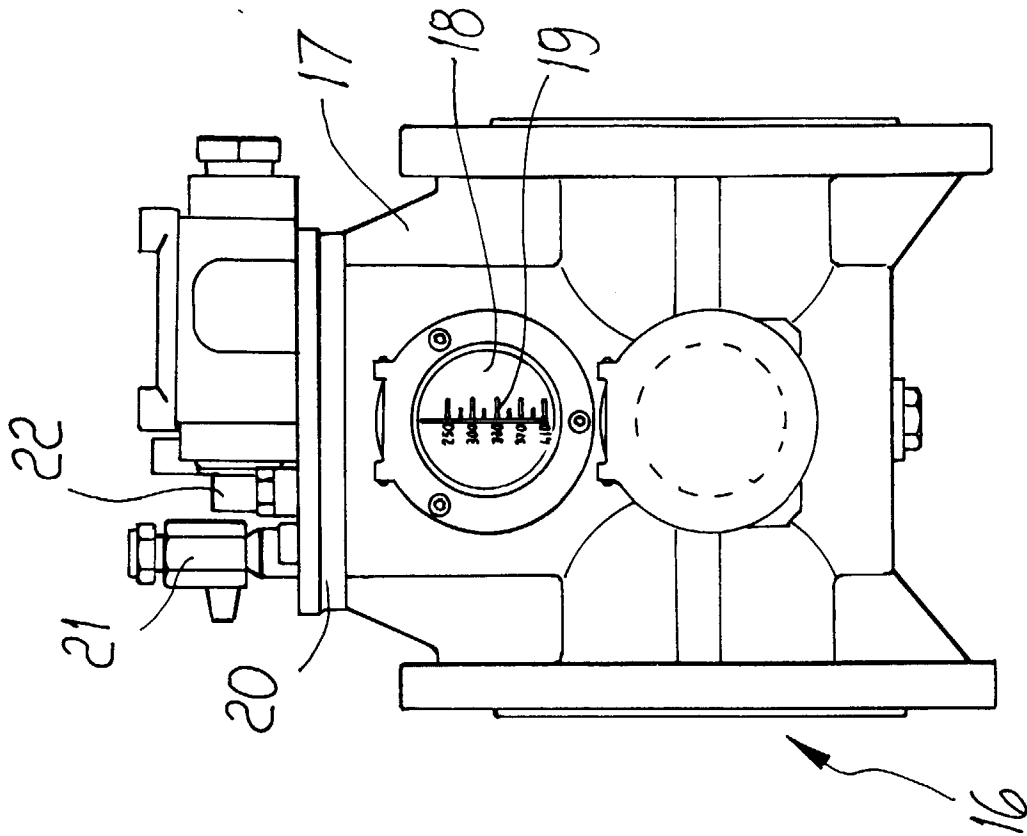


Fig. 2

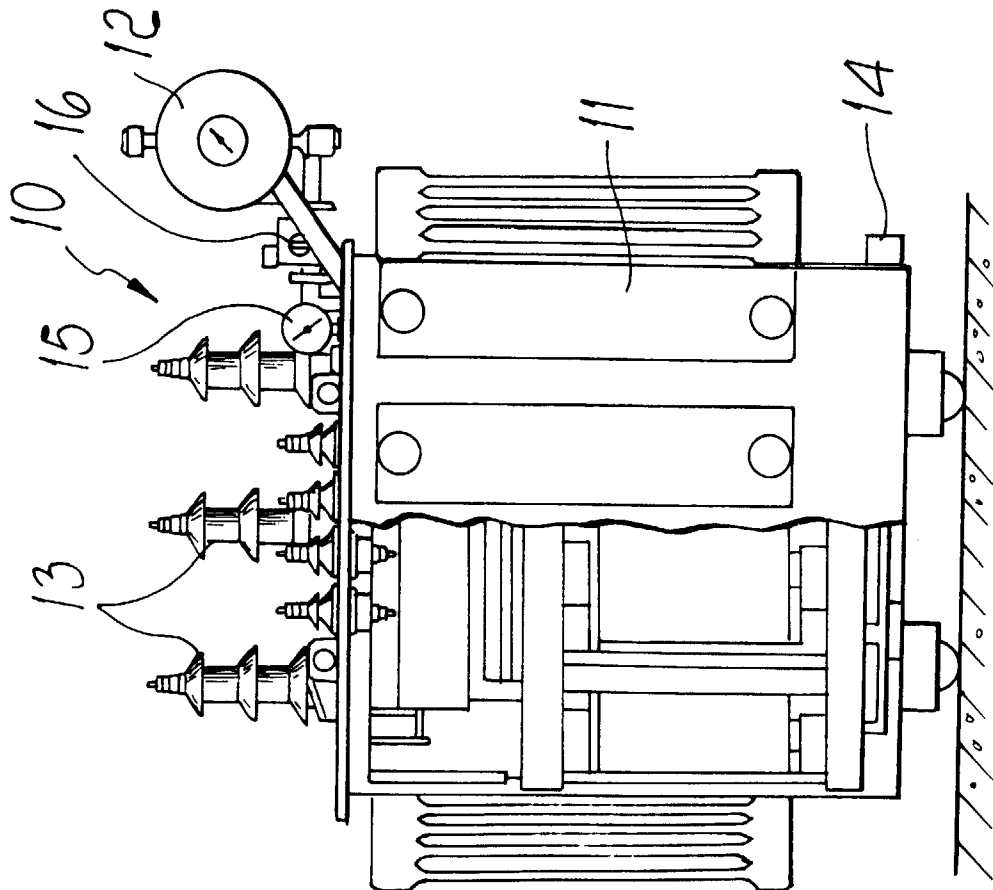
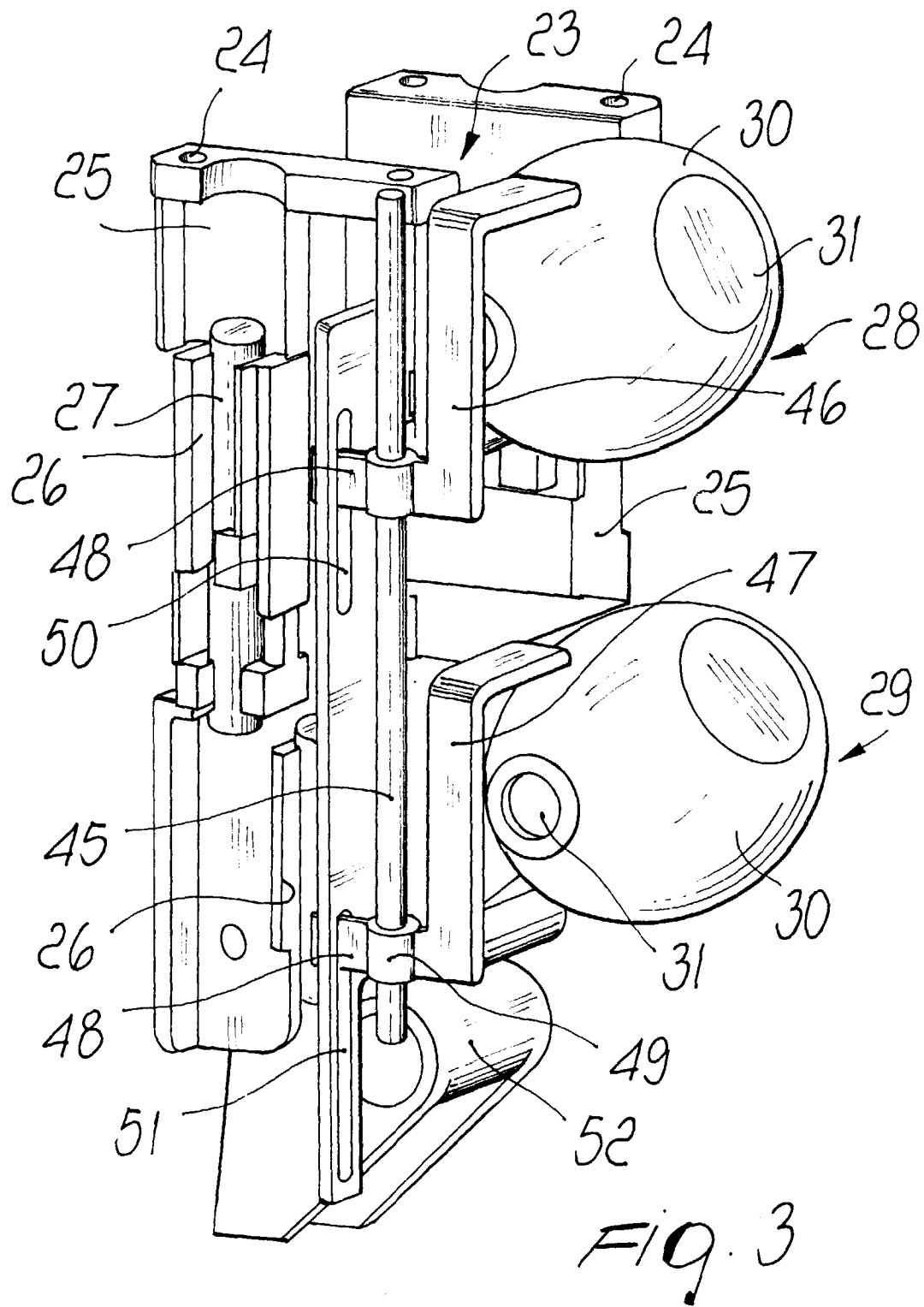


Fig. 1



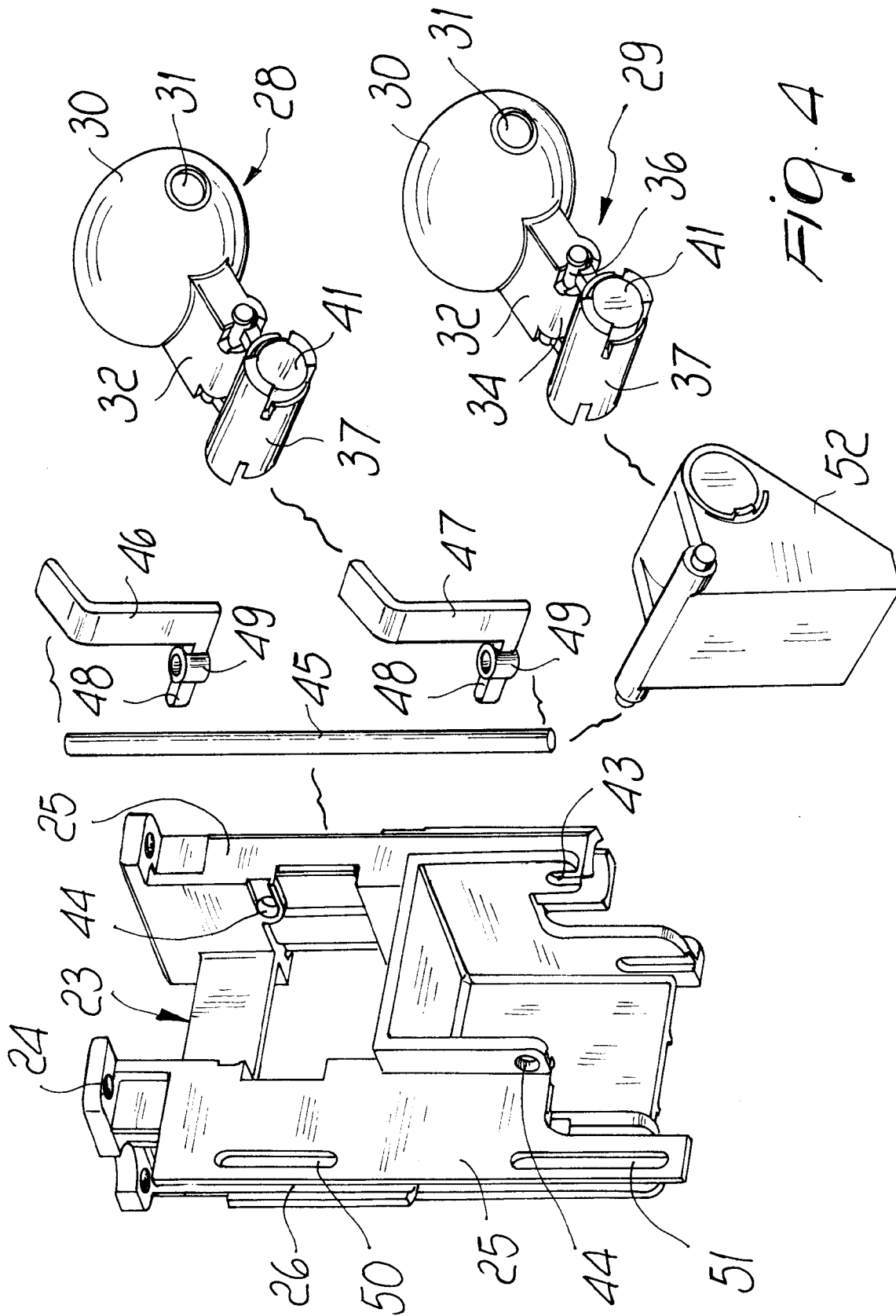


Fig. 4

